R·I·T

Courses 1988-89

Rochester Institute of Technology • Rochester, New York

RIT

Vol.4 No. 3 May 13,1988

RIT (USPS 676-870) is published thirteen times annually by Rochester Institute of Technology, One Lomb Memorial Drive, P.O. Box 9887, Rochester, N.Y. 14623, five times in May, once in June, four times in July, and three times in August. Second-class postage paid at Rochester, N. Y. *Postmaster:* Send address changes to *RIT,* Rochester Institute of Technology, One Lomb Memorial Drive, P.O. Box 9887, Rochester, N. Y. 14623.

Course Numbering

In addition to its tide, each course is identified by two numbers. The alpha-numeric directly to the left of the course tide is the official Institute course number. The number will appear on the grade report, transcripts, and other official correspondence. This is what the alpha-numeric means.

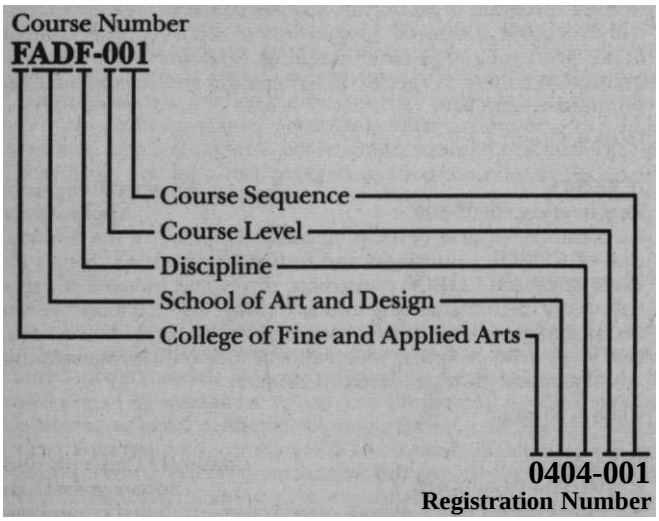
First letter: College offering the course

Second and third letters: School or department of that college

Fourth letter: Discipline

First number: Course level: O-Non-credit; 1-Diploma; 2 or 3-Lower level degree courses; 4, 5, or 6-Upper level undergraduate degree courses; 7 or 8-Courses for graduate credit.

Second and third numbers: Course differentiation and sequencing



Direcdy below the alpha-numeric in the course description is the registration number. You must use this number with a section number (i.e. 01, 02) when you register for a course, because the alpha-numeric course number cannot be read by the computer system.

Course prerequisites are shown in parentheses after course descriptions.

Course of Study 1988-1989

Produced by RIT Communications

Rochester Institute of Technology
Office of Admissions
One Lomb Memorial Drive
P.O. Box 9887
Rochester, NY **14623**
(716) 475-6631

This book represents the best academic planning at the time of publication. Course and curriculum changes sometimes occur after the book has been printed, and for this reason Rochester Institute of Technology does not assume a contractual obligation with its students for the contents of this publication.

For information about the colleges and programs at the undergraduate level, please refer to the Undergraduate Bulletin; for farther information about the colleges and programs at the graduate level, please request the Graduate Bulletin from:

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or telephone (716) 475-6631

Table of Contents

In this catalog you will find course descriptions for all course offerings given by the colleges, schools and departments of the Institute for the undergraduate or graduate credit. The listing does not include courses specifically for students of the National Technical Institute for the Deaf. These are described in a separate NTID catalog.

College of Applied Science and Technology

School of Computer Science

School of Computer Science courses are normally offered at least once annually.

Department of Applied Computer Studies

Courses are offered by the Department of Applied Computer Studies for students who are enrolled in one of the programs within the department and for students who are enrolled in other departments in the Institute.

Undergraduate Courses

ICSA-200 **Survey of Computer Science**
Registration #0602-200
An introduction to the field of computer science and technology for non-majors, serving as a basic literacy course and as a first course in the computer science minor sequence. Topics include an introduction to Pascal, the use of Pascal as a vehicle for the design and implementation of simple programs, basic computer organization concepts, and problem solving with computer software. Programming projects will be required.

Class 4, Credit 4

ICSA-205 **Computer Techniques**
Registration #0602-205
Students will be introduced to computer systems, learn problem solving techniques, and have an opportunity to study the FORTRAN programming language. Topics available for study include straightline programming, decision and repetition capabilities, formatted input/output, data structuring, and the use of subprograms. Programming projects will be required.

Class 3, Credit 3

ICSA-208 **Introduction to Programming**
Registration #0602-208
A continuation of the technical topics begun in ICSS-200, with emphasis on advanced features of Pascal and their use in implementing modular, well-documented programs. Topics include an overview of problem solving methods, Pascal control structures and their uses, procedures and functions with parameters, elementary data types, arrays, records, and modular programming. The course is organized around weekly programming assignments that stress features of structured programming and Pascal. The assignments may be completed faster than the required rate of one per week. Programming projects will be required. (ICSA-200 or equivalent)

Class 4, Credit 4

ICSA-210 **Program Design and**
Registration #0602-210 **Validation**
A third course in programming and data structures, where students use Pascal to implement moderately large programs. Topics include sorting, searching, arrays of records/text files, files of records, multidimensional arrays, recursion, pointers, classic data structures and their implementations (stacks, queues, linked lists, trees), and the application of these concepts to solve problems of intermediate complexity. The role of testing in the validation and acceptance of a program will be stressed. Programming projects will be required. (ICSA-208)

Class 4, Credit 4

ICSA-220 **FORTRAN Programming for**
Registration #0602-220 **Engineers**
Students will be introduced to computer systems, learn problem solving techniques, and have an opportunity to study the FORTRAN programming language. Topics available for study include straightline programming, decision and repetition capabilities formatted input/output, data structuring, use of subprograms, and application packages (e.g., plotter routines and the IMSL package). Several classical numerical techniques are illustrated. Programming projects will be required.

Class 4, Credit 4

ICSA-300 **Business Applications Using**
Registration #0602-300 **COBOL**
A study of elementary COBOL programming, using structured design and programming concepts developed in ICSP-210. The course will emphasize the use of COBOL in solving common business, commercial, and managerial problems. Topics include COBOL program organization, sequential file I/O, COBOL control structures, arithmetic operations and report editing, control break processing, and table handling. Students will write programs that adhere to specific programming and documentation standards. (ICSA-210)

Class 4, Credit 4

ICSA-303 **Advanced Business**
Registration #0602-303 **Applications**
An advanced course developing more expertise in the application of COBOL to business and industrial problems. Topics include advanced COBOL constructs, direct and indexed sequential access methods, sorting and searching, and database system access using commands embedded in the COBOL source. Students will write programs which adhere to specific programming and documentation standards. (ICSA-300)

Class 4, Credit 4

ICSA-410 **Computer Concepts and**
Registration #0602-410 **Software Systems**
An introduction to the overall organization of digital computers and operating systems for non-majors. Topics include basic machine organization, an overview of machine and assembly language, properties of common I/O devices, synchronization and scheduling of processes, physical and virtual memory management techniques, resource allocation and protection, and user interface issues. (ICSA-210)

Class 4, Credit 4

ICSA-411 **Data Communications and**
Registration #0602-411 **Computer Networks**
An introduction to data communications hardware and software, and use of these components in computer networks. Topics include communication system components, communications software, packet switching, network control, common carrier issues, long-haul vs. local area networks, and performance considerations. (ICSA-210)

Class 4, Credit 4

ICSA-483 **Applied Database**
Registration #0602-483 **Management**
An introduction to issues in data management in organizations, and the role of database management systems in addressing these issues. Topics include the uses and needs for data in organizations, review of simple data structures, the influence of computer architecture and I/O devices on the management of data, basic file organizations supporting data management (sequential, direct access, indexed sequential), logical data models and their physical implementation, database administration, and DBMS selection. (ICSA-300 or permission of instructor)

Class 4, Credit 4

ICSA-590 **Seminar in Applied**
Registration #0602-590 **Computer Studies**
Current topics and advances in applications of computer technology for undergraduate students. (Permission of instructor)

Credit variable 2-4

ICSA-599 **Independent Study**
Registration #0602-599
Faculty directed study of appropriate topics on a tutorial basis. This course may be used by an undergraduate student to study particular applications of computers that are not covered in depth in other courses. (Permission of instructor)

Credit variable 2-4

Graduate Courses

ICSA-700 **Computer Programming and**
Registration #0602-700 **Problem Solving**
An introductory course in the use of computers, interactive environments, file systems, editor. Programming in a modern software development environment with a structured programming language such as Pascal or Ada, covering: control structures, procedures and functions, recursion, arrays, pointers, file I/O, records. Application areas coven numerical methods, sorting and searching, graphics, text processing. Programming projects will be required. (Pre-calculus)

Credit 4

ICSA-701 **Programming I**
Registration #0602-701
Fundamentals of computer programming and problem solving using a modern software development environment and a structured programming language (Pascal or Ada). Introduction to and use of an interactive editor and file system. Applications in business, science, mathematics, engineering, education, systems programming, and graphics will be covered. Techniques will be introduced for data representation and structuring, sorting, and searching. Programming projects will be required. (Computer literacy, pre-calculus; discrete math is a corequisite.)

Credit 8

ICSA-702 **Programming II**
Registration #0602-702
The concept of computer programming at various levels of application. At a lower level is a macro assembly language. At a higher level, a new language—APL, Snobol, etc. Combining program segments written in assembly language with segments in a known high-level language. Modern programming practices, tools and techniques from the point of view of the software life-cycle: specification, design and prototyping, coding and verification, integration, and maintenance. A study of a programming language (e.g., ADA) and a software engineering environment (e.g., Unix) that supports these programming practices. Programming projects will be required. (ICSA-701 or equivalent)

Credit 8

ICSA-703 **Algorithms and Data**
Registration #0602-703 **Structures**
Topics include data abstraction, data representation, data structures, such as linked lists, trees, stacks, queues, hash tables, sparse matrix techniques, searching and sorting techniques, file structure and maintenance. Programming projects will be required. (Programming proficiency in some high-level structured programming language, discrete mathematics)

Credit 4

ICSA-704 **Assembly Language**
Registration #0602-704 **Programming**
Introductory computer architecture (von Neumann machine): addressing methods—direct, indirect, immediate, absolute, indexing, base register, etc.; operations-machine instructions, directives or pseudo-operations, and macros; representing program paradigms in assembler language—decisions, loops, subroutines, arrays, links, etc.; assembly language program design techniques; macro definitions and use; libraries. Programming projects will be required. (ICSA-700, 701 or a programming proficiency in some high-level language.)

Credit 4

ICSA-705 **Discrete Computational**
Registration #0602-705 **Structures**
The fundamental concepts of discrete mathematics which are necessary for understanding the mathematical foundations of computer science. Topics include: structures defined on countable sets elementary symbolic logic, patterns of mathematical proof, vectors and matrices, graphs and networks, combinatorics, formal languages, abstract mathematical systems. The relevance of the chosen topics to Computer Science and the applications of computers to these topics are stressed. (College algebra, computer literacy)

Credit 4

ICSA-706 **General-Purpose Software Tools**
Registration #0602-706
In this course students will be introduced to computers and problem solving by learning to use general-purpose application software. Students will use a variety of general-purpose software tools such as a spreadsheet, data base package, outline and word processors, and graphics software to complete a series of required projects. Emphasis is on using software for personal productivity and to enhance effectiveness and communication. Required projects will utilize packages individually and in an integrated fashion. (Graduate Standing)

Class 4, Credit 4

ICSA-707 **Advanced Programming**
Registration #0602-707
An introductory course in the life-cycle issues of large and single/multi-programmer programs. Structured and modular programming, data abstraction and information hiding. The Chief programmer concept. Specific focus on modern programming practices (specification, design and prototyping, coding and verification, integration and maintenance) and tools (software engineering environments such as Unix and software engineering languages such as ADA). Programming projects will be required. (ICSA-703)

Credit 4

ICSA-708 **Computer Organization and**
Registration #0602-708 **Programming**
An introduction to the basic concepts and terminology of hardware and software systems. Basic hardware is elementary circuit design-gates, Boolean algebra, simple combinational circuits (adders, decoders, multiplexers) and simple sequential circuits (various flip-flops, registers, serial adders, counters). The Operating System as the major software providing a "virtual" interface—virtual memory (paging, segmentation, etc.), file systems, multiprogramming, traps and interrupts, etc. The intent of this course is to prepare the student for future courses in computer architecture and operating systems. Programming projects will be required. (ICSA-704, ICSA703)

Credit 4

ICSA-709 Fundamentals of Computer Hardware
Registration #0602-709
A study of the concepts of computer hardware design and organization needed for effective computer software design and system implementation. Topics include computer peripherals and interfacing techniques; Boolean algebra; digital logic design; integrated circuit logic families; central processing unit design; microprogramming, buses and addressing; interrupts and direct memory access; hierarchical memories; system performance evaluation; and a survey of commercially available computers. (ICSA-700, ICSA-703)

Class 4, Credit 4

ICSA-720 Principles of Data Management
Registration #0602-720
Introduction to topics in analysis and design of data representations. This includes external data structuring for sorting and searching applications, file structures: Sequential, Indexed, Random, and Inverted, and data base concepts: views, architectures, normalization, and data manipulation. Programming projects will be required. (ICSA-700, ICSA-703, ICSA-709)

Class 4, Credit 4

ICSA-725 Principles of Distributed Systems
Registration #0602-725
Introduction to data communications, transmission, terminal handling, fundamentals of networking, high-level protocols, local networks. Issues in control of distributed systems. Communicating sequential processes, concurrency, redundancy, reliability. (ICSA-700, 703)

Class 4, Credit 4

ICSA-820 Software Engineering Concepts
Registration #0602-820
An introduction to the field of software engineering. The overview encompasses analysis and design methodologies and techniques, programming design languages, software project management principles, and quality assurance and control. (ICSA-700, 703, 709, BBUQ-740, 781, BBUA-703)

Class 4, Credit 4

ICSA-821 Analysis and Design Techniques
Registration #0602-821
An examination of current methodology and techniques in systems analysis and design. Methodologies covered include those of Yourdon, Warnier, and Jackson. Students will be required to demonstrate a practical mastery of a combination of several of the techniques that are presented. Application areas will include traditional information systems, distributed systems, and real-time systems. (ICSA-720, 725, 820)

Class 4, Credit 4

ICSA-823 Program Design and Implementation
Registration #0602-823
Presents techniques for developing, expressing and implementing program and systems designs. Emphasis is placed on the use of formal tools in the production of correct and reliable programs. Application areas will'include traditional information systems, distributed systems and real-time systems. An introduction to formal proofs of program correctness is included. Course work is expressed in a program design language and implemented in a modern programming language such as ADA, MODULA-2 or MESA as part of a team effort. Programming projects will be required. (ICSA-821)

Class 4, Credit 4

ICSA-830 Software Project Management
Registration #0602-830
An examination of the organizational, managerial and technical aspects of software development. Examines the use of models and software metrics in the following areas: cost estimation and manpower allocation, evaluation of alternative designs, implementation measures, and test management. Other topics include: configuration management, reviews, and inspections, management and control of the maintenance process. (BBUQ-744)

Class 4, Credit 4

ICSA-835 Program Testing and Reliability
Registration #0602-835
Topics covered include testing schemes (black-box, white-box), integration schemes, validation testing, graphic analysis. Reliability models (seeding, hazard) are covered. Software maintenance techniques and tools are covered. (ICSA-820)

Class 4, Credit 4

ICSA-890 Graduate Seminar in Applied Computer Studies
Registration #0602-890
Current topics and advances in applications of computer technology for graduate students. (Permission of instructor)

Credit variable 2-4

ICSA-894 Software Project Laboratory
Registration #0602-894
Within a controlled laboratory environment small student teams work on a never-ending software development project. Emphasis is placed on the use of good software engineering practice to achieve product continuity and integrity. Students will make presentations of results. (ICSA-823, 830, 835)

Class 2, Lab 4, Credit 4

ICSA-895 Software Engineering Project
Registration #0602-895
Under faculty supervision, student teams participate in an industry-sponsored software development project. The project will apply the knowledge and technology mastered in all previous software engineering course work and laboratories. (ICSA-823, 830,835)

Class 4, Credit 4

ICSA-899 Independent Study
Registration #0602-899
Faculty directed study of appropriate topics to a tutorial basis. This course may be used by a graduate student to study particular applications of computers that are not covered in depth in other courses. (Permission of instructor)

Credit variable 2-4

Computer Science Courses

Computer science courses may be taken as computer science electives except as noted.

ICSP-241 Programming I Algorithmic Structures
Registration #0601-241
An introduction to programming emphasizing the development and documentation of modular computer-based algorithms. A structured procedural programming language (e.g., Modula -2) is used to demonstrate modern programming principles. Topics include variables, expressions and assignment, control structures (sequencing, selection and repetition), modularity via modules, procedures and functions, parameter mechanisms, recursion, one- and two-dimensional arrays, and identifier scope in block structured languages. Programming assignments are an integral part of the course.

Class 4, Credit 4

ICSP-242 Programming II
Registration #0601-242 Data Structures
An introduction to the basic data structures used in computer applications. Both abstract concepts and implementation details will be discussed, including comparisons of alternative implementations. Topics include arrays, records, pointers, dynamic storage allocation, linked lists, stacks, queues, and trees. Programming projects are required. (ICSP-241)

Class 4, Credit 4

ICSP-243 Programming III Design
Registration #0601-243 and Implementation
A first course on the design and implementation of moderately large single-programmer systems. Modern principles of design and testing will be presented in class and reinforced by programming assignments. The importance of both internal and external program documentation will be stresssed. Topics include top-down design, stepwise refinement, test data selection, modularity measures (cohesion and coupling), common programming paradigms, and advanced file I/O. Programming projects are required. (ICSP-305)

Class 4, Credit 4

ICSP-305 Assembly Language
Registration #0601-305 Programming
A study of assembly language concepts and programming methods, including computer organization, assembly process, addressing, binary arithmetic, relocatability, storage allocation, subroutine linkage, looping and address modification, character manipulation, bit manipulation, floating point arithmetic, decimal instructions, some I/O, macros and debugging techniques. Programming projects will be required. (ICSP-242)

Class 4, Credit 4

ICSP-306 Systems Programming
Registration #0601-306 Fundamentals
A study of systems programming concepts and techniques. Topics include the roles of assembly languages, systems implementation languages, systems macros and supervisor calls, program linkage, reentrant and recursive subroutines, I/O programming at the device level, macros and conditional assembly. Programming projects will be required. (ICSS-325)

Class 4, Credit 4

ICSP-307 Business Applications
Registration #0601-307 Programming
An introduction to the concepts and techniques relevant to the business programming environment. Structured COBOL is used to solve common business application problems, including report generation, sorting and table processing and generation, and complex I/O processing. Project management, programming teams, and the module stubs for prototype development are used in the course. Programming projects will be required. (ICSS-325)

Class 4, Credit 4

ICSP-309 C Programming
Registration #0601-309
This course is an introduction to the C language for programmers already familiar with a high-level language and an assembly language. Topics include: data types and data structures, control structures, I/O, pointers, program design and maintenance, programming techniques, and interfacing with assembly language. (ICSP-305 cannot be taken for credit if credit has been given for ICSP-306)

Class 1, Credit 1

ICSP-319 Scientific Applications
Registration #0601-319 Programming
An introduction to classical algorithms used in the solution of numerical problems encountered in science and engineering. The FORTRAN and APL languages will be introduced as tools for implementing these algorithms. Topics include an introduction to FORTRAN and APL, algorithms for finding roots of equations, solutions to systems of equations, general matrix manipulation. Programming projects will be required. (ICSS-325)

Class 4, Credit 4

ICSP-450 Programming Language
Registration #0601-450 Concepts
A study of the syntax and semantics of a diverse set of high-level programming languages. The languages chosen are compared and contrasted in order to demonstrate general principles of programming language design. The course emphasizes the concepts underpinning modern languages, rather than the mastery of particular language details. Programming projects will be required. (ICSS-325)

Class 4, Credit 4

ICSP-488 Programming Systems
Registration #0601-488 Workshop
A workshop for the application of systems analysis, specification, design, implementation, and documentation techniques. Students will work in teams to solve specific problems. While working toward a solution of their problems, students will practice requirements analysis, system specification, data modeling, design specification, implementation, documentation, project management, quality assurance and software testing. Programming projects will be required. (ICSS-435, ICSS-485)

Class 4, Credit 4

ICSA-499 Cooperative Education
Registration #0602-499

One quarter of appropriate work experience in industry.

Credit 0

ICSS-202 Introduction to
Registration #0603-202 Computer Science
An introduction to the field of computer science. Topics include computer representation of information, integer (binary and decimal) and floating point arithmetic, logical operations, character codes, and an introduction to machine language and assembly language. The role of operating systems, compilers, and other software components will be surveyed.

Class 4, Credit 4

ICSS-315 Digital Computer
Registration #0603-315 Organization
An introduction to computer architecture and implementation. Topics include Boolean algebra, combinatorial and sequential circuit design, flip-flops and adders, storage mechanisms and their organization, instruction fetching, decoding, and execution in a simple CPU, microprogramming, inputyoutput subsystems, and interrupts. The laboratory experiments introduce elementary integrated circuit building blocks including gates, flip-flops, registers, counters and elementary sequential circuits. (ICSP-305)

Class 3, Lab 2, Credit 4

ICSS-325 Data Organization
Registration #0603-325 and Management
A course on the considerations associated with the external storage of data. Topics include file organization (sequential, indexed and direct access), secondary storage devices, an introduction to external sorting and searching, and the basics of database organization, and management. Programming projects will be required. (ICSP-243 or ICSS-360)

Class 4, Credit 4

ICSS-355 **The Human Side of Computers**
Registration #0603-355
The impact of computer systems on society is studied via class discussion, lectures, and films. Current topics such as the following are covered: the impact of computers on employment, automation and the labor force; overview of computer applications in government; innovative medical applications; robots in industry; office automation; computers in education and computer assisted instruction issues, privacy and the Freedom of Information Act; computer abuses and crime—the impact on law enforcement; the future—a cashless society; universal identifiers, computers in the home. Participants will develop several short discussion papers and a major study in one of the course topics. (ICSA-200 or ICSP-241)

Class 4, Credit 4

ICSS-360 **Fundamentals of Computer Science for Transfer Students**
Registration #0603-360
This course covers selected topics from ICSP-241, 242 and 243, and introduces students to the Unix operating system, the Modula-2 programming language, and concepts of software engineering. This course is intended for students with previous programming experience and a background in data structures. Open only to transfer students and students who have received advanced placement credit for ICSP-242; not to be taken as a computer science elective. ICSP-242 or equivalent)

Class 4, Credit 4

ICSS-380 **Introduction to Computer Science Theory**
Registration #0603-380
A survey of important topic areas in theory of computer science. Topics may include regular expressions; deterministic and nondeterministic finite state machines; analysis of time and space complexity of algorithms; algorithm design paradigms, concept of NP-Hard and NP-Complete algorithms; introduction to formal correctness of programs; Turing machines; and the halting problem. (Corequisite, SMAM-266) (SMAM-265)

Class 4, Credit 4

ICSS-400 **Logical Design**
Registration #0603-400
An in depth study of the logical design of digital circuits. Topics include combinational circuit design with emphasis upon use of MSI and LSI circuits and CAD tools, sequential circuit synthesis, both synchronous and asynchronous, and an introduction to interfacing techniques. Additional topics to be covered include testing, CAD tools such as logic simulators and logic reduction programs, integrated circuit technologies, and an introduction to VLSI design. Lab experiments required. (ICSP-315 and SMAM-265 or equivalent)

Class 3, Lab 2, Credit 4

ICSS 420 **Data Communication Systems**
Registration #0603-420
This course is an introduction to the concepts and principles of computer communication subsystems. It examines the effects of communication; media and software protocol on network performance, cost and reliability. The course covers the physical interconnection of machines, first-level software considerations of the hierarchical model for computer network design, and local area networks. (SMAM-351 and third-year standing in Computer Science and Technology)

Class 4, Credit 4

ICSS-430 **Numerical Methods**
Registration #0603-430
Topics include introductory error analysis, roots of an equation, solution of systems of linear and non-linear equations, interpolation, power series calculation of functions, numerical integration and first-order ordinary differential equations. The computational aspects rather than mathematical development will be emphasized. Programming projects will be required. (Either SMAM-252 or SMAM-215, and a high-level scientific programming language)

Class 4, Credit 4

ICSS-435 **Systems Specification, Design and Implementation**
Registration #0603-435
An introduction to the basic concepts of systems analysis, specification, design and implementation, and project management. Topics include an introduction to methodologies and tools in system design, with an emphasis on structured design techniques. Tools include scheduling tools, structured English, structured flowcharts, decision trees, Jackson design method, Warnier-Orr diagrams, dataflow diagrams, hierarchical design of programming systems, and cost estimation models. Online design tools may be used to prepare diagrams and specifications. (ICSS-325)

Class 4, Credit 4

ICSS-440 **Operating Systems**
Registration #0603-440
A general survey of operating system concepts. Topics include process synchronization, interprocess communication, deadlock, multiprogramming and multiprocessing, processor scheduling and resource management, memory management, overlays, static and dynamic relocation, virtual memory, file systems, logical and physical I/O, device allocation, I/O processor scheduling, process and resource protection. (ICSS-315, ICSS-325)

Class 4, Credit 4

ICSS-455 **Artificial Intelligence**
Registration #0603-455
An introduction to the field of artificial intelligence, including both theory and applications. A programming language that allows effective symbolic manipulation (PROLOG, LISP) is used to demonstrate the capabilities and limitations of the material presented in class. Topics include search strategies and their implementation, logic, networks, frames and scripts, productions, symbolic manipulation and list processing, problem-solving methods, expert systems, natural language understanding, and selections from vision, robotics, planning and learning. Programming assignments are an integral part of the course. (ICSP-450)

Class 4, Credit 4

ICSS-456 **Expert Systems**
Registration #0603-456
This course provides an introduction to the issues and techniques employed in expert systems. Topics will include a consideration of successful existing systems, control strategies, expert system building tools and environments, knowledge acquisition and uses of expert systems technology. Students will participate in group projects involving both the creation of expert systems and explorations of ways to effectively use such systems. (ICSS-455)

Class 4, Credit 4

ICSS-470 **Finite State Machines and Automata**
Registration #0603-470
Topics include finite state models, machine capabilities, descriptive methods, decomposition methods, regular expressions, bilateral analysis and synthesis, sequential iterative systems, and space-time transformations. (ICSS-315, SMAM-265 or equivalent)

Class 4, Credit 4

ICSS-480 **Formal Languages**
Registration #0603-480
Formal language theory and principles. Topics include context free and context sensitive grammars, regular expressions, Turing machines, and an introduction to unsolvability and computability. (ICSS-470)

Class 4, Credit 4

ICSS-485 Data Base Concepts
Registration #0605-485
A broad introduction to data base management systems (DBMS) and the design, implementation, and applications of data bases. Topics include an overview of DBMS architectures, concepts and implementations of the relational model, data base design and modelling techniques, hierarchical and network approaches, and issues such as recovery, concurrency, physical implementation concerns, and performance and management aspects. Optional topics include distributed data bases, data base machines, and data base interfaces and languages. A data base programming project is required. (ICSS-325)

Class 4, Credit 4

ICSS-515 Analysis of Algorithms
Registration #0603-515
A course covering the mathematics and techniques needed to analyze the computational complexity of algorithms. Several classic algorithms will be studied, to determine their space and time efficiency. (ICSS-325, SMAM-265 or equivalent)

Class 4, Credit 4

ICSS-520 Computer Architecture
Registration #0603-520
An introduction to computer architecture. Includes a survey of computer architecture fundamentals exemplified in commercially available computer systems, including classical CPU and control unit design, register, primary memory organization and access, internal and external bus structures, and virtual memory schemes. Alternatives to classical machine architecture, such as the stack machine and the associative processor, are defined, and compared. Parallel processors and distributed systems are also presented, along with an analysis of their performance relative to non-parallel machines. Programming projects will be required. (ICSS-440)

Class 4, Credit 4

ICSS-521 Introduction to
Registration #0603-521 Microprocessor Systems
An examination of microcomputers and microcomputer applications, including the study of microprocessors and their use in the construction of microcomputers. Additional topics covered include microcomputer busses, parallel and serial interfaces, analog interfacing, interrupts, and real time clocks. The use of microprocessors in real world situations is emphasized. Single board microcomputer systems are used in laboratory projects to explore hardware and software design issues, as well as memory design and I/O interface techniques. Students who have taken ICSS-545 cannot receive credit for this course. Programming projects will be required. (ICSS-315)

Class 3, Lab 2, Credit 4

ICSS-530 Fundamentals of Discrete
Registration #0603-530 Simulation
An introduction to discrete simulation modeling. Methods for the design of discrete simulation models are examined, and simulation models are designed and implemented using a general purpose discrete simulation language. Related topics such as the validity and appropriateness of general statistics for the model are covered. Both the theoretical and statistical aspects of modeling are examined. Programming projects will be required. (SMAM-309 or SMAM-352 and third-year standing in Computer Science and Technology)

Class 4, Credit 4

ICSS-540 Operating Systems
Registration #0603-540 Laboratory
Application of operating system concepts. Laboratory work includes development of a small multi-tasking operating system and a study of its functional characteristics; special topics include I/O programming, interrupt handling, resource allocation and scheduling methods. A significant programming project is an integral part of the course. (ICSP-306, ICSS-440)

Class 4, Credit 4

ICSS-541 Introduction to
Registration #0603-541 Computer Networks
This course presents the concepts and principles of the higher level protocols of the ISO reference model, as introduced in ICSS-420 Data Communication Systems. Included in this course will be the investigation of network topologies, delay analysis, routing techniques, interconnection of networks, security issues and user level services. Programming projects will be required. (ICSS-420)

Class 4, Credit 4

ICSS-542 Distributed Systems
Registration #0603-542 Laboratory
This course will build on topics developed in ICSS-420 Data Communication Systems and ICSS-541 Introduction to Computer Networks in a lab setting. Students will be required to design and implement a small computer network addressing issues such as routing strategies, virtual circuits vs. datagrams, data link protocols, and user (presentation) level services. (ICSS-540 and ICSS-541)

Class 4, Credit 4

ICSS-545 Computer Architecture
Registration #0603-545 Laboratory
This course applies the hardware and software concepts learned from logic design, computer architecture, data communications, and operating systems. Laboratory work will include the design, implementation, debugging, and documentation of major hardware/software projects. Topics to be presented in the lecture include busses, interfacing, bit slice architectures, microprogramming, microprocessors, analog interfacing, and real time computing. Additional topics related to the specific laboratory projects will also be covered. (ICSS-400, ICSS-420 and ICSS-520)

Class 3, Lab 2, Credit 4

ICSS-560 Compiler Construction
Registration #0603-560 Laboratory
A course in the design and implementation of high-level language compilers. Laboratory projects to be assigned in the areas of parsing, code generation, code optimization, and language design. (ICSS-580)

Class 4, Credit 4

ICSS-565 Computer Systems Selection
Registration #0603-565
A study of computer systems design, evaluation, and selection methodology. The design aspect deals with the problem of specifying physical systems on the basis of logical design criteria, and performance analysis of existing and proposed computer systems. The selection aspect covers vendor proposal requests, evaluation and validation of proposals, and procurement methods. (ICSS-315, ICSS-325)

Class 4, Credit 4

ICSS-570 Introduction to
Registration #0603-570 Computer Graphics
A study of the hardware and software principles of computer graphics. Topics include an introduction to the basic concepts, 2-D transformations, viewing transformations, display file structure, geometric models, picture structure, interactive and non-interactive techniques, raster graphics fundamentals, 3-D fundamentals, graphics packages and graphics systems, Students will use and develop a graphics software system based on an accepted graphics standard. Programming projects will be required. (Third-year standing in Computer Science and Technology)

Class 4, Credit 4

ICSS-571 Computer Graphics Laboratory
Registration #0603-571
This project-oriented course will build on topics developed in ICSS-570. Expanded topics will include: standard graphics software, animation techniques, 3-D modeling methods, hidden surface and line algorithms, shading, anti-alaising, color models, and design of the user interface. Students will be required to design and implement an interactive system for an application which incorporates several of the above areas. Programming projects will be required. (ICSS-570)

Class 4, Credit 4

ICSS-580 Language Processors
Registration #0603-580
A course exposing students to issues in the design of a variety of language processors and translators. The basic concepts will be presented in conjunction with the design of several such programs (e.g., assemblers, compilers, linkage editors, and processors). Programming projects will be required. (ICSP-450)

Class 4, Credit 4

ICSS-590 Seminar in Computer Science
Registration #0603-590
Current advances in computer science. (Prerequisites set by instructor)

Class 2-4, Credit 2-4

ICSS-599 Independent Study
Registration #0603-599
Faculty directed study of appropriate topics on a tutorial basis. This course will generally be used to enable an individual to study particular computer science topics in greater depth. (Faculty and departmental approval is required prior to registration. A maximum of two independent study courses is allowed.)

Class 2-4, Credit 2-4

ICSS-610 EDP Auditing
Registration #0603-610
A study of the techniques and approaches used to audit computer data centers and systems. Topics include the methodology and tools of EDP auditing, internal departmental controls, program controls, input/output controls, data security, physical security, computer hardware controls and data communication control. (Fourth-year standing in Computer Science and Technology)

Class 4, Credit 4

ICSS-690 Seminar in Computer Science
Registration #0603-690
Current advanced topics in computer science. Open to graduate students and fourth- and fifth-year undergraduates. (Prerequisites set by instructor)

Class 4, Credit 4

Graduate Courses

Computer Science

Undergraduate Computer Science and Technology students may take 700 and 800 level courses only by consent of the School Director and the consent of the instructor.

Graduate students must obtain the consent of a graduate advisor in order to enroll in graduate courses not listed in their own program of study.

ICSG-700 Foundations of
Registration #0605-700 Computing Theory
Review of discrete mathematics with emphasis on graph theory and proof techniques. A study of computer programs in the abstract, including program flow graphs, program transformations, the structuring theorem, abstract automata, and formal languages. An overview of computability and algorithmic complexity. (ICSA-705, 703)

Credit 4

ICSG-701 Computability
Registration #0605-701
Computability is the heart of theoretical computer science. It is the theory which attempts to formalize the notion of computation. Topics include computation by while-programs, Turing machines, recursive function theory, Symbol-Manipulation Systems, program methodology, the limitation of the concept of effective computability. (ICSG-700)

Credit 4

ICSG-702 Computational Complexity
Registration #0605-702
This course is concerned with the mathematical analysis of computer algorithms. Topics include matrix operations, combinatorial algorithms, integer and polynomial arithmetic, NP-completeness, and lower bounds on algorithms involving arithmetic operations. (ICSG-700)

Credit 4

ICSG-703 Coding Theory
Registration #0605-703
The study of error-correcting codes and their application to reliable communication of digitally encoded information. Topics include cyclic codes, Hamming codes, quadratic residue codes, B.C.H. codes, designs and codes, weight distributions. (ICSG-700)

Credit 4

ICSG-709 Topics in
Registration #0605-709 Computer Science Theory
Current topics in the field. The format of this course is a combination lecture and seminar. Students may register for this course more than once. Topics covered in the past include: arithmetic algorithms; the Fast Fourier Transform; combinatorial optimization. Programming projects may be required. (Permission of the instructor)

Credit variable 14

ICSG-710 Programming Language
Registration #0605-710 Theory
An introduction to several important programming languages and the basic concepts of language design and specification. Topics will include data and control structures, subprogram sequencing and control, and parameter passing. Languages selected will include examples of string processing, applicative, systems programming, and concurrent languages. Programming projects will be required. (ICSA-702 or equivalent)

Credit 4

ICSG-711 Compiler Construction
Registration #0605-711
The structure of language translators, lexical and syntactic analysis, storage allocation and management, code generation, optimization, error recovery. Programming projects will be required. (ICSG-700,710)

Credit 4

ICSG-712 Theory of Parsing
Registration #0605-712
Application of theoretical concepts developed in formal language and automata theory to the design of programming languages and their processors, syntactic and semantic notation for specifying programming languages, theoretical properties of some grammars, general parsing, non-backtrack parsing, and limited backtrack parsing algorithms. (ICSG-700)

Credit 4

ICSG-719 **Topics in**
Registration #0605-719 **Programming Languages**
Current topics in the field. The format of this course is a combination lecture and seminar. Students may register for this course more than once. Topics covered in the past include: logic programming, data flow, functional or applicative, and object-oriented languages; programming language semantics; formal verification. Programming projects will be required. (Permission of the instructor)

Credit variable 1-4

ICSG-720 **Computer Architecture**
Registration #0605-720
Review of classical computer architectures, the design of operation codes and addressing modes, data formats, and their implementations. Analysis of internal and external bus structures. Architectural features to support virtual storage and page-replacement policies, high-level language features, and operating systems. Speed-up techniques. Future directions. Programming projects will be required. (ICSA-708)

Credit 4

ICSG-721 **Microprocessors and**
Registration #0605-721 **Microcomputers**
A study of microprocessors, microcomputers and microcomputer applications. Topics to be covered include microprocessor architecture, microcomputer organization and buses, parallel and serial interface techniques, analog interfacing, interrupts, and development trends in'microprocessors. Emphasis will be on the use of microprocessors and small microcomputers. Single board microcomputer systems are used in laboratory projects to explore hardware and software design issues, as well as memory design and I/O interface techniques. Programming projects will be required. (ICSG-720)

Credit 4

ICSG-729 **Topics in**
Registration #0605-729 **Computer Architecture**
Current topics in the field. The format of this course is a combination lecture and seminar. Students may register for this course more than once. Programming projects will be required. (Permission of the instructor)

Credit variable 1-4

ICSG-730 **Operating Systems I**
Registration #0605-730
An introduction to solving problems using cooperating parallel processes and to the concepts of operating systems design. Emphasis will be on the use of operating systems from the programmer's point of view and on the design of operating systems from a conceptual rather than an implementation-oriented point of view. The student will be required to construct software systems of parallel processes and study how an operating system supports such parallelism. Also, the student will become conversant in the issues facing the operating system designer and will be able to evaluate tradeoffs inherent in the design process. Programming projects will be required. (ICSA-708)

Credit 4

ICSG-731 **Operating Systems II**
Registration #0605-731
A laboratory practice course, Operating Systems II is designed to provide the student with practical experience in implementing many of the notions discussed in Operating Systems I. The class, with the instructor serving primarily as a technical advisor, designs the kernel of a small operating system in class in the first two to three weeks. This kernel is module tested and downloaded to a stand-alone processor and test run until it is debugged. Then students form into groups of three to five persons each and choose a project to pursue which involves implementing additional features of the operating system. Typical projects are: file systems, memory management, scheduling, and inter-process communications. Programming projects will be required. (ICSG-730)

Credit 4

ICSG-739 **Topics in Operating Systems**
Registration #0605-739
Current topics in the field. The format of this course is a combination lecture and seminar. Students may register for this course more than once. Topics covered in the past include: Unix internals; concurrency methods; security; operating systems performance; software environments. Programming projects will be required. (Permission of the instructor)

Credit variable 1-4

ICSG-740 **Data Communications**
Registration #0605-740 **and Networks I**
Fundamentals of data communication, including terminal communication and computer-to-computer communication. Emphasis in the first course will include the theoretical basis for data communication, terminal handling, data transmission and multiplexing, error detection and correction, as well as an introduction to the hierarchical model for computer networks; an introduction to graph theory and the topological design of networks, queueing theory and delay analysis; the fundamental protocols for computer communication. (Statistics, ICSA-708)

Credit 4

ICSG-741 **Data Communication**
Registration #0605-741 **and Networks II**
A second course in computer communication and networks. Emphasis is on higher-level protocols and local networks. Included are design and analysis of communication protocols, routing algorithms, satellite and local networks; higher-level protocols and the application of computer networks. (ICSG-720, 730, 740)

Credit 4

ICSG-749 **Topics in**
Registration #0605-749 **Data Communications**
Current topics in the field. The format of this course is a combination lecture and seminar. Students may register for this course more than once. Topics covered in the past include: network reliability; special-purpose protocols; error-correcting codes. Programming projects will be required. (Permission of the instructor)

Credit variable 1-4

ICSG-750 **Introduction to**
Registration #0605-750 **Artificial Intelligence**
The theory and techniques underlying the development of "intel-' ligent" computer software. Emphasis will be placed on programming techniques and languages used in artificial intelligence research. Students will be required to design and implement programs that use these techniques to build game players, theorem provers, natural language understanding systems or other rudimentary artificial intelligence projects. Programming projects will be required. (ICSA707, 708)

Credit 4

ICSG-751 **Knowledge-Based Systems**
Registration #0605-751
An introduction to the issues and techniques of building knowledge-based systems. Topics will include a survey of existing expert system architectures and implementations, knowledge representation techniques, expert system building tools, and knowledge acquisition. In addition to examining existing expert systems, students will implement expert systems or expert system building tools in a Lisp or Prolog environment. Programming projects will be required. (ICSG-750)

Credit 4

ICSG-759 Topics in
Registration #0605-759 Artificial Intelligence
Current topics in the field. The format of this course is a combination lecture and seminar. Students may register for this course more than once. Topics covered in the past include: logic programming; natural language processing; pattern recognition; robotics. Programming projects will be required. (Permission of the instructor)
Credit variable 1 -4

ICSG-761 Fundamentals of
Registration #0605-761 Computer Graphics
Topics include basic concepts, 2-D transformations, windowing, clipping, interactive and raster graphics, 3-D transformations and perspective, hidden line and surface techniques, graphical software packages and graphics systems. Programming projects will be required. (ICSA-703)
Credit 4

ICSG-769 Topics in
Registration #0605-769 Computer Graphics
Current topics in the field. The format of this course is a combination lecture and seminar. Students may register for this course more than once. Topics covered in the past include: animation techniques and packages; modeling of solids, including shading, perspective, hidden line and surface removal; three-dimensional graphics software packages; algorithms and heuristics; special purpose computer hardware for graphics. Programming projects will be required. (Permission of the instructor)

Credit variable 1-4

ICSG-771 Data Base Systems
Registration #0605-771
The storage and processing of formatted data using data base management systems. Topics include: objectives of data base management, file and indexing structures, data base system architectures, normalization theory, data base machines and distributed data bases. Several existing and experimental systems will be studied. (ICSA-703, 708)

Credit 4

ICSG-772 Data Base System
Registration #0605-772 Implementation
An examination of the technical issues related to the implementation of shared access data bases. Topics include concurrency control, transaction processing, reliability and recovery. Extensions to the distributed processing environment also are covered. Programming projects will be required. (ICSG-771)

Credit 4

ICSG-773 Information Storage
Registration #0605-773 and Retrieval
A study of contemporary approaches to the storage and retrieval of unformatted text with emphasis on document data bases. Topics include: traditional approaches to indexing and retrieval, text analysis and automatic indexing, clustering algorithms, the SMART system, the extended Boolean logic model, pattern matching algorithms, and videotex. (ICSA-707)

Credit 4

ICSG-781 Software Engineering
Registration #0605-781
The software engineering methodologies and technologies useful for developing quality, cost-effective and schedule-meeting software. The course focuses on the engineering of programming systems products, with emphasis on quantitative models. Topics include: current problems in software development, Halstead's software science, complexity metrics, specification and design metrics, cost estimation models, growth dynamics, software reliability models, and models of program testing. (ICSA-708, 710)

Credit 4

ICSG-782 Software Engineering
Registration #0605-782 Laboratory
A projects course in applied software engineering with emphasis of the use of software based engineering tools. Available tools include Higher Order Software's specification and code generation system and Stanford University's WEB, an integrated programming and documentation system. Students work in small teams on software development projects. Programming projects will be required. (ICSG-781)

Credit 4

ICSG-783 On-Line Information
Registration #0605-783 Systems Design
The structured analysis, design, and implementation of on-line information systems are discussed. Topics include data and algorithm structuring, measures of software complexity, software behavior modeling, and packaging. System development and project management also are highlighted. (ICSA-707, 708)

Credit 4

ICSG-791 Simulation & Modeling I
Registration #0605-791
Computer simulation techniques are examined. Topics include abstract properties of simulations modeling, analysis of a simulation run, and statistics. A general purpose simulation language will be taught Programming projects will be required. (ICSA-703, statistics)

Credit 4

ICSG-799 Topics in
Registration #0605-799 Simulation & Modeling
The format of this course is a combination lecture and seminar covering current topics in the field. Students may register for this course more than once. Topics covered in the past include: continuous systems simulation; applications to world population models, operating systems; programming languages that support simulation and procedural applications (e.g., Simscript, Simula, SLAM, Ada). Programming projects will be required. (Permission of the instructor)

Credit variable 1-4

ICSG-829 System Programming Seminar
Registration #0605-829
The format of this course is a combination lecture and seminar covering current topics in the field. Students may register for this course more than once. Students will be guided through the construction of large software projects. Programming projects will be required. (Permission of the instructor)

Credit variable 1-4

ICSG-890 MS Thesis
Registration #0605-890
Capstone of the master's degree program. Student must submit an acceptable thesis proposal in order to enroll. (Permission of the Graduate Studies Committee)

Credit variable 0-4

ICSG-891 MS Project
Registration #0605-891
Capstone of the master's degree program. Student must submit an acceptable project proposal in order to enroll. (Permission of the Graduate Studies Committee)

Credit **2**

ICSG-892 Thesis Preparation
Registration #0605-892

Preparation for the master's thesis. (36 credits of graduate study)

Credit 3

ICSG-898 **Independent Study**
Registration #0605-898
Faculty directed study of appropriate topics on a tutorial basis. This course will generally be used to enable an individual to study computer science topics in greater depth and more detail. (Faculty approval)

Credit variable 1-4

ICSG-899 **Seminar**
Registration #0605-899
Current advances in computer science. Previous topics have included: data encryption, arithmetic algorithms, natural language processing, robotics, computer animation, speech processing, syntactic pattern recognition. (Permission of the instructor)

Credit variable 14

Packaging Science

All Department of Packaging Science courses are offered at least once annually.

Undergraduate Courses

IPKG-201 **Principles of Packaging**
Registration #0607-201
An overview of packaging: the historical development of packaging, the functions of packaging, and the materials, processes, and technology employed to protect goods during handling, shipment and storage. A brief review of container types, package design, and development, and research and testing will be presented, along with information about economic importance, social implications, and packaging as a profession.

Class 4, Credit 4

IPKG-301 **Engineering Design Graphics**
Registration #0607-301
A basic course in engineering drawing. Topics include, but are not limited to, lettering, line quality, use of instruments, free hand sketching, orthographic projections, pictorials, sections, auxiliary views, and dimensioning. Introduction to CAD utilization, CAD projects included.

Class 1, Lab 3, Credit 3

IPKG-302 **CAD Drawing**
Registration #0607-302
A course in computer-aided drafting (CAD). Students will learn how drawing is accomplished using a CAD application package. Course begins with basics and progresses to advanced CAD practices. Drawing assignments required,'concentrating on packaging applications. (IPKG-301)

Class 1, Lab 3, Credit 3

IPKG-310 **Methods of Evaluation**
Registration #0607-310
Information about recognized standard testing procedures will be presented, and students will gain practical experience in the operation of'various commonly used testing instruments which determine physical properties of fibre, metal, plastic, and glass packaging materials. (IPKG-201)

Lab 4, Credit 2

IPKG-311 **Packaging Materials I**
Registration #0607-311
The manufacture, physical and chemical properties, and uses of common packaging materials. Emphasis is on metals and plastics used in packaging, and adhesives, propellants, and other component materials. (IPKG-201)

Class 3, Credit 3

IPKG-312 **Packaging Materials II**
Registration #0607-312
The manufacture, physical and chemical properties, and uses of common packaging materials. Emphasis is on paper, paperboard, wood, and glass used in packaging applications. (IPKG-201)

Class 3, Credit 3

IPKG-321 **Rigid Containers**
Registration #0607-321
A detailed study of primary packages. History, manufacturing processes, characteristics, and applications for containers in direct contact with the product Structural design, chemical compatability and suitability of container for intended use will be analyzed for basic container types. Students will practice structural design and testing of prototype containers. Primary emphasis will be on rigid paperboard, glass, plastic and metal containers. (IPKG-301, 311, 312)

Class 2, Recitation, Lab 2, Credit 4

IPKG-322 **Flexible Containers**
Registration #0607-322
Corollary course for 321. Primary emphasis will be on flexible paper, foil, plastic, and laminated materials, and selected processing techniques. (IPKG-301, 311, 312)

Class 2, Recitation, Lab 2, Credit 4

IPKG-401 **Career Seminar**
Registration #0607-401
Career opportunities in Packaging Science; methods and procedures used in obtaining entry-level positions. Career advancement within the corporate organization; job changes. (Packaging Science juniors only)

Class 1, Credit 1

IPKG-420 **Technical Communication**
Registration #0607-420
Introduction to the principles of effective written technical communication for the packaging professional. Topics include: memos, business letters, summary activity reports, technical proposals, and research papers. This course is open only to packaging majors, and is required as part of the writing skills certification process under the RIT policy. (IPKG-321, 322)

Class 3, Credit 3

EPKG-431 **Packaging Production**
Registration #0607-431 **Systems**
A study of package forming and filling, closing, product/package identification, inspection, and other machinery commonly used in packaging, plus consideration of handling and storage/ retrieval systems. The characteristics of such equipment and maintenance programs will be considered. Students will gain practice in setting up complete production lines for packaging various products. (IPKG-321,322)

Class 2, Lab 4, Credit 4

IPKG-432 **Packaging for Distribution**
Registration #0607-432
An exploration of different shipping, storage, and use environments common to various products and packages. Structural design of shipping containers for product physical protection and methods for testing and predicting package performance will be studied. (IPKG-301, 321, 322)

Class 2, Lab 4, Credit 4

IPKG-433 Packaging for Marketing
Registration #0607-433
The interrelationship between packaging and marketing, detailing how the retail consumer package can be used as a scientific marketing tool. The course concentrates on a systematic approach to developing an optimum package for a given product to meet the demands of the retail market. Advertising, marketing demographics, and the impact of color upon packaging will be considered. Students will gain practice in the development of a complete package system. (IPKG-431,432)

Class 2, Lab 4, Credit 4

IPKG-499 Packaging Co-op
Registration #0607-499

One quarter of appropriate work experience in industry.

Credit 0

IPKG-520 Packaging Management
Registration #0607-520
A study of packaging organization in the contemporary corporation and project management techniques available to the packaging manager. Organization theory will be discussed, and compared with typical industry practice. Other topics will include PERT, value analysis, and the impact of regulatory agencies upon packaging from a management standpoint. (Professional elective)

Class 3, Recitation 1, Credit 4

IPKG-524 Packaging Economics
Registration #0607-524
A study of firm behavior with concentration on production costs and revenues. Market structures will be analyzed in order to develop an understanding of how packaging fits into the general economy. Students will be instructed in the use of basic economic reference materials for research purposes. A paper is required. (Professional elective)

Class 4, Credit 4

IPKG-530 Packaging and the
Registration #0607-530 Environment
Consideration of packaging in a social context Factors which enhance secondary use, recycling, recovery of resources, and proper disposal will be discussed. Package design in relation to solid waste disposal and materials and energy shortages will be considered. Other topics of current social interest will be discussed. Primarily a discussion class for senior students. Open to non-majors. (Professional elective)

Class 2, Recitation 1, Lab 2, Credit 4

IPKG-536 Medical Products Packaging
Registration #0607-536
Study of unique requirements for packaging materials and containers for sterilized medical devices. Current sterilization techniques, impacts on materials properties, and distribution requirements are considered for this specialized product group. (IPKG-433, Professional elective)

Class 2, Recitation 1, Lab 2, Credit 4

IPKG-541 Computer Applications
Registration #0607-541
Application of computer techniques and data processing for packaging. Review and analysis of current computer software packages for packaging, including optimum sizing, process control, simulation, and specification preparation. Computer program development and coding projects associated with packaging are assigned. (ICSA-210)

Class 3, Lab 2, Credit 4 **Class 3, Lab 2, Credit 4**

IPKG-555 Military and Export Packaging
Registration #0607-555
Study of the particular forms and requirements for packaging for the military and export environments. Preservation techniques, military specifications, crates and large export containers, construction techniques, the export handling and transportation environment, and related topics (IPKG-432; Professional elective)

Class 3, Lab 2, Credit 4

IPKG-562 Packaging Regulations
Registration #0607-562
A detailed study of federal, state, and local regulations that affect packaging. History of the development of packaging law; detailed study of recent packaging regulations, including the Fair Packaging and Labeling Act and the Poison Prevention Packaging Act; consideration of Food and Drug Administration regulation of packaging, including requirements for tamper evident packaging, hazardous materials packaging regulations administered by the Department of Transportation; freight classifications, freight claims, the Interstate Commerce Act as it applies to shipment of goods in packages; weights and measures law; consumer product safety law, environmental law, and patent, trademark, and copyright law as it applies to packaging. (IPKG-433)

Class 3, Credit 3

IPKG-568 Food Preservation and
Registration #0607-568 Packaging
Study of food products, common methods of processing and preservation, impact on quality and nutritional value of the product, and the relationships with common packaging methods and distribution practices. (IPKG-432, Professional elective)

Class 3, Lab 2, Credit 4

IPKG-570 Point of Purchase Displays
Registration #0607-570
An interdisciplinary course considering the unique requirements for display packaging at the retail point of purchase. The retail store environment, display techniques, customer motivation, product tie-ins, construction techniques, production and distribution requirements, product promotion and point of purchase support materials and activities, design, and printing of point of purchase displays. (Course is intended to be an interdisciplinary, senior elective for students in packaging, packaging design, audio-visual technology, retailing and printing.) (IPKG-433, FADK-403, BRER-410, ICIC-450, PPRM-403 or department approval, depending on major. Professional Elective.)

Class 2, Lab 4, Credit 4

IPKG-577 Packaging Internship
Registration #0607-577
This course number is used by students in the Packaging Science program for earning internship credits. The number of credits and the nature of on-location experience is determined by the student's advisor, subject to approval of the department.

Credit variable 1-8

IPKG-585 Principles of Shock
Registration #0607-585 and Vibration
A study of the factors involved in analyzing potential damage to packaged items resulting from impact or vibration forces. Students will be expected to master basic mathematical and physical concepts in addition to the use of the various pieces of testing equipment. (IPKG-432)

Credit variable 34

IPKG-590 Senior Thesis
Registration #0607-590
An in-depth study of some phase of packaging which will enable the student to make use of the knowledge and skills acquired during the course of the program.

Arranged, Credit 4

IPKG-598, 599 **Independent Study**
Registration #0607-598, 599
Independent study, in consultation with the instructor, on any packaging-related topic. (Independent study total credit allowed is limited to a maximum of 8 credits.)

Arranged, Credit variable 1-4

Graduate Courses

IPKG-701 **Research Methods**
Registration #0607-701 **in Packaging**
Discussion of procedures, methods, and requirements for carrying out the research project Students pursue advanced study and research in the following areas: distribution packaging, package systems development, product and/or package damage in the physical distribution environment, materials, quality preservation, production and mechanical properties of packaging materials and systems.

Credit 4

IPKG-721 **Packaging Administration**
Registration #0607-721
Study of the role of packaging operations in the corporate enterprise. Positioning of the packaging function in the corporation," managerial practice, interpersonal relationships, and control techniques are considered. Individualized instruction, case analysis, and/or research papers supplement classroom instruction.

Credit 4

IPKG-731 **Advanced Packaging**
Registration #0607-731 **Economics**
An advanced study of the firm's economic behavior in relationship to activities within the packaging function. Included are packaging costs, production theory, and case studies demonstrating general trends in the packaging industry. Individual instruction, case study, and/or research paper required, as appropriate to the student's level or interest

Credit 4

IPKG-742 **Distribution Systems**
Registration #0607-742
Study of the shipping and handling environment encountered by goods in packages during distribution to the product user. Materials handling, warehousing, and the impact of the distribution environment on shipping container design and development is considered. Case study or individual research appropriate to student's interest.

Credit 4

IPKG-750 **Graduate Seminar**
Registration #0607-750
Course concentrates on topic of current interest, depending on instructor, quarter offered, and mix of students. Content to be announced prior to registration dates.

Credit 4

IPKG-752 **The Legal Environment**
Registration #0607-752
An intensive study of federal, state, and local regulation that affects packaging. Individualized study and research on an interest basis.

Credit 4

IPKG-763 **Packaging for End Use**
Registration #0607-763
An intensive study of package design requirements specific to use of a product at specified end points. Individual design and development of a package system and its specifications, appropriate to the needs of the product and the consumer/user.

Credit 4

IPKG-770 **Advanced Computer**
Registration #0607-770 **Applications**
Study of the application of computer techniques and data processing for packaging applications: specification development, test simulation, optimum sizing of package systems, process control, and similar applications will be presented. Computer program development and individual research on an interest basis.

Credit **4**

IPKG-783 **Packaging Dynamics**
Registration #0607-783
The study of instrumentation systems for analysis, evaluation, and application of shock and vibration test methods and data to package system design and development for specific products. Individualized instruction appropriate to student's interests.

Credit **4**

IPKG-798 **Independent Study**
Registration #0607-798
Student-initiated study in an area of specialized interest, not leading to a thesis. A comprehensive written report of the investigation is required. Cannot be used to fulfill core requirements. Independent Study may be taken for a maximum of 8 credits.

Credit variable **1-4**

IPKG-799 **Advanced Package Design**
Registration #0607-799
Advanced package design projects selected in consultation with the instructor. Individual study appropriate to area of interest and background of student. (Consent of department)

Credit variable **1-4**

IPKG-890 **Graduate Thesis**
Registration #0607-890
An independent research project to be completed by the student in consultation with the major professor. A written thesis and an oral defense of the thesis is required. (Consent of department)

Credit variable (maximum of 12)

School of Engineering Technology

Civil Engineering Technology

ITEC-099 **Introduction to Civil**
Registration #0608-099 **Engineering Technology**
Introduces transfer students to the CET program in order to ease the transition from their previous college. Information is provided on cooperative education, technical electives, liberal arts core and concentration courses, and preregistration procedures. Discussion of topics including P.E. registration and N.I.C.E.T. certification.

Class **1,** Credit **0**

ITEC-210 **Engineering Graphics**
Registration #0608-210
An introduction to engineering graphics. Course is laboratory-oriented and provides training in development of basic graphical communication skills. The course is intended for students with little or no background in engineering drawing.

Class 2, Lab 4, Credit 4

ITEC-220 Civil Engineering Graphics
Registration #0608-220
This course includes the background information and actual work performance related to the preparation of plans and drawings for civil engineering works, as well as a basic exposure to the graphics of interfacing disciplines: architecture, mechanical and electrical engineering, and landscape architecture.

The course builds upon the fundamentals of graphics learned by the student in ITEC-210 and focuses on the actual drawings and related documents used in building civil engineering works; for example, site development, structures, water and wastewater transport systems, water and wastewater treatment, highways, and bridges. (ITEC-210 or equivalent)

Class 2, Lab 4, Credit 4

ITEC-230 Computer Applications
Registration #0608-230
Programming in BASIC, using time-sharing terminals and microcomputers. Student is introduced to log-on and log-off procedures and general methods of use of time-shared system. Concepts of BASIC language are presented with student learning application through program writing. Student also uses standalone microcomputers and is exposed to commercially available programs. Emphasis is on engineering technology applications.

Class 4, Credit 4

ITEC-320 Plane Surveying
Registration #0608-320
This course provides an introduction to plane surveying. Topics include note keeping, line and grade measurements, leveling, vertical and horizontal measurements, care of instruments and stadia. The course exposes the student to all aspects of plane surveying in regard to civil engineering technology, in a "hands-on" concept involving both office and field work. (Trigonometry)

Class 3, Lab 2, Credit 4

ITEC-330 Materials of Construction
Registration #0608-330
A study of the materials used in Portland cement and asphalt cement concrete. Laboratory work will include mix design and the testing of concrete mixes and materials by ASTM and AASHO Standard Methods.

Class 3, Lab 2, Credit 4

ITEC-340 Route Surveying
Registration #0608-340
Introduction to route surveying and earth work. Topics include simple horizontal curves, reverse and compound curves, transitional spiral curves, vertical curves, plan and profile views, cross sections, volume computations, and mass diagrams. Laboratory exercises include layout of curves in field. (Plane Surveying)

Class 3, Lab 2, Credit 4

ITEC-360 Elementary Soil Mechanics
Registration #0608-360
Introduction to soil mechanics and its application to problems encountered in civil engineering. Major topics include soil classification, strength and compressability analysis, and effect of water on soil characteristics. Laboratory tests commonly used to evaluate engineering properties of soils are performed.

Class 3, Lab 3, Credit 4

ITEC-380 Elementary Structures
Registration #0608-380
Application of the principles of Statics and Strength of Materials to the design of basic structural elements such as beams, columns, and trusses. The emphasis is on structural steel and reinforced concrete, with some time spent on timber members. There also will be practice in the use of AISC and ACI specifications. (Statics and Strength of Materials)

Class 4, Credit 4

ITEC-404 Applied Mechanics of Materials
Registration #0608-404
Basic strength of material and statics are reviewed. Advanced topics are covered to include stress and strain, Mohr's circle concept, transversely loaded members, statically indeterminate problems, Euler's equations, and column decision principles. (Statics and Strength of Materials)

Class 4, Credit 4

ITEC-420 Hydraulics
Registration #0608-420
Study of principal physical and mechanical properties of liquids, hydrostatic pressure and forces; pressure measuring devices; buoyancy and flotation, flow of liquids in closed conduits, and introductory principles of piping systems design; pumps and pump selection, flow of water in open channels and introduction to their design. (Physics, Statics and Strength of Materials, ITEC-421; Hydraulics Lab must be taken concurrently.)

Class 3, Credit 3

ITEC-421 Hydraulics Laboratory
Registration #0608-421
Experimental study of principal physical properties of liquids and major laws of fluid mechanics. Operating various laboratory equipment and devices while concurrently taking ITEC-420, Hydraulics, for principal theoretical studies of physical and mechanical properties of liquids, hydrostatics fluid kinematics and dynamics, hydraulic machinery and their operation.

Lab 3, Credit 1

ITEC-422 Elements of Building Construction
Registration #0608-422
Elements and details of building construction; study of building codes from a design concept; foundations; wood, steel and concrete construction and wall systems; and introduction to construction specifications for materials and methods.

Class 4, Credit 4

ITEC-428 Technical Communications
Registration #0608-428
The principles of organizing data and information into clear and concise engineering memos, letters, reports, and presentations. The techniques of library research, word processing, and oral presentation, including audiovisual, are stressed. (Basic college writing)

Class 4, Credit 4

ITEC-432 Water and Wastewater
Registration #0608-432 Transport Systems
Discussion of surface and groundwater sources. The hydraulic design of sanitary and storm sewer systems, and water distribution systems. (ITEC-420, 421)

Class 2, Credit 2

ITEC-438 Principles of the Treatment
Registration #0608-438 of Water and Sewage
An introduction to water and wastewater treatment, interpretation of analyzed physical, chemical, and biological parameters of water quality with regard to the design and operation of treatment processes and to the control of the quality of natural water; fundamental principles and applications of physical, chemical and biological processes employed in water and wastewater treatment; analysis of waste assimilative capacity of streams, with an introduction to microbiology. (SCHG-272, 276)

Class 3, Lab 2, Credit 4

ITEC-444 Mechanical Equipment for Buildings
Registration #0608-444
Presentation of mechanical and electrical equipment used in building construction. The codes applicable to plumbing, heating, air conditioning, and operation and control will be studied.

Class 2, Credit 2

ITEC-460 Construction Equipment
Registration #0608-460
Fundamentals of equipment selection; determining equipment requirements based upon the design and capabilities of currendy available construction equipment. Emphasis is given to economic aspects of equipment ownership, principles of equipment management, and earthmoving project analysis.

Class 4, Credit 4

ITEC-470 Timber Design and Construction
Registration #0608-470
Discussion of the properties of structural lumber including grades, sizes, and design properties. Design of beams, columns, trusses, plywood diaphragms and shear walls. Other topics include glued-laminated timber, nailed and bolted joints. The provisions of various building codes are investigated, and the specification of the National Forest Products Association is followed. (ITEC-404)

Class 4, Credit 4

ITEC-480 Groundwater Hydraulics
Registration #0608-480
Groundwater movement, flow-net concept, graded filter design and construction, flow to wells and trenches, dewatering system analysis and design, water-flow cut-off methods and their use for construction. (ITEC-420 and ITEC-527 or permission of instructor)

Class 4, Credit 4

ITEC-482 Hydrology
Registration #0608-482
Course presents major theoretical and practical considerations of hydrology in application to study groundwater hydraulics, hydraulic structures, water transportation systems, and transportation. (ITEC-420)

Class 4, Credit 4

ITEC-485 Hydraulic Structures
Registration #0608-485
This course will study analysis and design of dams, spillways, storage reservoirs, canals, tunnels and river diversion systems for the effective utilization of water resources, energy, soil conservation, and flood control. Principles of maintenance and operation of hydraulic structure also will be studied. (ITEC-432).

Class 4, Credit 4

ITEC-490 Structural Analysis
Registration #0608-490
Introduction to the analysis of statically determinate and indeterminate structures by classical and modern techniques. The types of structures covered include beams, trusses, and frames which are loaded in the plane of the structure. Topics include slope deflection, moment distribution, approximate methods, and an introduction to matrix methods. (lTEC-404)

Class 4, Credit 4

ITEC-495 Structural Design
Registration #0608-495
Structural design in reinforced concrete and structural steel. In the reinforced concrete portion of the course, the working stress method is briefly covered, but emphasis is on the strength method; members and frames are primarily of the indeterminate type. In the structural steel portion, the working stress method is used in designing members and frames that are primarily determinate. In both portions the accent is on building construction. Provisions of the ACI code and AISC specification will be followed. (ITEC-490)

Class 4, Credit 4

ITEC-499 Cooperative Education
Registration #0608-499

One quarter of appropriate work experience in industry.

Credit 0

ITEC-500 Labor Relations
Registration #0608-500
Introduction to the fundamentals of labor law and its applications to the construction industry. Topical areas include the Fair Labor Standards Act, Davis-Bacon Act, Title VII of the Civil Rights Act, National Labor Relations Act, hiring halls, pre-hire agreements, strikes and open shop construction. Several guest speakers representing government, private industry and organized labor will lecture.

Class 2, Credit 2

ITEC-505 Construction Safety
Registration #0608-505
General safety practices in construction operations. Safety standards, both voluntary and mandatory. Employer responsibilities under the provisions of OSHA and state labor law. A portion of this course is audiovisual.

Class 2, Credit 2

1TEC-509 Cost Estimating
Registration #0608-509
An introduction to direct cost estimating of a construction project The estimating techniques reviewed include productivity analysis, material pricing, and quantity take-offs. (ITEC-422 may be taken concurrently.)

Class 1, Recitation 2, Credit 2

ITEC-510 Design of Water
Registration #0608-510 Treatment Facilities
Principles of water treatment plant design, conceptual and hydraulic design of water purification and conditioning facility. Includes: settling, filtration, softening, disinfection, organics, removal, and plant design construction elements. (ITEC-438)

Class 2, Credit 2

ITEC-513 Computer Techniques in Civil
Registration #0608-513 Engineering Technology
Designed as a supplement to the introductory programming course. Topics include: word processing; use of packaged programs such as COGO and MINITAB; electronic mail; spread sheets and design of user-friendly programs. Work will be done using timesharing, primarily, but with some time devoted to personal computers. (ICSA-205)

Class 2, Credit 2

ITEC-514 Land Planning
Registration #0608-514
The environmental and social aspects of land planning are covered as well as the engineering and cost considerations. Topics included are zoning concepts, master plans, subdivision regulations and design criteria, flood plains, environmentally sensitive areas, wet lands, other planning and control tools, solar access planning, and urban revitalization.

Students are involved in an independent project consisting of a concept design for a subdivision, or other land use projects. Extensive use is made of field trips and attendance at appropriate meetings or work sessions. (Drafting, surveying, and ITEC-432)

Class 4, Credit 4

ITEC-516 Analysis and Design of Reinforced
Registration #0608-516 Concrete Structures
The course is organized to continue with the study of reinforced concrete that was begun in ITEC-495. Topics include retaining walls, footings, two-way slabs, torsion, rectangular tanks, yield-line analysis of slabs, and an introduction to prestressed concrete. The strength method of the ACI code is used. (ITEC-495)

Class 3, Recitation 2, Credit 4

ITEC-518 **Masonry Design**
Registration #0608-518
An introduction to masonry design and construction. Both brick and concrete masonry will be covered, with the emphasis on concrete masonry. Topics covered included terminology, non-reinforced masonry, reinforced masonry, joint reinforcement, types of mortar, design of bearing walls and partitions. Use will be made of the publication of the Brick Institute of America, the National Concrete Masonry Association, and the Portland Cement Association. (ITEC-404)

Class 2, Credit 2

1TEC-520 **Design of Wastewater**
Registration #0608-520 **Treatment Facilities**
Principles of wastewater treatment plant design, conceptual and hydraulic design of activated sludge and trickling filter plants are studied. Tertiary treatment facilities, such as nitrogen and phosphorous removal will be discussed. Processes, plant design, and construction elements are stressed. (ITEC-438)

Class 3, Lab 2, Credit 4

ITEC-522 **Principles of Treatment**
Registration #0608-522 **of Water and Sewage n**
Principles of microbiology and its application to water and wastewater. Principles and practice of water and wastewater treatment processes with emphasis on setting, chemical precipitation, adsorption, disinfection, granular tnedium filtration, aerobic suspended and attached growth, and anaerobic suspended growth. (ITEC-438)

Class 3, Lab 3, Credit 4

ITEC-525 **Hazardous Waste**
Registration #0608-525
Identification, classification and legal aspects of hazardous waste are studied. Topics include: generator, transport, storage and disposal of hazardous waste with emphasis on chemical landfill and incineration of hazardous and toxic wastes. (ITEC-438)

Class 4, Credit 4

ITEC-526 **Industrial Wastewater**
Registration #0608-526
Industrial wastewater characterization and waste flow survey. Case studies of selected industrial wastewater. (ITEC-438)

Class 2, (Lab 6 for students taking 4 cr.) Credit 2 or 4

ITEC-527 **Soil Mechanics and Foundations**
Registration #0608-527
Study of physical, mechanical and engineering properties of soils; methods of determination of bearing capacity, stress distribution within soil mass and settlement; spread footing analysis and design; lateral earth pressure and retaining walls analysis and design, pile foundation analysis and design principles; slope stability, study of modern and traditional soil improvement technology. (ITEC-360, 404, 528; Soil Mechanics Laboratory must be taken concurrently.)

Class 3, Credit 3

ITEC-528 **Soil Mechanics Laboratory**
Registration #0608-528
The Soil Mechanics Laboratory is to be taken concurrently with ITEC-527. Exercises will include tests in internal friction by direct shear, unconfined compression, triaxial compression, consolidation and compaction.

Lab 2, Credit 1

ITEC-530 **IVansportation Engineering**
Registration #0608-530
The course exposes the student to the field of highway, airport, and rail engineering. The areas of administration, planning, design, construction, maintenance, and operation are covered. After the introductory material is presented, stress is put on specific skills needed in these fields, including highway, rail, and airport standards, geometry and alignment, drainage, earthwork, safety standards, and structures.

Ample field exposure to all elements is part of the formal structured program. (Route surveying)

Class 4, Credit 4

ITEC-535 **Pavement Design**
Registration #0608-535
This course expands upon the background of the Transportation Engineering core course, providing additional detailed engineering knowledge on pavement design. Included with the theoretical knowledge will be the development of, and practice in, the necessary design skills. The course includes, not only the design of new pavements, but also addresses the very active programs in pavement recycling, bridge and pavement rehabilitation, and strengthening. Problems are attacked in a practical manner, utilizing the expertise of national organizations and state highway departments involved in this work. (ITEC-330, 530 or equivalent)

Class 3, Lab 2, Credit 4

ITEC-544 **Contracts and Specifications**
Registration #0608-544
This course includes a fundamental overview of contract law, followed by the application of this material into the contracts for construction. Subsequently, the student is exposed to construction specifications. Substantial use is made of actual documents from the New York State Department of Transportation, the Construction Specification Institute, and trade standards, such as an ANSI, ASTM, and others. Students are required to develop and assemble a mock-up set of contract documents.

Class 2, Credit 2

ITEC-546 **Professional Principles**
Registration #0608-546 **and Practices**
A treatment of legal and ethical aspects of the profession; review of codes of ethics and current professional problems; featuring several guest speakers representing different segments of the civil engineering field.

Class 1, Credit 1

ITEC-550 **Construction Practices**
Registration #0608-550
An introduction to basic construction management and organization with CPM scheduling, estimating, bidding, safety, labor, cost control and contracts. This is a survey course for non-construction students.

Class 4, Credit 4

ITEC-552 **Analysis and Design**
Registration #0608-552 **of Steel Structures**
This course is organized to continue with the study of structural steel that was begun in ITEC-495. Topics include torsion, continuous beams, plate girders, connections, and composite steel-concrete construction. Discussed will be the working stress method, plastic design, and an introduction to load resistance factor design. (ITEC-495)

Class 4, Credit 4

ITEC-556, 557 **Wastewater Treatment Plants**
Registration #0608-556, 557 **Operation and Control I & II**
A self-paced, audiovisual course. Emphasis is on the functional aspects of wastewater treatment plants' operation. Discussion of the significance of the results of laboratory analysis and interpretation and application to the control of treatment processes. (ITEC-438 and permission of instructor)

Credit variable 1-4

ITEC-560 Construction Project Management
Registration #0608-560
An introduction to basic construction management and organization. Topics include company and project organization, contracts, specifications, bonds, insurance, bidding, cost and financial accounting, and project planning and scheduling. (ITEC-509 and ITEC-422 may be taken concurrently.)

Class 4, Credit 4

ITEC-561 Construction Project Management II
Registration #0608-561
An overview of advanced applications in construction management through precedence modeling. Both CPM and PERT precedence models will be used for scheduling, resource leveling, and cost control. (ITEC-560)

Class 4, Credit 4

ITEC-580 Senior Construction Seminar
Registration #0608-580
Special topics are offered in a seminar format In the past topics have included construction finance, cost engineering, quality and production control, special engineering subjects, and value engineering. (Seniors only; permission of the instructor)

Class 3, Credit 4

ITEC-599 Independent Study
Registration #0608-599
A supervised investigation within a civil technology area of student interest. (Consent of the sponsor and departmental approval)

Credit variable 1-8

Electrical Engineering Technology

ITEE-201 DC Circuits
Registration #0609-201
An introduction to DC circuit analysis techniques. Topics include resistance, inductance, and capacitance, with circuit techniques of Ohm's Law, current-voltage division, simplification of series, parallel, bridge, and ladder networks, Kirchoff's Laws, Thevenin's and Norton's Theorem, Mesh and Nodal Analysis and Superposition. (Corequisite SMAM-204)

Class 3, Lab 2, Credit 4

ITEE-202 AC Circuits
Registration #0609-202
AC circuits and devices with topics of phasor algebra, reactance, impedance, AC power and power factor, resonance, maximum power transfer, frequency, bandwidth, and three-phase circuits. Use of the computer to solve and simulate circuit problems. (ITEE-201; corequisite, SMAT420)

Class 3, Lab 3, Credit 4

ITEE-203 Electronic Devices
Registration #0609-203
An introduction to electronic devices and systems. The operating characteristics and applications of diodes, zeners, and transistors will be investigated. Emphasis will be placed on the biasing of bipolar and FET amplifiers and on the basic characteristics of impedance and gain of simple amplifiers. (TTEE-202; Corequisite SMAT-420)

Class 3, Lab 3, Credit 4

ITEE-205 Drafting and Fabrication
Registration #0609-205
An introduction to the engineering technology field with emphasis on the skills that a student will need in a laboratory environment. The skills include fundamentals of drafting and electrical layout, prototyping, wirewrapping, and soldering. The fundamentals of printed circuit board fabrication and assembly will be discussed. (Corequisite ITEE-201)

Class 3, Lab 2, Credit 4

ITEE-207 EET First-Year Orientation
Registration #0609-207
Introduction to electrical engineering technology. Topics include engineering technology versus engineering, registration system, learning styles, cooperative education, time organization and management and electives in electrical engineering technology.

Class 1, Credit 1

ITEE-231 Logic
Registration #0609-231
Introduction to digital logic, number systems and codes, TTL gates, simplification of logic expressions, combination logic and sequential logic.

Class 3, Lab 2, Credit 4

ITEE-310 Electricity
Registration #0609-310
Circuits using DC sources are analyzed. Components stressed are the inductor, capacitor, diode, transistor, relays, and solenoids.

Class 3, Lab 3, Credit 4

ITEE-311 Electronics I
Registration #0609-311
Circuits using AC sources are analyzed. Components stressed are the transformer, SCR, triac, and motors. Circuits used in printers are analyzed. (ITEE-310)

Class 3, Lab 3, Credit 4

ITEE-312 Electronics II
Registration #0609-312
Continuation of ITEE-311. Circuits of other photofinishing equipment are analyzed. Additional topics include operational amplifiers, logic circuits and an introduction to computers. (ITEE-311)

Class 3, Lab 3, Credit 4

ITEE-314 Basic Electricity
Registration #0609-314
Basic study of important electrical concepts for both AC and DC circuits. Topics covered include AC/DC circuit theory, single- and three-phase power distribution, power factor, line losses, efficiency, AC motors and transformers, energy costs, wiring methods, instrumentation and circuit protection.

Class 3, Lab 2, Credit 4

ITEE-335 Transducers & Instrumentation
Registration #0609-335
An introduction to electrical transducers, their characteristics, applications, and amplification or drive requirements. (ITEE-362, 353)

Class 3, Lab 2, Credit 4

ITEE-337 Electric Machines/Transformers
Registration #0609-337
Power concepts, magnetism, electro-magnetic force, fields, armature, commutators, rotors, stators, brushes, starters, controllers, DC motors, DC generators, AC motors, alternators, single-phase and three-phase dynamos, three-phase circuits, phasors and transformers-properties, isolation, efficiency and voltage regulation. Control of electric motors by solid state devices is introduced. (ITEE-201, 202, 203)

Class 3, Lab 2, Credit 4

ITEE-353 Introduction to Microprocessors
Registration #0609-353
Introduction to microprocessor software and hardware. Hexadecimal, 2's complement arithmetic is used. Introductory programming of the 8085 in both machine and assembly language. Hardware considerations in a microprocessor system are discussed. Input/output and interrupts also are considered.

Class 3, Lab 3, Credit 4

ITEE-361 **Applied Electronics I**
Registration #0609-361
The application of electronic devices in practical circuits. Power supply devices, properties of transistor amplifiers, and power circuits are investigated.

Class 3, Lab 2, Credit 4

ITEE-362 **Applied Electronics II**
Registration #0609-362
A continuation of Applied Electronics I. The topics will include discrete differential amplifier, the op-amp, and power amplifiers. (ITEE-361)

Class 3, Lab 2, Credit 4

ITEE-363 **Applied Electronics**
Registration #0609-363 **for Communication**
This course applies the concepts of circuits and electronics to basic communication circuits for amplitude and frequency modulation. (ITEE-202, 362)

Class 3, Lab 2, Credit 4

ITEE-401 **Transformed Circuits I**
Registration #0609-401
An introductory course in the use of LaPlace transforms to determine the complete response of circuits containing independent and dependent sources, resistance, inductance, and capacitance. Application of basic circuit theorems to the solution of transformed networks. (SMAT-422 or equivalent)

Class 3, Recitation 2, Credit 4

ITEE-402 **Transformed Circuits II**
Registration #0609-402
Frequency response of network functions as solved by use of pole-zero diagrams and Bode diagrams. Mutual inductance. The Fourier series solution of circuits with non-sinusoidal inputs. (ITEE-401)

Class 2, Recitation 2, Credit 3

ITEE-404 **Control Systems I**
Registration #0609-404
Analysis and application of closed-loop control systems for stability, accuracy, transient response; block diagram algebra and transfer functions, Routh's and Nyquist's stability criteria: gain and phase margin, Bode plots, steady-state error, lead and lag compensating networks. (ITEE-402, SMAT-422)

Class 3, Lab 2, Credit 4

ITEE-407 **EET Transfer Orientation**
Registration #0609-407
Introduction to electrical engineering technology. Topics include engineering technology versus engineering, registration system, the quarter system, resources available at RIT, the cooperative education placement process, and electives in electrical engineering technology.

Class 1, Credit 1

ITEE-411 **Electrical Principles**
Registration #0609-411 **for Design I**
A service course offered to non-electrical majors studying in the technical disciplines; covers basic electrical circuits, network theorems, power and energy concepts, P. F. correction, and basics of transformers and motors.

Class 3, Lab 2, Credit 4

ITEE-412 **Electrical Principles**
Registration #0609-412 **for Design II**
An introductory survey course in the basics of analog and digital electronics; topics include basic semiconductors, transistor circuits, operational amplifiers, fundamental digital logic concepts, and an introduction to microcomputers. (ITEE-411)

Class 3, Lab 2, Credit 4

ITEE-413 **Applied Microprocessors**
Registration #0609-413
Applications of microprocessors for manufacturing engineering technology students. Application of the Z80 microprocessor, with emphasis on the interface to TRS80 microcomputers. Microcomputers as applied to robotics and numerically controlled machinery. (ITEE-412)

Class 3, Lab 2, Credit 4

ITEE-414 **Basic Electrical Principles**
Registration #0609-414
Basic study of important electrical concepts for both AC and DC circuits. Topics covered include AC/DC circuit theory, single and three phase power distribution, power factor, line losses, efficiency. AC motors and transformers, energy costs, wiring methods, instrumentation and circuit protection. (SMAT-421)

Class 3, Lab 2, Credit 4

ITEE-424 **Logic and Digital Devices**
Registration #0609-424
The analysis and simplification of logic equations using Boolean algebra with applications to semiconductor integrated circuits. Truth tables and Karnaugh map reduction techniques, multiple output circuits, multi-level gate networks, multiplexers and demultiplexers, synchronous sequential circuits, state diagrams and counter circuits are also studied.

Class 3, Lab 2, Credit 4

ITEE-425 **Power Concepts**
Registration #0609-425
Steady-state AC circuits both single and three phase, transformers, dynamometer theory, motor characteristics, DC and stepper motors, solid-state power electronic devices and application to control of motors.

Class 3, Lab 1, Credit 3

ITEE-428 **Linear Amplifier Design**
Registration #0609-428
Biasing of bipolar and field effect transistors is reviewed. Design and analysis of Class A amplifiers using small signal h-parameters is presented. Included are the topics of feedback and frequency response in multistage amplifiers. (Corequisite ITEE-402)

Class 3, Lab 3, Credit 4

ITEE-437 **Computer Programming**
Registration #0609-437 **Techniques**
The objective of this course is to learn to write good, well documented programs using PASCAL as the programming language. The emphasis of the program will be to learn modern programming techniques and methods of solving problems using computers.

Class 4, Credit 4

ITEE-499 **Cooperative Education**
Registration #0609-499

One quarter of appropriate work experience in industry.

Credit 0

ITEE-520 **Electrostatic and**
Registration #0609-520 **Magnetic Fields**
Basic principles of electrostatic and magnetic fields including vector analysis, Coulomb's law, field intensity, Gauss' law, energy and potential gradient, conductors, dielectrics, capacitance, Biot-Savart law, Ampere's circuit law, Stokes' theorem, magnetic flux density, force on current element and magnetic boundary conditions. (SMAT-422)

Class 3, Recitation 2, Credit 4

ITEE-524 **Microwave Systems**
Registration #0609-524
Microwave power sources, waveguide transmission systems, measurement of standing waves, impedance, Smith charts, power flow in waveguides, solid state microwave devices, microwave antennas and microwave communication system design are discussed. (ITEE-520)

Class 3, Lab 2, Credit 4

ITEE-530 **Operational Amplifiers**
Registration #0609-530
A study of discrete differential amplifiers and integrated operational amplifiers, including applications in instrumentation, active filters, waveform generation and shaping, and precision rectifiers. (ITEE-428)

Class 3, Lab 2, Credit 4

ITEE-532 **Power Amplifier Design**
Registration #0609-532
The design of Class A and B low frequency power amplifiers is studied with special attention to transistor ratings and heat sinking requirements. Principles of transformer design. Class C RF amplifiers and Class D regulators are also covered. (ITEE-428)

Class 3, Lab 2, Credit 4

ITEE-534 **Analog Communication**
Registration #0609-534 **Systems**
Circuit design and systems concepts for AM, DSB, SSB, VSB, and FM of each type of modulation are determined using the Fourier series of periodic waveforms. The noise figure, noise temperature, and signal-to-noise ratio of each system is determined. (ITEE-428)

Class 3, Lab 2, Credit 4

ITEE-535 **Telecommunication Systems**
Registration #0609-535
Topics include sampling theorem, plus modulation (PAM, PWM, PPM), digital modulation (PCM, DM), time-division multiplexing, quantization noise, baud rate, coding, PCM telephone circuitry, asynchronous and synchronous transmission, protocols, digital radio and space communication techniques, and fiber-optic communication systems. (ITEE-534 or equivalent)

Class 4, Credit 4

ITEE-536 **Control Systems II**
Registration #0609-536
A review of ITEE-404, Control Systems I; Root locus and Nichols charts will also be discussed. Design of control systems for specific application and performance criteria; application of control theory to specific electromechanical temperature and light control systems. Time domain analysis including state variables, matrices and numerical solutions to state equations will be studied. Digital computer control utilizing real-time controllers and z-transforms will also be included. (ITEE-404)

Class 3, Lab 2, Credit 4

ITEE-538 **Digital Computer Design I**
Registration #0609-538
Design of logic circuits using 7400 series TTL gates; a study of TTL flip-flops, one shots and oscillator circuits; design of timing circuits, shift registers and counters. (ITEE-424)

Class 3, Lab 2, Credit 4

ITEE-539 **Digital Computer Design II**
Registration #0609-539
A continuation of ITEE-538 with application of logic circuits to computer design. Semiconductor memories, ALUs and their applications to computers and microprocessors are considered. The basic operation of computers, and computer systems are examined. Machine language programming, indexing and indirect addressing and interrupt programming are introduced. The student will build a small prototype minicomputer for use in this course. (ITEE-538)

Class 3, Lab 2, Credit 4

ITEE-542 **Microprocessors**
Registration #0609-542
An introductory course in Microprocessors emphasizing the Motorola 6800 and Intel 8085. The topics covered include the CPU, ROMS, RAMS, programming and interface ICs. Practical applications of microprocessors are also considered. (ITEE-424, ITEE-437)

Class 3, Lab 3, Credit 4

ITEE-543 **Peripherals and Interfacing**
Registration #0609-543
A study of the most common peripherals used with microprocessors and minicomputers. Peripherals include UARTs, IC timers, TTYs, modems, CRT drivers, disc drives, line printers, and D/A and *AID* converters. Methods of interfacing these peripherals to minicomputers and microprocessors are emphasized. Advanced topics in microprocessors will also be considered. (ITEE-539 and ITEE-542 or permission of the instructor)

Class 3, Lab 3, Credit 4

ITEE-547 **Digital Processing of Signals**
Registration #0609-547
Basic concepts of linear systems are covered, followed by an introduction to digital signal processing from a hardware and software approach. Emphasis is placed on digital filter design and FFT. Applications are considered. Programming projects will be assigned. (SMAT-422, ITEE-530)

Class 3, Recitation 2, Credit 4

ITEE-550 **Power Systems I**
Registration #0609-550
Basic elements of a power system, energy sources, substation configuration, load cycles, balanced and unbalanced three phase circuits, power factor correction, transmission line configurations and impedances, voltage regulation of transformers, and the per unit system are studied. The symmetrical component method of analysis is introduced. (ITEE-425 or ITEE-412)

Class 4, Credit 4

ITEE-551 **Protective Relaying**
Registration #0609-551
The physical construction and characteristics of electromechanical relays, short circuit calculation and line, bus, transformer and motor generator protection are studied. Solid state relays, instrument transformers, and telecommunications and supervisory control are included. (ITEE-402 or equivalent)

Class 4, Credit 4

ITEE-552 **Power Systems II**
Registration #0609-552
The symmetrical component method of three phase circuit analysis is used for fault analysis. Lightning and surge protection, load flow, economic operation, and system stability are covered. System protection is introduced. (ITEE-550 or permission of instructor)

Class 4, Credit 4

ITEE-554 **Electronic Optic Devices**
Registration #0609-554
Basic photometry is discussed. Light emitting and light receiving devices are covered with circuits and applications. Optics is introduced with laser theory and fiber-optics.

Class 4, Credit 4

ITEE-555 **Transmission Lines**
Registration #0609-555 **and Antennas**
Analysis of voltage, current, and power along transmission lines. Design of matching stubs. Use of Smith chart. Solution of Maxwell's equations and their interpretation relevant to antenna theory. Characteristics of various antennas and arrays. (ITEE-402)

Lecture 3, Lab 2, Credit 4

ITEE-560 **Microelectronics I**
Registration #0609-560
Fabrication techniques of bipolar devices are presented: crystal growth, oxide growth, lithography, diffusion, epitaxy, ion implantation, and metallization. The physical basis of semiconductor operation is introduced along with IC transistor design considerations.

Lecture 3, Recitation 2, Credit 4

ITEE-561 **Microelectronics II**
Registration #0609-561
The fabrication techniques of MOS/CMOS devices are presented along with the physical basis of their operation and use in IC devices. VLSI design procedures using MOS/CMOS devices are introduced and developed. (ITEE-560)

Lecture 3, Recitation 2, Credit 4

ITEE-565 **16-bit Microprocessors**
Registration #0609-565
A study of 16-bit microprocessors, emphasizing the Motorola 68000 and the Intel 8086. The architecture, instruction set, and programming of these microprocessors will be discussed. Input/output, interrupts, and exception processing also will be considered. (ITEE-542 or equivalent)

Class 3, Lab 3, Credit 4

ITEE-580 **Senior Project**
Registration #0609-580
Selected independent study of design project by electrical technology students with the approval of the department. Approval must be granted first week of fall or winter quarter for spring quarter registration.

Class/Lab as required. Credit 4

Mechanical Engineering Technology

ITEM-211 **Introduction to Materials**
Registration #0610-211 **Technology**
A course dealing with the characteristics of materials and the fabrication of materials into finished products. Topics will include mechanical, electrical, thermal, chemical, magnetic and optical properties of materials, the structure of the materials and the interrelationship of material characteristics and manufacturing processes.

Class 4, Credit 4

ITEM-212 **Metrology**
Registration #0610-212
A course dealing with precision measurements as applied to the manufacturing processes. Gaging of dimensions, surfaces, and contours by various techniques are among the topics covered. (ITEC-210)

Class 1, Lab 2, Credit 2

ITEM-302 **Introduction to Statics**
Registration #0610-302
An introduction to statics covering forces, moments, vectors, equilibrium, friction, areas, volumes, and masses. (Algebra, trigonometry, physics)

Class 3, Recitation 2, Credit 4

ITEM-303 **Strength of Materials**
Registration #0610-303
An introduction to the effect of external forces on the behavior of solid materials, stresses, strains, Hook's law; thermal effects are studied with consideration of axial, torsional, and bending loads, by themselves and in combination. (ITEM-302)

Class 3, Recitation 2, Credit 4

ITEM-304 **Materials Testing**
Registration #0610-304
A laboratory course dealing with standard physical tests of various materials, instrumentation used in these tests and the preparation of laboratory reports. (ITEM-303)

Class 0, Lab 2, Credit 1

ITEM-306 **CAD Applications in**
Registration #0610-306 **Mechanical Design I**
This is an applications course in CAD which uses the fundamental concepts and software studied in Introduction to CAD, CAD I and CAD II. Instruction will be provided in geometric dimensioning and tolerancing. Laboratory exercises will emphasize machine component design problems. (ITEF-360)

Class 2, Lab 4, Credit 4

ITEM-307 **CAD Applications in**
Registration #0610-307 **Mechanical Design II**
This is the second of a two-course sequence in CAD applications. Students will have the opportunity to improve their CAD skills by solving more extensive problems. Instruction will be provided in statistical tolerancing. Laboratory exercises will emphasize machine design problems. (ITEM-306)

Class 2, Lab 4, Credit 4

ITEM-320 **Fluid Power Systems**
Registration #0610-320
Introduction to pneumatic and hydraulic components, pneumatic and hydraulic power systems; compressors, pumps efficiency and applications; integrated electromechanical power systems. Lab sessions develop a qualitative feel for characteristics and applications of power systems, machines and their control.

Class 3, Lab 2, Credit 4

ITEM-404 **Applied Mechanics of Materials**
Registration #0610-404
The basic concepts of mechanics of materials as applied to mechanical design are covered in depth. The course includes a review of statics, the concepts of stress and strain, the stress-strain relationship and strength of materials. Specific topics include simple normal and shear stresses, torsion of shafts, bending stress and deflection of beams, combined stresses and statically indeterminate problems. (TTEM-408 or equivalent)

Class 3, Recitation 2, Credit 4

ITEM-405 **Applied Dynamics**
Registration #0610-405
This is a course in the fundamentals of kinematics and kinetics of motion. Kinematics is the study of the geometry of motion. Kinetics relates the forces on objects to their resulting motion. This includes the study of Newton's Laws of Motion and energy methods. (ITEM-404, SMAT-421, or concurrent)

Class 3, Recitation 2, Credit 4

ITEM-406 **Dynamics of Machinery**
Registration #0610-406
A study of the kinematics of machine elements including gear trains, cams and linkages. Applications in robotics mechanisms are studied. Both graphical and computer methods are used. (ITEM-405 and 432)

Class 3, Recitation 2, Credit 4

ITEM-407 **Mechanical Engineering**
Registration #0610-407 **Technology Laboratory I**
A course in mechanical laboratory techniques and the preparation of laboratory reports; experimental work in materials testing, strength of materials, experimental stress analysis, metallurgy, and metallography; instruction in the preparation of laboratory reports. (Must be taken concurrently with ITEM-414.)

Class 2, Lab 2, Credit 3

ITEM-408 **Introduction to Strength**
Registration #0610-408 **of Materials**
Elements of statics and strength of materials. Topics include plane equilibrium, friction, stress, strain, torsion, and the bending of beams.

Class 3, Recitation 2, Credit 4

ITEM-409 **Mechanical Engineering**
Registration #0610-409 **Technology Laboratory II**
A course in mechanical laboratory techniques, the analysis of experimental results and the preparation of laboratory reports. Experimental work in mechanics of materials, materials science and plastics technology will be conducted. Instruction will be provided in several forms of technical communication. (ITEM-404,407, 415 concurrently)

Class 1, Lab 2, Credit 2

ITEM-414 **Materials Technology I**
Registration #0610-414
A course involving a study of materials, their structure and their characteristics. Topics covered include metallic structures, unit cell, phases and phase diagrams, physical properties, diffusion in metals, recovery, recrystallization and grain growth, ferrous and some non-ferrous metals, heat treatment and age hardening of metals.

Class 3, Credit 3

ITEM-415 **Materials Technology II**
Registration #0610-415
Three major study areas are plastics, ceramics and corrosion. Included are the structure of plastics, types of polymerization, processing of plastics, ceramic structures and properties, classification of ceramic materials, glasses, bricks, tiles, refractory and insulating materials, corrosion of materials, corrosion rates, types of corrosion, cathode and anode reactions, corrosion control and prevention.

Class 3, Credit 3

ITEM-429 **Technical Communication**
Registration #0610-429
This course encompasses instruction in both written and oral communication. Emphasis will be placed on the written technical report and the formal oral technical presentation. Topics covered in the course will include report research; report preparation; formulation of the report outline; report organization, format and style; and development of the executive summary. Written reports and oral presentations will be required from each student. Use of visual aids and assistant presentors will be incorporated into the formal oral presentations delivered by the student Evaluation of the students' written and oral presentations will be based on technical content and to a large extent on the students' command of the English language. Development of vocabulary and spelling skills; improvement of grammar, syntax and punctuation; and improvement of basic English language skills also are objectives of this course.

Class 3, Recitation 2, Credit 4

ITEM-432 **Computers in Mechanical**
Registration #0610-432 **Technology**
The use of computers to solve problems encountered in mechanical engineering technology will be emphasized. This will include an introduction to the RIT academic computing system and introduction to the use of personal computers. Instruction will be provided in word processing, spread sheet programming, plotting and other applications programs. Assignments will be based on problems encountered in mechanics of materials, dynamics, materials testing, etc. A course in a programming language is a prerequisite.

Class 2, Lab 2, Credit 3

ITEM-440 **Applied Thermodynamics**
Registration #0610-440
The first and second laws of thermodynamics and their applications in mechanical engineering technology. Thermodynamic properties of fluids including ideal gasses and pure substances are studied. Thermodynamic processes and applications of thermodynamic principles to steam cycles and refrigeration cycles.

Class 4, Credit 4

ITEM-442 **Heat Transfer**
Registration #0610-442
The first course in heat transfer. The theory and application of the fundamentals of heat conduction, convection, and radiation. The design and applications of heat transfer-apparatus. (ITEM-440)

Class 3, Lab 2, Credit 4

ITEM-451 **Vibration and Noise**
Registration #0610-451
A study of the basic concepts of vibration and noise. Designing equipment for survival in vibration and shock environments. Methods of reducing noise in machinery structures. Environmental tests for vibration and shock. Methods of vibration and noise analysis will be demonstrated. (SMAT-442, ITEM-405)

Class 4, Credit 4

ITEM-460 **Applied Fluid Mechanics**
Registration #0610-460
A study of the fundamentals of fluid statics and dynamics. Applications of kinematics, momentum, conservation of energy, and laminar and turbulent flow in pipes, dimensional analysis, fluid machinery and meters. (ITEM-440, and either ITEM-405 or ITEM-408)

Class 4, Credit 4

ITEM-465 **Thermofluid Laboratory**
Registration #0610-465
Laboratory experiments in thermodynamics, fluid mechanics and heat transfer. Special emphasis is placed on report preparation and computer-aided data reduction. (ITEM-440, ITEM-460)

Class 1, Lab 3, Credit 3

ITEM-499 **Cooperative Education**
Registration #0610-499

One quarter of appropriate work experience in industry.

Credit 0

ITEM-506 **Machine Design I**
Registration #0610-506
The study of the static and fatigue failure of machine components and the design and analysis of fasteners, springs, and gears. Computer programs are used to study the statics theories of failure and for fatigue analysis. (ITEM-405, 432)

Class 3, Recitation 2, Credit 4

ITEM-508 **Machine Design II**
Registration #0610-508
The study of selected topics such as bearings, helical, bevel and worm gears, belts, chains, clutches and brakes. Computer applications are presented for many of the topics studied. (ITEM-506)

Class 3, Lab 2, Credit 4

ITEM-512 **Computer-Integrated**
Registration #0610-512 **Mechanical Design**
The use of computers in solving mechanical design problems will be emphasized. This includes data manipulation, plotting, graphics, applications programming, and an introduction to finite elements. (ITEM-432, 506)

Class 3, Recitation 2, Credit 4

ITEM-521 **Logic Control Systems**
Registration #0610-521
The analysis and design of logic control systems using Boolean algebra. Emphasis is placed on the control of machines with fluid and relay logic. Introduction to electronic programmable controls. The concepts of ordinary and timed sequence control and machine protection are covered. Logic control systems will be demonstrated in the lab.

Class 3, Lab 2, Credit 4

ITEM-522 **HVAC Control Systems**
Registration #0610-522
An introduction to controls used in association with HVAC systems. The course integrates controls with HVAC processes to arrive at appropriate control and instrumentation systems. The course examines individual instruments, instrument and control systems, monitoring systems and computer control. (ITEM-542)

Class 4, Credit 4

ITEM-530 **Instrumentation**
Registration #0610-530
The basic approach to calibration and use of pressure, temperature, flow, humidity and liquid level measurement instruments. Techniques of test, calibration and proper use of instruments will be demonstrated. Principles of experimentation and computerized data reduction are examined. (ITEE-411, ITEM-460, SMAT-422)

Class 3, Lab 2, Credit 4

ITEM-535 **Analog Control Systems**
Registration #0610-535
The course provides students with an overview of analog feedback control systems. Students are introduced to topics such as block diagrams, classification of control types, mathematical models, measuring means, and LaPlace Transforms. Control systems design will also be discussed. Lab demonstrations will be presented. (ITEM-405, 460, and SMAT-422)

Class 4, Credit 4

ITEM-540 **Applied Thermodynamics II**
Registration #0610-540
Application of thermodynamics to internal combustion engines, compressors, steam cycles, refrigeration, air conditioning, psychometrics and combustion processes. (ITEM-440)

Class 4, Credit 4

ITEM-541 **Alternative Energy**
Registration #0610-541 **Applications**
The major emphasis of this course is in the area of solar energy: system design of solar hot water and space heating systems, and solar-assisted heat pumps. Other alternative sources of energy also are discussed: wind energy, and solid waste. (ITEM-442)

Class 4, Credit 4

ITEM-542 **HVAC System Engineering**
Registration #0610-542
Principles and applications of refrigeration, air conditioning, comfort heating, and ventilating. Thermodynamics of air conditioning, psychrometrics, moisture calculations; also related heat transfer topics.

Class 4, Credit 4

ITEM-543 **Energy Management I**
Registration #0610-543
Technical, management, and cost aspects of energy conservation. Technical aspects of reducing energy consumption in utilities, processes, buildings, heating, air conditioning, and ventilation systems. Special topics such as furnace efficiency, heat recovery, heat pumps, pumping and piping, and architectural considerations. (ITEM-540)

Class 4, Credit 4

ITEM-544 **Energy Management II**
Registration #0610-544
Technical, management, and cost aspects of energy conservation. Technical aspects of reducing energy consumption in utilities, processes, buildings, heating, air conditioning, and ventilation systems. Special topics such as furnace efficiency, heat recovery, heat pumps, pumping and piping, and architectural considerations. (ITEM-540)

Class 4, Credit 4

ITEM-545 **Solar Thermal Applications**
Registration #0610-545
Study of analytical methods to model and predict the performance of solar energy systems. The emphasis will be on the application and design of systems appropriate for the available technology. Additional areas of study include the economic feasibility and analysis of potential solar energy applications, selection of appropriate equipment based on the energy value and economic based adjustment of system designs derived from technical performance optimizations. (ITEM-440)

Class 4, Credit 4

ITEM-546 **Advanced HVAC Systems**
Registration #0610-546 **Engineering**
This course covers the thermodynamic analysis of air conditioning processes, especially with regard to equipment components such as coils, humidification apparatus, fans, and compressors. The methods of modeling the dynamic thermal performance of buildings are studied. Topics related to the influence of solar energy and light on the design of buildings. The design of electric lighting is introduced. The thermofluid analysis of pipe flow and air flow in ducts is also covered.

Class 4, Credit 4

ITEM-561 **Computer-Aided**
Registration #0610-561 **Energy Analysis**
The course examines the application of computer software for both HVAC systems analysis and the sizing of pipes and ducts. Students will use programs that are currently used in design offices to solve design problems. The computer is used to examine alternative designs and to gain insights into the effects of variations in system parameters.

Class **2,** Lab 4, Credit 4

ITEM-580 **Power Plant Design**
Registration #0610-580
Description of power plants and their components; boilers, turbine, pumps, condenser, heat exchangers, nuclear reactors. Relevant analytical tools; cycle calculations, heat balances, gas analysis, fuel analysis. Also, internal combustion power plants and cogeneration plants are covered. (ITEM-440, ITEM-460)

Class 4, Credit 4

ITEM-599 **Independent Study**
Registration #0610-599
A supervised investigation within a mechanical technology area of student interest. (Permission of instructor and departmental approval are required.)

Credit variable (1-4)

Manufacturing Engineering Technology

ITEF-220 **Introduction to**
Registration #0617-220 **Manufacturing Processes**
This course will introduce the student to basic metal cutting machine tool operation, proper machining practices and cutting tool selection. Hands-on experience will be emphasized through lathe, milling machine, drill press, band saw, grinder and precision layout work. The course will provide the student with the knowledge and the "how-to-do" skills of manufacturing. (ITEC-**210)**

Class 3, Lab 3, Credit 4

ITEF-229 **Introduction to**
Registration #0617-229 **Technical Communication**
The student will be introduced to technical communication in both written and verbal form. Emphasis will be placed on style, content, and the contrast between technical and non-technical communications.

Class 4, Credit 4

ITEF-260 **Introduction to CAD**
Registration #0617-260
This is a first course in CAD. It introduces the basic concepts in automated drafting and design. The course will be taught with the help of a PC-based CAD system. (ITEC-210)

Class 3, Lab 2, Credit 4

ITEF-265 **CAD I**
Registration #0617-265
This is a second-level course in CAD and will deal with the concepts of mechanical design using a turn-key CAD system. The scope of the course will be limited to the design of parts using 2D geometric models. (ITEF-260)

Class 3, Lab 2, Credit 4

ITEF-300 **BASIC Programming**
Registration #0617-300
This is a programming course involving microcomputers. The course will first introduce the fundamentals of computer hardware, software, and data processing and then concentrate on developing the skills in programming with BASIC. It will also deal with the use of canned programs for accomplishing many of the tasks in the manufacturing environment. Emphasis will be placed on the application of microcomputers to real-world problems.

Class 3, Lab/Recitation 2, Credit 4

ITEF-360 **CAD II**
Registration #0617-360
This is the third course in CAD and will deal with the concepts of mechanical design using a turn-key CAD system. In this course, the design of parts will be approached from the point of view of 3D geometric models. (ITEF-265)

Class 3, Lab 2, Credit 4

ITEF-372 **CAD Applications**
Registration #0617-372 **to Tool Design**
This course deals with the design of tools used in the manufacturing processes. The course will employ a CAD system for design purposes. (ITEF-260)

Class 3, Lab 2, Credit 4

ITEF-375 **Introduction to**
Registration #0617-375 **Computer-Aided Manufacturing**
This is the first course in Computer-Aided Manufacturing, and deals with the concepts in Distributed Numerical Control Systems. It provides hands-on experience in the automatic fabrication of parts designed in a CAD System. (ITEF-260)

Class 3, Lab 2, Credit 4

ITEF-403 **Machine Elements**
Registration #0617-403
This course covers the basic principles that apply to the design and selection of such frequendy used machine elements as bearings, shafts, fasteners, variable speed drives, gears, cams and springs. Emphasis will be given to applications for manufacturing equipment.

Class 4, Credit 4

ITEF-405 **Materials in Manufacturing**
Registration #0617-405
A course dealing with the materials used in modern manufacturing processes. Topics include metals, composites, plastics, and the selection of manufacturing materials from the point of view of design and manufacture.

Class 4, Credit 4

ITEF-420 **Manufacturing Processes**
Registration #0617-420
A comprehensive course in metal manufacturing processes. Topics include metal solidification processes, bulk deformation processes, sheet-metal working processes, particulate processing, machining, and joining processes. The course will address the processes from the point of view of "how," "why" and "under what conditions." Emphasis will be placed on the laboratory projects.

Class 3, Lab 3, Credit 4

ITEF-424 **Statistical Quality Control I**
Registration #0617-424
The basic concepts of statistics and probability are studied as they apply to quality control and reliability. Included are the study of control charts and sampling procedures and work measurement.

Class 4, Credit 4

ITEF-425 **Statistical Quality Control H**
Registration #0617-425
This is an advanced course in quality control. The course will cover in detail the following aspects: Process Control Techniques involving X charts, R charts, P charts, NP charts, and Acceptance Sampling techniques involving MIL-STD 105D, MIL-STD 414, and other MIL-STDs. (SMAT-309)

Class 3, Credit 3

ITEF-436 **Engineering Economics**
Registration #0617-436
The course deals with techniques required to make economic decisions. Topics covered in the course include cash flow analysis, present worth analysis, annual worth comparisons, rate of return evaluations, benefit cost analysis, breakeven analysis, replacement evaluations, bonds, and the effect of taxes on cash flows.

Class 4, Credit 4

ITEF-437 **Value Analysis**
Registration #0617-437
The course presents the techniques involved in analyzing products from the point of view of value and cost. It is a project oriented course where students select and solve real world problems. The techniques covered in the course include team building, project selection, brainstorming, Gordon techniques, attribute listing, morphological analysis, functional analysis, value index, paired comparisons, magnitude estimation, criteria analysis, and cost estimation.

Class 3, Credit 3

ITEF-450 **Plastics Processing**
Registration #0617-450
A course dealing with the various methods used to manufacture plastics products. Topics include compression and rotational molding, extrusion, injection molding, blow molding, thermoforming, pre- and post-molding operations and economics of plastics processing.

Class 3, Lab **2,** Credit 4

ITEF-460 **Computer-Aided Design**
Registration #0617-460
The course introduces CAD as an integral part of Computer Integrated Manufacturing. It deals with the basic concepts in CAD, the hardware and software related to 2D and 3D interactive graphics, CAD applications, the relationship between CAD and CAM, and the economics of CAD. The course concentrates on the CAD functions involving geometric modeling, finite element analysis, and drafting. Emphasis is placed on the laboratory work involving turn-key systems for 3D wire frame modeling and 3D solids modeling.

Class 3, Lab 2, Credit 4

ITEF-471 **Computer Numerical Control**
Registration #0617-471
An advanced course in the application of numerical control. Emphasis is placed on computer-assisted part programming for contouring in two and three axes. The course will concentrate on N/C programming with APT.

Class 2, Lab 2, Credit 3

ITEF-472 **Tool Engineering**
Registration #0617-472
An advanced course dealing with manufacturing tools. Examines concepts in tool design, tool specification and tool selection. Emphasis is on the design of dies.

Class 3, Lab 2, Credit 4

ITEF-473 **Compact II**
Registration #0617-473
This is the second advanced-level course in computer numerical control. Compact II is one of the most commonly used NC part programming languages in the industry. The students will learn to write Compact II programming language and work with the Manufacturing Data Systems Inc., time-sharing terminals to produce NC tapes. (ITEF-471)

Class 3, Lab 2, Credit 4

ITEF-475 **Computer-Aided**
Registration #0617-475 **Manufacturing**
A course dealing with the process aspects of Computer Integrated Manufacturing systems. Introduces the various elements of CIM and concentrates on the role of CAM in CIM. Deals with the concepts and application of Group Technology, Computer-Aided Process Planning, and Flexible Manufacturing Systems. Includes the relationships between CAD, CNC, Robotics, MRP and CAM. Emphasis is placed on building mini CAM systems in the laboratory. (ITEF-471, ITEF-485, ITEE-413, ITEM-521)

Class 3, Lab 2, Credit 4

ITEF-481 **Work Simplification**
Registration #0617-481 **and Measurement**
Principles and application of basic methods for the improvement of operator-assignment time relationship. Methods of measuring and analyzing work, motion studies, and process analysis are covered.

Class 3, Credit 3

ITEF-485 **Robots in Manufacturing**
Registration #0617-485
A course dealing with the technology and application of robotics. Included are the study of hardware and software of robots and the integration of robots with other elements of Computer Integrated Manufacturing (CIM) systems. The hardware aspects will include the mechanical components, the power systems, the control units, and the sensors. The software aspects will cover the various methods of programming the robots and interfacing them with other components of CIM. The integration aspects include the potential areas of application of robots and their economics. (ITEM-521, ITEE-413)

Class 3, Lab 2, Credit 4

ITEF-491 **Production Control**
Registration #0617-491
Fundamentals of production and inventory control concepts are presented. Major portion of the course is devoted to the principles and the application of MRP. Deals with the inventory control theories, forecasting, master production schedules, bill of materials, lead times, order points, gross to net procedures, and production schedules.

Class 4, Credit 4

ITEF-499 **Manufacturing Technology**
Registration #0617-499 **Co-op**
One quarter of appropriate work experience in industry.

Credit 0

ITEF-502 **Non-Traditional**
Registration #0617-502 **Manufacturing Processes**
A course dealing with precision machining using non-traditional processes. Includes such processes as electric discharge machining, electro-chemical machining, chemical milling, laser beam machining, electron beam machining, ultrasonic machining, water jet cutting, abrasive flow machining and plasma arc machining.

Class 3, Credit 3

ITEF-510 **Process Design**
Registration #0617-510
Project-oriented independent course. Presents an opportunity for the student to apply the knowledge gained in the program. The student is expected to design and build a system and demonstrate its operation. May include oral and written reports. (LI EF core or instructor's consent)

Class 1, Recitation 4, Credit variable 3-4

ITEF-526 **Quality Systems**
Registration #0617-526
Study of quality-related aspects from design of products to providing maintenance services in the field. Students are presented with case studies for analysis and problem solving.

Class 3, Credit 3

ITEF-530 **Special Topics in Computer**
Registration #0617-530 **Integrated Manufacturing**
An advanced course covering various problems faced by the industry in computer integrated manufacturing. Topics will include design for assembly, problems in design analysis, incompatible system components, hardware and software integration problems, universal standards, IGES, MAPS, hardware and software related problems in feedback devices and management and personnel problems. (ITEF-485)

Class 3, Credit 3

ITEF-599 **Independent Study**
Registration #0617-599
A supervised investigation within a manufacturing technology area of student interest. Student must submit written proposal and have it approved prior to registering.

Credit variable 1-4

Computer Engineering Technology

ITEP-201 **DC Circuits**
Registration #0618-201
An introduction to DC circuits analysis techniques. Topics include resistance, inductance, capacitance, with circuit techniques of Ohm's Law, current-voltage division, simplification of series, parallel, bridge and ladder networks, Kirchoffs Laws, Thevenin's and Norton's Theorems, Mesh and Nodal Analysis and Superposition. (Corequisite SMAM-204)

Class 3, Lab 2, Credit 4

ITEP-202 **AC Circuits**
Registration #0618-202
AC circuits and devices with topics of phasor algebra, reactance, impedance, AC power and power factor, resonance, maximum power transfer, frequency, band-width, and three-phase circuits. The computer will be used to solve and simulate circuit problems. (ITEP-201, corequisite SMAT-420)

Class 3, Lab 3, Credit 4

ITEP-203 **Electronic Devices**
Registration #0618-203
An introduction to electronic devices and systems. The operating characteristics and applications of diodes, zeners, and transistors will be investigated. Emphasis will be placed on the biasing of bipolar and FET amplifiers and on the basic characteristics of impedance and gain of simple amplifiers. (Corequisite SMAT-420) (ITEP-202)

Class 3, Lab 3, Credit 4

ITEP-205 **Drafting & Fabrication**
Registration #0618-205
An introduction to the engineering technology field with emphasis on the skills that a student will need in a laboratory environment. These include fundamentals of drafting and electrical layout, prototyping, wirewrapping, and soldering. The fundamentals of printed circuit board fabrication and assembly will be discussed. (Corequisite ITEP-201)

Class 3, Lab 2, Credit 4

ITEP-301 **Digital Fundamentals**
Registration #0618-301
A first course in digital fundamentals. Topics include binary arithmetic, Boolean algebra, logic gates, Karnaugh mapping, and an introduction to sequential logics. (Corequisite ITEP-203)

Class 3, Lab 2, Credit 4

ITEP-302 **Linear Electronics**
Registration #0618-302
A course in the analysis and design of linear amplifiers for students who have completed an introductory course in electronics. Emphasis will be placed on small signal modeling, depiction of amplifier characteristics, direct and capacitor coupled amplifiers, frequency response, differential amplifiers and feedback. (ITEP-203)

Class 3, Lab 3, Credit 4

ITEP-303 **Microcomputers**
Registration #0618-303
A first course involving the hardware and structure of a basic microprocessor-based microcomputer. Emphasis will center on the hardware characteristics that dictate performance limitations, design consideration, and interfacing principles. The laboratory will require programming assignments. (ITEP-203, 301; ICSP-305)

Class 3, Lab 3, Credit 4

ITEP-403 **Advanced Circuit Theory**
Registration #0618-403
A course for those who have had an associate degree sequence in circuits. Emphasis on transient circuits, LaPlace Transform applications, Bode and Fourier analysis. (ITEP-202, 203, SMAT-422)

Class 4, Recitation 2, Credit 5

ITEP-405 **Control Theory**
Registration #0618-405
A course in the fundamentals of linear control systems, as used from the standpoint of the digital computer. Emphasis on feedback control theory, control system components, digital control systems and solid state control. (ITEP-403)

Class 3, Lab 2, Credit 4 Class 3, Lab 2, Credit 4

ITEP-429 **Advanced Electronics**
Registration #0618-429
A course in the modern application of linear integrated circuits, with emphasis on the operational amplifier. (ITEP-403)

Class 3, Lab 2, Credit 4

ITEP-471 **Topics in Computer**
Registration #0618-471 **Engineering Technology**
A course for majors in computer technology, with topics as needed for updating in technology. Anticipated offerings include topics in new programming languages, advanced microprocessor and microcomputer systems, and computer communications systems and techniques. (Fifth-year status in computer technology)

Class 3, Lab 3, Credit 4

ITEP-499 **Cooperative Education**
Registration #0618-499
One quarter of appropriate work experience in industry. (ITEP-303, ICSP-305)

Credit 0

ITEP-538 **Digital System**
Registration #0618-538 **Design I**
An advanced course in the design techniques of complex combinational and sequential logic circuits and subsystems. Emphasis is on the use of different SSI/MSI logic families in implementing the designs. The internal structure and function of various logic gates are analyzed. The problems of interfacing various logic families are discussed. (ITEP-303)

Class 3, Lab 3, Credit 4

ITEP-539 **Digital System**
Registration #0618-539 **Design II**
A study of the design of complete digital systems using combinational and sequential subsystem circuit design and microprocessors. Included is the hardware design used in digital communications systems. Laboratory work is based around the designing, building and modifying of a multifunction microcomputer from individual components. Also included are the hardware ramifications of software and operating system design, and small system architecture problems. (ITEP-538, 303)

Class 3, Lab 3, Credit 4

ITEP-540 **Digital Systems**
Registration #0618-540 **Design m**
An introduction to the design of complete digital control systems. A/D and D/A converters, digital control theory and sensing devices are emphasized. (ITEP-405, 429, 539)

Class 3, Lab 3, Credit 4

ITEP-580 **Senior Project**
Registration #0618-580
Selected independent study design project by computer technology students with the approval of the department. Approval must be granted first week of the fall or winter quarter for spring quarter registration. (Fifth-year status in computer technology)

Class/Lab as required, Credit 4

Department of Instructional Technology

All courses in the Department of Instructional Technology are offered at least once every three years and/or upon sufficient demand:

Audiovisual Communications Service Courses

Service courses are offered by the Audiovisual Communications Department for other departments. These courses may not be taken by audiovisual communications majors.

ICIC-413 **AV Production for Biomedical**
Registration #0612-413 **Communications**
Design, creation, and presentation of 35mm slide and 35mm slide + tape productions as applied to medical and scientific needs. Planning, researching, scripting, production, revision, evaluation. Dissolve programming, graphics; combination of music, words, and images. (For biomedical photography majors only)

Class 2, Lab 4, Credit 4

ICIC-421 **Producing Audiovisual**
Registration #0612-421 **Presentations I**
Students develop slide + tape presentations in order to communicate an idea or to change the attitudes or behavior of the viewer. The development process includes: analyzing the needs of clients and audiences; preparing communications objectives; preparing treatment, storyboard, and script; producing audio track and visual materials; synchronization and presentation preparation. Project required. (Photographic skills required, for nonmajors)

Credit 4

ICIC-422 **Producing Audiovisual**
Registration #0612-422 **Presentations II**
Basic slide + tape planning and production similar to ICIC-421 but with increased emphasis on scripting and production planning and the unique characteristics of slide + tape as a delivery medium; increased emphasis on synchronization methods and more sophisticated presentation hardware. (ICIC-421, for nonmajors)

Credit 4

ICIC-426 **Training and Supervision in**
Registration #0612-426 **the Hospitality Industry**
Course includes theory and techniques of training employees in the food, hotel, and tourism management field. The course covers task analysis, job descriptions, recruitment and hiring, training and employee development, supervision, evaluation, and productivity. (Open to FHTM juniors and seniors only, prerequisite to ICIC-519)

Credit 4

ICIC-444 **Technical Writing for**
Registration #0612-444 **Computer Scientists**
An intensive course in the preparation of technical documents in the field of computer science. Topics include analysis of purpose of a document, and writing effectively for the expertise and interests of the intended audience. Writing assignments will cover reports and user documentation. This course is a prerequisite to the third quarter of cooperative education. (For computer science majors only)

Credit 2

ICIC-445 **Technical Writing**
Registration #0612-445
An intensive course in the preparation of documentation and reports to both management and a variety of information users. Topics include analysis of the document's purpose and audience, analysis and structure of content, effective writing, and layout techniques. Writing assignments include preparation of technical information for management and for non-technical staff; progress reports; and common organizational communications. (Course meets computer science technical writing requirements.) (English Composition from the College of Liberal Arts or from transfer institution)

Credit 4

ICIC-489 **Audio for Audiovisual**
Registration #0612-489 **Presentations**
Students record, transfer, edit, and mix sound tracks—with music, narration and sound effects—for audiovisual programs. Course stresses practical approach with hands-on experience. Enrollment for 4 credits requires production of the audio portion of a presentation.

Credit variable 3-4

ICIC-519 **Principles and Methods for**
Registration #0612-519 **Dietetics Education**
Principles of learning, behavioral objectives, motivation, perception, evaluation, guidance, teaching methods and audiovisual techniques; development of a teaching/learning unit for a specific group. (For dietetics majors only)

Credit 4

Upper Division Major Courses

ICIC-375 **Video Production for**
Registration #0612-375 **Audiovisual Presentations**
Designed primarily for audiovisual communications transfer students, the course covers the basic elements of non-studio video production as it relates to producing purposive, situation-linked video presentations integrated into an overall meeting or series of meetings. Covers establishing communications objectives, production design and planning, shooting and editing, presentation and client review. (Basic photography and basic audio production skills, previous audiovisual production experience.) (For audiovisual communications majors only.)

Credit 4 (offered only as needed)

ICIC-401 **Message Design**
Registration #0612-401
Reviews media formats as they may be applied to the design of purposive communications. Examines social and psychological principles as they relate to attitude change and motivation in learners. Students use design principles and structure messages for different media forms. (Required for graduation)

Credit 4

ICIC-424 **Visual Production Techniques**
Registration #0612-424
Students develop and refine the visual techniques in developing an audiovisual show, especially a multi-image show. Includes lighting, color balancing, format design and principles of continuity composition in audiovisual production. (Required for graduation, but may be waived on demonstration of competency)

Credit 4

ICIG430 **Audiovisual Presentation Design**
Registration #0612-430
Students review basic production skills and develop slide + tape presentations to communicate ideas or to change the attitudes of the viewer. This development process includes an analysis of the client's needs and setting communications objectives; preparing the treatment, script, and storyboard; producing the audio track and visual materials and synchronization of the presentation. Stresses more design and planning than production. (For audiovisual communications majors only, required for graduation)

Credit 4

ICIC-441 **Audiovisual Program Design I**
Registration #0612-441
Students differentiate between audiovisual presentations and programs and then design programs which incorporate a number of presentations within a program. Emphasis is on analyzing the performance problem, setting appropriate communications objectives, and then developing a program to improve performance. Actual case studies are used to illustrate the design process in business and industrial settings. (Required for graduation)

Credit 4

ICIC-442 **Audiovisual Program Design II**
Registration #0612-442
Students analyze the elements used in design of audiovisual programs and presentations. Emphasis is on the application of the key psychological principles—perception, memory, experience, attitudes—underlying successful communications. Students must design a series of presentations incorporating these principles. (Required for graduation) (ICIC-441)

Credit 4

ICIC-475 **Computer Graphics in Audiovisual Presentations**
Registration #0613-475
Covers the design and production of computer-generated slides and computer graphics for purposive, meeting presentations. Includes characteristics and features of optically produced and computer-generated special effects slides and computer-based presentations. Includes problems of production and staging. (ICIC-401, 441, 585) (For audiovisual communications majors only)

Credit 4

ICIC-490 **Audio Techniques**
Registration #0612-490
Students review principles of sound recording and produce audiotapes in a variety of situations. Course includes both practical and theoretical aspects of studio and field recording, selection of equipment, acoustical considerations, and the electronics related to audio recording. (ICIC-489 or equivalent)

Credit 4

ICIC-499 **Cooperative Education in Audiovisual Communications**
Registration #0612-499
One quarter of approved work experience in appropriate audiovisual field. For AVC majors only. Approval of advisor required prior to registration.

Credit 0

ICIC-501 **Practicum in Audiovisual Program Design**
Registration #0612-501
Allows a student to explore or develop a special competence in audiovisual program design and to work with clients in real or simulated work environments. A proposal must be submitted prior to registration guidelines available from the department. (For audiovisual communications majors only)

Credit variable 1-6

ICIC-502 **Practicum in Audiovisual Management**
Registration #0612-502
Allows a student to explore or develop a special competence in audiovisual management and to work with clients in real or simulated work environments. A proposal must be submitted prior to registration; guidelines available from the department. (For audiovisual communications majors only)

Credit variable 1-2

ICIC-503 **Practicum in Audiovisual Production**
Registration #0612-503
Allows a student to explore or develop a special competence in advanced production and work with "clients" in real or simulated work environments. A proposal must be submitted prior to registration; guidelines available from the department. (For audiovisual communications majors only)

Credit variable 1-2

ICIC-510 **Writing for Audiovisual Programs**
Registration #0612-510
Emphasizes the principles of scriptwriting for verbal and visual continuity, clarity, and impact. Considers the audience and purpose for which the script is being written, the intended medium and styles of writing. (Required for graduation)

Credit 4

ICIC-550 **Management of Audiovisual Programs**
Registration #0612-550
Covers organizational strategies, management practices, budgeting and fiscal control, personnel recruitment, selection, training and supervision, resource center operation and organization.

Credit 4

ICIC-560 **Media Facilities Design**
Registration #0612-560
Examines major variables influencing the design of such media facilities as media production areas, darkrooms, audio and television studios and control rooms, and training and instructional areas. Topics include acoustics, lighting, ventilation, electrical circuits, space requirements and layouts.

Credit 4

ICIC-571 **Staging Audiovisual Presentations**
Registration #0612-571
The student learns to plan and set up equipment for audiovisual presentations. Includes calculation of power requirements, analyzing facilities and developing plans, setting up, connecting and troubleshooting common audiovisual equipment such as sound systems, projectors, multi-image equipment, screens. (ICIC-489, ICIC-422)

Credit 2

ICIC-580 **Producing Multi-Image Presentations I**
Registration #0612-580
Students design, produce, and present multi-image productions (3-6 projectors). Covers both theory and practice of aspects such as synchronization, presentation planning and equipment selection, and the presentation development process. Projects required. (Photography skills, and ICIC-489, and ICIC-401 or ICIC-422 or equivalent)

Credit 4

ICIC-581 **Producing Multi-Image Presentations II**
Registration #0612-581
Students design and produce multi-image presentations (6-15 projectors) controlled by microprocessor-based programmers using leisure time programming. Basic research and theory of multi-image covered. Projects required. (ICIC-489, and ICIC-580, and ICIC-401 or equivalent)

Credit 4

ICIC-583 **Advanced Multi-Image Project**
Registration #0612-583
A special project to develop an advanced, complex multi-image presentation using memory programming and multiple projectors. Projects may focus on a single special effect or a complete presentation. The number of credits allowed depends on the scope and complexity of the project undertaken. (ICIC-580, and 581, and approval of project prior to enrollment)

Credit variable 1-2

ICIC-585 **Producing Special Effects**
Registration #0612-585 **Slides**
Building on basic black and white and color photography, the student designs, produces and evaluates optically produced graphic and pictorial slides for use in audiovisual presentations. Includes techniques to produce effects such as multiple exposures, streaks, zooms, neons, registration techniques to produce slide animation and seamless masking. Emphasis is on design and planning as well as production and use of slides in presentations. (Enrollment for 4 credits requires the prior approval of special effects sequence for multi-image.)

Credit variable 3-4

ICIC-586 **Advanced Special Effects**
Registration #0612-586 **Slides Production**
In this continuation of ICIC-585, the student will analyze, design, and produce special effects slides with a number of elements. The student will also have the opportunity to learn the operation of a computer-controlled special effects camera stand and to incorporate basic techniques like positive, negative, and gradation masks with camera and compound movements and multiple exposures to produce special effects slides like streaks, zooms, neons, step and repeats, spins, posterizations, seamless masks, pans and animation. Emphasis will be on the development of such slides for multiprojector presentations. In addition to camera operation, the student must design and produce any necessary artwork.

Credit variable 2-4

ICIC-587 **Production Seminar: Special**
Registration #0612-587 **Effects Slides**
For students with previous special effects slide experience who wish to explore new techniques with the optical camera stand. Students review special effects basics and camera operation, analyze existing special effects slides, and create new slides or slide sequences to meet presentation objectives. Exemplary slides or sequences will be duplicated for special effects library. Portfolio required for entry. (Approval of department; ICIC-585; slide + tape production course such as ICIC-413, 421, or 430; ICIC-580 recommended but not required)

Credit 2

ICIC-595, 596 **Senior Project**
Registration #0612-595, 596
Focus is on the design and production of an interview presentation package based on each senior's own job aspirations, professional skills, personal qualities and portfolio materials. These courses are to be taken in the senior year. Both are required for graduation. (For audiovisual communications majors only)

Credit 2

ICIC-601 **Audiovisual Seminar**
Registration #0612-601
Permits students to discuss in a seminar setting a series of topics related to the field of audiovisual communications, including career choices, academic preparation, and professional growth opportunities. (Required for graduation)

Credit 2

Graduate Courses

Instructional Technology

ICTF-700 **Introduction to Instructional**
Registration #0613-700 **Technology I**
An overview of the basic elements of instructional technology including: technology and its application to instruction; instructional development; past, present, and future trends in instructional technology, and, instructional objectives. The course is a mix of self instructional modules and seminars. (Required for graduation)

Credit 2

ICIT-705 **Sources of Information in**
Registration #0613-705 **Instructional Technology**
Students develop general search techniques and strategies for finding information, evaluating it, and establishing a reference file. Sources of print material include journals and periodicals related to instructional technology, books, research reports and conference proceedings, catalogues and commercial information, and automated information systems. Interpreting recent copyright changes is also covered. Actual search problems are given and an information search project is required.

Credit 3

ICIT-710 **Programmed Instruction**
Registration #0613-710
Students review principles and techniques of preparing programmed instruction; then design, produce and validate their own programmed instruction materials; includes research and development related to programmed instruction and sources of programmed materials.

Credit 4

ICIT-712 **Computer-Assisted**
Registration #0613-712 **Instruction (CAI-1)**
Students learn the use of the computer for instruction (computer-assisted instruction) and then produce their own computer-assisted instruction programs. Students review research and computer-assisted instruction, various hardware and software configurations, programming languages, and sources of already developed computer-assisted courses. The course covers some methods of course and lesson development Project required. (ICIT-755 or with permission of department)

Credit 4

ICTF-713 **Advanced Computer-Assisted**
Registration #0613-713 **Instruction (CAI-2)**
The student develops complex and sophisticated instructional sequences which incorporate advanced CAI programming techniques; enters the sequences on the computer, tests and debugs the sequences; and using the computer, gathers the student response information necessary to validate the sequences. The student also explains and demonstrates CAI and writes proposals for CAI courses and lessons. (ICIT-712) Two projects required.

Credit 4

ICIT-714 **Computer Based Interactive**
Registration #0613-714 **Instructional Systems (CAI-3)**
Students plan and produce segments of a computer-based, highly interactive course which also utilizes a pictorial display medium, preferably video. The student must enter all computer elements and produce the scripts and directions for noncomputer segments, as well as preparing all technical and user documentation. The course incorporates the principles of ICIT-712 (CAI-1) and ICIT-713 (CAI-2). Major project required. (ICIT-712,713,750, 755, 756, media design skills)

Credit 4

ICIT-715 **Instructional Television**
Registration #0613-715
Explores the various uses of television as an instructional medium, e.g., individualized instruction, instruction of mass audiences, stand-alone instruction, integrated instruction. Students must produce at least one television program. Surveys the hardware, technology and software of television.

Credit 4 (offered on demand)

ICIT-720 **Research in Instructional**
Registration #0613-720 **Technology**
Examines the fundamentals of educational research: hypothesis stating, designs, statistical procedures, reporting techniques, and types of research. Specifically examines the research in instruction. Students learn to critique research articles and develop evaluation plans.

Credit 4

ICIT-721 **Evaluation of Training**
Registration #0613-721 **and Instruction**
A course to train students in the development and application of testing methods used in measuring performance, principally cognitive and psychomotor skills, as well as methods to determine overall course effectiveness. Covers methods for both formative and summative evaluation, test construction, and means of validating instructional materials and instructional systems.

Credit 4

ICIT-722 **Research Project**
Registration #0613-722
A variable credit course which allows a student to conduct a research project based on the student's interests and with the advice and consent of a faculty member. A formal research proposal must be submitted before registering for this course (guidelines available from the department). (ICIT-750, 751, and 720 or 721 and 30 hours of course work)

Credit variable 1-3

ICIT-735 **Psychology of Learning**
Registration #0613-735 **and Teaching**
Relates various theories of learning to actual teaching and training. Students review learning principles and apply them to practical instructional situations. Emphasis is on behavioral approach to developing instruction and training. (Required for graduation)

Credit 4

ICIT-736 **Interviewing, Counseling**
Registration #0613-736 **and Coaching in Training**
The course distinguishes between counseling, coaching, and training, stressing task-related interpersonal and cognitive skills such as working with a subject matter expert or job counseling. Includes methods of interaction to maintain communications and to shape behavior. (ICIT-735, 770 or concurrently)

Credit 3

ICIT-745 **Instructional Facility Design**
Registration #0613-745
Designed to enable the instructional developer to assist and participate in the design of spaces and related facilities for effective learning. Specific topics include acoustics, lighting, ventilation, electric circuits, planning for electronic distribution systems, equipment specifications, spatial relationships, together with architectural engineering and contracting procedures.

Credit 4 (offered on demand)

ICIT-749 **Seminar in Strategy, Technology,**
Registration #0613-749 **and Futuring in**
Human Resource Development
Training and development, especially in business and industry, and human resource development exist within the larger context of national and global economics. Trends in business direcdy affect the development of human resources into an effective work force. This closing seminar examines future directions as they relate to—and may have an impact upon—training and human resource development in various sectors of the economy. After reviewing past, current, and projected economic and societal trends, seminar participants are required to analyze and project various possible developments in an area of their own interest. (Required for graduation) (Prerequisites or corequisites: all core courses and 40 hours of course work.)

Credit 3

ICIT-750 **Instructional Development I**
Registration #0613-750
Covers the concepts and principles underlying the development of instructional programs and materials. Instructional development is the systematic solution of instruction and learning problems involving needs assessment task analysis, specification of objectives, analysis and synthesis of instructional strategies, and methods of evaluation. A limited instructional development project is part of the course. (Required for graduation) (Note: ICIT-700 must be taken before or simultaneously with ICIT-750; must be taken before 22 hours of program are completed; ICIT-735 and ICIT-755 are prerequisites)

Credit 4

ICIT-751 **Instructional Development II**
Registration #0613-751
A continuation of Instructional Development (ICIT-750) in which instructional development principles are applied in an actual project selected by the student More sophisticated means of development, evaluation, and revision are included along with strategies for media selection and development. Literature of the field is also covered. (Required for graduation) (ICIT-750)

Credit 4

ICIT-752 **Instructional Development m**
Registration #0613-752
Stresses the difference between personnel/faculty development, instructional/program development, and curriculum/organizational development and how the instructional developer or trainer becomes an agent for change. Examines the methods of disseminating and promoting the adoption of innovative methods and materials. Students research special problems related to selected areas of instructional development. (ICIT-750, 751)

Credit 4 (offered only on demand)

ICIT-753 **Group Dynamics**
Registration #0613-753
Almost without exception, an instructional designer works as part of an instructional development team. This course helps instructional developers develop their abilities to plan, conduct, and evaluate various group processes—especially in relation to course development Each course participant will review appropriate functions, advantages, and disadvantages of different group dynamic procedures and interventions and will demonstrate appropriate "attending," listening, group guiding, problem solving, and decision making skills needed to plan and to moderate task-oriented small group meetings. (Required for graduation)

Credit 4

ICIT-755 **Criterion Referenced Instruction**
Registration #0613-755 **and Technical Training I**
See description for ICIT-756. (Required for graduation)

Credit **4**

ICIT-756 **Criterion Referenced Instruction**
Registration #0613-756 **and Technical Training II**
A two-course sequence which applies the principles of instructional development specifically to those areas of training in which performance criteria can be precisely stated and accurately measured. Such training usually tends to be in technical skill areas where procedures or product are predetermined or can be clearly specified. The course is largely self-paced and self-instructional and the student must complete a project in the technical training area. (Required for graduation)

Credit 3

ICIT-757 **Techniques of Work Analysis**
Registration #0613-757
Students learn a variety of job analysis and task analysis techniques based on Functional Job Analysis. Data gathered from analyses is cast into various formats for job restructuring, writing job descriptions, establishing task and job hierarchies, and developing training programs. Students learn to develop job inventories and checklists for gathering task information for a number of interrelated purposes.

Credit 3

ICTT-758 **Developing Instructional**
Registration #0613-758 **Modules**
The course is designed to follow ICIT-756 to give the student extended practice in the development, evaluation, and revision of self-instructional materials. The course, largely self-instructional and project oriented, emphasizes structuring the module, actual module writing, and tryout and revision procedures. Students must have already selected a content area and developed objectives, a course plan, and criterion tests. (ICIT-755, ICIT-756)

Credit 3

ICIT-759 **Technical Writing for**
Registration #0613-759 **Instructional Developers**
This course introduces instructional developers to the process of writing technical manuals and reports. Includes an overview of the production process, content and audience analysis, information layout. Two major writing projects and other exercises required. (Writing skills and experience, ICIT-700, 755, 756, 758)

Credit 3

ICIT-762 **Management & Budgeting in**
Registration #0613-762 **Instructional Technology**
Applies basic theories of management to areas of instructional technology and to management of personnel of those areas. Examines the organizational structure of instructional development units. Covers budgeting and actual financing for services and projects.

Credit 4

ICIT-765 **Individual Learning**
Registration #0613-765 **Style Analysis**
Examines the ways different individuals learn and relates instructional strategies to learning styles. Covers cognitive style mapping, aptitude treatment interaction, application of norm and criterion referenced tests as each relates to individual learning style. (ICIT-735)

Credit 4

ICIT-770 **Interpersonal**
Registration #0613-770 **Communications**
Instructional development requires that instructional technologists be able to work well with people. Participants in the course are taught to be sensitive to others as well as to examine their own feelings in a group situation. (Required for graduation)

Credit 2

ICIT-772 **Group Development and**
Registration #0613-772 **Organizational Change**
Similar in format to ICIT-770, the course extends the concept and practice of interpersonal communications to the area of work-and-task-oriented team-building and organizational change. The course stresses actual personal interaction in a training laboratory environment while including some of the theoretical aspects of causing work-oriented, personal and organizational change. (ICIT-750, 751, 757, 770, 753, and permission of department)

Credit 3 (offered on demand)

ICIT-840 **"" Internship**
Registration #0613-840
Special opportunities may occur for students to obtain work experience in a job or environment similar or coincident with their career objectives. In fact, students are encouraged to locate such opportunities. This course recognizes this experience. A proposal (guidelines available from the department) must be approved by the department prior to registering for this course. (ICIT-750, ICIT-751 plus 20 hours of course work)

Credit variable 1-3

ICTF-850 **Independent Study**
Registration #0613-850
An opportunity for a student to explore, with a faculty advisor, an area of interest to the student. A proposal (guidelines available from the department) must be approved by the department prior to registering for this course. (ICIT-750, ICIT-751 plus 20 hours of course work)
Credit variable 1-3

School of Food, Hotel and Tourism Management

Dietetics and Nutritional Care

ISMD-213 **Nutrition Science**
Registration #0620-213
The study of specific nutrients and their functions; physiological, psychological and sociological needs of humans for food; development of dietary standards and guides; application of nutritional principles in planning and analyzing menus for individuals of all ages; survey of current health nutrition problems and food misinformation.

Class 4, Credit 4

ISMD-402 **Dietetics Environment**
Registration #0620-402 **Coordinated Dietetics Program**
Introductory clinical dietetics course. Students interact with a representative sampling of personnel in all areas of dietetics. Supervised observations are planned in food management systems, health care facilities and community nutrition programs. (ISMF-215, ISMD-213)

Class 1, Credit 4, Clinical hours by arrangement.

ISMD-525, 526 **Advanced Nutrition and**
Registration #0620-525, 526 **Diet Therapy I & II**
Biological metabolism and interrelationships of nutrients, enzymes, and other biochemical substances in humans. Etiology, symptoms, treatment, and prevention of nutritional diseases; evaluation of nutritional status, role of the diet in metabolic, gastrointestinal, renal, musculoskeletal, cardiac, endocrine, febrile, and other diseases. (ISMD-213, SCHG-203, SBIG-212)

ISMD-525 Class 4, Credit 5

ISMD-526 Class 4, Credit 4

ISMD-550 **Community Nutrition**
Registration #0620-550
Study of current nutrition problems in the community. Survey of agencies involved in giving nutrition information or nutritional care. An independent study project involving nutrition care in a clinical facility in the community is required. Assignments are arranged by the instructor. (ISMD-213, ISMD-526 or ISMD-562)

Class 2, Credit 4, Clinical hours by arrangement

ISMD-551 **Food Systems Management II**
Registration #0620-551 **(Coordinated Dietetics Program)**
Principles of management in organizational structure, supervision and evaluation of employee performance, and use of computers in food management; the functions of an administrative dietitian in planning, organizing, directing, coordinating, and controlling dietetic activities. (ISMF-215,331)

Class 1, Credit 8, Practicum in hospital by arrangement

ISMD-554 **Nutrition in Life Cycle**
Registration #0620-554
This is an applied course in nutritional needs throughout the life cycle. Emphasis will be given to nutrition during pregnancy, infancy, early childhood, adolescence, and in later years. (ISMD-213)

Class 4, Credit 4

ISMD-560, 561 **Clinical Dietetics I & H**
Registration #0620-560, 561 **(Coordinated Dietetics Program)**
An intensive integrated study and application of advanced nutrition and diet therapy theories and principles. The course is structured to integrate class lectures (ISMD-560) with clinical experience (ISMD-561) in a hospital setting. Designed for senior students in the Coordinated Dietetics Program. (ISMD-213, SCHG-203, SBIG-212)

ISMD-560 Class 4, Credit 4

ISMD-561 Clinical Hours by Arrangement Credit 4

ISMD-562, 563 **Clinical Dietetics m & IV**
Registration #0620-562, 563 **(Coordinated Dietetics Program)**
A continuation of ISMD-560, 561 in the succeeding quarter with the clinical experience being conducted in the hospital. (ISMD-560, 561)

ISMD-562 Class 4, Credit 4

ISMD-563 Clinical Hours by Arrangement Credit 6

Food and Beverage Management

ISMF-210 **Introduction to Food, Hotel**
Registration #0621-210 **and Tourism Management**
An orientation course designed to trace the history, organizational structure, problems, opportunities and the place of the industry in the national and world economy. Trends and developments in the industry today are stressed.

Class 4, Credit 4

ISMF-215 **Principles of Food Production**
Registration #0621-215
Introduction to foods and basic preparation of high quality food products. Topics include history, kinds, varieties, seasonal availability, sources, and composition of foods and ingredients; essential vocabulary; organization and management of work area; techniques and methods used for menu planning. Uniform required.

Class 3, Lab 6, Credit 5

ISMF-220 **Career Seminar**
Registration #0621-220
Seminar designed to define career opportunities in the food, hotel and tourist industries. Students will be aided in developing career objectives. Leading industry executives will participate.

Class 1, Credit 1

ISMF-311 **Design & Equipment**
Registration #0621-311 **Engineering**
Recognizing, analyzing and solving equipment and space problems in layouts of existing institutions and in designing new food service plans. Consideration of food service equipment; determination of needs; development of specifications; procedures of maintenance, sanitation, and safety. (ISMF-331)

Class 3, Lab 2, Credit 4

ISMF-314 **Sanitation and Safety**
Registration #0621-314
Survey of micro-organisms of importance to the food industry; emphasis on causes and prevention of food spoilage and poisoning. Responsibilities of management to provide and establish safe working conditions and policies; discussion of current problems confronting the industry as a result of recent legislative developments as they relate to safety and health.

Class 2, Credit 2 (For all ISMD, ISMF, and ISMH majors)

ISMF-321 **Menu Planning**
Registration #0621-321 **and Merchandising**
Recognizing, analyzing, research and solving fundamental merchandising techniques including menus for food and beverages found in the food service industry. (ISMF-215)

Class 4, Credit 4

ISMF-331 **Food Systems Management I**
Registration #0621-331
Application of standards, preparation, and service of high quality food. Recognizing, analyzing, planning, scheduling, solving and evaluating problems related to all aspects of food production and management based on scientific, technological, economic, and social factors. Students will assume various operational positions found in commercial feeding facilities by operating the department's 80-seat restaurant. Students will be instructed in utilizing the Remanco Computer System. Students in the Coordinated Dietetics program will have hospital practicum arranged. (ISMF-215, 314)

Class 1, Lab 12, Credit 5

ISMF-340 **Beverage Operations**
Registration #0621-340
Practical course dealing with the management of a commercial beverage operation. Class and laboratory includes objectives, procedures, characteristics, regulations, controls and mixology of alcoholic beverages. Students will utilize computerized dispensing equipment. (Open to juniors only, age 18 or older)

Class 3, Credit 3

ISMF-341 **Beverage Operations Lab**
Registration #0621-341
Course will allow experience in the actual operation of Henry's beverage center. Students will become familiar with Remanco and Bevcon electronic liquor control system. Open to seniors only, age 18 or older. (ISMF-340)

Lab 4, Credit 2

ISMF-416 **Product Development**
Registration #0621-416
Food Science; sensory and objective evaluation of food quality; chemical and physical properties of foods; interaction of food ingredients; recipe development and presentation; problem-solving; experimental design; technical writing. (ISMF-331, science requirement, junior or senior status)

Class 2, Lab 6, Credit 4

ISMF-424 Food and Labor Cost Control
Registration #0621-424
A fundamental course to assist the student in costing of food and labor needed to operate a food service system. Included is analysis of standardized recipes, scheduling, application of internal controls, and computations of operating statements. Analysis of sales activity and current inventory data will be done on the Remanco System. (BBUA-302, ISMF-425, ISMF-331, sophomore or junior status)

Class 4, Credit 4

ISMF-425 Purchasing and Inventory
Registration #0621-425 Control
Course covers controls of purchasing systems, including selection, ordering, receiving, storage, issuing, evaluation of food, non-food supplies and services. (ISMF-210, 215, 314, sophomore or junior status)

Class 3, Credit 3

ISMF-430 Restaurant Management
Registration #0621-430
Application of theories and techniques dealing with total restaurant operation including: menu planning, marketing strategies, supervision of purchasing, equipment, production and service operations. Creation and calculation of management reports to evaluate efficiency and effectiveness of restaurant operations. (ISMF-331, 340, 341, 424,425, ICIC-426) (Senior Standing)

Class 1, Lab 12, Credit 5

ISMF-447 Garde Manger
Registration #0621-447
The course is designed to allow the student to develop techniques specific to Garde Manger work. Students will be exposed to and practice in a hands-on environment: tallow sculpture, aspic, chaudfroid, vegetable carvings, pates, gelatin molds, and butter sculptures. If time permits, the class will also cover the areas of confections such as pastillage, royal icing, pulled sugar, chocolate sculptures, cocoa paintings and marzipan work. (ISMF-210, ISMF-215, ISMF-314, ISMF-331, and instructor's approval)

Lab 8, Credit 4

ISMF-499 Cooperative Education
Registration #0621-499
Career-related work experience. Employment within the food, hotel, tourism industry monitored by the Center for Cooperative Education and Career Services and the School of Food, Hotel and Tourism Management. Designed for the student to experience progressive training on the job as related to the academic option. Freshmen begin Co-op in the summer following their first-year studies. Graduation requirement.
Credit 0

ISMF-511 Banquet and Catering
Registration #0621-511 Management
Management experience in planning, organizing, supervising preparation and service of foods for special functions. Emphasis is placed on experiences in organizational behavior, the responsibilities of management in marketing, promotion, sales promotion, sales production, personnel and customer relations and attitudes. Evaluation of management experience by preparation of operations reports. Open to seniors only. (ISMF-331, 340, 341, 424, 426)

Class 1, Lab 12, Credit 4

ISMF-554 Senior Career Seminar
Registration #0621-554
A variety of current topics will be researched and discussed as they pertain to the hospitality industry: e.g., employee stress, employee dishonesty, alcoholism, divorce, management's response to current DWI laws, legal drinking age, casino operations.

Credit variable 1-4

ISMF-555 Research Problems
Registration #0621-555
Independent study of research problems in food and hospitality management Senior students only with faculty sponsorship.

Credit variable 1-8

Hotel and Resort Management

ISMH-400 Resort and Recreation
Registration #0622-400 Enterprises
A course designed to provide students an understanding of the planning, development managing, design, marketing and operations of tourist and recreational enterprises. Student will additionally select specific recreational areas to analyze the unique planning and development strategies associated with each type of enterprise (ISMF-210). See courses ISMH-401 to 406 for specific enterprises.

Class 4, Credit 4

ISMH-401 Ski Resort Management
Registration #0622-401
The development marketing and management of ski resorts will be studied with micro-computer applications. (ISMH-400)

Class 1, Credit 1

ISMH-402 Marina Management
Registration #0622-402
The development marketing and management of marinas will be studied with micro-computer applications. (ISMH-400)

Class 1, Credit 1

ISMH-403 Golf Course Management
Registration #0622-403
The development marketing and management of golf courses will be studied with micro-computer applications. (ISMH-400)

Class 1, Credit 1

ISMH-404 Campground Management
Registration #0622-404
The development marketing and management of campgrounds will be studied with micro-computer applications. (ISMH-400)

Class 1, Credit 1

ISMH-405 Theme Park Management
Registration #0622-405
The development marketing and management of theme parks will be studied with micro-computer applications. (ISMH-400)

Class 1, Credit 1

ISMH-406 Resorts and Condominium
Registration #0622-406 Management
The development, marketing and management of resorts and condominiums will be studied with micro-computer applications. (ISMH-400)

Class 1, Credit 1

ISMH-410 Tourist Consumption
Registration #0622-410 Analysis
A course designed to analyze the consumption of tourist goods and services. The analysis will include economic, recreation and personality theory in order to fully understand tourism consumption. Computer research applications are utilized.

Class 4, Credit 4

ISMH-411 Problem Analysis & Decision-
Registration #0622-411 Making for Tourist Industries
The course is designed to assist the student in constructing a problem-solving framework for the analysis of tourist industry management problems. Computer research applications are utilized. (Junior or senior status)

Class 4, Credit 4

ISMH-412 **Maintenance and Engineering**
Registration #0622-412 **Systems of Hotel/Resort Properties**
A course designed to expose the student to various problems of maintaining a resort property. Maintenance practices, equipment, record keeping, and specific needs of recreational surfaces will be discussed as to proper maintenance for quality resort development. Computer energy monitoring systems are evaluated. (Junior or senior status)

Class 4, Credit 4

ISMH-420 **Hotel and Travel Law**
Registration #0622-420
Policies, laws, and liabilities are examined as they pertain to the traveling public. The focus will be on current management problems and responsibilities as they entail the legal aspects of the hospitality industry. (Junior or senior status)

Class 4, Credit 4

ISMH-423 **Hotel Operations**
Registration #0622-423
The course is designed to introduce the student to the distinctive nature of hotel operations. This is accomplished by identifying the standard functions which inter-relate to produce the whole: hotel service. The hotel's principal product, the guest room, will be given detailed study which will include a manual practice problem. Computerized reservation systems, ethics, security and on-the-job application of operational problems are included. (ISMF-210, BBUA-302, junior standing)

Class 5, Credit 5

ISMH-450 **Hotel Marketing and**
Registration #0622-450 **Sales Management**
The course is designed to introduce the -student to the application of the marketing concept in hotel operations. This will be accomplished by defining the marketing function, situation analysis, marketing organization, sales office work form flow, customer contact methods, and servicing procedures, as generally practiced in the hotel industry. (ISMH-423, BBUM-463)

Class 4, Credit 4

Travel Management

ISMT-201 **Travel Lab 1**
Registration #0623-201
The basics of the domestic air transportation system are examined with the focus on the student achieving proficiency in reservations, itinerary construction, fare calculation, and ticketing procedures. The labs make use of the various air carrier and accommodation tariffs and guides. This course provides the basic understanding needed for the subsequent travel labs.

Class 3, Credit 3

ISMT-202 **Travel Lab H**
Registration #0623-202
The international air transportation system is surveyed. Emphasis is given to the application of fares, baggage allowances, currency regulations and adjustments, and fare construction principles utilizing the Mileage System. Documentation requirements for international travel are also reviewed. (ISMT-201)

Class 2, Credit 2

ISMT-210 **Introduction to A. A. SABRE**
Registration #0623-210 **Reservations**
An operational proficiency of American Airlines' SABRE reservation system is acquired by the student. Utilizing SABRE's Training mode, course topics include: PNR retrieval, availability, name and phone fields, ticketing field, remarks field, fare quotes, itinerary pricing, PNR queues, flight information AA/OA. This course is equally divided between lecture and Travel Lab simulations.

Class 4, Credit 4

ISMT-220 **Travel Intermediaries**
Registration #0623-220
A functional approach is utilized to aid in the understanding of the travel industry through the analysis of the marketing channels of distribution. The channel functions performed by the retail travel agent and the wholesale tour operator are examined in relation to suppliers' (air earners, hotel, etc.) marketing strategies and operations. Emphasis is placed on channel problems associated with group sales and packaged promotions.

Class 4, Credit 4

ISMT-303 **Travel Lab ED**
Registration #0623-303
Cruise travel and rail travel are examined in considerable detail. Principles of salesmanship are reviewed and students are given the opportunity to practice various techniques through the application of role-playing. Motor coach and auto rentals are also discussed. (ISMT-201, 202)

Class 2, Credit 2

ISMT-310 **Intermediate SABRE**
Registration #0623-310 **Applications**
Utilization of SABRE for Phase IV faring, pre-paid ticket advice, queue printing, currency conversion/rates, STARS, segments and accounting data entries, invoicing/itineraries. (ISMT-210)

Class 4, Credit 4

ISMT-320 **Passenger Transportation**
Registration #0623-320 **Systems**
A detailed examination of the economic forces which help determine product configurations and pricing structure of the various modes of passenger transportation. The market structure of the passenger transportation system is surveyed with the emphasis placed upon the analysis of the pricing system's multiple interactions created in part because of the nature of the various demand components and supply consequences. (ISMT-220 or permission of instructor)

Class 4, Credit 4

ISMT-330 **Convention Sales**
Registration #0623-330 **and Services**
A detailed analysis of the convention industry is conducted as to the planning, cooperating agencies and bureaus, staffing, operations, sales, and management. Emphasis is given jointly in planning convention sales to various market segments, and in providing convention services at the meeting site. Students utilize local facilities to view first hand, convention operation. (BBUM-463)
Class 4, Credit 4

ISMT-350 **SABRE Applications to**
Registration #0623-350 **Non-Airline Information Systems**
Utilization of SABRE's non-airline information system. Topics include: car sale option fields, hotel index-descriptions, hotel availability, selling from hotel availability, immigration-customs guide.

Class 4, Credit 4

ISMT-370 **Passenger Transportation Policy**
Registration #0623-370
An examination of the development of transportation policy as it relates to the various modes of passenger transportation. The role of regulatory policy is discussed with emphasis on how it affects the economic and social policies and the physical aspects of passenger transportation. The various passenger transportation regulatory agencies are surveyed with the primary focus being their effect on the development of the present passenger system and to their possible future implications. (ISMT-220 or permission of instructor)

Class 4, Credit 4

ISMT-375 **Touristic Geography**
Registration #0623-375
People's opinions about what the world is, how it got that way, and what it should be like, are very diverse. Geography's concern with places, spatial analysis, and the relationships between man and land gives it a unique and vital role among all other disciplines. It is a field in which the concerns of both the social and physical sciences converge in the study of specific places.

Touristic Geography shares the geographer's curiosity about place, its spatial expanse, and its man-land interdependence. As an academic discipline, Touristic Geography focuses upon man's leisure proclivities and their spatial manifestations, be they exotic or mundane, esoteric or hedonistic.

Credit 4

ISMT-420 **Corporate Travel Planning**
Registration #0623-420
This course focuses upon the specific travel goals, accounting policies, and informational requirements of corporate (business) travel. Three major orientations of corporate travel are examined: corporate travel utilizing the retail travel agent, corporate travel operated through the firm's transportation manager, and incentive travel. One of these orientations is emphasized during the quarter, corresponding to the interests of the students enrolled. (ISMT-220 or permission of instructor)

Class 4, Credit 4

ISMT-421 **Tour Operations**
Registration #0623-421
The operation of a typical tour wholesaler's program is examined. Emphasis is given to escorted and hosted tours, since they usually require direct involvement by representatives of the tour wholesaler. Financial and documentation flows are emphasized. The role of the tour guide/escort is highlighted. (ISMT-220 or permission of instructor)

Class 4, Credit 4

ISMT-422 **Travel Product Development**
Registration #0623-422
This course examines the planning function associated with the tour operator's development of new service offerings and/or the selection of new travel destination. Initially, a marketing research orientation is utilized with emphasis on tour specifications (packaging), negotiations and pricing of the final package. The methods of marketing to various market segments are subsequently examined. (ISMT-220 or permission of instructor)

Class 4, Credit 4

ISMT-423 **Computer Reservation**
Registration #0623-423 **and Accounting Systems**
A survey of American Airlines SABRE computer reservation system used in passenger transportation is conducted. Application of the ASTA manual and several computer accounting systems, such as Holiday and ADS Nova IV, are examined. (ISMT-310, permission of instructor)

Class 4, Credit 4

ISMT-538 **Tourism Planning**
Registration #0623-538 **and Development**
This course is designed to analyze the process of developing a tourist region or municipality. Identification of tourism resources, marketing plans, human resource needs, necessary infrastructures, economic impact, and financing strategies will comprise the basis of the class. (Senior status or permission of instructor)

Credit 4

ISMT-550 **Seminar in Travel**
Registration #0623-550 **Management**
A survey of the current issues faced by the travel industry. The course is designed as a capstone course for travel management majors, and only to seniors who have completed all of their co-op requirements. Various topics are discussed and different orientations are taken corresponding to the interests of the students and issues of current relevance in the travel industry. (Senior status)

Class 4, Credit 4

Graduate Courses

ISMM-750 **The Hospitality-Tourism Industry:**
Registration #0624-750 **A Systems Approach**
General systems theory is used to examine the major components of the hospitality-tourism industry. The interactions and interdependencies of these components are discussed with reference to the properties of open systems. Students will become acquainted with systems in terms of a philosophy, a theory and a procedure for decision-making and evaluation.

Credit 4

ISMM-760 **Research Methods and Applications**
Registration #0624-760 **in the Hospitality-Tourism Industry**
A survey of research methods that are especially applicable to the hospitality-tourism industry. Emphasis on utilization of primary data collection and its application to specific forecasting and modelling techniques used within the industry.

Credit 4

ISMM-770 **Employee Relations and**
Registration #0624-770 **Training in Service Industries**
An overview and examination of various supervisory/managerial skills. Self-description of the student's management style is conducted using the Laffertry Level I: Life Style Inventory. These are matched to those needed within the hospitality-tourism industry. Students will prepare presentations that are staff development/ training oriented and targeted at employee, supervisory, mid-level, and key management personnel.

Credit 4

ISMM-822 **Computerized Systems**
Registration #0624-822 **for Food Service**
Survey of computer information systems for planning and control in food service and restaurant operations. Various software and hardware packages are explored in relation to planning and control functions. These include: presale, point-of-sale (production, service and check handling) and postsale (post costing, check statement, menu adjustments, accounting, etc.).

Credit 4

ISMM-824 **Organizational Strategies**
Registration #0624-824 **of Hospitality Firms**
An analysis of the organizational structure, operational procedures, corporate policies, financial growth, and related factors in specific hospitality firms. Traces the evolution of various selected companies to reveal individual growth strategies.

Credit 4

ISMM-826 **Tourism Policy Analysis**
Registration #0624-826
An analysis of the goals and objectives for tourism development in geographic areas of different size. Topics include employment, income redistribution, cultural impact, labor supply, and tourism resource base. Specific policies for touristic regions are compared for effectiveness and overall cost benefits. Local, state, national and international examples are included.

Credit 4

ISMM-828 Meeting Planning Management
Registration #0624-828
An examination of the role of professional meeting planners, as they function in the corporate, association, and educational environments. Both corporate and independent meeting planners will be assessed. Methods of planning and programming for meeting will be surveyed and evaluated. A review of the economic impact of conferencing and support service functions will be undertaken. Negotiations skills are examined.

Credit 4

ISMM-842 Food and Beverage
Registration #0624-842 Marketing Strategies
Market segmentation; methods in marketing research; creating a menu, environment, theme for a defined market; improving the market share through quality control, innovation, promotions, public relations, menu engineering and community involvement; premarketing; creating a new image; marketing to increase profitability. Case studies and projects.

Credit 4

ISMM-844 Hospitality Resource Management
Registration #0624-844
This course is designed to analyze the inputs associated with the development of hospitality firms. Labor markets, financial instruments, tourism infrastructures, real estate markets, and educational support systems will be assessed in order to determine the development of hospitality firms.

Credit 4

1SMM-846 Travel Marketing Systems
Registration #0624-846
Travel marketing systems includes the identification of markets, product pricing strategies, and mixes of communication as they relate to the tourism distribution system. The efficiencies of various channel configurations and their resultant organizational patterns are evaluated.

Credit 4

ISMM-848 Convention and Exhibition
Registration #0624-848 Management
The organization and operation of exhibit/convention space is examined from the meeting planner's perspective. Emphasis is given to use of exhibits to enhance both program and attendance. A detailed review of the factors necessary for successful exhibits and exhibitor relations is conducted with emphasis on the various methods employed to encourage participation. Budget controls and financial reporting systems are analyzed. The decision-making process on use of the exhibit as an income producing segment of conferencing is stressed.

Credit 4

ISMM-862 Product Development and
Registration #0624-862 Problem Solving in Food Service
Evaluation of food ingredient interactions and quality standards of food products by sensory (taste) panels and objective measures. Creation of new food products or special dietary products; evaluation of new food ingredients or preparation methods; comparison of time and/or labor-saving products/methods. Emphasis on practical applications, experimental design and communicating the results both orally and in writing.

Credit 4

ISMM-864 Problem Analysis and Decision
Registration #0624-864 Making in the Service Economies
Specific hospitality-tourism industry and enterprise problems are analyzed using various problem-solving frameworks. The student will structure individual problems and design an appropriate analytical and decision-making framework for each.

Credit 4

ISMM-866 Tourism Planning and
Registration #0624-866 Travel Product Development
Tourism planning defines the frames of reference used in making choices concerning the development of tourism facilities and use of space. Topics include: tourism income and expenditure; pricing policy; taxing authorities; ownership patterns; financing and leakage potentials of the various tourism infrastructures. This course focuses on the planning and development of tourism as it is "packaged" through its distribution channels.

Credit **4**

ISMM-868 Legal Issues and Evaluation of Events
Registration #0624-868
An examination of the instruments used to confirm meeting arrangements. Focus is placed on informal instruments (letter of agreement) and formal documentation (contract). A survey of legal decisions impacting the liability of the planner and its impact on the meeting function is conducted. The performance of meeting planners and their interrelationships and interdependencies with external support staffs are assessed.

Credit **4**

ISMM-880 Seminar: Current Issues
Registration #0624-880
A small group examination of contemporary issues and topics chosen by the students and faculty member. Research, oral presentations and class discussions of all issues selected.

Credit **4**

ISMM-890 Practicum in Hospitality-
Registration #0624-890 Tourism Training
An opportunity for the student to apply skills learned in previous courses in a work or laboratory setting. A proposal must be approved by the director of the program, *p*rior to enrolling in the course.

Credit variable 1-6

ISMM-896 Graduate Project
Registration #0624-896
This course number is used to fulfill the graduate paper requirement under the non-thesis option for the MS degree in Hospitality-Tourism Management. The candidate must obtain the approval of the director of the program and, if necessary, an appropriate faculty member to supervise the paper ***before*** registering for this course. A formal written paper and an oral presentation of the project results are required.

Credit variable 1-3

ISMM-898 Thesis
Registration #0624-898
Thesis based on experimental evidence obtained by the candidate in an appropriate topic demonstrating the reduction of theory into practice. A formal written thesis and oral defense are required. The candidate must obtain the approval of the director of the program and, if necessary, an appropriate faculty member to guide the thesis ***before*** registering for the thesis.

Credit variable 2-9

ISMM-899 Independent Study
Registration #0624-899
An opportunity for the advanced student to undertake independent investigation in a special area under the guidance of a faculty member. A written proposal is to be forwarded to the sponsoring faculty member and approved by the director of the program ***prior*** to registering for this course. The independent study must seek to answer questions outside the scope of regular course work.

Credit variable 1-6

Department of Military and Aerospace Science Reserve Officers Training Corps (ROTC)

ARMY

First Year

MMSM-201 **Introduction to Military Science**
Registration #0640-201
This course is designed to introduce the student to the ROTC program and military map reading techniques. Topics of primary interest will include: the organization and purpose of ROTC program, the organization of the U.S. Army, the National Guard, the Army Reserve, Career branches and the role of a lieutenant; leadership laboratory.

Class 1, Lab 1, Credit 2

MMSM-202 **Applied Military Dynamics**
Registration #0640-202
This course is designed to give the student an introduction to some military dynamics. Topics of primary interest are military writing style, experiential small group leadership opportunity, weapons and marksmanship training and an introduction to evaluating and applying first aid.

Class 1, Lab 1, Credit 2

MMSM-203 **Military Heritage**
Registration #0640-203
This course is designed to provide a practical introduction to the basic military organization and rank structure; the historical basis for customs and traditions found in the military, and current discussions on the military and its impact upon society; leadership laboratory.

Class 1, Lab 1, Credit 2

Second Year

MMSM-301 **Military Geography**
Registration #0640-301
A study of military land navigation with special emphasis given to navigation using a map and compass. Geographic concepts and realities are studied as they apply to the solution of military problems. Major topics for discussion will include identification of terrain features, use of grid coordinates, polar coordinates, military correspondence, and First Aid tasks. This course stresses practical application rather than theory; leadership lab.

Class 1, Lab 1, Credit 2

MMSM-302 **Psychology and Leadership**
Registration #0640-302
This course provides the student the basic principles of leadership and management of human resources; motivation, morale and communication. Special emphasis is planned on applying the theories and models of the behavioral sciences and personnel management to leadership as it functions in a military environment; leadership laboratory.

Class 1, Lab 1, Credit 2

MMSM-303 **The Military and American Society**
Registration #0640-303
This course is designed to give the student an introduction to the principles of war and the study of the application of these principles in recent military history. Emphasis will be placed on the Army's role today as peacekeeper and NATO partner. Other topics will include Soviet Union military systems command and staff functions and the officer personal management system. Leadership laboratory.

Class 1, Lab 1, Credit 2

Third Year

MMSM-401 **Military Tactics**
Registration #0640-401
This course stresses practical exercises on basic map reading skills and provides a working knowledge of fundamentals and principles of combat operation as planned for and executed at light infantry squad and platoon level; leadership laboratory.

Class 2, Lab 1, Credit 3

MMSM-402 **Military Communications**
Registration #0640-402
This course provides knowledge and training of basic military skills essential as a junior officer; an introduction to military communication equipment and techniques; the leadership communication process. Leadership laboratory.

Class 2, Lab 1, Credit 3

MMSM-403 **Military Operations**
Registration #0640-403
A continuation of military skills training with emphasis on military intelligence/security, operations at the small unit level; staff functions and leadership laboratory; field training exercise.

Class 2, Lab 1, Credit 3

Fourth Year

MMSM-501 **Combined Arms Operations**
Registration #0640-501
The course introduces the student to the mission, organization, and capabilities of the branches of the Army. Discussions on the tactics of the Airland Battle, advanced studies in U. S. and Soviet capabilities and tactics, U.S. NBC Defense and U.S. Army Intelligence and Electronic Warfare System; leadership laboratory.

Class 2, Lab 1, Credit 3

MMSM-502 **Military Administration and Logistic Management**
Registration #0640-502
This course includes discussions and seminars on the Army Training Management System, military justice, supply and property accountability, maintenance management, officer-enlisted personnel management; leadership laboratory.

Class 2, Lab 1, Credit 3

MMSM-503 **Military Ethos**
Registration #0640-503
This course examines the ideas and issues that define the role of the military in our larger society. Emphasis is placed on the professional and ethical standards required of the military officer. Other topics include: planning and conducting meetings, teaching and counseling, active duty orientation, preparations for commissioning; leadership laboratory; field training exercise.

Class 2, Lab 1, Credit **3**

MMSM-510 **Senior Seminar and Project**
Registration #0640-510
For military science students who have completed their junior year of military study. The seminar is direcdy related to military science projects that students are working on and consists of written and/or oral presentations given during the quarter. Students may also be required to present this material to other students in a classroom environment

Class 2, Credit 2

AIR FORCE

MMSF-201, 202, 203 Leadership Lab I
Registration #0650-201, 202,203
Leadership Laboratory **I** focuses on benefits, opportunities, and privileges, responsibilities associated with an Air Force commission. AF customs and courtesies, AF environment, drills, and ceremonies are also covered. Demonstrates all flight movement procedures. Responsibility of base units to mission accomplishment.

Credit 1

MMSF-210, 211,212 The Air Force Today I, II, HI
Registration #0650-210,211,212
Course series on the basic characteristics of air doctrine; US Air Force mission and organization; functions of US strategic offensive, general purpose, and aerospace support forces; officership; and assessment of written communicative skills.
Credit 1

MMSF-301, 302,303 Leadership Lab II
Registration #0650-301, 302,303
Demonstrates commanding effectively in individual drill positions and flight formations, effective execution of cadet officer functions within parade ceremonies and squadron drill movements. Application of personal leadership to both military and civilian activities and comprehension of field training are covered.

Credit 1

MMSF-401, 402,403,404,405,406, Leadership Lab III, IV, V
501, 502, 503
Registration #0650-401, 402,
403,404,405,406,501, 502,503
Advanced leadership experiences in officer activities gives students opportunity to apply principles learned in labs and courses. Orientation for active duty.

Credit 1

Note: Other AFROTC courses can be found under the College of Liberal Arts and College of Business.

College of Business

Undergraduate Business Courses

Accounting

BBUA-301 **Financial Accounting**
Registration #0101-301
Basic accounting principles and techniques within a framework of sound modern theory. Methods of accounting for revenues, costs, liabilities, and assets. Typical records for various types of business enterprise. Preparation and use of classified financial statements. Includes completion of computer-assisted practice set. (SMAM-225)

Credit 4

BBUA-302 **Managerial Accounting**
Registration #0101-302
The accounting function as a source of data for managerial decision making. Control of the operations of the firm is emphasized through the use of reports for internal and external consumption. Major emphasis is on the analysis of accounting data rather than on its collection. (BBUA-301)

Credit 4

BBUA-319 **Legal Environment of**
Registration #0101-319 **Business**
An introduction to legal principles and their relationships to business organizations. This includes a review of the laws that govern their operations. This course will explore the background and origin of the U.S. legal system, its law enforcement agencies, and the legal procedures used by the government to enforce its laws. Representative topics will include environmental law, bankruptcies, regulatory law. A substantial portion of the course will deal with contract law.

Credit 4

BBUA-320 **Business Law**
Registration #0101-320
This course explores in greater depth the implications of the Uniform Commercial Code to business operations. Representative topics covered include: sales, secured transactions, commercial paper, corporations, and securities regulation. Topical cases and examples are used to help the student grasp the business implications of the law and its nomenclature. (BBUA-319)

Credit 4

BBUA-408, 409 **Intermediate Accounting I, II**
Registration #0101-408, 409
A detailed study of the concepts, theories and practices used to prepare comprehensive financial statements in accordance with generally accepted accounting principles. The course will explore alternative accounting methods and valuation bases and the impact these have on financial statements. Current pronouncements of the Financial Accounting Standards Board will be studied if they are appropriate to the subjects of the course outline. (BBUA-302, junior status)

Credit 4

BBUA-431 **Cost Accounting**
Registration #0101-431
This course emphasizes the uses of cost data and cost reports for managerial decisions. Included are problems and procedures relating to job-order, process, standard cost systems and the techniques of overhead distribution. The role of the controller's organization in the furnishing of accounting data and reports for managerial planning and control is emphasized. (BBUA-302, junior status)

Credit 4

BBUA-522 **Tax Accounting I**
Registration #0101-522
A basic course in Federal taxation relating to concepts of income, deductions and credits. The tax structure of various forms of sole proprietorship, partnership, S corporation, and C corporation will be compared. Tax research will be introduced as a component of the decision process. (BBUA-302, junior status)

Credit 4

BBUA-523 **Tax Accounting II**
Registration #0101-523
A course in Federal taxation emphasizing specialized topics in individuals and business taxation. Advanced topics will include acquisitions, mergers, liquidations and tax planning. (BBUA-522, junior status)

Credit 4

BBUA-530 **Auditing**
Registration #0101-530
A study of the legal, ethical, and technical environment in which the auditor works. Current auditing theory standards, procedures and techniques are studied. Audit programs are developed and problems connected with fraud and internal control are examined. (BBUA-409, junior status)

Credit 4

BBUA-540 **Advanced Accounting**
Registration #0101-540
The application of modern accounting theory to problems of advanced complexity. The student is made aware of the media for expression of current accounting thought. Topical coverage includes consolidated financial statements, partnerships, estates and trusts, government and not-for-profit entities and an introduction to alternate accounting theories. (BBUA-409, junior status)

Credit 4

BBUA-550 **Accounting Theory**
Registration #0101-550
A comprehensive study of the official pronouncements of the Accounting Principles Board and the Financial Accounting Standards Board. The course will examine alternative theories of accounting. (BBUA-409, senior status)

Credit 4

BBUA-554 **Seminar in Accounting**
Registration #0101-554
A seminar series covering selected topics in accounting, including management accounting, taxation, international accounting and accounting for non-profit organizations. Specific course topics to be announced when seminar is offered. (BBUA-302, junior status)

Credit 4

Management

BBUB-310,311 **Air Force Management**
Registration #0102-310, 311 **and Leadership I, II**
Integrated management and leadership courses emphasize the concepts and skills required of the successful young officer, manager, and leader. The first course includes applied written and oral communication techniques, coordination, history of management theory, analytic methods of decision-making, strategic and tactical planning, various leadership theories, and followership. The second course stresses organizing, staffing, controlling, counseling, human motivation and group dynamics, ethics, managerial power and politics, managing change, career development, and performance appraisal. Actual Air Force case studies are used to enhance the learning process. (ROTC)

Credit 5 each

NOTE: Other Air Force ROTC course listings can be found under the College of Applied Science and Technology.

BBUB-312 **Career Seminar**
Registration #0102-312
Career planning for the college student Aptitudes, interests and course and major selections while in college. Transition from college to the world of work; job search; resumes, interviews, job offers. Getting on board. Importance of career paths to career achievement in organizations.

Credit 2

BBUB-430 **Organizational Behavior**
Registration #0102-430
Human behavior in organizations. Course emphasis: individual and interpersonal skills; group and intergroup processes; and management of organizational performance and change. Topics include: leadership; communication; motivation; perception and conflict management (junior status)

Credit 4

BBUB-432 **Comparative Management**
Registration #0102-432
An analysis of business behavior and organization in western Europe, the U.S., and the Pacific Basin. Particular emphasis is placed on the differential effect of cultures on management and performance. Variations in leadership styles, risk tolerance and motivation in different cultures will be reviewed. (BBUB-430, junior status)

Credit 4

BBUB-438 **Business Ethics**
Registration #0102-438
This course examines major western society ethical theories and moral traditions and their business applications. Students have an opportunity to bring theories and traditions to bear on specific issues. These issues will be related to case studies: equal opportunity ind affirmative action, product liability, introduction of new technologies (such as bioengineering), and also to business practices in other cultures. (BBUB-430, junior status)

Credit 4

BBUB-455 **Human Resources**
Registration #0102-455 **Management**
An overview of the personnel and human resource (personnel) function in both large and small organizations. The major topics studied include employee selection, training and development compensation, safety and health, performance evaluation, compensation systems, the management of ineffective performance, and equal employment opportunity. Some emphasis is placed on the legal aspects of managing human resources. (BBUB-430, junior status)

Credit 4

BBUB-460 **Management and Leadership**
Registration #0102-460
The role of managerial leadership in guiding employee contributions to the attainment of organizational goals. Leadership, supervision and delegation as techniques for motivating employee performance. The importance of interpersonal skills for effective managerial leadership. (BBUB-430, junior status)

Credit 4

BBUB-462 **Management Development**
Registration #0102-462
Training and management development practices in work organizations. Both management and individual approaches to skills development and utilization over the career cycle will be considered. (BBUB-430, junior status)

Credit 4

BBUB-475 **Human Resources**
Registration #0102-475 **Planning and Selection**
Course is designed to provide information, insight, and skills about forecasting the demand for managers and individual contributors within a firm and recruiting and selecting employees to meet that demand. The role of computer-generated information in forecasting will be studied. Emphasis is given to matching the demands of individuals and the organization as a byproduct of forecasting. Among the selection methods studied are personnel tests, employment interviews, biographical data, reference checks, and the assessment center method. (BBUB-455, junior status)

Credit 4

BBUB-485 **Employee and**
Registration #0102-485 **Labor Relations**
Overview of the functioning of labor unions and employee associations in both the private and public sectors. The course includes information about the collective bargaining process, union certification and decertification, the grievance process, and the factors precipitating strikes. Emphasis is placed upon achieving a better understanding of both the management and labor points of view. Also considers new models of management/labor relations. (BBUB-455, junior status)

Credit 4

BBUB-490 **Entrepreneurship I**
Registration #0102-490
An exploration of the basics of small business management with an emphasis on understanding the role of the small business owner. Major topics studied include starting and operating a small business, small business marketing, managing small business operations, managing human resources, financial and administrative controls, and governmental interaction with the small business. (Junior status)

Credit 4

BBUB-491 **Entrepreneurship II**
Registration #0102-491
The focus of this course is on the creating and building of new ventures. Issues and problems that will be examined include: the forces that drive the new venture process; factors critical to the birth, survival and growth of a new venture; roles played by the founder of the new venture; and the sources of funds available for the creation of a new venture. An integral part of the course will be the development, writing, and oral presentation of a business plan by each student. Case analysis will be a primary vehicle for the learning of course concepts. Students taking this course will benefit from having taken previous College of Business courses in accounting, finance, and marketing. (BBUB-490)

Credit 4

BBUB-507 **Business Environment**
Registration #0102-507
The impact and effect of social responsibility and law on business activity including the managerial response to those environmental forces. Topics include a study of the demands made on the firm by consumers, citizens groups, the government, and educational institutions. Ethics in business are treated extensively. The implications of current events are an integral part of this course. (Senior status)

Credit 4

BBUB-515 **Technology Management**
Registration #0102-515
The technological innovation process in management will be studied. Also internal and external factors that influence the rate, timing and success of industrial innovations. Technological innovation as a strategic tool to be used in confronting competition and also as a strategic challenge. Designed for advanced standing juniors and for seniors who may manage in a technology-intensive organization. (BBUB-430, BBUF-441, BBUM-463 and senior status. For non-College of Business students, consent of instructor)

Credit 4

BBUB-536 Organizational Performance
Registration #0102-536
Applications of organizational design and theory to organizational performance. Traditional and emerging concepts that affect work organization performance. Characteristics of high performance organizations. Interaction of organization and environment. May include a strengths/weaknesses analysis of an existing organization. (BBUB-430, junior status)

Credit 4

BBUB-547 Entrepreneurial
Registration #0102-547 Field Studies
Students enrolled in this course are provided the opportunity to serve as consultants to a specific small business firm within this geographic area. Under an arrangement with the Small Business Administration, and working under the supervision of a senior faculty member, teams of students provide management consulting about a variety of problems to small businesses. As a practicum this course does not have regularly scheduled class hours. Instead students confer with their faculty member on an as-needed basis. (Senior status)

Credit 4

BBUB-551 Policy and Strategy
Registration #0102-551
An integrated view of business operations, both national and international. This course is designed to provide experience in combining theory and practice gained in other experiences, and in studying state-of-the-art principles of policy, planning and implementation. Cases are used extensively as major vehicles for understanding the applications of strategic management principles and techniques for company operations. (BBUB-430, BBUF-441, BBUM-463, BBUQ-401, senior status)

Credit 4

BBUB-552 Business Policy for Food/Hotel/
Registration #0102-552 Tourism Students
A special action-oriented course for Food, Hotel and Tourism students only. Emphasis is on policy and strategy issues from the perspective of management in planning and reaching organizational goals. Group discussion and case analyses are used extensively in understanding the applications of strategic management principles and techniques to the Food, Hotel and Tourism industries. (Senior status)

Credit 4

BBUB-554 Management Seminar
Registration #0102-554
A variety of special interest topics in the field of management, ordinarily treated in more depth than would be possible in a survey course. The topic and instructor for each seminar will be announced in advance, along with any prerequisites or other special requirements. Seminar topics in recent years have included stress management, microcomputers in human resources management, compensation and appraisal, and human resources planning. (Junior status)

Credit 4

Economics

BBUE-405 Intermediate Microeconomics
Registration #0103-405
A course in economic theory at an intermediate level dealing with the contemporary analysis of price and distribution under conditions of free competition and various degrees of monopoly control. Business applications are given along with the exposition of the theory itself. (GSSE-301, 302, junior status)

Credit 4

BBUE-406 Intermediate
Registration #0103-406 Macroeconomics
The course is concerned with the overall performance of the economy. It deals with the aggregate analysis of saving and investment, the level of income, the level of employment, and the level of prices. Governmental monetary and fiscal policies will also be evaluated. (GSSE-301, 302, junior status)

Credit 4

BBUE-407 Managerial Economics
Registration #0103-407
Analysis of the firm, Problems facing management economizing in the use of resources, optimal combinations of products, pricing, competitive forces in markets affecting the firm. (BBUE-405, junior status)

Credit 4 (offered upon demand)

BBUE-408 Business Cycles and
Registration #0103-408 Forecasting
Analysis of economic conditions affecting the firm. Theory of business fluctuations. Forecasting techniques and services available to the firm. (BBUE-405 or BBUE-406, junior status)

Credit 4 (offered upon demand)

BBUE-443 Recent Economic Policies
Registration #0103-443
A seminar type course on recent monetary and fiscal policies in the United States. Topics will cover the economic background, nature and effects of the policies during the most recent 10-year period. (GSSE-301, 302, junior status)

Credit 4

BBUE-481 Money and Banking
Registration #0103-481
Analysis of money, credit, and financial system. Banking operations and the money supply process. The business of commercial banking and the act of central banking. Central bank activities in relation to national and international monetary policies. (GSSE-301, 302, junior status)

Credit 4

BBUE-509 Advanced Money and
Registration #0103-509 Banking
Development of monetary theory. Money and income: theories of interest, liquidity preference and loanable funds; theories of income and employment, Keynesian and neo-Keynesian approach. Money and prices; quantity theory, velocity and cash—balance approach; inflationary process; and money wage rates and prices. (BBUE-481, junior status)

Credit 4

BBUE-530 Labor Economics
Registration #0103-530
A course in applied economics, using economic theory and analysis for the study of labor institutions and their relation to the economy as a whole. Topics include wage theory, supply and demand, forces of labor, wages and unions, unemployment, inflation and public policy. (BBUE-405 or 406, junior status)

Credit 4 (offered upon demand)

BBUE-554 Seminar in Economics
Registration #0103-554
Investigation of advanced problems and policies in economics. Emphasis is on student reports and papers. (Junior status, permission of instructor)

Credit 4

Finance

BBUF-441 **Corporate Finance**
Registration #0104-441
An introduction to the functions of Financial Management and Financial Markets and Institutions. Asset Valuation as it applies to capital budgeting, working capital management and long term financing. (BBUQ-330, BBUA-302, GSSE-301, junior status)

Credit 4

BBUF-445 **Advanced Corporate Finance**
Registration #0104-445
A broad coverage of business finance with emphasis on the analytical techniques of resource allocation and asset management. Covers securities and securities' markets, capital structures, analysis of financial statements, financing business operations, cost of capital, theories of leverage and dividend policy, and capital budgeting. (BBUF-441, junior status)

Credit 4

BBUF-450 **Mathematics of Finance and**
Registration #0104-450 **Economics**
The introduction of calculus and matrix algebra as a language for expressing models and solving problems in finance and economics. Students will be exposed to the use of mathematics in finance and economic journal articles. (BBUE-405, junior status)

Credit 4 (offered upon demand)

BBUF-503 **Financial Problems**
Registration #0104-503
An examination of problems encountered in many areas of corporate finance. The emphasis is on analytical and decision making techniques used to develop acceptable solutions. The case approach is used extensively. (BBUF-445, junior status)

Credit 4

BBUF-504 **International Finance**
Registration #0104-504
This course is concerned with the monetary aspects of international economic relations. It deals with the following topics: the balance of payments, foreign exchange rates and markets, gold standard, flexible exchange rates system, international capital movements, exchange, restrictions, and international monetary experience. (BBUF-441, junior status)

Credit 4 (offered upon demand)

BBUF-507 **Security Analysis**
Registration #0104-507
The course is introductory and provides background in the field of securities investment. It is both descriptive and analytical in nature. The course coverage emphasizes the securities markets, type of issues, the historical investment perspective, and the valuation of different types of securities. (BBUF-441, junior status)

Credit 4

BBUF-508 **Portfolio Management**
Registration #0104-508
This course deals with the considerations involved in the construction and management of securities portfolios. The emphasis is on the requirements of the institutional investor, the examination of the efficient market hypothesis, modern portfolio theory, and the valuation of investment results. (BBUF-507, junior status)

Credit 4

BBUF-510 **Financial Institutions**
Registration #0104-510 **and Markets**
Analysis of the different kinds of financial institutions such as commercial banks, savings institutions, insurance companies, pension funds, and others. It will cover their operations and relationships with the economic system. (BBUF-441, junior status)

Credit 4

BBUF-525 **Theory of Finance**
Registration #0104-525
This course is a sophisticated approach to the theory underlying modern business finance. Current developments in financial decision-making under risk and uncertainty are examined and the statistical foundations of modern finance theory are studied in detail. (BBUF-445, junior status)

Credit 4

BBUF-530 **Public & Non-Profit**
Registration #0104-530 **Sector Finance**
An exposure to the financial management practices of public sector institutions with an emphasis on state and local governmental agencies. This course will also expose the students to the financial management practices of private non-profit institutions such as cultural, educational and health related institutions. (BBUF-445, junior status)

Credit 4

BBUF-554 **Seminar in Finance**
Registration #0104-554
Course will be designed by individual instructor. (Varies by seminar content) (Permission of instructor, junior status)

Credit 4

Marketing

BBUM-463 **Principles of Marketing**
Registration #0105-463
A basic course in which the student is introduced to the marketing system and specific marketing functions of the business firm. An analytical approach is used to develop an understanding of marketing strategy. (Junior status)

Credit 4

BBUM-505 **Consumer Behavior**
Registration #0105-505
A course focusing on the role of the ultimate consumer in the marketing process. Emphasis will be on understanding the psychological, cultural and socioeconomic influences in the consumer decision-making process. (BBUM-463, junior status)

Credit 4

BBUM-510 **Consumer Services Analysis**
Registration #0105-510
A course designed to examine the common attributes and problems of consumer service institutions. Topics to be covered: factors of market segmentation, customer needs, models of present and future service organizations, organizational concerns, and external environmental variables affecting consumer service industries. (BBUM-463, junior status)

Credit 4

BBUM-550 **Marketing Management**
Registration #0105-550 **Problems**
A course designed to provide the student with an in-depth knowledge of middle and upper management level marketing problems. In addition, the student should become familiar with tools used by marketing managers at these levels. (BBUM-505, 551, senior status)

Credit 4

BBUM-551 **Marketing Research**
Registration #0105-551
A study of research methods and procedures used in the marketing process. Topics include problem formulation, sources of market data, research methodology, data collection, data analysis, and the role of marketing research within the firm. (BBUM-463, BBUQ-330, junior status)

Credit 4

BBUM-553 **Sales Management**
Registration #0105-553
The course emphasizes the sales function of marketing management. It centers around the problems managers face in the direction, control, and supervision of sales activities. (BBUM-463, junior status)

Credit 4

BBUM-554 **Seminar in Marketing**
Registration #0105-554
The objective of this course is to enable the student to bring together interests, learnings and experiences obtained in previous marketing courses. Specific course content will vary. (BBUM-463, junior status)

Credit 4

BBUM-555 **International Marketing**
Registration #0105-555
Management problems of marketing in foreign countries. Topics to be considered include the economic, cultural, and political roots of marketing systems. (BBUM-463, junior status)

Credit 4

BBUM-556 **Marketing Logistics**
Registration #0105-556
A study of physical supply and physical distribution activities. Topics include transportation, inventory control, materials handling, warehousing, order processing, protective packaging, product scheduling, facility location and customer service. (BBUM-463, BBUQ-330, junior status)

Credit 4

BBUM-557 **Comparative Marketing**
Registration #0105-557
A study of marketing in selected foreign countries to acquaint the student with its functional role in various economic environments. Comparisons between geographic regions and cultural settings are explored. (BBUM-555, junior status)

Credit 4 (offered upon demand)

BBUM-560 **Marketing Communications**
Registration #0105-560
This course is an overview of total promotion techniques and research. The course will stress promotion in terms of accomplishing overall marketing objectives, impact on the consumer, and the evaluation of promotion effectiveness. (BBUM-463, junior status)

Credit 4

BBUM-565 **Advanced Marketing**
Registration #0105-565 **Research**
This course is a continuation of the groundwork acquired in the marketing research course. Emphasis is on the analytical basis of marketing research in support of management decision-making. Multivariate analytic techniques will be stressed and applied to projects and data base analysis. (BBUM-551, junior status)

Credit 4

BBUM-570 **Industrial Marketing**
Registration #0105-570
The course is concerned with developing understanding and application of marketing processes to industrial marketing organizations. Topics covered include: industrial purchasing motivations, industrial purchasing organizations, and industrial channels. (BBUM-463, junior status)

Credit 4

Retail Management

BBUM-201 **Introduction to Retail Industry**
Registration #0105-201
An introduction to the tasks, functions, and structures of the retail industry. The major forms and types of retailers will be studied along with the various approaches to the controllable retail variables including location, merchandising, image pricing, and promotion. The nature and expectations of various career paths will be considered.

Credit **4**

BBUM-301 **Retail Accounting and**
Registration #0105-301 **Merchandise Control**
A study of the acquisition of merchandise investment planning, analysis, and control of the dollar merchandise investment to meet profitability objectives. The course will be organized around the task of the retail buyer. (BBUA-301)

Credit 4

BBUM-401 **Retail Store Operations**
Registration #0105-401 **and Management**
A detailed examination of the operation of a retail enterprise including fixturing, information systems, operating costs, merchandise flows, and security. Particular attention will be paid to the managerial tasks of selecting, training and motivating store personnel. (BBUM-201, junior status)

Credit 4

BBUM-412 **Advanced Merchandising**
Registration #0105-412
An extension of basic merchandising with advanced topics and complex merchandising applications. The emphasis is on merchandising as a control and management tool. The course will enable the student to develop and evaluate the impact of alternative merchandising decisions on the performance of the retail operation. (BBUM-301, junior status)

Credit 4

BBUM-413 **Buying Management and**
Registration #0105-413 **Market Analysis**
A seminar addressing the specific role of the buyer within the retail organization and the retailers' markets, performing the following functions: merchandise management and planning, the buying and selling activity and merchandise resource relationships. Information gathering as it specifically supplements the buyers' knowledge of the field is accomplished through exposure to many periodicals, trade journals, trade associations, retail buying offices, and other market contacts. (BBUM-201,301, junior status)

Credit 4

BBUM-431 **Interior Design**
Registration #0105-431
An overview of interior design principles for the home furnishings retailer. Topics include basic principles of design, color theory, floor plans, electrical plans and furniture history. (Junior status)

Credit 4

BBUM-452 **Retail Sales Promotion**
Registration #0105-452
The study of the overall sales promotion functions in a retail environment. Includes the planning, analysis, and evaluation of alternative promotional activities in terms of media selection, budgeting, copy writing, layout. The full promotional mix employed by typical retailers including newspapers, broadcast, display, specialty advertising, and in-store promotions is analyzed and evaluated. (BBUM-201, junior status)

Credit 4

BBUM-501 **Senior Seminar in Retail Management**
Registration #0105-501
An opportunity to apply and integrate all previous retailing and business core courses to solve retail management problems in a number of different organizations and situations. The problems will reflect a mix of actual managerial problems and complex cases. Written and oral presentations of analysis and conclusions will be stressed. The course will reflect a top management perspective. (All retail core courses, one senior-level co-op)

Credit 4

BBUM-502 **Current Trends in Retailing**
Registration #0105-502
A course that studies and identifies the forces that promote trends in the industry, and the environments in which they exist Further analysis and attempts to translate the trends into lifestyle merchandising strategies. (BBUM-201, junior status)

Credit 4

BBUM-503 **Textiles**
Registration #0105-503
Analysis of textile fibers, weaves, and fabrics, methods of printing, dyeing and finishing, evaluation of fabrics and materials commonly used in fashion and home furnishings. (BBUM-301, junior status)

Credit 4

BBUM-558 **Seminar in Retail Management**
Registration #0105-558
Selected topics associated with various aspects of retailing. Course content and structure will differ according to faculty assigned and quarter when offered. (BBUM-201, 301, junior status)

Credit 4

Decision Sciences

BBUQ-330 **Introduction to Data Analysis**
Registration #0106-330
An introduction to the use of data analysis and applied statistics in decision making. Topics include descriptive statistics (graphics, two variable regression and correlation) and a brief overview of probability theory, probability distributions, sampling theory and sampling distributions, the central limit theorem and confidence intervals. Extensive use of MINITAB. (SMAM-226, ICSA-200)

Credit 4

BBUQ-332 **Applied Data Analysis**
Registration #0106-332
A second course in data analysis and statistics emphasizing inference. Topics to be covered include an introduction to specialized sampling distributions; hypothesis testing; non-parametric statistics; multiple regression analysis; ANOVA and experimental design. Extensive use of MINITAB. (BBUQ-330)

Credit 4

BBUQ-334 **Management Science**
Registration #0106-334
A survey of quantitative approaches to decision making. Topics include linear programming models (goal, integer, assignment, and transportation models), decision analysis, and simulation. Extensive use of computer software. (BBUQ-330)

Credit 4

BBUQ-353 **Business Forecasting**
Registration #0106-353
An introduction to forecasting methods in business, with an emphasis on data-based, statistical techniques. Extensive use of MINITAB. (BBUQ-330)

Credit 4

BBUQ-363 **Systems Analysis and Design I**
Registration #0106-363
The system development process, with emphasis on the analysis of information and logical design of a system. Topics include: the life cycle of a computer-based system, the role of the systems analyst, systems analysis tools and techniques, system performance analysis and feasibility analysis. (ICSA-300)

Credit 4

BBUQ-401 **Operations Management**
Registration #0106-401
A survey of production/operations management. Topics include quality assurance, project management, production planning, scheduling, material requirements and capacity planning, inventory management, just-in-time/total quality control (JIT/TQC), international operations and strategic considerations. (BBUQ-334, junior status)

Credit 4

BBUQ-406 **Quality and Reliability**
Registration #0106-406
Study of total quality control (TQC), reliability concepts and problem-solving methods and tools; objectives of quality planning and control; and the use of statistical methods for quality control and improvement. The course focus is on the management of quality, reliability, productivity and profit improvement. (BBUQ-401, junior status)

Credit 4

BBUQ-408 **Materials and Operations Planning**
Registration #0106-408
Study of the planning aspects of materials and operations for the product-process life cycle of a selected "thread" product. Includes aspects such as product/process design and start-up, defect/problem prevention, forecasting, scheduling, materials and capacity planning, operations organization and planning/information systems. Operations settings include: project/one-time build; job/lot build; and repetitive/continuous manufacturing. (BBUQ-401, junior status)

Credit 4

BBUQ-409 **Shop Floor Management**
Registration #0106-409
This course emphasizes execution; activities and techniques necessary to successfully manage the shop floor are studied. Topics include: executing the schedule, plant organization, just-in-time concepts and methods, cost management (direct/indirect), throughput and lead time management, inventory management, waste management material management, interactions with the rest of the firm (e.g., ethics, policies, procedures, responsibilities, and contributions), measurement and reporting, including the use of corrective feedback loops. (BBUQ-401, junior status)

Credit 4

BBUQ-412 **Inventory Management & Material Control**
Registration #0106-412
Study of inventory management emphasizing the independent demand environment including distribution. Definition and functions of inventory; concepts, principles, techniques and systems necessary to select order or ship, store, account for, and value inventory; inventory performance measures. (BBUQ-401, junior status)

Credit 4

BBUQ-415 Purchasing Management
Registration #0106-415
Study of the activities, responsibilities, relationships and systems involved in the purchase of materials, services and capital equipment. Topics include: identifying requirements; evaluating and selecting "best value" vendors; techniques for planning and executing the purchasing function, including fundamentals of negotiation; ethical and legal aspects of purchasing; interactions with the engineering, quality, manufacturing, materials management, transportation and legal functions and with suppliers; and international aspects of purchasing. Purchasing's responsibility for quality, delivery, inventory, price and contribution to profit are also covered. (Junior status)

Credit 4

BBUQ-444 Manufacturing Strategy and Tactics
Registration #0106-444
This course integrates the skills learned in operations and materials management with the fundamental disciplines of accounting, financial and marketing management. Key focuses in the course are manufacturing strategy, the creation and maintenance of a culture for continuous improvement, and the management of change. Manufacturing is investigated in a global context, including the risks and opportunities involved, the successes and failures of foreign and domestic firms and the strategies and tactics employed by them. The viability of an economy without a manufacturing base is questioned. Strategic and tactical plans are developed for selected, example firms. (BBUQ-401, junior status)

Credit 4

BBUQ-464 Systems Analysis and Design II
Registration #0106-464
A continuation of the system development process, with focus on decision support systems, expert systems and an automated systems design tool. (BBUQ-363, junior status)

Credit 4

BBUQ-478 Systems Simulation
Registration #0106-478
The development of system models and their manipulation using simulation. Topics include: statistical review, sampling of random events, elementary queuing theory, data collection and analysis for simulation modeling and models validation. A special purpose simulation language, such as GPSS, will be used in team projects that simulate a production process. (BBUQ-330, ICSA-210, junior status)

Credit 4

BBUQ-505 Information Systems
Registration #0106-505
The role of information systems in business organizations is discussed. Basic systems concepts and the software components of computer-based information systems are introduced. Hands-on use of personal computer technology is an integral and substantial part of the course. (ICSA-200, BBUA-302, BBUB-430, senior status)

Credit 4

BBUQ-540 Microcomputer Hardware
Registration #0106-540 and Applications
A survey of current microcomputer hardware and software being used in business. Topics will include personal computers, the internal functions of PC's and peripheral equipment, and applications software including the use of spreadsheet, database, graphics, and code generating packages. (ICSA-483, senior status)

Credit 4

BBUQ-553 Information Systems Management
Registration #0106-553
Study of the management of information systems. This course will focus on the responsibilities of a manager of information systems, including the selection of hardware, software, and staff; the establishment of IS standards; the development of positive relationships within the organization; and the general application of previously learned management principles to the IS function. Case analysis will be utilized. (ICSA-483, senior status)

Credit 4

BBUQ-554 Seminar in Decision Sciences
Registration #0106-554
The course content depends on the instructor and quarter when offered. Specific content for a particular quarter will be announced prior to course offering. (Permission of instructor)

Credit 4

Graduate Business Courses

Accounting

BBUA-703 Accounting Concepts
Registration #0101-703 for Managers
An introduction to financial and managerial accounting concepts, with particular emphasis placed on their use for decision making. Topics covered will include: financial statements, transaction analysis, measuring economic values, responsibility accounting, budgeting, decentralized and divisional performance measurement.

Credit 4

BBUA-704 Accounting Theory I
Registration #0101-704
A comprehensive exposure at an intermediate level to accounting theory and practice. Emphasis is placed on applying underlying accounting theory to complex accounting measurement problems. The effects of alternative methods are considered throughout the entire course. (BBUA-703)

Credit 4

BBUA-705 Accounting Theory II
Registration #0101-705
Continuation of Accounting Theory I with emphasis on liabilities, equity, long-term debt and special measurement and reporting problems. Included here is the Statement of Cash Flows, pensions, leases, and accounting for changes in prices. (BBUA-704)

Credit 4

BBUA-706 Cost Accounting
Registration #0101-706
A thorough study of the principles and techniques used to accumulate costs for inventory valuation and managerial decision making. Includes problems and procedures relating to job order, process, and standard costs systems, with particular attention to the problems of overhead distribution and control. (BBUA-703)

Credit 4

BBUA-707 Advanced Accounting
Registration #0101-707 and Theory
Analysis and evaluation of current accounting thought relating to the nature, measurement and reporting of business income and financial position; concepts of income in relation to the reporting entity; attention to special areas relating to consolidated statements, foreign currency statement translation, governmental and not-for-profit accounting. (BBUA-705)

Credit 4

BBUA-708 Auditing
Registration #0101-708
The theory and practice of auditing examined; critical study of auditing procedures and standards in the light of current practice; measurement and reliance of internal control covered by case studies; modern auditing techniques by statistical sampling and electronic data processing applications. (BBUA-705)

Credit 4

BBUA-709 Basic Taxation Accounting
Registration #0101-709
Study of federal income taxation of individuals, partnerships and corporations. Problems of the S Corporation and corporate accumulations are examined. Income tax and accounting concepts affecting revenues and deductions are compared, including concepts of gross income, basis, recognition of gain and loss, capital asset transactions, exemptions, deductions and credits. (BBUA-703)

Credit 4

BBUA-730 Business Law I
Registration #0101-730
An introduction to law and ethical considerations in the areas of contracts, creditors rights, agency, partnership, corporations, bailments, and international law in a global economy.

Credit 4

BBUA-731 Business Law II
Registration #0101-731
Topics of business law with ethical considerations intended to help prepare students for the CPA exam. Topics from the Uniform Commercial Code include: sales, commercial paper and secured transactions, and personal and real property. Regulation of the securities market, liability of accountants, and international law also are discussed. (BBUA-730)

Credit 4

BBUA-810 Advanced Taxation
Registration #0101-810 Accounting
A study of federal income taxation as it relates to corporate and partnership tax planning particularly in reorganization, merger, and liquidation. Problem areas in property transactions including nontaxable exchanges and valuation will be explored. Family tax planning including the use of trusts, and other income shifting devices in the environment of estate and gift taxes is examined. Emphasis will be on the need for tax planning in the complex business or personal situation. (BBUA-709 or equivalent)

Credit 4

Management

BBUB-740 Organizational Behavior
Registration #0102-740
The importance of human behavior in reaching organizational goals. Course emphasis: managing individual and interpersonal relations; group and intergroup dynamics; leadership, communication and motivation skills in managing organizational performance and change.

Credit 4

BBUB-741 Organization and
Registration #0102-741 Management
A study of organizations as systems, including their subsystems and interrelationships with other organizations and the external environment Focus is placed on the role of managers as those responsible for understanding and integrating the needs of the organization, its members, and its external environment Major topics studied include organization structure and design, organizational effectiveness, organizational change, organizational analysis, and bureaucracy.

Credit 4

BBUB-742 Technology Management
Registration #0102-742
This course examines the technological innovation process in organizations and the factors, both internal and external, which influence the rate, timing and success of industrial innovations. Technological innovation as a strategic tool to be used in confronting competition and also as a strategic challenge facing managers. Designed for the graduate student who is now or in the future will be managing in a technology-intensive organization. The course will be most useful to students who have completed the first portion of the MBA program. (BBUB-740)

Credit 4

BBUB-745 Business and Public Policy
Registration #0102-745
The processes and mechanisms whereby public policy issues are generated, negotiated, and resolved with particular attention to business-government relations, corporate governance, public opinion processes, business ethics, and issues involving international trade and multinational corporations. The course includes ongoing discussion of relevant court decisions and legislative actions.

Credit 4

BBUB-746 Management and Career
Registration #0102-746 Development
Study and application of current methods of developing managers, with a primary emphasis on career development of both managerial personnel in general and the person taking this course. Student is required to develop a career plan (career pathing). Implications of current technological developments for training, replacement and advancement of managerial personnel are discussed. Insight is also provided into the organizational function of management development. (BBUB-740)

Credit 4

BBUB-748 Employee and Labor
Registration #0102-748 Relations
A study of labor-management relations as they influence managerial decision making in both union and nonunion organizations. Topics may include collective bargaining, conflicts and agreements between labor and management, sharing of productivity gains between labor and management and contemporary issues. An analysis is made of how market forces, labor unions, employee associations and labor law influence employee compensation. Employee and labor relations are studied in both private and public sector firms. (BBUB-740, BBUE-711)

Credit 4

BBUB-750 Human Resource
Registration #0102-750 Management
A study of personnel systems or the methods of human resource management in organizations. The major personnel topics studied include organizational staffing (selection and recruitment), training and development, compensation, equal employment opportunity, human resource forecasting, and performance appraisal. (BBUB-740, BBUQ-782)

Credit 4

BBUB-753 Entrepreneurial
Registration #0102-753 Field Studies
Students enrolled in this course are provided the opportunity to serve as consultants to a specific small business firm within this geographic area. Under an arrangement with the Small Business Administration, and working under the supervision of a senior faculty member, teams of students provide management consulting about a variety of problems to small businesses. As a practicum this course does not have regularly scheduled class hours. Instead students confer with their faculty member on an as-needed basis. (BBUA-703, BBUF-721, BBUM-761)

Credit 4

BBUB-755 Compensation and
Registration #0102-755 Reward Systems
A comprehensive analysis of compensation (wages and benefits) in contemporary organizations. Among the major topics studied are the role of money, the practical problems of developing and administering compensation programs, motivational factors related to compensation, motivational features of benefits, the role of government, and current trends in benefit packages. Forces shaping the establishment of wage rates in a given firm are also studied. (BBUB-740, 750)

Credit 4

BBUB-756 Conflict Management and
Registration #0102-756 Negotiating Skills for Managers
A study of current theories and techniques related to constructive management of organizational conflicts and negotiations. Current theories on interpersonal, group and intergroup conflict management are reviewed. (BBUB-740)

Credit 4

BBUB-757 Management and Leadership
Registration #0102-757
Manager-oriented skills related to the interpersonal aspects of managerial work, managing key individual work relationships (bosses, peers, and subordinates), use of communication and leadership skills as a key aspect of effective management. The course deals with individual, interpersonal, group and organizational aspects of leadership. (BBUB-740)

Credit 4

BBUB-758 Seminar in Management
Registration #0102-758
A presentation of current specialty topics within the broad field of management. Seminar topics have included organizational power and politics, improving individual and managerial effectiveness, managerial control systems, money and motivation, organization development, conflict resolution, comparative management, and small business information systems. The course topic for a specific quarter will be announced prior to the course offering. Although a seminar, the course may include some lectures and examinations. (BBUB-740, varies with instructor)

Credit 4

BBUB-759 Policy and Strategy
Registration #0102-759
This course provides experience in combining theory and practice gained in other course work. This integrative exposure is achieved by solving complex and interrelated business policy problems that cut across die functional areas of marketing, production, finance, and personnel. This course is aimed at the formulation and implementation of business policy as viewed by top management. The case method and computer simulation are used extensively. Since this is a capstone course, the workload is considerably above average. (All other required courses)

Credit 4

BBUB-760 Comparative Management
Registration #0102-760
An analysis of business behavior and organization in Western Europe, the Pacific Basin, and the U.S. with particular emphasis on values, authority, individual and group relations, labor-management ties, and organizational structure. In addition, leadership styles, risk tolerance, and motivational techniques will be studied. In all cases, the differential effect of culture on management will be carefully appraised. (BBUB-740)

Credit 4

BBUB-768 Advanced Seminar in Management
Registration #0102-768
Study and discussion of strategic issues in management for the advanced student. Topics will vary with the instructor. (BBUF-721, 722, BBUM-761, and BBUB-740 or 741, permission of instructor)

Credit 4

BBUB-770 Research Methods
Registration #0102-770
This course concerns the development, presentation, and use of research in managerial decision-making. Included are the processes by which meaningful research problems are generated, identification of the relevant literature, operationalizing the research design, and interpretation of findings. Students typically work in small groups to execute a research project in one of the functional areas of management for the profit or not-for-profit sector. (BBUQ-782)

Credit 4

BBUB-799 Independent Study
Registration #0102-799
A supervised investigation and report within a business area of professional interest The exact content should be contained in a proposal for review, acceptance, and assignment to an appropriate faculty member, who will provide supervision and evaluation. Appropriateness to written career objectives and availability of faculty will be included in the review and considerations for acceptance. (Permission of instructor and graduate department)

Credit 1-4

Economics

BBUE-711 Microeconomics
Registration #0103-711
This is an intermediate microeconomic theory course with applications. The fundamentals of consumer behavior theory, market demand, and the theory of the firm are stressed with applications. Also, resource allocation and product distribution are fundamentals to management and to understanding the role of a firm in an economy.

Credit 4

BBUE-712 Macroeconomics
Registration #0103-712
This is an intermediate macroeconomic theory course with applications. A basic framework of product and money market equilibrium is explored with applications in fiscal and monetary policy. An understanding of major aggregate economic relationships is developed, as well as economic policy. (BBUE-711)

Credit 4

BBUE-713 Advanced Microeconomic
Registration #0103-713 Theory
An advanced study of the fundamental economic principles underlying the nature of a business firm. Topics include: theories of demand and revenue; theory of costs and production analysis in both the short-run and the long-run; equilibrium of demand and supply and efficiency of competition; market structures and their characteristics; pricing and output under perfect competition, pure monopoly, imperfect competition, and oligopoly, resource allocation and product distribution. Business applications are given along with the exposition of the theory. (BBUE-711)

Credit 4

BBUE-714 Advanced Macroeconomic
Registration #0103-714 Theory
An advanced study of the fluctuations and growth of economic activity in a modern complex society. Topics include measuring macroeconomic activity; modeling economic activity; microeconomic foundations in macroeconomic theory (the labor, the commodity, the money, and the bond markets); a parallel discussion of the complete classical and Keynesian macroeconomic models; recent criticism of the two models; the general equilibrium; the phenomena of inflation and unemployment and the way business can forecast them; the impact of fiscal and monetary growth; reality and macroeconomic disequilibrium; and wage-price policies. (BBUE-712)

Credit 4

BBUE-715 Managerial Economics
Registration #0103-715
Analysis of the economic conditions facing the firm. Topics include: demand and cost analyses, resource utilization, pricing, market structure, and other selected topics. (BBUA-703, BBUE-711, BBUQ-782)

Credit 4

BBUE-716 Seminar in Economics
Registration #0103-716
Content will differ depending on the quarter and instructor. Topics that may be covered include international finance, monetary theory, labor economics and market structure. (Permission of instructor)

Credit 4

Finance

BBUF-721 Financial Management I
Registration #0104-721
An examination of the basic financial theories relating to the valuation of assets and the analysis of risk. The course will concentrate on both the theory and practice of capital budgeting decision making. Topics include: capital budgeting techniques, portfolio risk and diversification, the capital asset pricing model, and practical problems in the selection of long-term assets. (BBUQ-782, BBUA-703, BBUE-711)

Credit 4

BBUF-722 Financial Management II
Registration #0104-722
An introduction to the concept of capital market efficiency. In this course, capital structure decisions and dividend policy will receive primary emphasis. Other topics will include option valuation, leasing, working capital management, and financial analysis. (BBUF-721)

Credit 4

BBUF-723 Theory of Finance
Registration #0104-723
This course involves a study of the current literature and most recent developments relating to the theories of valuation, risk, investment analysis, cost of capital, capital structure and dividend policy. Topics will be studied within the framework of the capital asset pricing model and the option pricing model. Also considered are specific areas of application and the policy implications of the theories studied. (BBUF-721, 722)

Credit 4

BBUF-724 Problems in Finance
Registration #0104-724
This course is designed to give the student greater in-depth understanding of contemporary problems in finance. The focus will be on state-of-the-art techniques in both theory and practice. Examples of specific topics that might be addressed in this course include leasing, agency cost problems, mergers and acquisitions, international finance, financial distress, and regulatory impacts on capital markets. Specific topics will be determined by the instructor. (BBUF-721, 722)

Credit 4

BBUF-725 Securities and
Registration #0104-725 Investment Analysis
Study of securities and other investment media and their markets. Analysis of investment values based on financial and other data. Considers factors such as return, growth, risk and the impact of various institutional arrangements on value determination. (BBUF-721, 722)

Credit 4

BBUF-726 Capital Markets
Registration #0104-726
This course will review the statistical tools employed in financial analysis and examine the descriptive evidence on the behavior of security prices. The course will consider theory and evidence of capital market efficiency, portfolio theory, and the theory and evidence on the relationship between expected return and risk. The implications of the theory for applied practice will also be considered. Other topics will include: the evaluation of portfolio performance, international capital markets and efficient markets for other assets. (BBUF-721, 722)

Credit 4

BBUF-729 Seminar in Finance
Registration #0104-729
This course will take on different content depending on the instructor and quarter when offered. Topics that may be covered are: financial models, financial analysis techniques, financial institutions and capital markets. Specific content for a particular quarter will be announced prior to course offering. (BBUF-721, 722, and permission of instructor)

Credit 4

Marketing

BBUM-761 Marketing Concepts
Registration #0105-761
Critical examination of the marketing system as a whole; functional relationships performed by various institutions such as manufacturers, brokers, wholesalers, and retailers. Analysis of costs, strategies and techniques related to the marketing system. Both behavioral and quantitative aspects of marketing are considered.

Credit 4

BBUM-762 Advanced Marketing
Registration #0105-762 Management
Advanced study of selected problems that face marketing managers concerned with promotion, place, price, and product. Material centers on staff marketing functions. Research topics unique to the field of marketing are covered. (BBUM-761)

Credit 4

BBUM-763 Consumer Behavior
Registration #0105-763
A study of the market in terms of the psychological and socioeconomic determinations of buying behaviors, including current trends in purchasing power and population movements. (BBUM-761)

Credit 4

BBUM-764 Marketing Logistics
Registration #0105-764
The study of an integrated system for the distribution of products from producer to consumer. The emphasis is on the physical flow of goods both between and within marketing institutions. Specific topics covered are unit geographic location, internal product flow, inter-unit transportation, and warehousing. (BBUM-761)

Credit 4

BBUM-765 Sales Management
Registration #0105-765
An examination of selling and sales management as they pervade both the marketing process and the management communications process. Topics covered include building and managing an effective sales force and selling philosophy and techniques creating managerial "win-win" situations with both superiors and subordinates. (BBUM-761)

Credit 4

BBUM-766 International Marketing
Registration #0105-766
A study of the differences in market arrangements as well as in the legal, cultural, and economic factors found in foreign countries. Topics included are planning and organizing for international marketing operations; forecasting and analysis; interrelationships with other functions; and product, pricing, promotion, and channel strategy. (BBUM-761)

Credit 4

BBUM-767 Marketing Communications
Registration #0105-767
A study of interrelationships of three communications mix functions: public relations, advertising, and sales promotion. Topics covered will center on the use of these functions in the development of models for persuasive communications and their interrelationships with other elements of the marketing mix. (BBUM-761)

Credit 4

BBUM-769 Seminar in Marketing
Registration #0105-769
This course will take on different content depending on the instructor and quarter when offered. Topics that may be covered are: marketing models, marketing channels, articulation with top marketing executives, and marketing positioning. Specific content for a particular quarter will be announced prior to course offering. (Permission of instructor and BBUM-761)

Credit 4

Decision Sciences

BBUQ-743 Operations Management
Registration #0106-743
Study of the production of goods and services. Topics include quality assurance, forecasting, resource planning, scheduling, materials and capacity management, inventory management, project management, just-in-time/total quality control (JIT/TQC), international operations, strategic considerations and current topics. (BBUQ-780, 782)

Credit 4

BBUQ-744 Project Management
Registration # 0106-744
An introduction to the principles of project management Topics include: the role of the project management; the identification and definition of the project goal; developing a strategy to accomplish that goal; planning the project; estimating the resources required; selling the project; staffing and team building, implementing the project (managing performance, resources, and schedule); shutting down the project. (This course is for matriculated and non-matriculated graduate students with approval from the graduate business office.)

BBUQ-780 Management Science
Registration #0106-780
An introduction to quantitative approaches to decision making. Topics covered include linear programming, goal programming, integer programming, simulation, and decision analysis. The emphasis is not on the techniques per se, but rather on modeling, problem solving and showing how quantitative approaches can be used to contribute to a better decision-making process. (BBUQ-781 or equivalent)

Credit 4

BBUQ-781 Introduction to Statistics
Registration #0106-781
An introduction to the use of statistics in business. Topics covered include descriptive statistics, probability concepts, probability distributions, sampling methods, and sampling distributions. Includes the use of computerized data analysis.
Credit 4

BBUQ-782 Applied Statistical Analysis
Registration #0106-782
The course emphasizes the use of statistical tools in decision making. Topics include estimation of means and proportions; one and two sample tests of means, proportions, and variances; chi-square tests; and simple and multiple regression analysis. Extensive use of a statistical software package. (BBUQ-781 or equivalent)

Credit 4

BBUQ-784 Decision Analysis
Registration #0106-784
An in-depth study of the decision-making process. Emphasis will be on how to structure a complex problem into manageable form, methods for improving creative-problem solving, and the use of decision support systems in decision making. (BBUQ-780)

Credit 4

BBUQ-785 Applied Regression Analysis
Registration #0106-785
The primary objective of this course is to teach the student how to effectively utilize a variety of data analysis techniques commonly referred to as regression analysis. Emphasis will be placed on model formulation and analysis. All students will be required to analyze several large data sets using a standard statistical package. Relevant theory will be introduced to enable the student to pursue further study in data analysis. (BBUQ-782)

Credit 4 (not offered in 1988-89)

BBUQ-789 Simulation
Registration #0106-789
An introductory course in the use of computer simulation in the solution of complex business problems. A simulation language is introduced and applied in the solution of a term project. Particular attention is focused on the types of problems for which computer simulation is a viable solution technique as well as methods for establishing the validity of the simulation. (BBUQ-780, 782)

Credit 4

BBUQ-790 Information Systems
Registration #0106-790
The types of computer applications which are used in business organizations are studied. Basic systems concepts and the responsibilities of the participants in systems development projects also are covered. Hands-on application of personal computer software is an integral and substantial part of the course. (BBUA-703, BBUF-721, BBUB-740, 741)

Credit 4

BBUQ-793 Business Forecasting Methods
Registration #0106-793
An introduction to quantitative and qualitative forecasting methods and their use in business forecasting. The student will be taught how to recognize which forecasting procedures to use based upon an analysis of problem characteristics. Includes the use of interactive forecasting techniques. (BBUQ-782)

Credit 4 (not offered in 1988-89)

BBUQ-795 Seminar in Decision Sciences
Registration #0106-795
This course will take on different content depending on the instructor and quarter when offered. Specific content for a particular quarter will be announced prior to course offering. (Permission of instructor)

Credit 4

College of Continuing Education

Business and the Arts

Accounting

CBCA-201 **Financial Accounting**
Registration #0201-201
Emphasis is placed on analyzing and recording business transactions, and understanding the results of these transactions. Preparations of basic financial statements required by any business are included.

Credit 4

CBCA-203 **Managerial Accounting**
Registration #0201-203
The functions and uses of accounting information are presented. Emphasis is placed on the preparation and operation of dynamic budcdet and the use of accounting data for control and profit planning. (CBCA-201)

Credit 4

CBCA-207, 208 **Accounting for Engineers**
Registration #0201-207, 208
A survey of basic accounting principles for those interested in a general understanding of accounting terminology, its functions within an organization and the application of accounting data in decision making.

Credit 4/Qtr.

CBCA-308,309 **Intermediate Accounting I & II**
Registration #0201-308, 309
Designed to broaden understanding of accounting practices and improve skills in gathering, analyzing, reporting, and evaluating accounting theory and concepts as they relate to business problems. (CBCA-203)

Credit 4/Qtr.

Business Law

CBCB-301 **Business Law I**
Registration #0202-301
Introductory course in business law including basic legal principles and procedures, criminal law, torts, contracts, sales, and real property.

Credit 4

CBCB-302 **Business Law II**
Registration #0202-302
Continuation of CBCB-301 includes law agency, partnerships, corporations, insurance and bankruptcy. Also presents survey of commercial paper, secured transactions, and bank deposits.

Credit 4

CBCB-310 **Legal Environment of**
Registration #0202-310 **Business**
Foundation course which introduces: the function of law in society; the fundamentals of the federal and state court systems; contract formation (offer, acceptance, consideration, and capacity) and related ethical issues; and the emergence of the federal regulatory agencies and the practical impact of these agencies on the American business community.

Credit 4

Data Processing and Systems Analysis

CBCC-321 **Data Processing Principles**
Registration #0203-321
Introduction to computer technology including an examination of the current concepts, functions and techniques associated with information processing. This course includes discussion and practical examples of the interrelatedness of computer operations, programming, and systems analysis. Typically includes minimal introductory exposure to computer lab and a few computer applications assignments.

Credit 4

CBCC-322 **Data Processing Systems**
Registration #0203-322
Covers the spectrum of management considerations pertaining to the use of computers in business systems. Provides a methodology for effective planning, development, installation, and management of computer-based business information systems. (CBCC-321 or equivalent)

Credit 4

CBCC-351 **BASIC Programming for**
Registration #0203-351 **Business**
An introduction to computers and computer programming for business students. After a brief survey of computer systems and terminology, this course introduces the student to BASIC programming covering all major functions; problems and examples will be drawn from business applications. Students will learn how to use a time-shared computer system. NOTE: Not for computer science majors.

Credit 2

Finance

CBCD-204 **Personal Financial**
Registration #0204-204 **Management**
The main objective of this course is to enable you to manage your personal finances more effectively. The course deals with personal budgeting, protection of personal assets, consumer credit, investments, and estate planning.

Credit 4

CBCD-304 **Personal Financial Decision**
Registration #0204-304 **Making**
The course will focus on the financial decision-making process from an individual planning perspective to include basic tax planning concepts, accumulation, and retirement planning models. This course will expand on the topics presented in Personal Financial Management (CBCD-204), with particular emphasis on planning for decisions related to insurance, investments, and estate transfers. Throughout the course basic mathematical concepts (compounding, discounting, etc.) and the effects of taxation will be applied to each area.

Credit 4

General Management

CBCE-101, 102,103 **Human Relations**
Registration #0205-101, 102,103
Designed to acquaint both employees and supervisors with basic principles of human behavior: motivation, morale, leadership, communication, emotional understanding and organizational behavior. Managerial aspects common to all supervisory positions emphasized. An identical daytime class also available for shift workers.

Credit 2/Qtr.

CBCE-200, 201, 202 **The Management Process**
Registration #0205-200, 201,202
A comprehensive 3-quarter course in effective supervision and management for supervisors and potential supervisors. Approximately 50 topics of current importance to supervisors are presented, as well as essential management principles, business communications, and practical supervision techniques. Specific supervisory problems of course participants are discussed in informal sessions and through projects conducted outside the classroom. Instruction is usually guided by a team of management specialists. Lecture-discussion, panel presentations, audiovisual presentation, simulation exercises and case studies. (Course extends over three consecutive quarters and should be taken in sequence.) A management certificate is awarded for successful completion of the course.

Credit 4/Qtr (12 total)

CBCE-203 **Organization and Management**
Registration #0205-203
A general introduction to the major management functions and the organization of business. Topics include business and personal planning, organizing, staffing, implementing, directing, control, time management, appraisal, compensation, organization theories, decision-making, problem solving, influences on managerial decision making, communication, management styles and motivation. Extensive use is made of learning groups in which students work together in small groups to discuss and apply concepts. Some out of class time is required to prepare for a learning group presentation.

Credit 4

CBCE-305 **Customer Relations Systems**
Registration #0205-305
This course provides an introduction to basic concepts of how to develop, implement, and measure processes to improve customer satisfaction. Includes innovative techniques to determine how customer care can be integrated as a standard business practice and how concepts of quality can be applied toward achieving customer care.

Credit 4

CBCE-306 **Customer Service Technology**
Registration #0205-306
An overview and analysis of technological systems for handling goods and information quickly and cost effectively, to maximize customer satisfaction.

Credit 4

CBCE-353 **Management Science**
Registration #0205-353
Foundation course which introduces mathematical model-building and the use of management science in the decision-making process. Mathematical techniques will include: linear programming; the assignment model; the transportation model; inventory control models; critical-path models (PERT/CPM); and computer simulation. Homework assignments will include running "canned" computer application programs. (CBCH-201,202, 351, 352 and CBCC-321)

Credit 4

CBCE-298, 398 **Special Topics: Management**
Registration #0205-298, 398
Special topics are experimental courses offered quarterly. Watch for titles in the course listing each quarter.

Credit Variable

Small Business Management

CBCE-221 **New Venture Development**
Registration #0205-221
Course presents factors to be considered by those interested in the ownership and management of small business enterprises. Includes who should be an entrepreneur, guidelines for starting a new business, basic legal consideration, and approaches for obtaining capital and credit.

Credit 4

CBCE-222 **Small Business Management**
Registration #0205-222 **and Finances**
The functions required to successfully manage and finance a small business are presented. A variety of topics include staffing a small business, purchasing and supplier relations, comsumer credit policies, and the financial and administrative controls necessary to minimize business risk.

Credit 4

CBCE-223 **Small Business Marketing**
Registration #0205-223 **and Planning**
Presents various successful planning and marketing approaches (including market determination, distribution and pricing strategies). The regulatory environment facing small business is included along with techniques for planning growth.

Credit 4

Marketing

CBCG-210 **Effective Selling**
Registration #0207-210
Investigates the importance of the sales function within the overall marketing organization and the necessary general characteristics of a successful salesperson. The various steps of the sales process and the practical applications of effective sales presentation are discussed.

Credit 4

CBCG-213 **Advertising Principles**
Registration #0207-213
Social, economic and mass communication aspects of advertising with special emphasis on the role of advertising in the marketing mix. Special topics include agency/client relationship, radio and TV ratings, history of advertising, the creative process and psychographics. Guest lectures discuss corporate campaigns.

Credit 4

CBCG-214 **Advertising Evaluation**
Registration #0207-214 **and Techniques**
Course presents basic approaches used in planning, preparation and evaluation of advertising and sales promotional materials. Course incorporates a number of projects involving writing/ layout/production for print, broadcast and specialized media advertising.

Credit 4

CBCG-361 **Marketing**
Registration #0207-361
An introductory course in marketing designed to provide a better awareness of the function of marketing and how marketing relates to other areas of business. Topics include the marketing concept, developing a product strategy, behavioral aspects of consumer marketing, the marketing mix, segmentation and current marketing issues.

Credit 4

CBCG-362 **Marketing Practices**
Registration #0207-362 **for the Service Economy**
Focuses on applications of traditional marketing concepts and techniques to die service sector (e.g., banking, health care, transportation; and services within organizations), to optimize quality, customer satisfaction, and sales/revenues/profits. Includes a brief review of the increased role of services in the economy.

Credit 2

Mathematics and Statistics for Business

CBCH-201, 202* **Mathematics for Business**
Registration #0208-201, 202
An introduction to mathematical concepts and quantitative methods required in business management. Included are: sets and real number system, linear, non-linear and exponential functions, and system of equations and inequalities. Differential and integrated calculus is introduced plus some special topics in quantitative analysis such as linear programming and simulation.

Credit 4/Qtr.

NOTE: Entering students who want to register for CBCH-201 are required to take a diagnostic examination to determine the level at which they may start the sequence. Students who have had previous college level mathematics courses should consult with an advisor.

CBCH-351, 352 **Business Statistics**
Registration #0208-351, 352
An introduction to the basic tools of statistical analysis used in business including charts, frequency distribution, averages, dispersion, probability theory, sampling. Logical procedures for making business decisions under conditions of uncertainty are emphasized. Hypothesis testing including, one, two, and k-sample test means, proportions, regression and correlation analysis are also included. (CBCH-202)

Credit 4/Qtr.

Personnel Administration

CBCI-224 **Interviewing Techniques**
Registration #0209-224
A practical approach to interviewing techniques with emphasis on role plays and case studies. Coverage includes employment, disciplinary, counseling, and performance appraisal interviews.

Credit 4

CBCI-225 **Recruiting, Training and Supervising**
Registration #0209-225 **Service Industry Personnel**
This course examines problems and solutions related to establishing realistic and attractive wages and career paths for employees in service sector businesses. In addition, it explores motivation, training and communication techniques that lead to the kind of quality performance required in service industries and organizations, to optimize customer satisfaction.

Credit 2

CBCI-229 **Personnel Administration**
Registration #0209-229
An introduction to personnel administration including an overview and discussion of employment, equal employment opportunity, job evaluation, training, performance appraisal, compensation, benefits, personnel planning, labor relations, and other related topics.

Credit 4

Production Management and Industrial Engineering

CBCJ-209 **Production Management**
Registration #0210-209
The organization of production functions with emphasis on management responsibilities. All levels of factory operation are discussed and relationship between various aspects of production are presented.

Credit **4**

CBCJ-305 **Fundamentals of Industrial**
Registration #0210-305 **Engineering**
An overview of industrial engineering problems and techniques is presented including facilities selection and layout, methods analysis, work measurements, operations planning and control materials handling and an introduction to operations research.

Credit **4**

CBCJ-306 **Industrial Engineering**
Registration #0210-306 **Economy**
The economic factors required for rational decisions are presented. Emphasis is placed on analytical tools used in manufacturing environment including evaluation of capital spending alternatives, depreciation methods, decision-making under risk conditions, and value analysis methods.

Credit **4**

Transportation, Logistics and Purchasing Management

CBCL-234 **Introduction to Logistics**
Registration #0212-234 **and Transportation**
Overview of the transportation and logistics industry as a vital part of the nation's social and economic structure. Introduces basic understanding of the functional areas of logistics management and their interrelationships. The purchase and use of transportation services as related to the firm's logistical mission is emphasized. (Formerly titled Traffic and Transportation Management Principles and Practices)

Credit **4**

CBCL-239 **Traffic and Transportation**
Registration #0212-239 **Law, Rates, Accounting and Control**
Introduces the role of government in the transportation industry. The evolution of past and current regulatory and promotional policies is explored. The determination and utilization of freight rates are examined. Various methods to forecast and control transportation costs also are discussed. (Formerly titled Traffic and Transportation Rates and Classifications)

Credit **4**

CBCL-241 **International Logistics and**
Registration #0212-241 **Transportation**
Introduces the basic skills required to move materials in support of the logistics function internationally. Includes discussions of duties, customs regulations, and the various instruments used to facilitate international trade.

Credit **4**

Real Estate

CBCM-201 **Basic Real Estate Principles**
Registration #0213-201 **Salesperson's Course**
Comprehensive study of real estate principles including: law of agency, human rights and fair housing, real estate instruments, financing, valuation and listings, contracts, license law and ethics, closings, land use regulations, and real estate math. Completion of this course satisfies the NYS educational requirement for a real estate salesperson's license. For licensure, participants must attend all classes and pass the final exam. Individuals interested in licensure only should call 475-5594.

Credit 4

CBCM-202 **Advanced Real Estate Principles**
Registration #0213-202 **Broker's Course**
A study of topics related to real estate including: operation of a broker's office, construction, general business law, subdivision and development, leases, taxes, assessments, investment property, alienation, property management, condominiums and cooperatives, rent regulations, appraisals, and advertising. Completion of this course and Basic Real Estate Principles satisfies the educational requirement for a real estate broker's license. For licensure, participants must attend all classes and pass the final exam. Individuals interested in licensure only should call 475-5594.

Credit 4

CBCM-203 **Real Estate Investment**
Registration #0213-203 **and Finances**
An introduction to real estate investment with emphasis on the purchase and sale of real estate, the acquisition of financing, the selection of appropriate ownership forms, and the use of statistical data in making real estate decisions.

Credit 4

CBCM-204 **Real Estate Evaluation**
Registration #0213-204
The evaluation of real estate through appraisal and analysis, basic consideration in real estate management, and the advantages of various types of real estate investments are discussed.

Credit 4

Insurance

CBCN-271, 272 **Principles of Insurance**
Registration #0214-271, 272
This two quarter sequence course leads to qualification for taking the New York State agents and brokers examination for Casualty and Property insurance licenses. All casualty and property insurance are covered in the class. Emphasis placed on providing students with practical working knowledcde of insurance policies and coverages. The course offers practical insight for both insurance professionals and insurance buyers.

Credit 4/Qtr.

Interdisciplinary Studies

CIDA-220 **Careers and Credits**
Registration #0220-220
This course is designed specifically for adults who want to know more about themselves—their talents and skills—so that they can make informed career choices and realistic educational plans. Using skills interest inventories, class discussion, individualized and group activities, assigned readings and papers, students will be able to assess their individual goals, interests and abilities.

Credit 2

Ceramics

CHAC-201 **Introduction to Ceramics**
Registration #0222-201
An extensive survey of on and off the wheel forming techniques using stoneware and porcelain clays. Students will be introduced to a variety of decorative methods as well as the basics of glazing and firing finished work. Class projects will emphasize the development of competent skills and good design.

Credit 2

CHAC-211 **Intermediate Ceramic Wheel**
Registration #0222-211 **Throwing**
An exploration of Japanese wheel throwing techniques. Students will work with raku stoneware and porcelain, using methods and tools common to Japanese potters. Class projects will concentrate on production techniques with special emphasis being given to glazing and firing procedures. (CHAC-201 or equivalent)

Credit 2

CHAC-301 **Advanced Ceramics**
Registration #0222-301
An introduction to the world of the professional potter. Work will center on advanced forming and decorative techniques ranging from sectional throwing to photo-sensitive emulsion glazing. Special emphasis will be on independent projects which require the potter to master clay and glazing formulation, design, production and firing techniques. Kiln design and construction as well as marketing techniques for finished work will be discussed. (CHAC-211 or equivalent)

Credit 2

CHAC-295 **Independent Study: Ceramics**
Registration #0222-295
Independent study may be developed at upper division level. Projects must be developed with instructor, subject to the approval of the program director. Credit may vary from one to five quarter-credits. For information on independent study contact the Division of Business and the Arts.

Credit Variable

CHAC-298 **Special Topics: Ceramics**
Registration #0222-298
Special topics are experimental courses announced quarterly. Watch for titles in the course listing each quarter.

Credit Variable

Design

CHAD-201, 202, 203 **Basic Design**
Registration #0223-201, 202, 203
Study of basic elements of design: line, shape, texture, color, space and their incorporation in design principles as applied to two and three-dimensional design problems including the graphic arts.

Credit 2/Qtr.

CHAD-211, 212, 213 **Display Design**
Registration #0223-211, 212, 213
First quarter examines the fundamentals of three-dimensional design. The second and third quarters apply these principles to develop mechanical, graphic and model making manipulative skills and problem solving approaches used by designers in space planning. (CHAF-201, 202,203 and CHAD-201,202,203 or equivalent experience)

Credit 2/Qtr.

CHAD-215, 216,217 **Rendering Techniques**
Registration #0223-215, 216, 217
This course will introduce students to the materials and techniques used by designers in rendering interiors, layouts, products, etc. Marker sketching, perspective, shadowing, media selection, and presentation techniques will be covered. Suggested for all design students. (CHAF-201, 202, 203; CHAD-201, 202, 203 or equivalent)

Credit 2/Qtr.

CHAD-218 **Introduction to Designing**
Registration #0223-218 **Home Interiors**
Basic principles of interior design. Processes used by both professionals and informed amateurs: gathering information about clients and their needs, activities and preferences; assembling product and color samples and information; measuring spaces and furnishings; arriving at the best interior plans for clients. (Credits may be applied to Interior Design diploma program)

Credit 2

CHAD-220 **Art for Reproduction**
Registration #0223-220
This course prepares students to enter the field of graphic design by providing orientation and the studio experience in the presentation of imagery for reproduction. Presentations will include board techniques, materials, tools, mechanical art procedures, printing and bindery processes, etc. (CHAD-201, 202, 203 or equivalent)

Credit 3

CHAD-224, 225 **Interior Design**
Registration #0223-224, 225
Career orientation. Emphasis on practical aspects of the profession. Details of purchasing all furnishings used in a home. Client centered planning and design. (CHAF-201, 202, 203; CHAD-201, 202, 203 or equivalents)

Credit 2/Qtr.

CHAD-226 **History of Interior Design**
Registration #0223-226
Historical survey of period decoration and furniture styles from antiquity to the present.

Credit 2

CHAD-227 **Business Aspects of**
Registration #0223-227 **Environmental Design**
This course will introduce students to the various occupations available to the environmental and interior designer, and instruct them in the use of their artistic and technical skills to obtain employment and establish themselves in the design community. Dealing with clients, vendors, and contractors will also be covered. Assignments will be structured to meet the personal business needs of each student.

Credit 2

CHAD-231 **Color Theory in Art**
Registration #0223-231
An opportunity to develop an awareness of and sensitivity to the world of color through slide lectures, class discussion and instructor's evaluation. Emphasis on the visual impact of color. (CHAD-201, 202, 203 or equivalent experience)

Credit 2

CHAD-235 **Commercial Interior Design**
Registration #0223-235
Students will learn to develop a good commercial interior plan given clear specifications and boundaries. Presentation techniques, client relations and fee philosophy will also be discussed with frequent field trips and guest speakers. (CHAD-224, 225 or equivalent)

Credit **4**

CHAD-251, 252, 253 **Environmental Design**
Registration #0223-251, 252, 253
The study of enclosed space, using material and the elements of design, line, form, texture, and color to develop living space. (CHAF-201, 202, 203 and CHAD-201, 202, 203 or equivalent experience)

Credit 2/Qtr.

CHAD-261,262, 263 **Advanced Design and**
Registration #0223-261, 262, 263 **Typography**
Study of commercial layout procedures from rough layouts to comprehensives, type selection, copy Fitting, pictorial indication and production procedures as related to contemporary practices. Course emphasizes the design, structure, historical development and techniques of lettering. Proceeds from rough letter indication to development of finished lettering, and application in commercial advertising problems. Typography and photo lettering methods will be studied in relationship to their use in commercial design. (CHAF-201, 202, 203 and CHAD-201, 202, 203) (Formerly titled Lettering and Layout)

Credit 2/Qtr.

CHAD-270 **Graphic Communication**
Registration #0223-270 **for the Non-Artist I**
Introduces basic skills in communication graphics, including: elements of design (line, shape, texture, color, space) and their application to two-dimensional projects; typography and commercial layout procedures (from rough layouts to comprehensives); and rendering techniques (marker sketching, shadowing, and perspective). Course is designed for people with little or no previous art training. Lecture/demonstration and studio format; student projects followed by critiques.

Credit 3

CHAD-271 **Graphic Communication**
Registration #0223-271 **for the Non-Artist II**
An exploration of current approaches to solving graphic design problems in the communications professions applying basic skills in design, lettering and layout, and rendering, with emphasis on the use and selection of art materials, photographs, and photographic/electronic image producing equipment; and an exploration of design in the advertising process, involving planning, creating, producing, and evaluating media. (CHAD-270 or equivalent)

Credit 3

CHAD-301,302 **Advertising**
Registration #0223-301, 302
Advertising is planned, created and placed by bright, inquisitive, hard working people in a fast paced, time-conscious business. They work within limits of budgets, marketing objectives, re-Search, media, competitor's actions and a growing list of government regulations. This course examines the world of advertising and what is required to create advertising campaigns by tracing a campaign development step by step.

Credit 4/Qtr.

CHAD-311, 312,313 **Graphic Design**
Registration #0223-311, 312,313
A contemporary approach to design for printed advertising with the emphasis on creative experience. (CHAF-201, 202, 203; CHAD-201, 202, 203 or equivalents. CHAD-261, 262, 263 recommended)

Credit 2/Qtr.

CHAD-315, 316, 317 **Advertising Design**
Registration #0223-315,316,317
The functions and skills of the art director touch on all phases of advertising art from concepts and professional studio procedures to practical approaches in design and production. (CHAF-201, 202, 203 and CHAD-201, 202, 203 or equivalent experience. CHAD-261, 262, 263 and 311, 312, 313 recommended)

Credit 2/Qtr.

CHAD-360 **Portfolio Workshop**
Registration #0223-360
A workshop designed to help students take what they have learned in art classes (or work situations) and prepare and present a saleable portfolio. Projects will be tailored to the needs of individual students allowing them to compile an accurate representation of their skills in a concise, positive and beneficial manner. Visits from prominent people in the field showing their work and sharing their experiences.

Credit 2

CHAD-295 **Independent Study: Design**
Registration #0223-295
Independent studies may develop at the upper division level. Projects must be developed with instructor, subject to approval of the program chairperson or the Division of Business and the Arts. Credit may vary from one to five quarter-credits. For information on independent study contact the Division of Business and the Arts.

Credit Variable

CHAD-298, 398 **Special Topics: Design**
Registration #0223-298, 398
Special Topics are experimental courses announced quarterly. Watch for titles in the course listing each quarter.

Credit Variable

Drawing

CHAF-201, 202, 203 **Basic Drawing and Media**
Registration #0224-201, 202, 203
An intensive study of the fundamentals of drawing and application of media, designed to develop a flexible, creative mind capable of interpreting ideas. Specific emphasis is placed on problems confronting the student who has had little or no drawing experience.

Credit 2/Qtr.

CHAF-207 **Basic Figure Drawing**
Registration #0224-207
Drawing from the costumed and nude model. The student makes a visual analysis of action, and gesture through quick sketches. Short poses gradually extend to longer studies so that the student can develop techniques, skills and the control of media. (CHAF-201, 202, 203 or equivalent)

Credit 2

CHAF-306 **Drawing**
Registration #0224-306
Drawing in a variety of media, including an introduction to line, form and color as elements of pictorial expression. Presents organic, inorganic, and imaginative stimuli. May be elected more than once for credit. (CHAF-201, 202, 203; CHAD-201, 202, 203 or equivalent)

Credit 2

CHAF-307 **Figure Drawing**
Registration #0224-307
Drawing from the costumed and nude model for combined action and figure construction. Short poses gradually extended to longer studies for sustained attention to the problem. May be elected more than once for credit. (CHAF-207 or equivalent)

Credit 2

CHAF-210 **Interpretive Landscape**
Registration #0224-210 **Drawing**
Students will sketch directly from nature on location during field trips. In subsequent studio sessions compositions translating first impressions using various media will then be developed. Special attention will be given to individual approaches and expression.

Credit 4

Painting

CHAF-211 **Introduction to Painting**
Registration #0224-211
Study of the materials and techniques of painting through use of still-life and nature forms. Basic training and foundation for advanced work. (CHAF-201, 202,203; CHAD-201,202, 203 or equivalents)

Credit 2

CHAF-301 **Painting**
Registration #0224-301
Painting with opportunities for gifted and advanced students to explore media, seek new skills, develop a new style of expression. The instructor, an accomplished artist, works individually with the student Models are available on a limited basis. Still-life and sketches will be used for inspiration. May be elected more than once for credit. (CHAF-211 or equivalent)

Credit 2

CHAF-227 **Figure Painting**
Registration #0224-227
Painting from costumed and nude models. The emphasis is placed on action, structure, gesture, composition, experimental attitudes and techniques. The student is provided with an opportunity to achieve clear understanding of various media in his or her individual search for expression. May be elected more than once for credit. (CHAF-317 or equivalent)

Credit 2

CHAF-337 **Portrait Painting**
Registration #0224-337
Particular attention is given to the development of anatomical understanding. Several media will be explained. Emphasis will be placed on understanding various aesthetic and craft traditions. Individual attention is supplemented by demonstrations and discussions with the instructor who is an active portrait artist in the community. May be elected more than once for credit (CHAF-207 and CHAF-211 or equivalents)

Credit 2

CHAF-341 **Watercolor Painting**
Registration #0224-341
Basic study of watercolor media, methods, and techniques. Students receive individual, as well as group instruction with emphasis on composition, color, and personal expression. Media: watercolor, tempera, and casein. May be elected more than once for credit (CHAF-201,202, 203 or equivalents)

Credit 2

Sculpture

CHAF-247 **Sculpture**
Registration #0224-247
Study of basic theories of form and space utilizing sculptural processes and techniques. Solutions to problems, traditional and modern, are achieved through exercises using various materials such as clay, wood, plaster, plastic. Through discussion and practice, the student is introduced to the proper use of the sculptor's tool and methods. (CHAF-201,202,203; and CHAD-201,202, 203 or equivalents)

Credit 2

CHAF-357 **Sculpture Workshop**
Registration #0224-357
An in-depth study of sculptural methods, techniques and materials (clay, wood, plaster, stone and welded metal). Students may concentrate in one material. May be elected more than once for credit (CHAF-247)

Credit 2

Illustration

CHAF-361 Illustration
Registration #0224-361
Fundamentals of visualization and pictorial organization in terms of advertising and editorial illustration. Emphasis on contemporary graphics procedures. May be elected more than once for credit (CHAF-207 or equivalent)

CHAF-362 Airbrush Techniques
Registration #0224-362
This course is designed to provide an opportunity for beginners to develop the basic skills and techniques of painting with an airbrush and allow experienced users to enhance their skills. Graphic artists, fine artist illustrators, and photographers can benefit from this exposure to airbrush techniques and applications through demonstration and experiential learning. Class will be limited to 10 students. (0223-201, 202, 203, and 0224-201, 202, 203 or equivalent)

Credit 3

CHAF-263 Calligraphy
Registration #0224-263
Students will explore the history of the alphabet through slides, lectures, and projects. Italic handwriting with related variations and techniques will be taught

Credit 2

CHAF-363 Calligraphy Workshop
Registration #0224-363
Further study in the methods and techniques of calligraphy. Students will be able to pursue study in a variety of styles and letter forms in a concentrated manner. May be elected more than once for credit (CHAF-263 or equivalent)

Credit 2

Printmaking

CHAF-296 Introduction to Printmaking
Registration #0224-296
An introduction to the methods, materials, tools, and techniques of printmaking. Areas covered may include woodcut etching, engraving, stencil, coliographs, and lithography. Students are required to pull an edition of print in one area. Additional fee required for supplies. (CHAF-201, 202, 203, and CHAD-201, 202, 203 or equivalents)

Credit 2

CHAF-397 Printmaking Workshop
Registration #0224-397
Further study of methods and techniques of etching, lithography and relief printing. Students may concentrate in one print medium. May be elected more than once for credit. Additional fee required for supplies. (CHAF-296)

Credit 2

CHAF-295 Independent Study: Fine Arts
Registration #0224-295
Independent studies may be developed at the upper level. Projects must be developed with an instructor, subject to the approval of the program chairperson or Division of Business and the Arts. Credit may vary from one to five quarter-credits. For information on independent study contact the Division of Business and the Arts.

Credit Variable

CHAF-298 Special Topics: Fine Arts
Registration #0224-298
Special topics are experimental courses announced quarterly. Watch for tides in the course listing each quarter.

Credit Variable

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Metalcrafts and Jewelry

CHAM-201 Introduction to Metalcrafts
Registration #0225-201 and Jewelry
Emphasis will be placed on basic jewelry making techniques involving sawing, filing, soldering, hand and machine finishing techniques, simple stone setting and more. Design will be stressed throughout the course. May be elected more than once for credit.

Credit 2

CHAM-211 Intermediate Metalcrafts and
Registration #0225-211 Jewelry
Work of a more complex nature will be introduced. Some techniques included will be surface treatment of metal, more sophisticated stone setting, basic hollowware, casting and more.

Independent and creative statements will be emphasized in keeping with the student's technical and aesthetic development. May be elected more than once for credit. (6 credits CHAM-201 or presentation of portfolio)

Credit 2

CHAM-301 Advanced Metalcrafts and
Registration #0225-301 Jewelry
For advanced students in the arts or crafts interested in and capable of exploring a particular area. Content and method decided by conference between student and instructor and directed toward development of student's own creative ability. Advanced level academic credit is variable in proportion to class and outside assignments scheduled. May be elected more than once for credit. (Presentation of portfolio)

Credit 2

CHAM-295 Independent Study:
Registration #0225-295 Metalcrafts/Jewelry
Independent studies may be developed at the upper division level. Project must be developed with instructor, subject to approval of the program chairperson or the Division of Business and the Arts. Credit may vary from one to five quarter-credits. For information on independent studies contact the Division of Business and the Arts.

Credit Variable

CHAM-298 Special Topics: Metalcrafts
Registration #0225-298 and Jewelry
Special topics are experimental courses announced quarterly. Watch for tides in the course listing each quarter.

Credit Variable

Weaving/Textiles

CHAT-201 Introduction to Weaving
Registration #0226-201
An introduction to the materials, processes and techniques of weaving. Emphasis on basic skills includes fiber analysis, yarn calculations, warping loom dressing, 4 harness loom techniques, finishing, designing, drafting and color effects. May be elected more than once for credit.

Credit 2

CHAT-211 Intermediate Weaving
Registration #0226-211
A continuation in the development of weaving techniques and design skills through advanced study of color effects, drafting, 4 harness and tapestry techniques. The course will include samples of a particular technique plus home assignments and a final project to satisfy individual needs. May be elected more than once for credit. (6 credits CHAT-201 or presentation of portfolio)

Credit 2

CHAT-301 **Advanced Weaving**
Registration #0226-301
For advanced students in the arts or crafts interested in and capable of exploring a particular area. Content and method decided before registration by conference between student and instructor and directed toward development of student's own creative ability. Advanced level academic credit is variable in proportion to the class and outside assignments schedules. May be elected more than once for credit. (Presentation of portfolio)

Credit 2

CHAT-295 **Independent Study:**
Registration #0226-295 **Weaving/Textiles**
Independent studies may be developed at the upper division level. Projects must be developed with the instructor, subject to the approval of the program chairperson. Credit may vary from one to five quarter-credits. For information on independent study contact the Division of Business and the Arts office.

Credit Variable

CHAT-298 **Special Topics:**
Registration #0226-298 **Weaving/Textiles**
Special topics are experimental courses announced quarterly. Watch for titles in the course listing each quarter.

Credit Variable

Woodworking

CHAW-201 **Introduction to Woodworking**
Registration #0227-201
Elementary problems in choice of woods, joinery, finishing, use and care of hand tools, and basic procedures in machine woodworking. Suggested introductory project: Construct a dovetailed box from a hardwood with hand cut dovetails. May be elected more than once for credit.

Credit 2

CHAW-211 **Intermediate Woodworking**
Registration #0227-211
Students who have acquired the ability to use hand and powered tools will advance at their own pace on an individually challenging technique and project. The development of design skills and technical ability will be emphasized. May be elected more than once for credit.

Credit 2

CHAW-301 **Advanced Woodworking**
Registration #0227-301
For advanced students in the arts or crafts interested in and capable of exploring a particular area. Content and methods decided before registration by conference between student and instructor and directed toward development of student's own creative ability. Advanced level academic credit is variable in proportion to class and outside assignments scheduled. May be elected more than once for credit. (Presentation of portfolio)

Credit 2

CHAW-295 **Independent Study:**
Registration #0227-295 **Woodworking**
Independent studies may be developed at the upper division level. Projects must be developed with an instructor, subject to the approval of the program director. Credit may vary from one to five quarter-credits. For information on independent study contact the Division of Business and the Arts.

Credit Variable

CHAW-298 **Special Topics: Woodworking**
Registration #0227-298
Special topics are experimental courses announced quarterly. Watch for titles in the course listing each quarter.

Credit Variable

International Studies

CHGI-211 **Chinese Language and Culture:**
Registration #0233-211 **China and the Chinese People**
Introduces basic Chinese culture as well as 100 daily conversational sentences. The emphasis in this quarter will be on Chinese culture characteristics, traditional philosophies and religions, beliefs, family structure, political life, economic system and trade practices, especially when these impact on contemporary practices.
Credit 4

CHGI-212 **Chinese Language and Culture: Chinese**
Registration #0233-212 **Communism Ideology and Practice**
Continues an introduction to basic Chinese culture as well as 100 daily conversational sentences. This quarter's emphasis is on the special features of Chinese communism, their trade ideologies and practices, their general relationships with foreign countries, internal developments and conflicts.

Credit 4

CHGI-213 **Chinese Language and**
Registration #0233-213 **Culture: Contemporary Issues**
Continues an introduction to Chinese culture as well as 100 daily conversational sentences. This quarter's emphasis is on the contemporary issues, their relations with the United States, their business practices. During the third quarter more time will be spent on language practice and students' independent work. It is more beneficial if students have had at least one of the two previous courses.

Credit 4

CHGI-221 **Japan: The Changing**
Registration #0233-221 **Tradition**
What are foundations of Japan's economic and technological success? This course considers the economy, government, and society of modern Japan and traces its emergence from the first contacts with the West in the 1500s to its present position as a leading economic power. This course may serve as a social science elective.

Credit 4

Deaf Studies

CHGD-211 **Sign Language & Manual**
Registration #0234-211 **Communications System I**
Develops fluency at a basic level. This course includes introduction and practice of approximately 300 basic signs, theoretical consideration and practice of grammatical features of sign language, fingerspelling and sociolinguistic information regarding the appropriate application of manual communication skills in communicating with deaf persons.

Credit 2

CHGD-212 **Sign Language & Manual**
Registration #0234-212 **Communications System II**
A continuation of conversational signing skill development The course includes 300 additional basic signs, continued practice with the grammatical features of sign language, fingerspelling practice, and further sociolinguistic information regarding the appropriate use of manual communication skills between deaf and hearing persons. (CHGD-211 or equivalent sign skill)

Credit 2

CHGD-213 **Sign Language & Manual**
Registration #0234-213 **Communications System III**
The third in a series of basic conversational sign language courses. Introduces the student to approximately 300 additional signs, continues the practice of the grammatical features of sign language, refines fingerspelling skills, and further develops students' sensitivity to the use of manual communication by deaf and hearing persons. (CHGD-212 or equivalent sign skill)

Credit 4

CHGD-311 American Sign Language I
Registration #0234-311
This course is designed to continue sign language skill development as the language is used among deaf community members. Students are exposed to many new signed expressions; grammar, syntax and lexical items of A. S. L. Videotapes, dialogues, language games, lecture and readings are used in presentation of this content. (CHGD-213 or equivalent sign skill)

Credit 2

CHGD-312 American Sign Language II
Registration #0234-312
The second in a series of American Sign Language courses. This course continues the study of grammar, syntax and lexical items of A. S. L. Culture aspects of the deaf community are considered as they relate to the language of deaf people. (CHGD-311 or equivalent sign skill)

Credit 2

CHGD-241 Aspects & Issues of Deafness I
Registration #0234-241
Develops knowledge and understanding of the effects of hearing impairment, particularly with regard to the audiological, psychological, educational and vocational implications. Class activities include a simulated deafness experience, films, lectures and discussions.

Credit 3

CHGD-242 Aspects & Issues of Deafness II
Registration #0234-242
Examines deafness from a cultural perspective, focusing on: what constitutes culture, what characterizes deaf culture, dynamics of interaction between the deaf and the larger community, and historical perspectives on deaf heritage. Films, individual case studies, cultural simulation, discussions and lecture will be implemented. (Recommended: CHGD-241)

Credit 3

Humanities

CHGH-201 Humanities
Registration #0235-201
An interdisciplinary course in which literature, architecture, art, music and philosophy are related to selected historical, economic and scientific forces that have shaped western civilization. Part of a three-course sequence, this course is concerned with the modern period, from the end of the Romantic Age to the present day. Despite the relatedness of these three courses, any of them can be taken alone, and no one course is prerequisite to either of the others.

Credit 4

CHGH-202 Humanities
Registration #0235-202
An interdisciplinary course in which literature, architecture, art, music and philosophy are related to selected historical, economic and scientific forces that have shaped (particularly) western civilization. Part of a three-course sequence, this course focuses on ancient Greece, Rome and Israel, as well as the Middle Ages. This course has no prerequisites, nor does it serve as prerequisite for other courses.

Credit 4

CHGH-203 Humanities
Registration #0235-203
An interdisciplinary course in which literature, architecture, art, music and philosophy are related to selected historical, economic and scientific forces that have shaped (particularly) western civilization. Part of a three-course sequence, this course focuses on the development of the humanities from the Renaissance through the Romantic Age. This course has no prerequisite, nor does it serve as prerequisite for other courses.

Credit 4

CHGH-210 Introduction to Art
Registration #0235-210 Appreciation
Examines the elements involved in the creation of the visual arts (painting, sculpture, architecture) and the factors that affect audience response (line, color, texture, rhythm). Particular emphasis given to historical perspectives and organic unity.

Credit 4

CHGH-230 Introduction to Music
Registration #0235-230 Appreciation
A study of the elements of music (rhythm, melody, harmony), of different musical styles, and of music in the context of history. Emphasized topics include major musical periods (Rococo, Baroque, Classical, Romantic and Modern). Major composers considered are: Bach, Vivaldi, Handel, Mozart, Haydn, Beethoven, Brahms, Chopin, Tchaikovsky, Liszt, Dvorak, Stravinsky and Copeland.

Credit 4

CHGH-260 Introduction to Literature
Registration #0235-260
An introduction to the elements and distinctive qualities of five varieties of literary experience: poetry, short fiction, film, the novel, and briefly, expository prose. Emphasized topics include form, theme, style, versification, and characterization. Although this course is not historically oriented, students will become familiar with cultures from many periods in history.

Credit 4

CHGH-270 Introduction to Philosophy
Registration #0235-270
This course acquaints students with methods of philosophical questioning and argumentation through an examination of major philosophers and the issues they address. Issues to be examined include questions about the nature of knowledge, the nature of reality, ethics, and aesthetics. Emphasis will be placed on a critical examination of the reasoning offered by philosophers in behalf of their views.

Credit 4

CHGH-275 Contemporary Moral Problems
Registration #0235-275
A one-quarter course that presents moral issues which arise in the professions and other vocations of technical expertise. These problems in applied ethics are studied through contemporary literature by moral philosophers (e.g., Habermas, Singer) as well as key classical texts (e.g., those of Plato, Locke, Hume, etc.).

Credit 4

CHGH-298 Special Topics: Humanities
Registration #0235-298
Experimental lower-division courses will be offered under this number, titles will appear in each quarter's course listing.

Credit Variable

CHGH-323 **Modern Europe**
Registration #0235-323
An examination of the development of Europe from the 17th Century to the present time, with emphasis on theories and concepts of civilization, culture, government, and international relations. Also emphasized: the Industrial Revolution, 19th Century democracies, governmental experiments of the 20th Century, World Wars I and II, and the Post (WWII) War Period.

Credit 4

CHGH-326 **Modern America**
Registration #0235-326
Traces the emergence of the U.S. as a world power from the time of the Civil War to the present Stresses problems created at home by continued industrialization and urbanization. Included are such issues as urbanization, civil rights, and the growing political influence of women and minorities.

Credit 4

CHGH-340 **Values and Experience**
Registration #0235-340
A study of the interaction between values and experience. Focuses on the impact of social institutions (religion, family, education, government) and technological developments on values and beliefs (including the definition of reality). This is a science, technology and humanities elective.

Credit 4

CHGH-341 **Symbols, Behavior, Culture**
Registration #0235-341 **and Technology**
A study of symbol and sign systems, emphasizing principles and rules that underlie linguistic behavior. Examines the ways in which behavior reflects and influences culture, and the ways in which miscommunication results from technical, behavioral and cultural factors. This is a science, technology and humanities elective.

Credit 4

CHGH-342 **Dimensions of Science**
Registration #0235-342
A survey and exploration of the impact of science on, and its interactions with, other elements of civilization, such as literature, technology, politics, philosophy, the arts, and human values. This is a science, technology and humanities elective.

Credit 4

Communications

NOTE: Students who apply for Dynamic Communications I, CHGL-204, or Communications, CHGL-220 must take a pre-test to determine the course most appropriate for their communication needs. Only students who have credit for CHGL-204, or equivalent, may register for Dynamic Communications n, CHGL-205.

CHGL-120 **Basic Communication**
Registration #0236-120
This course provides an opportunity for students to improve their reading, writing, listening skills. For college-prep students or adults who want to upgrade their communication skills.

Credit 1 (Diploma)

CHGL-204 **Dynamic Communications I**
Registration #0236-204
The first of a two-course sequence, Dynamic Communications I focuses on writing skills. The achievement of clarity, logic, coherence, logical development of ideas, and effective use of language is emphasized. Basic research techniques and critical reading skills are also included. (Requires pre-test)

Credit 4

CHGL-205 **Dynamic Communications II**
Registration #0236-205
This course builds on the skills acquired in Dynamic Communications I. Emphasis will be on organizing and supporting ideas in papers of several paragraphs. The major exercise is the writing of an 8-10 page researched position paper and an oral defense of the paper's thesis. A study of critical reading techniques will teach students to evaluate the substance, logic, organization, and clarity of their own writing. (CHGL-204 or equivalent)

Credit 4

CHGL-206 **Vocabulary**
Registration #0236-206
This course will help you improve your vocabulary and its usage. Some aspects of language study which direcdy apply to vocabulary building will be examined: origins of words, historical development of their forms and meanings, their current usages, and use of dictionary and context to distinguish meanings.

Credit 1

CHGL-220 **Communications**
Registration #0236-220
This course consolidates the objectives and content of Dynamic Communications I, CHGL-204, and Dynamic Communications II, CHGL-205. (Requires pre test)

Credit 4

CHGL-301 **Professional Presentations**
Registration #0236-301
This course focuses on the principles of preparing and delivering oral presentations. Students will deliver a variety of speech types representative of those commonly occurring in business, industrial, community, and social settings. Self, peer, and instructor critiquing will be used for evaluation of in-class, tape-recorded, and TV-monitored speeches.

Credit 4

CHGL-302 **Discussion Skills and**
Registration #0236-302 **Leadership**
Students will study the theory of leadership in small groups and the dynamics of group behavior. The major exercises of the course are leading and participating as members in conferences which simulate those of civic, business, and industrial settings. Peer critiquing and TV tapings allow students to apply theory as they learn to recognize the elements of successful conferences.

Credit 4

CHGL-307 **Communicating in Business**
Registration #0236-307
This course focuses on the development of those communication skills essential to functioning effectively in the business world. Students will learn the process of analyzing communication situations and responding to them appropriately. Topics include reports, memos, letters, oral presentations, and interpersonal skills. (CHGL-204 and 205 or equivalent)

Credit 4

CHGL-308 **Technical Report Writing**
Registration #0236-308
Students learn to prepare reports of the sort required by practicing engineers and managers in industry and business. They will develop the ability to analyze audiences and purposes, state problems, design reports, and write and edit them. Assigned reports will be discussed and critiqued by peers and instructor. (CHGL-204, 205 or equivalent)

Credit 4

CHGL-323 Technical Writing and Editing
Registration #0236-323
This course focuses on the writing skills required for preparing technical documents. Adapting material and language for audience and purpose, and conventions of technical writing style are emphasized. Strategies for evaluating technical discourse are studied and applied. Prior to enrolling in this course, students must demonstrate command of standard written English prose.

Credit 4

CHGL-324 Research Techniques
Registration #0236-324
This course focuses on techniques for information generation. Interviewing skills, review and use of literature, and task analysis are included.

Credit 2

CHGL-325 Instructional Design
Registration #0236-325 Principles
An introduction to the process of designing instructional packages from need and task analysis through identifying goals and objectives, media selection, program development, and validation testing.

Credit 2

CHGL-326 Document Design
Registration #0236-326
An overview of the principles and techniques involved in document design. Includes basic principles of graphic design and visual communication, use of computer graphics, and introduction to typography and reproduction methods.

Credit 2

CHGL-327 Practicum: Designing Manuals
Registration #0236-327
With supervision, students will apply general principles of technical communication to the process of planning, researching, writing, editing, formatting, and producing a finished manual.

Credit 2

CHGL-328 Writing in the Sciences
Registration #0236-328
This course reviews current conventions used in presenting the results of scientific investigation in reports and journal articles. The elements of a scientific manuscript embodying technical content, organization, style, validity, and significance will be discussed and put into practice.

Credit 2

CHGL-329 Oral Communication Skills
Registration #0236-329
This course focuses on effective techniques for oral presentation of technical material, and participation, both as leader and member, in formal and informal meetings.

Credit 2

CHGL-330 Communicating Online
Registration #0236-330
Reviews recent research in online communication, presents principles for online writing and screen design, and examines systems for storage and retrieval of online information.

Credit 2

CHGL-331 Promotional Writing
Registration #0236-331
This course focuses on practical guidelines for preparing marketing materials including brochures, data sheets, trade press articles, press kits, and newsletters.

Credit 2

CHGL-332 Managing the Project
Registration #0236-332
Principles of project management are studied and applied in cases and examples taken from the fields of technical and marketing communication. Major topics include planning, organizing, scheduling, budgeting, controlling, monitoring, and reporting. Conflict resolution, team building, and motivation are also covered.

Credit 2

CHGL-333 Audiovisual Presentations
Registration #0236-333
This course introduces a variety of ways to visualize information for presentation to audiences. Students will learn how to match the media to the message and the audience, how to prepare simple materials quickly, and how to work with production units for more sophisticated visuals. From flip charts to video, visualizing information will be studied and practiced.

Credit 2

CHGL-298, 398 Special Topics:
Registration #0236-298, 398 Communications
Special Topics are experimental courses announced quarterly. Watch for titles in the course listing each quarter.

Credit Variable

CHGL-340 Interpersonal Communication
Registration #0236-340 for Customer Service
This course examines key dimensions of interpersonal communication, focusing on effective message styles and listening strategies to improve customer satisfaction. Techniques and actions that lead to positive outcomes such as conflict resolution, problem solving, and goal attainment are stressed. The role and importance of interpersonal skills in customer interactions and organizational policy, management and ethical issues are reviewed. Through simulation and role playing, skills are developed that may be applied to a variety of work, social and other situations.

Credit **4**

CHGL-360 Introduction to Public
Registration #0236-360 Relations
An overview of the public relations function, covering tasks, responsibilities and roles of the PR practitioner as researcher, image-developer, designer, editor, coordinator, marketer and advertiser; as advisor to management; and as spokesperson, media manager, and services purchaser and provider. Course may be counted as either a business or communication elective. (Consult advisor)

Credit 2

CHGL-365 Writing for the
Registration #0236-365 Organization I
Course is designed for non-professional writers whose positions frequendy require preparation of correspondence as well as copy for inbound and outbound company publications. Emphasis will be on developing clarity, precise use of language, and style in writing letters, reporting information, and creating feature articles. (Comm-220 or equivalent)

Credit 2

CHGL-366 Writing for the
Registration #0236-366 Organization II
Introduction to writing at the corporate level, including handling crisis communication, covering meetings, adapting interviews for print, and preparing company statements for various media. Techniques are outlined for creating interest, presenting financial information, and quoting. Emphasis will be on producing clear, correct copy that is appropriate for purpose and audience. (Comm-220 or equivalent; CHGL-365 recommended)

Credit 2

CHGL-367 **Scripting and**
Registration #0236-367 **Speechwriting**
Introduces principles for two specialized forms of writing: speechwriting and scripting. Speechwriting covers techniques for preparing speech in the "voice" of another adapting message, wording, and tone to speaker. Scripting covers story boarding, using basic script formats, and enhancing the message, where appropriate, with dimensions of characterization, sound, and color. (Comm-220 or equivalent)

Credit 4

Social Sciences

CHGS-201 **Anthropology: Introduction**
Registration #0237-201
Examines the similarities and differences among cultures. The course focuses particularly on the influences of environment, technology, work, authority, kin and non-kin groups, enculturation, religion, folklore, and art in different societies.

Credit 4

CHGS-211 **Psychology: Introduction**
Registration #0237-211
How people think, feel and interact with others comprises the central content of this course. Students learn how scientific method is used to discover some of the factors involved in sensation, perception, motivation, emotion, stress and learning. Given particular attention are: physical and personality development, psychological disorders, and social behavior. Students are encouraged to relate this information to their personal and professional lives.

Credit 4

CHGS-221 **Principles of Economics I**
Registration #0237-221
This course covers the basic principles of macro-economics. It traces the development of economics from an historical perspective, the functioning of the American economic system, and covers such topics as money and banking, economic growth and problems of inflation, unemployment, scarcity of resources, business cycles, international trade, and supply and demand.

Credit 4

CHGS-222 **Principles of Economics II**
Registration #0237-222
This course covers micro-economic problems such as distribution of income, allocation of resources, price determination under competition, monopolies, supply and demand, and their applications to business firms and labor unions. It also deals with the structure of American industry and the roles played by government, business, and individuals viewed in the light of current economic trends.

Credit 4

CHGS-223 **Principles of Economics III**
Registration #0237-223
A further elaboration of the elementary principles of economic analysis introduced in Principles of Economics I (macroeconomics) and II (microeconomics). Particular emphasis will be placed on the application of these principles to the decision-making process of business and industry, domestically and internationally. (CHGS-221 or CHGS-222)

Credit 4

CHGS-227 **The New Service Economy**
Registration #0237-227
Provides an overview of the emerging national and regional service economies. Defines the service sector, both consumer and producer services, using a variety of local examples drawn from health care, information and communication, hospitality, financial and personnel services. Economic and labor force implications of the service economy are analyzed along with the structure of service organizations, service delivery systems and levels of service.

Credit 2

CHGS-231 **Sociology: Introduction**
Registration #0237-231
A scientific examination of human beings and their relationships with one another. Consideration is given to the role of the individual in society, social interaction, social institutions and social change. Objectives are to examine the human condition in the context of social relationships, dispel myths and prejudices, and ascertain practical applications of concepts.

Credit 4

CHGS-261 **Political Science: Introduction**
Registration #0237-261
Introduces the discipline of political science. It is designed to acquaint students with the complexities of political issues, political thought and behavior, government structures and processes, public policy, and international affairs.

Credit 4

CHGS-316 **Psychology: Behavior**
Registration #0237-316 **in Industry**
Industry presents one environment for understanding human behavior. This course applies psychological and social concepts to the industrial setting. Topics to be covered are motivation, performance, assessment, quality of work life, group behavior, leadership, organizational structure, communication and decision making. (CHGS-211)

Credit 4

CHGS-317 **Psychology of Stress**
Registration #0237-317 **and Adjustment**
Physiological, psychological, and social stress can have serious consequences on one's daijy life. This course is designed to familiarize students with basic concepts, the positive and negative ramifications of stress, and strategies for stress management (CHGS-211 or equivalent)

Credit 4

CHGS-320 **Psychology of Persuasion**
Registration #0237-320
Examines important research on persuasive communication, covering: What causes people to respond to persuasive communication in different ways? How can the communicator predict group responses to a given persuasive message? Projects will require students to use theory in designing effective strategies for various purposes and audiences.

Credit 2

Photography

NOTE: Students enrolled in photographic courses have the studies and laboratories available to them only for the scheduled class times. On a space available basis additional time may be secured, but not to exceed the equivalent of one regularly scheduled lab or studio period per week. Work done in the studios or laboratories must be for the specific purpose of meeting course objectives.

CHGP-021 Introduction to Photography
Registration #0231-021
For the novice photographer who would like to learn how to produce aesthetically and technically acceptable photographs. Topics include cameras, lenses, films, developing, printing, enlarging, filters, flash photography and print finishing. The emphasis is on successful solution of practical photographic problems.

Credit 0

CHGP-101 Photography Workshop
Registration #0231-101
A flexible course in the application of photography for self-expression. Emphasis is on criticism and the development of the individual's ability to create meaningful and purposeful photographs. Class time devoted to developing and enlarging, as well as group and individual critique sessions. All shooting assignments are completed outside of class.

Credit 2

CHGP-102 Photography Workshop
Registration #0231-102
Continuation of CHGP-101. Students are encouraged to develop in areas of specific interest to them. Excellence in the creative as well as the technical aspects of photography, printing and presentation is stressed. Students should bring examples of past work to first class. This course may be elected more than once for credit.

* Credit 2

CHGP-104 Color Photography Workshop
Registration #0231-104
The course will acquaint students with skills in color materials handling, from exposure to color printing. Aesthetic and communicative aspects of color photography will be stressed. Small format equipment with color negative and reversal materials will be used. Students should bring examples of the past work to first class. May be elected more than once for credit. (CHGP-102 or equivalent)

Credit 2

CHGP-201,202,203 Basic Professional
Registration #0231-201, 202, 203 Photography
An introductory course to photographic principles and practice designed primarily for the inexperienced who aspire to enter photography as a profession, who would find such knowledge useful in a related field or who wish to improve personal knowledge. Both theory and practice are provided in a wide range of picture taking and darkroom techniques. Some background in photography is desirable but not absolutely necessary. This course is a prerequisite to all other courses in the professional photography program.

Credit 4/Qtr.

CHGP-211,212, 213 Color Photography
Registration #0231-211, 212,213
Color theory and applied problems in color photography, processing and printing. Negative and reversal processing, color balance and correction, internegatives, duplication techniques, elements of masking and optimum reproduction methods. (CHGP-201, 202, 203 or equivalent)

Credit 4/Qtr.

CHGP-221,222, 223 Illustrative Photography
Registration #0231-221, 222, 223
The application of various specialized photographic techniques to creative image making. Special emphasis on single source studio lighting techniques to achieve desired visual effects. Novel and innovative camera methods and photographic design concepts are stressed. Particular emphasis on advertising photography applications and on the essence of the subject. Topics will include still life, food and consumable products, fashion assignments and some location photography. The principal camera format used will be 4x5. Equipment is available at the studios for use during class hours. Some small format photography will also be required. (CHGP-201, 202, 203 or equivalent)

Credit 3/Qtr.

CHGP-231,232, 233 Portrait Photography
Registration #0231-231,232, 233
A foundation course in portraiture, including concepts and psychology of portraiture and the use of professional cameras and studio equipment through lectures, demonstrations, and assigned projects. Stress is placed on understanding facial types and on the appropriate use of light. It is recommended that students who enroll in this course also schedule Portrait Retouching CHGP-331,332,333. (CHGP-201,202,203 or equivalent)
Credit 3/Qtr.

CHGP-241,242, 243 Commercial Photography
Registration #0231-241, 242, 243
Materials, equipment and techniques with emphasis on the solution of problems in commercial photography. It is recommended that students who enroll in this course also schedule Commerical Retouching, CHGP-321, 323. (CHGP-201, 202, 203 or equivalent)
Credit 3/Qtr.

CHGP-301,302 Motion Picture Photography
Registration #0231-301,302
Designed for the amateur, the school teacher and those interested in basic film production. Super 8mm will be the principal size camera and film used, however, 16mm will be used toward the conclusion of the course. Included will be scripts and story boards, composition, continuity, cutting, editing, sound and presentation. The participants should have a personal Super 8mm camera available for use during the program.

Credit 3/Qtr.

CHGP-321, 322, 323 Commercial Retouching
Registration #0231-321,322,323
Methods used in retouching commercial negatives and prints: bleaching, lettering, use of etching knife and abrasives. Last quarter includes color retouching and use of airbrush.

Credit 1/Qtr.

CHGP-331, 332, 333 Portrait Retouching
Registration #0231-331,332, 333
Retouching portrait negatives, using pencil, knife, abrasives and dyes. Last quarter includes Ektacolor negatives and major correction of anatomical features.

Credit 1/Qtr.

CHGP-351 Industrial Photography:
Registration #0231-351 Instrumentation
Fundamental applications of a variety of photographic techniques will be presented. Weekly projects will give students hands-on experience with methods such as high-speed flash, sequence, motion picture and streak photography; panoramic and peripheral photography; schlieren, shadow graph and thermal photography; infrared, ultraviolet and polarization photography; etc.

Although mathematical concepts are utilized, emphasis is placed on understanding underlying photographic measurement principles rather than on absolute mathematical rigor. May be elected three times for credit. (CHGP-201, 202, 203 or equivalent)

Credit 3

CHGP-352 **Industrial Photography:**
Registration #0231-352 **Audiovisual Techniques**
You will have an opportunity to prepare audiovisual programs using current techniques and equipment. You will learn special photographic methods used for the production of programs that exhibit both technical excellence and visual impact. Also included are presentations on the use of the medium as a training, promotional and educational tool. May be elected three times for credit. (CHGP-201, 202, 203 or equivalent)

Credit 3

CHGP-353 **Industrial Photography:**
Registration #0231-353 **Special Topics**
Through guided individual study students have the opportunity for more comprehensive work in either the instrumentation or audiovisual areas. Also, specialized topics not covered in standard course may be scheduled with the consent of individual faculty members. For listing of special topics available any particular quarter consult department chairperson. May be elected more than once for credit. (CHGP-201, 202, 203 or equivalent)

Credit 3

CHGP-361,362 **Law Enforcement**
Registration #0231-361, 362 **Photography**
Advanced photographic applications in various aspects of law enforcement photography. Fingerprints, infrared and ultraviolet photography. Forgery, surveillance and accident photography. (CHGP-201, 202, 203 or equivalent)

Credit 3/Qtr.

CHGP-366 **Dye Transfer Printing**
Registration #0231-366
The dye transfer color printing process is covered in its theory and through practical laboratory assignments. Mordant, dye acidity and contrast, color balance controls, dyeing, image transfer and registration. (CHGP-211, 212, 213 or equivalent)

Credit 3

CHGP-401,402,403 **Fashion Photography**
Registration #0231-401, 402, 403
A course designed to expand the photographer's vision and awareness to the problems of fashion photography. Emphasis on sensitivity to light, the beauty of the model, and most important, on the development of the student's personal taste in expressing the inherent qualities of the garment Students should bring to first class examples of past work, whether it be fashion photography or not. (CHGP-201, 202, 203 or equivalent)

Credit 3/Qtr.

CHGP-404,405, 406 **Architectural Photography**
Registration #0231-404, 405, 406
Photographic interpretation and effective visual presentation of buildings, both as structures for habitation as well as art forms in themselves. Use and application of view camera included. Effective use of small format equipment. Assignments to be completed outside of class time include exteriors, interiors, landscapes, details and individual as well as group buildings. Students must make arrangements for printing outside of class.

Credit 3/Qtr.

CHGP-411 **Photography of the**
Registration #0231-411 **Natural World**
Through lectures, field trips, class discussion, and critiques, the student is offered an opportunity to develop an awareness and sensitivity to the beauty of the natural world. There are a number of field trips scheduled to areas such as Letchworth Park, Bergen Swamp, Sapsucker Woods and other appropriate locations. Transparency materials are exclusively in the 35mm format. The student is expected to have his or her own camera, light meter and some type of close-up accessory. May be elected twice for credit. (CHGP-201, 202, 203 or equivalent)

Credit 4

CHGP-431,432,433 **Photographic Communication**
Registration #0231-431, 432,433
Photography for people in action situations. The decisive moment and "candid" pictures. Picture stories and sequences. Effective use of available light Historical perspectives. Use of writing and captions in conjunction with photographic images. Shooting and printing portion of the assignments to be completed outside of class time.

Credit 2/Qtr.

CHGP-295, 298 **Photographic Vision I and Q**
Registration #0231-295, 298
The Photographic Vision is a video-based two course sequence all about photography, presented in a medium that enhances the power of the photograph. The course covers the basic mechanical skills of camera handling, the nomenclature of the tools and materials, the history of photography, and the technical, artistic and commercial dimensions of this craft. Photography is approached as an art form and as unique means of human communication as well as a technical skill. Students desiring darkroom experience should also register for a Photography Workshop: CHGP-101 or 102. Completion of CHGP-295 and 298, CHGP-101, 102 along with four credits of Photography electives, will satisfy the requirements of Basic Professional Photography: CHGP-201, 202 and 203.

Credit 3/Qtr.

Photographic Science

CHGR-207, 208,209 **Fundamentals of**
Registration #0238-207, 208,209 **Photographic Science**
Principles of sensitometry, photographic chemistry and applied photography. Subject areas include densitometers, sensitometers, logarithms, characteristic curves and photographic response relationships. General emulsion and photographic processing chemistry formulations, time-temperature relationship, chemical balance and process control. The view camera and its use, perspective, depth of field, lighting and proper metering techniques, Filters, flash and photography as a pictorial and a scientific instrument (A background in algebra and trigonometry is suggested)

Credit 4/Qtr.

CHGR-217, 218,219 (Lec.) **Photographic Chemistry**
CHGR-224, 225, 226 (Lab)
Registration #0238-217, 218,
219, 224,225, 226
This course will provide the student with an understanding of the chemical basis of photography necessary to the continued study of photographic science, and to provide a systematic study of the manufacture and properties of silver halide photographic emulsions and processing solutions.

Specific topics will be: formation and growth of silver halide crystals; chemical and spectral sensitization; addenda and coating; latent image theory and application of conventional and diffusion transfer processing; comparisons and silver halide and non-silver photographic systems.

The course will assume only an introductory knowledge of chemistry. Yet science or engineering graduates entering photographic research or involved in other areas of photographic technology will find in the course a basis for their work and for further study. The lecture may be taken by itself. (CHGR-201,202 and 203 and CHGR-207, 208 or equivalent)

Credit 4/Qtr., Lec. 3, Lab 1

CHGR-227, 228, 229 **Black and White Sensitometry**
Registration #0238-227, 228, 229
The relation of photographic density to exposure in a light-sensitive silver halide emulsion, including radiation source, exposure measuring devices, sensitometers, chemical development and processing, D-Log curves, densitometers, tone reproduction, and the necessary latent image theory. (CHGP-207, 208, 209 and CTAM-210 or equivalent)

Credit 4/Qtr.

CHGR-237,238 Radiometry
Registration #0238-237, 238
You will become acquainted with the human visual process, light sources, attenuators, receivers and the physical parameters involved in the generation, propagation, composition and measurement of radiant energy particularly as it relates to photographic materials and fundamental optical systems.

A background in algebra and trigonometry is recommended. (CHGP-207 and CTAM-210 or equivalent)

Credit 3/Qtr.

CHGR-307 Quality Control of
Registration #0238-307 Photographic Solutions
Principles of photographic processing solutions, their chemical and sensitometric analysis, the application of statistics and the design of photographic processing machines for precision photographic processing. Identification of processing errors, processing for permanence, modification and restoration of photographic images.

Content purpose and criticality of control of the chemical components in Black and White and Color processing solutions. Current procedures and instrumentation for the analysis and control of processing solutions. Testing for the identification of processing errors. Design of replenishment formulas. Principles of machirje design construction materials and processing solution compatibility. Specific examples of use in present day machines. (CHGR-217, 218,219 or equivalent)

Credit 3/Qtr.

CHGR-407, 408,409 Optics
Registration #0238-407, 408,409
Introduction to geometrical and physical opticals applied to photographic systems and optical instruments. (CTAM-251, 252 or equivalents)

Credit 3/Qtr.

CHGR-414, 415,416 Color Sensitometry
Registration #0238-414, 415,416
Photometric measurements, color specification, spectrophotometry, visual and printing densities, integral and analytical color densitometry, color reproduction, dye deficiencies and masking. (CHGR-227, 228, 229 and CTAM-251, 252, 253 or equivalents. Computer programming background also required)

Credit 3 (CHGR-414, 415), Credit 4 (CHGR-416)

CHGR-417,418,419 Image Evaluation
Registration #0238-117,418,419
The course objective is to develop fundamental and rigorous understanding of the problems of evaluating photo-opticals systems. Both the subjective and the objective methods of analysis are discussed in considerable detail.

The main topics are: point-and-line-spread function of photo-optical systems; derivation of the line-spread function of photographic emulsions; one-dimension image formation and convolution integrals; Fourier analysis and Fourier transforms; auto-correlation and its applications; modulation transfer function of photo-optical systems (MTF). (CHGR-407, 408, 409 and CTAM-305, 328 or equivalent Computer programming background also required)

Credit 3/Qtr.

CHGR-421 Mathematical Methods in
Registration #0238-421 Photographic Science
A survey of various mathematical techniques useful in devising or modeling photographic systems. Each method is applied to numerous problems and examples from photographic science after development of the pertinent mathematics. Topics selected from: linear spaces, transformations, dimensional analysis, information theory, system analysis, distributory theory, stochastic processes. (CTAM-251, 252, 253 or equivalents)

Credit 4

CHGR-520 Xerography and
Registration #0238-520 Electrographics
The objectives of this course, which is directed towards working engineers, scientists and experienced technicians, are to provide a comprehensive program devoted to the scientific background and practical applications of electro-photography, to emphasize the relationship of silver photography to electrostatic imaging, and to provide practical experience in xerographic image formation and reproduction.

Topics which will be covered in lectures, demonstrations, and laboratories include: electrical imaging and electrostatic principles; photoconductivity; the electrical latent image; dry and wet development; image transfer and fusing, and novel technical approaches.

The prerequisites assume a background in general physics (especially electricity) and college mathematics or equivalent experience.

Fundamental principles of selected subjects will be reviewed.

Credit 3

CHGR-527 Theory of the Photographic
Registration #0238-527 Process
An advanced course in photographic theory covering the underlying principles and mechanisms of the photographic process. Latent image formation, photographic sensitivity, emulsions, and development processes will be discussed in terms of the basic principles of solid state physics. The concepts of band structure, trapping levels, lattice defects, surface space charge layers, and interface electro-chemistry will be described and employed. (CHGR-217, 218, 219 and 224, 225, 226 or equivalent)

Credit 4

CHGR-528 Theory of the Color Process
Registration #0238-528
The measurements of color photography, colorimetry, tone and color reproduction, spectrophotometry, and masking theory are treated in a common mathematical notation. (CHGR-217, 218, 219 and 224, 225, 226 and CHGR-414, 415, 416 or equivalent)

Credit 4

CHGR-529 Non-Silver Imaging Systems
Registration #0238-529
The purpose of the course is to examine the more promising nonsilver and unconventional silver halide systems in view of the future requirements in cost, sensitivity, image quality, color rendition, ecology (to compare them to present silver imaging systems), and to consider the reasons for the commercial failure and future prospects of other systems.

The course will emphasize the principles and methods of physics and chemistry which have been developed into non-silver photographic systems, rather than the extensive empiricism which has been characteristic of this field. The student will gain an understanding of the principle non-silver systems and today's research and product trends. Topics include: latent-image theory; exposure effects: mechanism of development and spectral sensitization; sensitometry; and image evaluation. (CHGR-527 or equivalent)

Credit 4

CHGR-557, 558,559 Independent Research
Registration #0238-557, 558, 559
Individual project involving research in an applied professional or scientific photographic subject carried out under the guidance of a professor. (Permission of chairperson, photography)

Credit 3/Qtr.

Printing

CHGT-lll, 112,113 **Color Separation Camerawork**
Registration #0239-111,112,113
Fundamentals of light and color as applied to masking and color separation in offset lithography. Densitometric control of the photographic operations is emphasized; various masking methods are surveyed. Laboratory projects supplement lecture material. (CHGT-101,102, 103 or equivalent)

Credit 2/Qtr.

CHGT-121, 122, 123 **Offset Layout and Stripping**
Registration #0239-121, 122, 123
No longer offered. See course CHGT-221, 222, 223.

CHGT-131, 132 **Offset Platemaking**
Registration #0239-131, 132
A comprehensive course covering all aspects of offset platemaking. Includes all imaging methods for lithographic plates, such as the various forms of presensitized, wipe-on, photopolymer, deep-tech, bi- and tri-metal plates, as well as transfer and direct camera plate systems; basic step and repeat layout and procedures on two machines also are studied.

Credit 2/Qtr.

CHGT-141, 142, 143 **Offset Presswork**
Registration #0239-141,142,143
A study of the fundamentals of lithographic presswork. Emphasis is placed on principles, procedures, equipment and the relationship of materials.

Credit 2/Qtr.

CHGT-151, 152,153 **Color Stripping**
Registration #0239-151, 152,153
An advanced study of image assembly to include **4** color process stripping; pin register systems; proofing systems; contacting procedures. (Students should have taken CHGT-121,122,123, CHGT-221, 222, 223 or equivalent experience)

Credit 2/Qtr.

CHGT-201, 202, 203 **Introduction to Printing**
Registration #0239-201, 202, 203
Survey of the various phases of production employed in major printing processes, encompassing the major steps from design to finished printed product.

Credit 2/Qtr.

CHGT-207 **Printing Design and Layout**
Registration #0239-207
Fundamentals of layout and design as applied to commercial printing and advertising, including how to design with type, specify type and illustrations, and produce layouts from thumbnail sketches to a completed comprehensive design. Emphasis on technical and printing problems.

Credit 3

CHGT-211 **Phototypesetting Procedures**
Registration #0239-211
Study and analysis of phototypesetting procedures, emphasizing techniques of phototypography through the medium of contemporary laboratory facilities. One field trip.

Credit 2

CHGT-215 **Bookbinding**
Registration #0239-215
This course is intended to give the student an introduction to the skills of hand bookbinding. The purpose is to experience bookbinding as an art form. Content will cover history, materials, methods of bookbinding and restoration. Students should bring two books of their own for rebinding.

Credit 3

CHGT-219 **Estimating**
Registration #0239-219
A basic course in planning production, cost of materials, hour costs, hour rates, estimating time and time standards.

Credit 4

CHGT-221, 222, 223 **Offset Film Assembly**
Registration #0239-221, 222, 223
A comprehensive course sequence of applied study in offset film assembly to include: imposition planning and layout; black and white, flat color, and process color film assembly techniques; pin register systems; proofing systems; roomlight film contacting procedures. Lab projects are designed to include a wide variety of film assembly techniques and emphasize the development of job analysis, planning and construction skills.

Credit 3/Qtr.

CHGT-227 **Copy Preparation**
Registration #0239-227
Copy preparation for reproduction; working from layouts; arrangement and handlings for paste-up, separation mechanicals, and photographic copy; requirements of reproduction proofs; writing complete specifications for stripping and camera.

Credit 3

CHGT-231, 232 **Printing Plates**
Registration #0239-231, 232
Theory and practice of platemaking for lithographic, letter press and flexographic printing plus theory of gravure cylinder making.

Credit 2/Qtr.

CHGT-237 **Technology of Typesetting**
Registration #0239-237
An introduction to machine typesetting including hot metal, tape and phototypesetting.

Credit 2

CHGT-241 **Typography**
Registration #0239-241
The typographical factors important to all phases of printing design from simple commercial work to books. Special attention is given to the logical selection of types, and their fitness for a variety of jobs.

Credit 2

CHGT-251,252 **Paper and Printing**
Registration #0239-251, 252
A survey of kinds of paper and papermaking emphasizing the graphic arts processes and their relation to varieties of paper, instruction in utilizing paper characteristic for printing advantage. Attention given to the economics of paper buying, the problems of the pressroom, and the paper revolution.

Credit 2

CHGT-301,302,303 **Reproduction Camerawork**
Registration #0239-301, 302,303
The photographic process as it relates to the printing of black and white and color reproductions. Emphasis on basic photography; line and half-tone photography; tone reproduction; and color separation photography. The theoretical approach is stressed; however, students will be involved in various photographic activities.

Credit 2/Qtr.

CHGT-314 **Flexography**
Registration #0239-314
A study of the theory and practice of flexographic printing, uses and development of flexography, plate and ink requirements, press principles and operation, experiments in printing on a wide variety of surfaces.

Credit 3

CHGT-317, 318 **Computer Applications**
Registration #0239-317, 318 **in Printing**
A basic course covering computers and how they are used in graphic arts applications. Characteristics and types of computers used are discussed as well as introduction to programming concepts.

Credit 2/Qtr.

CHGT-341 **Printing Processes**
Registration #0239-341 **Introduction to Offset Press**
A basic introduction to offset presses. Covering: lithographic theory, the applications of lithography, capabilities and limitations of process and basic press design and function. The material will be presented in the form of lectures and demonstrations. (CHGT-203)

Credit 2

CHGT-407 **Ink and Color**
Registration #0239-407
This course is designed to meet the needs of both management and production printing students. A two-hour lecture course on all facets of ink manufacturing and color matching; lab project participation by the student is stricdy voluntary. Emphasis on technical and printing problems with offset (wet/dry) and letterpress inks.

Credit 2

CHGT-421 **Imposition and Finishing**
Registration #0239-421
Course is designed to understand imposition planning as related to and governed by folding and other finishing operations. Content deals with the concepts of pre-press planning, binding and finishing. Included are topics on preparing layouts, forms and folded paper material for binding. Laboratory experiments include operation of modern bindery equipment and the binding of a hardcover book.

Credit 2

Science and Technology

Mathematics

NOTE: Entering students who apply for any of the beginning mathematics courses, CTAM-201, 210 or 251, are required to take a diagnostic examination to determine the level at which they may start the mathematics sequence. Students who have had previous college level mathematics courses should consult with an advisor.

CTAM-101,102,103 **Mathematics**
Registration #0240-101, 102,103
A three-quarter sequence for students whose high-school mathematics background is insufficient to allow them to enroll in degree-level mathematics course. This is an accelerated intermediate high school algebra course with an introduction to trigonometry.

Credit 3/Qtr.

CTAM-201, 202 **Technical Mathematics**
Registration #0240-201, 202
A two-quarter sequence to meet the needs of students enrolled in AAS degree programs. This is an introduction to college algebra and trigonometry covering basic algebraic concepts and operations, algebraic and transcendental (trigonometric, logarithmic, and exponential) functions. (CTAM-103 or equivalent)

Credit 4/Qtr.

CTAM-203 **Technical Calculus**
Registration #0240-203
An elementary applied calculus course for students in the AAS program. This course covers the basic differential and integral calculus of algebraic and transcendental function with applications. (CTAM-202 or equivalent)

Credit 4

CTAM-205 **Mathematical Thought**
Registration #0240-205 **and Processes**
An examination of mathematical thought and processes through a study of elementary mathematical concepts. This course is designed to acquaint the student with the "mathematical way of thinking," the development of mathematical formulas, the applications of mathematics in today's society on an elementary level.

Credit 4

CTAM-206 **Modern Mathematical Methods**
Registration #0240-206
An examination of selected modern mathematical methods used in today's society. This examination includes a study of the nature of these methods, a study of how these methods are used, and a study of the usefulness of these methods in today's society.

Credit 4

CTAM-210 **College Algebra**
Registration #0240-210 **and Trigonometry**
A precalculus course covering a study of algebraic and transcendental (trigonometric, logarithmic, and exponential) functions including graphs and equations. (Three years of high school mathematics or equivalent including intermediate algebra)

Credit **4**

CTAM-251 **Calculus**
Registration #0240-251
Topics include limits, derivatives of algebraic and trigonometric functions; continuity; differentials; related rates; curve sketching; maxima and minima problems; indeterminate forms. (CTAM-210 or equivalent)

Credit 4

CTAM-252 **Calculus**
Registration #0240-252
Topics include the indefinite integral; the definite integral; applications; differentiation and integration of transcendental functions. (CTAM-251 or equivalent)

Credit 4

CTAM-253 **Calculus**
Registration #0240-253
Topics include methods of integration; plane analytic geometry; polar coordinates; vector algebra with emphasis on applications; sequences and series. (CTAM-252 or equivalent)

Credit 4

CTAM-265 **Discrete Mathematics I**
Registration #0240-265
An introduction to discrete mathematics with applications in computer science and mathematics, with an emphasis on proof techniques. It covers the basics of combinatorics, sets, functions, the natural numbers, and the integers modulon. (CTAM-201, 202 or equivalent)

Credit **4**

CTAM-266 **Discrete Mathematics II**
Registration #0240-266
A continuation of discrete mathematics with applications in computer science and operations research. It covers finite state machines, relations, graphs, trees, optimization and matching. (CTAM-265)

Credit 4

CTAM-305 **Calculus**
Registration #0240-305
Partial differentiation; multiple integrals; solid analytic geometry; vector calculus with emphasis on applications to science and engineering. (CTAM-253 or equivalent)

Credit 4

CTAM-306 **Differential Equations**
Registration #0240-306
Ordinary differential equations through nth order with emphasis on first and second order linear. Applications, LaPlace Transforms. (CTAM-305 or equivalent)

Credit 4

CTAM-318 **Boundary Value Problems**
Registration #0240-318
A continuation of CTAM-306, Differential Equations. Topics covered are Fourier Series, and introduction to partial differential equations; series solutions of differential equations; applications of the material covered. (CTAM-306 or equivalent)

Credit 4

CTAM-328 **Engineering Mathematics**
Registration #0240-328
An introduction to matrix algebra and vector analysis. Topics covered are matrix operations with application; vector algebra, vector calculus, gradient, divergence and curl; linear and surface integrals; independence of path and the divergence theorem; applications. (CTAM-305 or equivalent)

Credit 4

CTAM-341, 342 **Engineering Statistics**
Registration #0240-341,342
Designed to provide the student with a working understanding of the basic statistical strategies useful in the analysis and interpretation of data generated by problems of variation in the physical and applied sciences, and as such is a study of the concepts and techniques of mathematical probability and statistics and its role as the central core of all statistical strategies. (CTAM-305 or equivalent)

Credit 4/Qtr.

CTAM-407 **Linear Algebra**
Registration #0240-407
Topics covered in this course are: vector spaces; systems of linear equations; linear transformations and matrices; determinants; characteristic roots and vectors; similarity of matrices and quadratic forms; applications of the above. (CTAM-252 or equivalent)

Credit 4

CTAM-417 **Numerical Analysis**
Registration #0240-417
This course covers linear difference equations; numerical methods for solving equations; interpolation, iteration, and approximating procedures; error analysis or related methods; empirical formulas; and problems involving computer applications. Where applicable, the computer will be used in solving problems. (FORTRAN or BASIC Programming and CTAM-306 or equivalents)

Credit 4

CTAM-420 **Complex Variables**
Registration #0240-420
A study of the calculus of complex functions. Cauchy Theory leading to residue theory and conformal mapping. (CTAM-305 or equivalent)

Credit 4

Electrical (Applied Science)

CTBE-401,402,403 (Lec.) **Circuit Analysis**
CTBE-406,407,408 (Lab)
Registration #0241-401, 402, 403,406,407,408
Circuit parameters, Ohm's Law, Kirchhoffs Laws, combination of elements, voltage and current division, mesh and nodal analysis, linearity and superposition. Thevenin's and Norton's theorems, dependent sources, transient analysis, sinusoidal steady-state analysis, polyphrase circuits, complex frequency, pole-zero diagrams, resonance, magnetically coupled circuits, two-port theory. Fourier series analysis of circuits. LaPlace transform techniques of circuit solution. (CTCP-303 and CTAM-305 or concurrent with CTAM-306)

Lec. 3, Lab 1, Credit 4/Qtr.

CTBE-411,412,413 **Electric and Magnetic Fields**
Registration #0241-411,412,413
Electric and magnetic field application in dielectrics and magnetic core component. Wave propagation and the formulation of dynamic field equations and their specific application to radiation problems, waveguides, antennas, shielding, and transmission lines. (CTAM-328 and CTBM-342 or equivalent)

Credit 4/Qtr.

CTBE-421,422,423 **Electronics**
Registration #0241-421,422,423
An integrated treatment of basic electronic devices and their circuits with emphasis on active circuits and their analysis; biasing, stability, and frequency response consideration, feedback amplifiers and nonlinear circuits. (CTBE-403 and 408 or equivalent)

Credit 4/Qtr.

CTBE-431,432 **Electronics (Advanced)**
Registration #0241-431,432
An in-depth study of stability, feedback, temperature and noise effects as applied to operational amplifiers. Application of integrated circuit operational amplifiers as RC filters and in linear and nonlinear modes. (CTBE-423 or equivalent)

Credit 4/Qtr.

CTBE-433 **Electronics**
Registration #0241-433 **(Communications)**
Introduction to systems for transmitting information at high frequencies: AM, FM, PM. Digital and sampled data systems including basic information theory and noise. Emphasis is on basic understanding utilizing analysis as a tool to demonstrate application and to further understanding. Topics to include propagation, RF amplification, modulation and detection, basic antenna and transmission line principles, D-A and A-D conversion, signal-to-noise ratio, band-width, sampling theory, and noise sources with their effects on information transmission. (CTBE-412 and CTBE-423 or equivalent)

Credit 4

CTBE-434 **Digital Logic Design**
Registration #0241-434
Concepts of Boolean algebra and related switching circuit theory, analysis and synthesis of AND/OR, NAND/NOR logic. Use of Karnaugh map techniques for combinational logic. Simplification, analysis, and synthesis of sequential circuits, using transition and state tables, number systems and codes. TTL, ECL, HTL, digital MOS device characteristics. (CTBE-423 or equivalent)

Credit 3 each course

CTBE-461,462,463 **Electrical Engineering Principles**
Registration #0241-461,462,463
A course for non-electrical majors. Electric and magnetic circuits, electrical measurements, electronic devices, transformers, power systems, machines, and control circuits. (CTAM-305 and CTCP-303 or equivalent)

Credit 4/Qtr.

CTBE-501 **Electromagnetic Energy Conversion**
Registration #0241-501
Theoretical development of magnetic circuit principles as applied to electromechanical energy conversion with emphasis on electromagnetic field and mechanical energies. Electromagnetic devices are discussed with emphasis on the magnetic circuit point of view under steady-state operation conditions. (CTAM-306 and CTBE-412 or equivalent)

Credit 4

CTBE-511, 512 **Control Systems**
Registration #0241-511, 512
Control systems are analyzed with emphasis on open and closed loop operation. System parameters are discussed including block diagrams, transfer functions, and stability. Nyquist criteria and Bode plots are presented to predict and analyze the operation and design of control systems. (CTBE-501 and CTBE-403 and 408, CTBE-511, or equivalent)
Credit 4/Qtr.

Mechanical (Applied Science)

CTBM-341,342 **Engineering Mechanics**
Registration #0242-341, 342
Vector methods in statics and dynamics, force systems, friction, moments, centers of mass and centroids, moments and products of inertia, work, velocity, acceleration, kinetic energy, momentum, rigid body motion, rotation, work, potential energy, conservative forces and impulse. (CTCP-302 and CTAM-305)

Credit 4/Qtr.

CTBM-344 (Lec.); 354 (Lab) **Strength of Materials I**
Registration #0242-344, 354
Stress, strain, Hooke's Law, shear, torsion, shear and bending in beams, moment diagrams and deflection of statically determinate beams. (CTBM-341 or equivalent)

Lec. 3, Lab 1, Credit 4

CTBM-345 **Strength of Materials II**
Registration #0242-345
A continuation of the study of the way engineering materials behave. Slope and deflection of statically indeterminate beams, analysis of special beams, reinforced concrete beams, shear center, bending or torsion stresses combined with direct stresses, combined stresses for general types of loading. Mohr's circle, column analysis, energy of strain and impact, Castigliano's Theorem. (CTBM-344 and 354)

Credit 4

CTBM-401 **Thermodynamics I**
Registration #0242-401
Fundamental properties of thermodynamic systems: perfect gases, state and energy equations, laws of thermodynamics, and properties of pure substances. (CTCP-302 and CTAM-306 or equivalents)

Credit 4

CTBM-402 **Thermodynamics II**
Registration #0242-402
Thermodynamic properties of steam and refrigerants: fluids, heat transfer, mixtures of gases and vapors, internal combustion cycles and vapor power cycles. (CTBM-401 or equivalent)

Credit 4

CTBM-403 **Thermodynamics III**
Registration #0242-403
Additional material on vapor power cycles and internal combustion engines, reactive systems, and fundamentals of heat transfer. (CTBM-402 or equivalent)

Credit 4

CTBM-411 **Fluid Mechanics I**
Registration #0242-411
The basic properties of fluids are described. The principles of fluid behavior are investigated and applied to practical problems. Forces developed by fluids in motion are also examined. Major topics include incompressible viscous flow and boundary-layer theory. Films showing flow phenomena are used to supplement the lecture material. (CTBM-401 or equivalent)

Credit 4

CTBM-412 **Fluid Mechanics H**
Registration #0242-412
Introduction to special flow systems. Major topics include potential flow, compressible flow, and the behavior of fluids in open channels, dimensional analysis and its relation to model flow-testing. Lectures are supplemented with films. (CTBM-411)

Credit 4

CTBM-551 **Machine Design I**
Registration #0242-551
Statics of linkage mechanisms, kinematics and dynamics of linkages, analytical methods of solution based on vector analysis, graphical methods, and additional vector methods of solution. (CTBM-345 or equivalent)

Credit 3

CTBM-552 **Machine Design II**
Registration #0242-552
Kinematics of cam mechanisms, dynamic analysis of cams and some vibrational analysis, cam synthesis, stress analysis of machine design, including the selection of materials. (CTBM-551)

Credit 3

CTBM-553 **Machine Design m**
Registration #0242-553
Design of machine elements (shafts, springs, gears, bearings, clutches and brakes), vibration analysis, material selection, additional analytical and graphical solutions. (CTBM-552)

Credit 3

Chemistry

CTCC-211, 212,213 **General Chemistry**
Registration #0244-211,212, 213
For chemistry majors and others who desire an in-depth study of general chemistry; atomic structure, chemical bond, properties of elements and compounds, states of matter, solutions, acids and bases, oxidation-reduction reactions, chemicals calculations, qualitative and quantitative analysis. (3 years of high school math or equivalent, including intermediate algebra)

Credit 3/Qtr.

CTCC-216 **Qualitative Inorganic Analysis**
Registration #0244-216
A lecture-laboratory course designed to present and illustrate the principles of the methodology of qualitative inorganic cation and anion analyses. (Concurrent with CTCC-213 or equivalent)

Credit 2

CTCC-217, 218 **Quantitative Analysis**
Registration #0244-217, 218
A lecture-laboratory course designed to illustrate the techniques and skills required for volumetric and gravimetric quantitative analysis. (Concurrent with CTCC-211, 212 or equivalent)

Credit 2/Qtr.

CTCC-231 Organic Chemistry
Registration #0244-231
A lecture course serving as an introduction to the science of organic chemistry. A survey of the nomenclature of organic molecules and a discussion of the structure and properties of the various classes of organic compounds is presented. (CTCC-213 or equivalent)

Credit 3

CTCC-232, 233 (Lec.) Organic Chemistry
CTCC-237, 238 (Lab)
Registration #0244-232, 233, 237,238
Fundamental principles of organic reactions are examined for the various types of organic chemicals. Nomenclature, stereochemistry, physical characterization techniques, and reaction types are stressed. Laboratory; preparation of various types of organic chemicals. Emphasis is on the techniques of separation and identification. (CTCC-231 or equivalent)

Lec. 3, Lab 2, Credit 5/Qtr.

CTCC-241, 242, 243 (Lec.) Engineering Chemistry
CTCC-246, 247, 248 (Lab)
Registration #0244-241, 242, 243, 246, 247, 248
A general chemistry course for engineering science and applied science students. The fundamental concepts relating to the physical states of matter, the atomic theory, chemical reactions, thermodynamics, kinetics, electrochemistry, solutions, acid-base theory, oxidation-reduction reactions, nuclear chemistry and a brief introduction to organic chemistry, biochemistry and polymer chemistry as these topics relate to technological problems are presented. The emphasis is placed on the techniques available for the solution of real problems. The laboratory includes applications of the principles discussed in lecture to the solution of specific or project oriented laboratory problems. (CTAM-202 or equivalent)

Lec. 3, Lab 1, Credit 4/Qtr.

CTCC-311 (Lec.) CTCC-316 (Lab) Analytical Chemistry
Registration #0244-311,316 Instrumental Analysis
Elementary treatment of instrumental theory and techniques; properties of light; refractive index, ultraviolet, visible and infrared spectrophotometry; emission spectroscopy; flame photometry; electrochemistry; NernstLaw; pH meters and electrodes. A knowledge of organic chemistry is desirable. (CTCC-213, CTCC-218 or equivalents; CTAM-210 required or to be taken concurrently)

Lec. 3, Lec./Lab 2, Credit 5

CTCC-312 (Lec.) CTCC-317 (Lab) Analytical
Registration #0244-312, 317 Chemistry-Separations
Inorganic and organic separations; Raoult and Henry Laws; phase rules; distillation; extraction; absorption and surface effects; electrophoresis; chromatography including gas, liquid, column, paper, thin layer, and ion exchange. (CTCC-213, CTCC-218 or equivalents, CTCC-231; CTAM-210 or equivalent)

Lec. 3, Lec./Lab 2, Credit 5

CTCC-313 (Lec.) Introduction to Physical
Registration #0244-313 Chemistry
Properties of gases, kinetic-molecular theory; Boltzman Distribution functions; non-ideal behavior, first law of thermodynamics; heat capacities; Euler's theorem and homogeneous functions; thermochemistry; and introduction to the second law. (CTCC-231, CTCC-233 or equivalents; CTAM-253)

Credit 3

CTCC-401,402 (Lec.) Physical Chemistry
CTCC-405,406 (Lab)
Registration #0244-401,402,405,406
Kinetic-molecular theory of gases, states of matter, atomic and molecular structure, thermodynamics, quantum theory, chemical kinetics, photochemistry, spectroscopy (x-ray, optical, magnetic), chemical kinetics, electrochemistry, absorption and heterogeneous catalysis, and macromolecular structure analysis. (CTCC-313; CTAM-305 or take concurrently)

Lec. 3, Lec./Lab 2, Credit 5/Qtr.

CTCC-403 (Lec.) CTCC-407 (Lab) Physical Chemistry
Registration #0244-403, 407
A lecture course presenting some of the more mathematical aspects of physical chemistry. Selected topics from the areas of chemical statistics, quantum theory, chemical bonding molecular states and spectra, and the gas, liquid and solid states are discussed. (CTCC-402 and 406 or equivalent)

Lec. 3, Lec./Lab 2, Credit 5

CTCC-417 Chemical Literature
Registration #0244-417 and Technical Writing
Organization of technical libraries, classification of scientific literature into original and secondary sources and techniques for making literature searches; use of card catalog, index, abstracts, monographs, handbooks, critical tables, journals, bibliographies, technical catalogs, and patents; preparation of literature research reports. (CTCC-233 and 238, CTCC-313 or equivalent)

Credit 2

CTCC-511,512 Instrumental Analysis
Registration #0244-511, 512
Instrumental techniques of analysis including spectrophotometry, conductance, potentiometry, and refractive index measurement, gas chromatography, mass spectroscopy, NMR, and electron spin resonance. Emphasis is placed on the uses of instrumental methods for structure determination, measurement of reaction, kinetics and mechanisms. (CTCC-313, CTAM-253 or equivalents)

Credit 4/Qtr.

CTCC-521 Synthetic Organic Chemistry
Registration #0244-521
An extensive discussion of the methodology and strategy of the synthesis of complex organic molecules including a discussion of the stereochemistry and mechanism of the synthetic processes. (CTCC-233 and 238 or equivalent)

Credit 3

CTCC-522 Physical Organic Chemistry
Registration #0244-522
Topics include activation parameters, kinetic treatment of mechanism elucidation, linear-free energy concepts, quantitative analysis of conformational and electronic effects, simple Huckel Molecular Orbital Theory, electrocyclic reactions, acidity functions and primary and secondary isotope effects. (CTCC-403 or equivalent)

Credit 3

CTCC-523 Advanced Topics
Registration #0244-523 in Organic Chemistry
Several of the following advanced topics in organic chemistry are covered: polyfunctional compounds, modern synthetic methods, stereochemistry, conformational analysis, free radical reactions, natural and synthetic polymers. (CTCC-233 and 238 or equivalent)

Credit 3

CTCC-525 (Lec.) CTCC-535 (Lab) Qualitative
Registration #0244-525, 535 Organic Analysis
A combination of chemistry and spectroscopic techniques is used to identity the structure of "unknown" organic compounds. (CTCC-233 and 238)

Lec. 1, Lec./Lab 2, Credit 3

CTCC-528 **Organic Chemistry**
Registration #0244-528 **of Polymers**
Introduction to the chemistry of synthetic, high molecular weight polymers and a survey of their diverse structures and properties. Mechanisms of condensation, free radical and ionic polymerization. (CTCC-233 and 238 or equivalent)

Credit 3

CTCC-551 **Inorganic Chemistry**
Registration #0244-551
The properties and structures of the elements and their compounds in relation to electronic and stereochemical principles. Some emphasis on the reactions and spectroscopic identification of inorganic compounds. (CTCC-403 and 407 or equivalents)

Credit 4

CTCC-555 **Biochemistry**
Registration #0244-555
Introducdon to modern biological chemistry, physiological and physical-chemical aspects of energy metabolism, intermediary metabolism, biosynthesis of biopolymers, and metabolic regulations; structure and function of proteins and nucleic acids as an introduction to enzymology, molecular biology, and molecular genetics. (CTCC-233 and 238 or equivalent)

Credit 3

CTCC-561 **Surface and Colloid**
Registration #0244-561 **Chemistry**
Surface energy of liquids and solids, adsorption, catalysis, preparation and properties of classical colloids, electrical and optical properties of colloids, formation and properties of macromolecules. (CTCC-403 or equivalent)

Credit 3

CTCC-562 **Photochemistry**
Registration #0244-562
Properties of visible and ultraviolet radiation, adsorption of radiation, spectra, mechanisms in gases, liquids, and solids; experimental techniques. (CTCC-403 or equivalent)

Credit 3

CTCC-563 **Chemical Thermodynamics**
Registration #0244-563
A study of the basic fundamentals of thermodynamics and their use in deriving the interrelationships of thermodynamic functions. Thermodynamic properties of gases will be calculated based on spectroscopic data. (CTCC-403 or equivalent)

Credit 3

CTCC-564 **Quantum Chemistry**
Registration #0244-564
The application of quantum mechanics to the covalent bond, diatomic molecules, resonance and complex molecules; molecular spectroscopy; elements of quantum statistical mechanics. (CTCC-403 or equivalent)

Credit 3

CTCC-565 **Chemical Kinetics**
Registration #0244-565
Methods of investigating the kinetics of chemical reactions and the theories used to interpret their results. Focus on homogeneous reactions in gas and liquid phases; discussions of references from recent chemical literature. (CTCC-403 or equivalent)

Credit 3

CTCC-598 **Topics in Chemistry;**
Registration #0244-598 **Spectrometric Identification**
of Organic Compounds
A practical approach to the elucidation of the structure of organic compounds through detailed analysis of their infrared, ultraviolet-visible, nuclear magnetic resonance and mass spectrometric properties. The emphasis is on the solution of real problems. (CTCC-233 or equivalent)

Credit 3

CTCC-599 **Independent Study:**
Registration #0244-599 **Chemistry**
Faculty-directed study of chemical topics on a tutorial basis. (Consent of instructor)

Credit 1-3

Physics

CTCP-201, 202, 203 (Lec.) **College Physics**
CTCP-206, 207, 208 (Lab)
Registration #0245-201, 202,
203,206,207, 208
A basic course in physics using algebra and trigonometry; topics covered: statics, dynamics, harmonic motion, sound, heat, fluid-flow, wave motion, optics, electricity and magnetism. Emphasis on understanding of basic principles and problem solving. (CTAM-202. Students who have not taken CTAM-202 must take the math qualifying exam.)

Lec. 3, Lab 1, Credit 4/Qtr.

CTCP-301, 302,303 (Lec.) **Physics**
CTCP-306, 307,308 (Lab)
Registration #0245-301, 302,
303,306,307,308
Physics for engineering and science students. The following topics are covered: statics, dynamics, harmonic motion, wave motion, sound, thermodynamics, fluid-flow, optics, electricity and magnetism. Calculus is used freely. (CTAM-253 or equivalent)

Lec. 4, Lab 1, Credit 5/Qtr.

CTCP-457 **Modem Physics**
Registration #0245-457
An introductory course of 20th century physics. Review of some classical concepts, special relativity, quantum effects, duality of waves and particles, the hydrogen atom. (CTCP-303, CTAM-305)

Credit 4

CTCP-458 **Modern Physics**
Registration #0245-458
A continuation of CTCP-457. Many electron atoms, molecular physics, solid state physics and devices. (CTCP-457 or equivalent)

Credit 4

CTCP-459 **Nuclear Physics**
Registration #0245-459
Elementary particles, nuclear structure, nuclear reactions, fission, fusion. Nuclear power, accelerating machines. (CTCP-458 or equivalent)

Credit 4

Contemporary Science

CTCS-221 **Contemporary**
Registration #0246-221 **Science: Biology**
An introduction to the fundamental principles of biology for nonscience majors and the application of these concepts to areas of interest in our contemporary technological society. Topics to be discussed include the cell as a biological unit. The biogenesis-abiogenesis controversy, genetic coding and introduction to plant and animal biology. The course is presented in a lecture-demonstration format (CTAM-201 or CTAM-205 or CBCH-201 or equivalent)

Credit 4

CTCS-222 Contemporary
Registration #0246-222 Science: Chemistry
An introduction to the fundamental principles of chemistry for nonscience majors and the application of those concepts to areas of interest and concern in our contemporary technological society. Topics to be discussed include the atomic theory, chemical periodicity, nuclear reactions and energy, physical states of matter, chemical compounds, chemical reactions, organic chemistry, biological chemistry and macromolecular chemistry. The course is presented in lecture-demonstration format. (CTAM-201 or CTAM-205 or CBCH-201 or equivalent)

Credit 4

CTCS-223 Contemporary
Registration #0246-223 Science: Physics
An introduction to the fundamental principles of physics for nonscience majors, and the application of these concepts to areas of interest and concern in our contemporary technological society. The conceptual basis for the phenomena of heat, light, sound, mechanics, electricity and magnetism are discussed and are related to such topics as astronomy, space exploration, lasers and environmental concerns. The course is presented in a lecture-demonstration format. (CTAM-201 or CTAM-205 or CBCH-201 or equivalent)

Credit 4

CTCS-224 Contemporary
Registration #0246-224 Science: Oceanus
An introduction to the fundamental principles of oceanography for nonscience majors, and the application of those concepts to areas of interest and concern in our contemporary technological society. The marine environment will be investigated in terms of basic scientific concepts, and topics to be discussed will include plate tectonics and earthquake prediction, the impact of ocean pollutants, climate fluctuations, cetacean intelligence and resources from the sea. (A TeleCourse offering)

Credit 4

CTCS-289 Contemporary Science:
Registration #0246-289 Mechanical Universe
This course is an introduction to physics for nonscience majors that uses the video course, "The Mechanical Universe . . . and Beyond," as the main method for presentation of material. The topics covered include: units and dimensional analysis, motion, force, energy, heat, waves, light, relativity, atoms and quantum mechanics. A TeleCourse offering. (CTAM-201 or CBCH-201)

Credit 4

Computer Programming

CTDP-200 Introduction to
Registration #0249-200 Microcomputers
No longer offered. See CTDS-200.

CTDP-201 Computer Techniques
Registration #0249-201
Programming in BASIC on RIT's VAX computers. After an introduction to time-sharing and editing procedures the course deals with the computer as a tool for solving applied problems. Not for computer systems majors. (CTAM-202)

Credit 2

CTDP-208 Introduction to Programming
Registration #0249-208
Fundamentals of programming using the structured programming language PASCAL. Topics include basic problem-solving methods, algorithm development, elementary data types, expression evaluation, use of basic control structures and subprograms. Programming projects will be required. (CTDS-202 or permission of a computer systems advisor)

Credit 4

CTDP-210 Program Design and
Registration #0249-210 Validation
Program design, including specification, structured development, advanced data types, procedures and functions, program validation and verification. Programming paradigms, including basic internal sorting and searching algorithms. Programming projects are required. (CTDP-208)

Credit 4

CTDP-215 FORTRAN Programming
Registration #0249-215
A study of FORTRAN programming techniques and applications. Topics include FORTRAN constants, variables, expressions, functions, logical operations, storage allocations, statements. I/O manipuladon and subprograms. Debugging and diagnostic methods. Programming projects will be required. (CTDS-202 or permission of advisor)

Credit 4

CTDP-241 Programming I
Registration #0249-241 Algorithmic Structures
An introduction to programming emphasizing the development and documentation of modular computer-based algorithms. A structured procedural programming language (e.g. Pascal) is used to demonstrate modern programming principles. Topics include variables, expressions and assignment, control structures (sequencing, selection and repetition), modularity via procedures and functions, parameter mechanisms, and identifier scope in block structured languages. Programming assignments are an integral part of this course. (CTDS-202)

Credit 4

CTDP-242 Programming II
Registration #0249-242 Data Structures
An introduction to the basic data structures used in computer applications. Both abstract concepts and implementation details will be discussed, including comparisons of alternate implementations. Topics include arrays, records, pointers, dynamic storage allocation, linked lists, stacks, queues and trees. Programming projects are required. (CTDP-241)

Credit 4

CTDP-243 Programming HI
Registration #0249-243 Design and Implementation
A first course on the design and implementation of moderately large single-programmer systems. Modern principles of design and testing will be presented in class and reinforced by programming assignments. The importance of both internal and external program documentation will be stressed. Topics include top-down design, stepwise refinement, test data selection, modularity measures (cohesion and coupling), common programming paradigms, and advanced file I/O. Programming projects are required. (CTDP-242, CTDP-305)

Credit 4

CTDP-301 COBOL Programming
Registration #0249-301
No longer offered. See course CTDP-307.

CTDP-304 Advanced COBOL Programming
Registration #0249-304
No longer offered.

CTDP-305 Assembly Language
Registration #0249-305 Programming
A study of assembly language programming methods with topics including computer organization, assembly process, assembly coding, addressing, binary arithmetic, relocatability, storage allocation, subroutine linkage, looping and address modification, character manipulation, bit manipulation, floating-point arithmetic, decimal instruction set, some system I/O, macros and debugging techniques. Programming projects will be required. (CTDS-202)

Credit 4

CTDP-307 **Business Applications**
Registration #0249-307 **Programming**
The mastery of the techniques and concepts of programming within a business programming environment. Emphasis on algorithmic solutions to business problems, including report generation, sorting and table processing and generation, complex I/O processing. Programming projects are required. (CTDS-325)

Credit 4

CTDP-318 **APL Programming**
Registration #0249-318 **Techniques and Applications**
Topics include APL programming and style, function definition and recursive programming, APL report formatting features, file I/O subsystem, graphic I/O and business systems applications. Programming projects will be required. (A high-level programming language)

Credit 4

CTDP-320 **Computer Programming**
Registration #0249-320 **for Engineers**
Computer programming in FORTRAN. Application emphasis is on numerical methods. Programming projects are required. (CTAM-305)

Credit 4

CTDP-330 **PL/1 Programming**
Registration #0249-330
Topics include elementary data types and control structures, data structuring capabilities (arrays and records), run-time error handling, standard built-in functions, text processing, user written functions and subroutines. Emphasis on developing well-structured and modular programs. Programming projects are required. (A high level programming language)

Credit 4

CTDP-488 **Programming Systems**
Registration #0249-488 **Workshop**
A workshop for the mastery of the techniques and concepts of programming systems, design and implementation. Students will work with data modeling, both with and without a data-base management system product. Student will gain experience with system specification and design charting techniques, project scheduling and management and programming team experience. Programming projects will be required. (CTDP-307, CTDS-335, CTDS-485)

Credit 4

Computer Systems

CTDS-200 **Introduction to Computers &**
Registration #0250-200 **Programming**
Basic concepts and overview of computer science. The topics include historical development, algorithms, flowcharting and programming in BASIC. Exposure to assembler language, hardware concepts, software concepts, binary and hex numbers and logic. Application of the computer to various disciplines. Not for computer science majors. (High School intermediate algebra) (Also a TeleCourse offering)

Credit 4

CTDS-201 **Applications Software**
Registration #0250-201
An introduction to several types of applications software. The lectures and hands-on experience labs are oriented to the IBM PC. Major subjects covered will include: hardware components; disk storage; disk operating system (DOS); word processing (WORDSTAR or WORDPERFECT); spreadsheeting (LOTUS 1-2-3); and data base management (DBASE III). A course for persons involved in information management. (CTDS-200)

Credit 4

CTDS-202 **Introduction to**
Registration #0250-202 **Computer Science**
An introduction to the computer: information representation, instruction execution and the software interface to the user. Topics include integer and floating point arithmetic, logical operations, introduction to machine and assembly language, input/output operations, operating systems. (Three years high school mathematics, permission of advisor)

Credit 4

CTDS-230 **Discrete Structure**
Registration #0250-230
Foundations of discrete mathematics. Topics include: propositional logic, functions and relations, algebra of sets, Boolean algebra and Boolean functions, permutations and combinations, vectors and matrices, graphs, digraphs, trees and strings. (CTAM-265)

Credit 4

CTDS-315 **Digital Computer**
Registration #0250-315 **Organization**
Introduction to computer architecture and implementation. Topics include a review of arithmetic and Boolean algebra; combinatorial and sequential circuit design; flip-flops and adders; storage mechanisms and their organization; instruction; fetch decode and execution in a simple CPU; input/output subsystems; interrupts. The laboratory experiments introduce elementary integrated circuit building blocks including gates, flip-flops, registers, counters and elementary sequential circuits. (CTAM-265, CTDP-305)

Credit 4

CTDS-320 **Data Structure Analysis**
Registration #0250-320
Information structures: sequential lists, stacks, queues, sequential allocation; linked lists, doubly linked lists, linked allocation; trees, tree traversal; lists, orthogonal lists, multilinked structures; dynamic storage allocation and garbage collection. Programming projects are required. (CTDP-210)

Credit 4

CTDS-325 **Data Organization and**
Registration #0250-325 **Management**
A course dealing with the methodology associated with the external storage of data. Topics include file organization (sequential, indexed and direct access physical organization); space optimization and directory organization; an introduction to external sorting and searching and the basis of data modeling, data base organization and management. Programming projects are required. (CTDP-243)

Credit 4

CTDS-335 **System Specification, Design**
Registration #0250-335 **and Implementation**
Students are introduced to basic concepts of system specification and design, systems implementation and project management. Tools used include PERT/CPM (scheduling tools), structured English, structured flowcharts and decision trees (description tools), dataflow diagramming (description and design tool) and hierarchical design of programming systems (design tool). Students are also introduced to HIPO charts, NS charts, etc. and to the structured design methods of Yourdon. (CTDS-325)

Credit 4

CTDS-340 **Finite State Machines**
Registration #0250-340 **and Automata**
Topics include finite state models, machine capabilities, descriptive methods, decomposition methods, regular expressions, bilateral analysis and synthesis, sequential iterative systems and space-time transformations. (CTDS-315)

Credit 4

CTDS-400 Logical Design
Registration #0250-400
An introduction to switching theory, sequential circuit analysis and synthesis, error detection, error correction networks, speed-up techniques, serial and parallel approaches, interfacing techniques. (CTDS-315)

Credit 4

CTDS-420 Data Communication Systems
Registration #0250-420
Data communication and telecommunication systems. Including communication techniques and interfaces, common carrier implications and tariffs, multiplexors; buffering response time and human factors; network design analysis and cost, software considerations. (CBCH-351, CTDS-315)

Credit 4

CTDS-430 Numerical Methods
Registration #0250-430
Topics included are: error analysis, roots of an equation, solution of systems of equations, interpolation, power series calculation of functions, numerical integration and first order differential equations. Programming projects are required. (SMAT-421 or equivalent and FORTRAN or BASIC)

Credit 4

CTDS-440 Operating Systems
Registration #0250-440
A general survey of operating system concepts. Topics include process synchronization, interprocess communication, deadlocks, resource management, memory management, overlays, static and dynamic relocation, virtual memory, file systems, logical and physical I/O, device allocation, process and resource protection. (CTDS-315 and CTDS-325)

Credit 4

CTDS-480 Formal Languages
Registration #0250-480
Formal language theory and principles. Topics include context free, context sensitive grammars, regular expressions; Turing machines; introduction to computability. (CTDS-340)

Credit 4

CTDS-485 Data Base Concepts
Registration #0250-485
Topics include data organization and structure; relational, hierarchical and network approach; data security and recovery. Comparison of the data base approach with traditional file organization and access methods; performance and management issues. (CTDS-325)

Credit 4

CTDS-520 Computer Architecture
Registration #0250-520
A study of computer architecture and design. Topics include review of basic theories, hardware technology, parallel and distributive logic, synchronous and asynchronous machines and analysis of commercial machines. Alternatives to classical machine structure. (CTDS-315)

Credit 4

CTDS-525 Assemblers, Interpreters,
Registration #0250-525 and Compilers
A survey of three basic programming language processors; assemblers, interpreters, and compilers. The topics include design and construction of language processors, formal syntactic definition methods, parsing techniques and code generation techniques. (CTDS-325)

Credit 4

CTDS-530 Discrete Simulation
Registration #0250-530
Computer simulation techniques. Abstract properties of simulation modeling, analysis of a simulation run and statistics. The simulation language GPSS will be taught Programming projects are required. (CBCH-351 or equivalent and programming experience)

Credit 4

CTDS-545 Processor Design Concepts
Registration #0250-545
A survey of bit-slice processor design and implementation techniques. Topics include microprogramming and emulation, comparison of microcode and hardwired logic, I/O processors and subsystems. (CTDS-315)

Credit 4

CTDS-550 Review of Computer Science
Registration #0250-550
Review of significant advances in computer science which have occurred in the last few years. Designed to give graduating students an overview of recent technological and theoretical advances. Reports on outside readings. (Senior year standing)

Credit 4

CTDS-565 Computer Systems Selection
Registration #0250-565
A study of computer systems design, evaluation and selection methodology. The design aspect deals with the problem of specifying physical systems on the basis of logical design specifications and performance analysis of existing and proposed computer systems. The selection aspect covers vendor proposal requests, evaluation and validation of proposals and procurement methods. (CTDS-315 and CTDS-325)

Credit 4

Lower Division Electrical Technology

CTEE-101,102, 103 Basic Mathematics
Registration #0253-101, 102,103 for Electronics
Course will begin with a brief review of fundamental arithmetic and algebraic concepts for those whose skills have lessened due to time lapse. The slide rule, powers of ten and units and dimensions applicable to the field of electronics will be emphasized. Ratios, simultaneous equations, exponents, radicals, quadratic equations, and logarithms with specific applications; solution of Ohm's and Kirchhoffs Laws, trigonometric functions, right triangles and vector algebra. (One year of high school mathematics or equivalent)

Credit 3/Qtr.

CTEE-105,106,107 Electrical Schematics
Registration #0253-105, 106,107
Electrical symbols, schematics, color codes, specifications and ratings, logic diagrams, block diagrams, wiring and control diagrams. (Concurrent enrollment in CTEE-101)

Credit 1/Qtr.

CTEE-321 (Lec.) Digital Systems
CTEE-326 (Lab)
Registration #0253-321, 326
Introduction to binary and octal number systems, logic components and their functions; truth tables; gates, switches, counters, flipflops, integrators, differentiators and adders; application to mechanical, relay, fluidic, pneumatic and electronic digital logic systems. (CTIL-203 or equivalent)

Lec. 3, Lab 1, Credit 4

CTEE-322 **Analog Systems**
Registration #0253-322
Introduction to all types of transducers; study of operational amplifiers and their uses with transducers in analog control of electromechanical systems; study of all types of differential transducers and their role in analog control systems. (CTIL-203 or equivalent)

Credit 3

CTEE-323 **Computer Systems**
Registration #0253-323
Flow diagrams of a computing system; computer input-output systems, card, tape, photoelectric, voice; computing portion of the computer, storage, memory, comparing systems, information flow; similarities and differences between analog and digital computers; advantages, disadvantages and limitations of the analog and digital computers; auxiliary computer systems, sorters, plotters, keypunch, printers, related computer systems, numerical control; interfacing systems between computer and computer controlled systems; processing typical problems on the computer including flow diagrams; discussion of types of problems which lend themselves to computer systems. (CTIL-203)

Credit 3

CTEE-331 **Programmable Controllers**
Registration #0253-331
Overview of programmable controllers, software and hardware, processor unit and memory, programming tools, input/output systems and languages.

Credit 3

CTEE-361, 362,363 (Lec.) **Applied Electronics**
CTEE-366, 367,368 (Lab)
Registration #0253-361, 362, 363,366,367,368
Applications of electronic components and circuits which have become electronic building blocks; applications of oscillators, tuned circuits, amplifiers, power amplifiers, multi-vibrators, switching, waveshaping and other circuits; applications of integrated circuits including special purpose amplifier, operational amplifier, timers, regulators, zero voltage switches and other integrated circuits both linear and digital. The laboratory includes testing, troubleshooting and analysis of electronic circuits. (CTIL-203)

Lec. 3, Lab 1, Credit 4/Qtr.

Lower Division Mechanical Technology

CTEM-301 **Statics**
Registration #0254-301
Basic principles of statics, systems of forces, free-body diagrams, equilibrium conditions, friction, centroids, moments of inertia. (CTCP-201 or equivalent)

Credit 4

CTEM-302 **Dynamics**
Registration #0254-302
Principles of dynamics; kinematics and kinetics of rectilinear, rotational and plane motion; velocity, acceleration; inertia; work, energy, power, impact. (CTEM-301 or equivalent)

Credit 4

CTEM-303 **Strength of Materials**
Registration #0254-303
Strength of materials, principles of stress and strain, properties of materials, shear and thermal stresses, stress and deflection of beams, column analysis, connections, combined stresses. (CTEM-301 or equivalent)

Credit 4

CTEM-315 **Principles of Mechanical Design I**
Registration #0254-315
Additional material, with emphasis on applications, on area moments, centers of gravity, beam deflection, end loading, columns, stress and strain, plastic deformation, stress concentrations, torsion. (CTEM-303)

Credit 3

CTEM-316 **Principles of Mechanical Design II**
Registration #0254-316
Thin-walled tubes, non-circular shafts, springs, screw threads, belts, stress in cylindrical shells. (CTEM-315)

Credit 3

CTEM-317 **Principles of Mechanical Design III**
Registration #0254-317
Ball and roller bearings, gears, stresses in thick-walled cylinders, shrink and press fits, flywheel design, elastic impact, curved beams, cams, loading of flat plates. (CTEM-316 and CTID-203)

Credit 3

CTEM-420 **Calculus for Technologists I**
Registration #0254-420
No longer offered. See SMAT420.

CTEM-421 **Calculus for Technologists II**
Registration #0254-421
No longer offered. See SMAT-421.

CTEM-422 **Solutions of Engineering Problems**
Registration #0254-422
No longer offered. See SMAT-422.

Lower Division Manufacturing Technology

CTEF-201, 202, 203 **Manufacturing Analysis**
Registration #0255-201, 202,203
Introduction to current manufacturing processes, casting, forming, stamping, welding and chipless machining, to produce parts on a production basis. Selected pieces will be analyzed with respect to production sequencing and cost, including costs of material handling, manufacture, inspection, and assembly. Projects involving solution to production problems will be assigned. (CTIS-203 or equivalent)

Credit 3/Qtr.

CTEF-210 **Industrial Plastics**
Registration #0255-210
An introductory course in industrial plastics with emphasis on the practical aspects such as properties, identification, processing methods, design and suitability for given applications. Classwork will be supplemented with demonstrations, discussions of samples, and several field trips.

Credit 4

CTEF-314, 315 **Materials Technology I, H**
Registration #0255-314, 315
A two quarter course involving a study of materials, their structure and characteristics. Topics covered include atomic and crystal structure, phases and phase diagrams, physical properties, corrosion and oxidation, diffusion in metals, recovery, recrystallization and grain growth, age hardening and heat treatment of metals. The effect of processes such as welding on the metallurgy of the part will be examined. Organic and ceramic materials will also be studied. (CTEF-314)

Credit 3/Qtr.

CTEF-328 **Report Writing**
Registration #0255-328
Principles of organizing data and information into clear and concise engineering reports; technique of library research; oral reports; minutes of meetings; business letters; short and formal reports.

Credit 2

CTEF-360 **Introduction to**
Registration #0255-360 **Numerical Control**
The philosophy of the use of numerical control in manufacturing. The course will review manual programming, examine different applications of numerical control, and introduce computer-assisted programming techniques. N/C machine tools will be demonstrated.

Credit 4

CTEF-370 **Tool Design**
Registration #0255-370
The design of special tooling, jigs, and fixtures for economic production. The principles of positioning, locating and clamping are studied along with the analysis of cutting forces. Also covered are tools for inspection and gauging. (CTEF-202)

Credit 4

CTEF-380 **Time Study**
Registration #0255-380
The principles and applications of the basic techniques for improvement of the man-job-time relationship, job standards and recording, and work-space design for the efficient use of manpower. (CTEF-202)

Credit 3

CTEF-391 **Production Control**
Registration #0255-391
This course prepares the student to deal with production planning algorithms and inventory control models. Subjects such as forecasting, inventory control techniques, production planning and scheduling and material requirements planning will be presented. (CTEF-202)

Credit 4

Building Technology (Industrial Technology)

CTIB-101, 102 **Architectural & Structural**
Registration #0261-101,102 **Blueprint Reading (Residential, Commercial)**
Reading and interpretation of architectural and structural drawings; use of scales, symbols for materials, drafting conventions, schedules and specifications; freehand sketching, elementary mathematics, and some quantity take-off.

Credit 3/Qtr.

CTIB-201 **Architectural Drawing**
Registration #0261-201
Introduction to architecture, the role of architectural drawings in the construction process, and basic drafting techniques used in architectural drawing including pencil techniques, freehand sketching and lettering. Introduction to drawings required in the traditional construction drawing set.

Credit 2

CTIB-202 **Architectural Drawing**
Registration #0261-202
Introduction to the techniques of the architectural design process including preliminary presentation drawings, isometrics, and perspectives. Preparation of drawings required in the design and construction process of different building types. (CTIB-201)

Credit 2

CTIB-203 **Architectural Drawing**
Registration #0261-203
Advanced study in the complete architectural process required in developing more complex building types. Preparation of design and schematic drawings of different building types with concentration on detail and construction drawings. (CTTB-202)

Credit 2

CTIB-204, 205, 206 **Architectural Drawing**
Registration #0261-204, 205, 206
Design development, presentation and working drawing preparation including: plans, elevation, sections, and details of different building types. Site planning, perspective presentation and related design skills. (CTIB-203)

Credit 2/Qtr.

CTIB-207, 208,209 **Architectural Drawing**
Registration #0261-207, 208, 209
Advanced design development, presentation and working drawing preparation including, plans, elevation, sections, and details of different building types. Site planning, perspective presentation and related design skills. (CTIB-206)

Credit 2/Qtr.

CTIB-231 **Surveying**
Registration #0261-231
Introduction to surveying including measurement of horizontal distances, leveling, theory of error, bearings and azimuths, measurement of angles, tachymetry, traverse surveys and computations. Several field trips provide familiarization with instrument use. (High school algebra and trigonometry or equivalent)

Credit **4**

CTIB-241 **Building Construction**
Registration #0261-241 **(Materials)**
Study of basic construction materials including concrete, masonry, metal, wood, bitumens, plastics, coatings, glass and glazing. Basic physical properties of materials are defined and emphasis is placed on practical applications. Design of concrete mixtures and basic stress-strain relationships are covered.

Credit 3

CTIB-242, 243 **Building Construction**
Registration #0261-242, 243 **(Methods and Procedures)**
Elements and details of building construction. Study of fundamental design concepts, building codes, foundations, wood, steel and concrete construction, specifications and construction management (CTIB-241 or equivalent)

Credit 3/Qtr.

CTIB-251 **Construction Contracting**
Registration #0261-251
Construction activities from the contractors' viewpoint. Bidding procedures from bid advertisement to bid opening; bonds, insurance, contracts, subcontracts and bidding documents; construction safety, project planning, scheduling and control. Governmental controls including zoning and building codes.

Credit 3

CTTB-252,253 **Building Estimating**
Registration #0261-252, 253 **(Residential, Commercial)**
Basic cost estimating of residential and commercial construction projects including types of estimates, quantity taken off, unit price, material and labor costs, overhead, profit and contingencies. Job cost data sources and cost indices are reviewed. (CTIB-101 or CTIB-203 or equivalent)

Credit 3/Qtr.

CTIB-301 **Structural Theory**
Registration #0261-301
Analysis of loads, determination of reactions, horizontal and vertical shear, shear diagrams, bending moments, axial and combined stress, truss analysis, deflections and introduction to computer analysis. (CTEM-301 and CTEM-303 or equivalents)

Credit 4

CTIB-302 **Structural Design**
Registration #0261-302
Fundamentals of structural design including the basic design concepts of structural steel, reinforced concrete, and timber: design of beams, columns, and trusses including connections. (CTIB-301 or equivalent)

Credit 4

CTIB-311, 312,313 **Architectural Projects**
Registration #0261-311, 312, 313
Advanced work in architectural drafting to develop specialized skills in design development, contract documents, frame construction, shop drawings, site planning or other related areas. Program to be planned individually to match the individual requirements of each student. (CTIB-206 or equivalent)

Credit 2/Qtr.

Engineering Drawing

CTID-lOl **Mechanical Blueprint Reading I**
Registration #0262-101
The major thrust of this course is to enable the student to visualize machine paris represented on the blueprint as actually needed in practice. This is accomplished by covering such topics as lines, freehand sketching, orthographic projection, auxiliary and sectional views as well as callouts for machine processes. A brief introduction to Geometric Dimensioning and Tolerancing is also included.

Credit 1

CTTD-102 **Mechanical Blueprint Reading II**
Registration #0262-102
This course is a continuation of CTTD-101 dealing with further study of machine detail and assembly drawings, however, the major emphasis of the course will be the application of modern geometric dimensioning and tolerancing as used on all types of drawings as derived from the ANSI Y14.5 government standards.

Credit 1

CTID-141, 142, 143 **Tool Design**
Registration #0262-141, 142,143
Drafting and design of shop tools. Student makes design drawings under instructor's supervision. Design of various machine cutting tools, gauge design, design of drilling jigs and milling fixtures. Principles and practice of punch and die design. Fundamentals of plastic molding and extruding with emphasis on production of practical designs. Consideration given to importance of tooling costs, redesign for economical production and production processes as they affect the designer. Course designed for tool and die makers, manufacturing managers, quality control managers and engineers. Drafting board and instruments required. (CTID-203 and CTIS-203, CTAM-103 or equivalents)

Credit 2/Qtr.

CTID-151, 152,153 **Machine Design**
Registration #0262-151, 152,153
These courses cover analytically the major topics of machine design. They include properties and behavior of materials, basic principles of statics and dynamics, design of basic machine elements, spring and linkage design, methods of fastening, gear and bearing selection. (CTAM-103, CTID-203, CTIS-203 or equivalent)

Credit 3/Qtr.

CTID-201 **Engineering Drawing**
Registration #0262-201
This is an introductory course in mechanical drawing. Spatial objects are first drawn by free hand sketching before drawing instruments are used. Topics covered include lettering, orthographic and isometric drawing, auxiliary and section views, and principles of dimensioning and tolerances.

Credit 2

CTiD-202 **Engineering Drawing**
Registration #0262-202
This course is a continuation of CTID-201 which covers in more detail the topics included in CTID-201. In addition, drawings involving flat pattern developments and intersections, threads, fasteners and springs are also taught. (CTID-201 or equivalent)

Credit 2

CTID-203 **Engineering Drawing**
Registration #0262-203
This course continues the teaching of the fundamentals of drafting as done in CTID-201-2 and includes topics on geometric tolerancing and dimensioning and welding, electrical, and piping drawings. The last half of the course requires the student to prepare a complete set of drawings, including detail, assembly, parts and materials list, as needed to manufacture a complete machine component. (CTID-202 or equivalent)

Credit 2

CTID-211 **Engineering Graphics**
Registration #0262-211
This is an introductory course in drafting addressed to prospective engineering students. Its content is essentially the same as CTID-201 and 202 with emphasis on graphic communication rather than skills development

Credit 2

CTID-212 **Engineering Graphics**
Registration #0262-212
This course covers the fundamental principles of descriptive geometry as used to find graphical solutions of spatial engineering problems. Students are taught methods of drawing an object in any view desired and also problems of ordinary point-line-plane are solvable by the same methods. (CTID-211 or CTID-202 or equivalent)

Credit 2

CTID-213 **Engineering Graphics**
Registration #0262-213
The subject of graphical kinematics is introduced by first covering the principles of basic motion; namely velocity and acceleration. These concepts are then applied to the design and analysis of mechanisms such as linkages, cams, gears, pulleys, belts, etc. The graphical approach is emphasized where applicable throughout the course. (CTID-212 or equivalent)

Credit 2

Electromechanical (Industrial Technology)

CTIL-201 (Lec.) CTIL-206 (Lab) **Elements of Electricity**
Registration #0264-201, 206 **and Electronics**
This course and its mandatory associated laboratory provide an introduction to Basic Electricity and its application to direct current circuitry. Included are principles relating to current, voltage, resistance, OHMS law, problems related to various circuit configurations are presented. (CTAM-103 or equivalent)

Class 2, Lab 8, Credit 4

CTIL-202 (Lec.) CTIL-207 (Lab) Elements of Electricity
Registration #0264-202, 207 and Electronics
This course and its mandatory associated laboratory provide an introduction to Basic Electricity and its application to alternating current circuitry. Included are principles relating to current, voltage, inductance, capacitance, inductive reactance, capacitive reactance, impedance, phase angle, power factor, sinusoids, power, etc. Applicable principles necessary to solve problems related to various circuit configurations are presented. (CTAM-103 or equivalent)

Lec. 3, Lab 1, Credit 4

CTIL-203 (Lec.) CTIL-208 (Lab) Elements of Electricity
Registration #0264-203, 208 and Electronics
This course and its mandatory associated laboratory provide an introduction to Basic Transistor Theory. The theory and application of PN Junction diodes and PNP and NPN Transistors are fully developed. A thorough analysis of the common-base, common-emitter and common-collector configurations is provided. (CTAM-103 or equivalent)

Lec. 1, Lab 3, Credit 4

CTIL-221, 222 Mechanical Components
Registration #0264-221, 222 and Mechanisms
Introduction to mechanical elements of electromechanical systems; Study of individual components and mechanisms in terms of functions and operating characteristics. Topics covered are: Torque, inertia, work, power, efficiency, gears, (spur, bevel, helical, worm), gear trains, differentials and integrators, belt drives, chain drives, pins, couplings, cams, linkages, switches. Independent approach to practical problem solving is stressed. (CTCP-201, 202 and CTID-201, 202, 203 or equivalents)

Credit 4/Qtr.

CTIL-301, 302 (Lec.) Machines and Power Systems
CTIL-306, 307 (Lab)
Registration #0264-301, 302, 306,307
Basic concepts and characteristics of D.C., synchronous and induction machines including transformer action, turns ratio, losses, power factor, waveforms and impedance matching; single phase and three phase operation; study of the machine in an electromechanical system including types of control (torque, speed, voltage, current) and associated devices (clutches, brakes, coupling, bearings, mounting); electrical and mechanical power transmission; specialized machines such as metadynes, amplidynes, selsyns, sychro control transformers and their systems applications. Lab sessions develop a qualitative feel for characteristics and applications of power systems, machines and their control. (CTIL-201, 202, 203 and CTAM-201, 202 or equivalents)

Lec. 3, Lab 1, Credit 4/Qtr.

CTIL-303 (Lec.) CTIL-308 (Lab) Pneumatic and
Registration #0264-303, 308 Hydraulic Systems
Introduction to pneumatic and hydraulic components; pneumatic and hydraulic power systems; compressors, pumps, efficiency and applications; integrated electromechanical power systems; Lab sessions develop a qualitative feel for characteristics and applications of power systems, machines and their control. (CTCP-201, 202)

Lec. 3, Lab 1, Credit 4

CTIL-351, 352 Electromechanical Devices
Registration #0264-351,352 and Systems
Concepts and principles of electromechanical system components and systems; temperature, displacement, force, electropneumatic, electrohydraulic transducers, encoders, amplifiers and control elements and their applications to systems. Thermistor, thermocouple, pneumatic temperature transducer. LVDT, proximity sensors, strain gauges, pressure, flow, level transducers, control values, motors, mechanisms and control devices; open loop, closed loop, digital analog, sequential systems. Analysis of systems representative of types found in industrial use today. The laboratory includes analysis and troubleshooting of operational electromechanical systems. (CTIL-301/306 and 302/307)

Credit 4/Qtr.

CTEL-353 (Lec.); CTIL-358 (Lab) Introduction to
Registration #0264-353, 358 Microprocessors
This course will provide the student with an understanding of microprocessor fundamentals; binary numbering system and common codes; logical operations and their importance in microprocessor applications; and a brief history of the development of microprocessors up to the present with a comparison of size and speeds. Microprocessor architectures, memory and I/O requirements are discussed as well as various common hardware applications. In addition to hardware, the software environment will be presented. The classroom endeavors are closely related to the associated laboratory efforts. (CTIL-201, 202, 203)

Lec. 3, Lab 1, Credit **4**

Machine Shop

NOTE: All courses must be taken in the proper sequence in each program. For additional information call department, 475-5006.

CTIS-101,102, 103 Precision Measurement
Registration #0266-101, 102, 103
The care and use of all common inspection and gauging equipment Techniques of inspecting various types of parts, quality control procedures and discussion and application on the use of tolerancing; blueprints and true positioning. Sine bar, contour projector, casting layout, surface finishes, thread gauging, common types of production gauging and the use of optical flats are used in the second and third quarters.

Credit 1/Qtr.

CTIS-104 to CTIS-109 Advanced Machine Shop I, II
Registration #0266-104, 105,
106, 107,108, 109
Advanced work on lathes, milling machines and grinders; explanations and demonstrations on more difficult problems; assemblies and temporary tooling. Some work done entirely in metrics. Must accurately handle tool room layout, machining, and measuring equipment. Special emphasis on skill, neatness and accuracy. (CTIS-203)

Credit 1/Qtr.

CTIS-111 to CTIS-119 Instrument Making &
Registration #0266-111, 112, Experimental Work I, II, m
113, 114,115, 116,117, 118,119
Students must operate all tool room equipment Skillful manipulation of hand tools; make small temporary tooling required to form or bend the finished parts; blank development and precision layout; make small punches, dies, cutters and assemblies to simulate actual industrial model work. (CTIS-203)

Credit 1/Qtr.

CTIS-121 to CTIS-129 Tool and Die Making I, II, m
Registration #0266-121, 122,
123, 124,125,126,127,128,129
Planning and making accurate complete tool and die assemblies. Emphasis is on accuracy of the individual parts and in the fitting of the assembled tool or die. Samples from the forming and blanking dies are inspected for quality. (CTIS-106)

Credit **1**/Qtr.

CTIS-131 to CTIS-139
Registration #0266-131, 132,133—Hand Screw Mach Op
Registration #0266-134, 135,136—Automatic Screw Mach Op
Registration #0266-137, 138,139—Automatic Screw Mach Op
Operation and set-up of both hand and automatic single and multiple spindle automatic screw machines to produce parts using standard and special tools. Constructional details and general maintenance of equipment; advanced set-up, developing ingenuity in setting up and tooling for more economical production. (Mechanical Blueprint Reading CTID-101 should be taken concurrently)
Credit 1/Qtr.

CTIS-151,152,153 **Shop Mathematics**
Registration #0266-151, 152,153
Precision measuring instruments, calculations of feeds and speeds, tapers, screw threads and gear ratios; indexing calculations, gearing percentages, figuring stresses, graphs and elementary algebra designed to increase analytical ability to solve complicated shop problems.

Credit 2/Qtr.

CTIS-154,155, 156 **Shop IVigonometry**
Registration #0266-154, 155, 156
Elements of geometry designed to increase analytical ability in solving complicated shop problems; solving trigonometric equations and their unknown dimensions or angles from data on practical working drawings. (CTIS-153 or equivalent)

Credit 2/Qtr.

CTIS-157, 158 **Shop Mathematics**
Registration #0266-157, 158
Identical to Shop Mathematics CTIS-151, 152, 153 except for differences in scheduling and credits per quarter. Offered Winter and Spring quarter evenings.

Credit 3/Qtr.

CTIS-161,162 **Heat Treatment**
Registration #0266-161, 162
Practical heat treatment of metals; Carburizing, cyaniding, nitriding, annealing, normalizing and hardening of steels. Relation of tool steels to particular applications and their resulting properties, including hardness, toughness, wear resistance, machinability and movement in hardening; treatment of nonferrous alloys including aluminum, brass, bronze, zinc beryllium, copper, silver, monel, stainless and magnetic steel. Several types of heat treating furnaces and atmospheres are available for laboratory exercises and demonstrations of these metals and alloys to prove out the theories of class lectures and discussions.

Credit 2/Qtr.

CTIS-201, 202, 203 (Lec.) **Machine Shop**
CTIS-206, 207, 208 (Lab)
Registration #0266-201, 202,
203,206,207, 208
Machine shop theory and techniques involving basic machine tools, machining theories and practices. Explanations, demonstrations and working out of basic problems in measuring, layout and cutting tools, with lathe, milling, drilling and grinding work. Must register for lecture and lab.

Credit 2/Qtr.

CTIS-204 (Lec.) CTIS-209 (Lab) **Machine Shop**
Registration #0266-204, 209
A combination of CTIS-201, 202, 203 and 206, 207, 208. Offered summer only.

Credit 6

CTIS-281 **Numerical Control (Mill)**
Registration #0266-281
This course is designed to offer the student the fundamentals and techniques in Numerical Control Part Programming Explanations and demonstration of EIA and ASCII Punched tape coding. Point to Point and Contour Programming, linear and circular interpolation, looping and macros. Special canned cycles are introduced and used along with the hands on experience. (Phase I Machine Shop diploma or equivalent)

Credit 3

CTIS-282 **Numerical Control (Lathe)**
Registration #0266-282
Code system and format as used by industry for writing programs in contour, linear and circular interpolation along with safe and efficient tooling techniques. Canned turning, facing, drilling and threading cycles will be covered with compensation for tooling radius. Bar feed programming along with straight and taper threading. Will include hands on. (Phase I Machine Shop diploma programs or approval of machine shop counselor)

Credit **3**

CTIS-283 **Computer Programming for**
Registration #0266-283 **Numerical Control**
Course emphasizing programming for numerically controlled machine tools with point-to-point and straight-line milling capabilities. Pattern manipulations utilizing programs developed for a computer system will be stressed. Part programming output consisting of original input information, necessary information, for post-processors for various machine tools with graphical output of optimum cutter path on a plotter interfaced to the computer. (CAM) Computer Aided Manufacturing is introduced utilizing the E-Z CAM computer aided system. (CTIS-281 or 282 or programming experience)

Credit **3**

Machine Tool

CAIM-l 12 **Principles of Blueprint**
Registration #0270-112 **Reading II**
This course is a continuation of unit I, dealing with further study of machine detail and assembly drawings. However, the major emphasis of the course will be the application of modern geometric dimensioning and tolerancing as used on all types of drawings and derived from the ANSI Y14.5 government standards.

Class **3,** Credit **3**

CAIM-l20 **Industrial Machine Shop I**
Registration #0270-120
A beginning industrial machine shop course introducing students to the basic machines in industry today, and the techniques used in operating them. The care and skillful use of precision measuring and gauging equipment. Introduction to metal cutting machines such as lathes, horizontal and vertical mills, bandsaws, and drill presses. Also covered are the basic skills in layout and bench work.

Lab 15, Credit 4

CAIM-121 **Basic Machine Shop I (DT)**
Registration #0270-121
This course is intended to introduce the student to hands-on experience performing such tasks as: tool grinding, thread cutting, drilling layout and bench work. The techniques of precision measurement are covered to a great extent Safety and proper work habits are emphasized throughout the quarter.

Lab 5 hours per week, Credit 2

CAIM-l22 **Basic Machine Shop D (DT)**
Registration #0270-122
In this course the student will be introduced to more advanced types of machining, such as, horizontal mills, precision grinding, layout, drilling and tapping, and additional bench work projects. Safety and neatness of work are stressed throughout the quarter. (0270-121 or equivalent)

Lab 5 hours per week, Credit 2

CAIM-l23 **Machine Shop (AET)**
Registration #0270-123
This course is designed to introduce the student to hands-on machine shop experience. Techniques are demonstrated to the student in precision measurement, tool grinding, engine lathe, drill press, layout and sawing. Safety and neatness of work is stressed throughout the quarter.

Lab 5 hours per week, Credit 2

CAIM-210 Materials and Methods
Registration #0270-210
Machine shop theory and techniques involving the basic machine tools, the practical application of cutting material, tool geometry, measuring and inspection, turning and milling, threads and threading, drilling and grinding work. Introduction to plastics and powder metals, their properties and processing.

Class 3, Credit 3

CAIM-214 Numerical Control
Registration #0270-214 Programming and Machining
An introduction to the field of numerical control and N/C programming. Techniques for both manual and computer assisted programming of cutter paths are practiced. Programs include: turning and milling in point to point, linear and circular interpolation modes, use of loops, macros, canned cycles and cutter compensation. Operation of state-of-the-art CAM computer, printer, plotter, bit pad, DNC and CNC controls included. (CAIM-120 or equivalent, CAIG-107 or equivalent)

Class 3, Credit 3

CAIM-218 Tool and Gage Making
Registration #0270-218
This course offers the student a basic knowledge of jigs and fixtures. Studies of the basic principles and construction of work holding devices: clamps, locators, supports and tool assemblies. Design consideration: economics, comparative cost analysis and practical application of jigs and fixtures. The actual development of a workable jig and fixture design. (CAIM-110, CAIM-120)

Class 3, Credit 3

CAIM-220 Diemaking
Registration #0270-220
Introduction to diemaking and its relation to the production process of stamping sheet and plate materials, both metals and nonmetals.

Empirical (experience) and technical data is used to develop the details, techniques, and theories of cutting and forming processes of pressworking (stamping) dies.

Guidelines for the manufacture of die components, selection of proper die sets, and economical materials use is emphasized. (CAIM-110, CAIM-231.)

Class 3, Credit 3

CAIM-222 Metallurgy and Heat Treating
Registration #0270-222
An introductory course in the physical and mechanical characteristics of metals and alloys. Heat treating of steels and the use of the iron-carbon equilibrium diagram, transformation diagram, hardenability of tool steels and alloy steels.

Class 3, Lab 3, Credit 3

CAIM-231 Industrial Machine Shop II
Registration #0270-231
Extensive application and advanced projects using machine tools, such as engine lathes, turret lathes, vertical mills, and surface grinders. Explanation and demonstrations on more difficult problems, assemblies and temporary tooling. Emphasis on neatness, time, quality and accuracy are stressed. (CAIM-120, CAIM-106 or equivalent)

Lab 15, Credit 4

CAIM-232 Intermediate Machine Tool
Registration #0270-232 Technology
Complex part and assembly machining involving more advanced techniques on turning, milling centers, and surface and cylindrical grinders. Principles of cutting theory and basic cutter grinding are discussed and demonstrated. Advanced manufacturing processes involving electro discharge machining (EDM), numerical control (N/C), and Computer-Aided Manufacturing (CAM) are introduced and applied. (CAIM-231)

Lab 15, Credit 4

CAIM-233 Advanced Machine Tool
Registration #0270-233 Technology
This course teaches the manufacturing and assembly processes involved in building a die, jig or fixture needed to produce a part to print specifications.

Students manufacture a die, jig or fixture by utilizing standard machining techniques, and also special machines and equipment such as: electrical discharge machine (EDM), cylindrical grinder, jig bore, internal grinder, honer, radius dresser, and heat treating of 0-1 tool steel. Components and piece parts are inspected for conformance to the prints.

Lab 15, Credit 4

Drafting Technology

CAID-l10 Principles of Blueprint
Registration #0271-110 Reading
To aid the student in reading, visualizing and interpreting basic blueprints in the industrial environment.

Class 3, Credit 3

CAID-147 Blueprint Reading (EMT/PKG)
Registration #0271-147
An introductory course which develops the concept of how and why engineering drawings exist. Drawings are sketched and interpreted. Mechanical, electrical, and hydraulic blueprints are studied and include working with tolerances and geometric tolerancing.

Class 1, Lab 2, Credit 2

CAID-201 Introduction to Computer-
Registration #0271-201 Integrated Manufacturing
This course will discuss the multidisciplinary and interrelated nature of Computer-Integrated Manufacturing through the use of a common data base, information resource management, and interpersonal communication skills. Topics will include computer hardware and software applications for areas of factory automation, manufacturing processes, and system controls. Case studies and periodicals will be used to illustrate working models.

Credit 3

CAID-208 Introduction to Computers
Registration #0271-208
Presents computer terminology, functions and commands. Programs will be developed.

Class 5, Lab 5, Credit 3

CAED-210 Manufacturing Processes
Registration #0271-210
Manufacturing Processes will acquaint students with methods of fabrication which are commonly used to convert ideas and raw materials into usable products and/or machines.

Class 5, Credit 5

CAID-211 Materials Selection
Registration #0271-211
Investigates the use and conditions of materials in a product life cycle. The atomic, chemical and mechanical composition of materials, including the testing of materials will be studied.

Class 3, Credit 2

CAID-215 Drafting Mechanics I
Registration #0271-215
Presents the methods and tools to measure and qualify the physical world. Topics will include components, forces, motion and problem solving as it relates to mechanical physics. (CAID-255 is a required lab.)

Class 4, Credit 4

CAID-216 **Engineering Drawing for Machinists**
Registration #0271-216
The course is intended to aid the student in understanding machine shop drawings. After completing this course, the student will have proper knowledge of geometric construction, sketching, multiview projection, sectional views, auxiliary views, and the use of drafting instruments and equipment. (CAID-110)

Class 3, Credit 3

CAID-217 **Drafting Mechanics II**
Registration #0271-217
This course will investigate the operation of different components in a mechanical system. Appropriate component selection related to specific design application also will be studied.

Class 5, Credit 3

CAID-219 **Drafting Mechanics III**
Registration #0271-219
Will provide a basic working understanding of electricity, current flow and power with applications in simple circuits.

Class 3, Credit 2

CAXD-225 **Drafting Mechanics Lab**
Registration #0271-225
A laboratory course providing hands-on experience with experiments dealing with components, forces and motion.

Lab 3, Credit 1

CAID-238 **Technical Drawing I (Descriptive Geometry)**
Registration #0271-238
Technical Descriptive Geometry is a survey of the theories and methods used to graphically represent the solutions to spatial relationship problems dealing with points, lines, and planes. Projections and multiview projection theories, visualization of {joints, lines, and planes, and solids, size and shape description, auxiliary views, developments, and intersections will be covered. Problems will be solved through sketching and instrument drawings. (This course satisfies the requirements of CTID-211 and **212.)**

Lec. 3, Lab 5, Credit 5

CAID-239 **Technical Drawing H**
Registration #0271-239
Technical Drawing II will present technical information to analyze and prepare accurate mechanical production drawings from verbal instructions and engineers' sketches. Accuracy and neatness is stressed. Proficiency is developed in both coordinate and geometric dimensioning and tolerancing. Four significant working drawing projects will be accomplished, with consideration given to manufacturing processes and operations. (CAID-238)

Class 2, Lab 8, Credit 5

CAID-240 **Technical Drawing m**
Registration #0271-240
Will enable the student to interpret an engineer's design layout The student individually and in a team setting will draw a complete set of working detail drawings, including a listing of manufacturing methods, materials, specifications, heat treatment and parts listed. (CAID-239)

Class 1, Lab 6, Credit 3

CAID-241 **Technical Drawing IV**
Registration #0271-241
This course applies the study of electronic components and graphic symbology to the practice of drawing schematic, block, and logic diagrams and printed circuit board layouts. A portfolio of drawings will be developed by the completion of the course.

Class 2, Lab 3, Credit 2

CAID-245 **Introduction to Computer-Aided Drafting (CAD)**
Registration #0271-245
The course includes an overview of the architecture and components of various CAD systems. A CAD system will be used to gain operator skills. (CAID-238 or equivalent)

Class 1, Lab 3, Credit 2

CAID-247 **Computer-Aided Drafting (CAD)**
Registration #0271-247
The purpose of this course is to develop a set of working drawings with advanced system commands. Flowcharting and file management techniques will be required as supporting documentation for each project The course will also include the digitizing board as an electronic input device for existing drawings and/or sketches. (CAID-245)

Class 2, Lab 4, Credit 3

CAID-248 **CAM-CNC**
Registration #0271-248
The study of basic concepts for computer numerical control and computer-aided machining. NC Programs will be produced manually and with the aid of CAM equipment. Techniques of point to point, continuous path, linear and circular interpolation, loops and macros and special canned cycles will be covered and used. Prototype parts will be produced using numerical control machines. Projects will be drawn in CAD and converted to codes for numerical control equipment (0271-245)

Credit 4

CAID-249 **Fundamentals of Designing Printed Circuits**
Registration #0271-249
This course will provide practical knowledge and skills of printed circuit board terminology, layout, components, construction techniques, and design parameters. Camera ready (manually taped) board layouts will be generated by interpreting schematic diagrams, parts lists, and engineering and component specifications.

Lecture 3, Lab 3, Credit 4

CAID-251 **CAD/CAM Printed Circuit Board Layout**
Registration #0271-251
This course is designed to cover all aspects necessary to produce the libraries, artwork, and documentation requirements of a CAD generated printed circuit board layout To maximize CAD hands-on time, class size will be limited. (CAID-249 or equivalent)

Class 3, Lab 3, Credit 3

Communications

CAIG-104 **Communication Skills**
Registration #0274-104
A review of basic skills in reading, writing, listening, speaking, study skills and time management.

Class 2, Recitation 1, Lab 1, Credit 2

CAIG-105 **Communicating on the Job**
Registration #0274-105
An application of communication skills to entry-level jobs. Includes writing business letters and memos, giving and following directions, filling out forms, practicing interpersonal communications in simulated job scenes. (CAIG-104)

Class 3, Recitation 1.5, Credit 3

CAIG-206 **Technical Communication**
Registration #0274-206
An introduction to the principles of technical writing for the technician. Assignments typically relate to projects in the student's major field of study and include a proposal, short informal reports, instructions, and a formal technical report An extensive Job Search Module prepares students to explore career options, then search, apply and interview for employment. (CAIG-105, 204)

Class 4.5, Credit 4

CAIG-210 **Interpersonal**
Registration #0274-210 **Communications**
An opportunity to explore and practice the communication skills that service technicians will use on the job. Emphasis will be focused on ways to work with customers and clients as a representative of the service organization. (CAIG-105)

Class 2, Credit 1

CAIG-220 **Composition:**
Registration #0274-220 **Written and Oral**
An emphasis on developing the college essay and adapting the writing process to oral presentations. Topics include reasoning and persuasion; planning, organizing, developing and revising the expository essay. Documented library research paper is required. (CAIG-105)

Class 4.5, Credit 4

Mathematics

CAIG-106 **Industrial Mathematics**
Registration #0274-106
Topics include fractions and decimals; measurement; introduction to algebra; ratio and proportion; speeds and feeds, tapers, pulleys and gears; introduction to geometry and trigonometry with applications to machine tool and drafting.

Required of all first quarter students in Machine Tool Technology and Drafting Technology programs.

Class 3, Recitation 4.5, Credit 3

CAIG-107 **Algebra and Trigonometry I**
Registration #0274-107
A concentrated review of elementary algebra and trigonometry. Topics include properties of real numbers; order of operations, operations with real numbers and polynomials; factoring and algebraic fractions; linear equations; graphing; exponents and radicals; quadratic equations; solution of right and oblique triangles with applications to numerical control and vectors.

Class 3, Recitation 4.5, Credit 3

CAIG-207, 208 **Algebra and Trigonometry II,**
Registration #0274-207, 208 **m**
A standard pre-calculus sequence.
207: Topics include a review of the fundamentals of algebra; relations, functions and their graphs; solution of linear, fractional and radical equations; solution of linear systems; exponents and radicals; vectors. (CAIG-107 or equivalent)
208: Topics include quadratic functions and conic sections; logarithmic and exponential functions; trigonometric functions, equations, identities and graphs; inverse trigonometric functions; polar coordinates and graphs; variation. (CA1G207 or equivalent)

Class 4, Credit 4

Computer Service

CAIC-201 **Fundamentals of Computers**
Registration #0275-201
An introduction to electronic data processing. A study of basic computer theory, file storage media, input-output devices, binary and hexadecimal number systems and programming techniques.

Class 3, Recitation 3, Credit 4

CAIC-202 **Computers I**
Registration #0275-202
The study of the organization and operation of microcomputers and microprocessors, with emphasis on CPU operation during machine and assembly program execution. Microprocessor instruction sets in regard to data transfer, arithmetic and logic instructions, and control over I/O devices will be studied. (CAIC-201, CAIC-212)

Class 3, Lab 4, Credit 4

CAIC-203 **Computers II**
Registration #0275-203
The analysis of microcomputers with emphasis on system logic, timing and interfacing to I/O devices. Functional and in depth operation of these components will be studied, with use of diagnostic programs and digital test equipment. (CAIC-202, CAIE-205, CAIC-215)

Class 2, Lab **4,** Credit 3

CAIC-204 **Computers III**
Registration #0275-204
The study of micro and mini-computer operating systems used in industry today. The student will learn file management, copy, backup, directory, and formating routines along with various methods of file protection. These commands will be used to communicate with die computer system during systems troubleshooting and preventative maintenance techniques. (CAIC-201)

Class 3, Lab **4,** Credit **4**

CAIC-205 **Introductory Programming I**
Registration #0275-205
An interactive programming course utilizing the BASIC language. Emphasis is placed on development of skills necessary for die technician to communicate with a computer using the BASIC language.

Class 1, Lab 2, Credit 2

CAIC-207 **Introductory Programming II**
Registration #0275-207
An interactive programming course utilizing the PASCAL language. Emphasis is placed on the development of skills necessary for the technician to communicate with a computer using the PASCAL language.

Class 1, Lab 2, Credit 2

CAIC-209 **Introductory Programming III**
Registration #0275-209
An interactive programming course utilizing the FORTRAN language. Emphasis is placed on the development of skills necessary for the technician to communicate with a computer using the FORTRAN language.

Class 1, Lab 2, Credit 2

CAIC-211 **Introductory Programming IV**
Registration #0275-211
An interactive programming course utilizing the COBOL language. Emphasis is placed on the development of skills necessary for the technician to communicate with a computer using the COBOL language.

Class 1, Lab 2, Credit 2

CAIC-212 **Electrical/Electronic**
Registration #0275-212 **Schematic Interpretation**
The student will learn to read and interpret various diagrams related to the servicing of computers. Drawings studied will be electrical wiring diagrams, schematics, logic and block diagrams and others found in service manuals.

Class 2, Credit 2

CAIC-215 **Special Tool/Equipment Use**
Registration #0275-215
The care and use of special tools and testing equipment used to repair computers will be studied. The student will demonstrate proficiency in a lab situation. (CAIE-203, CAIC-212)

Lab/Dem. 2, Credit 1

CAIC-216 **Digital Circuits**
Registration #0275-216
A study of the logic concepts and circuits used in digital systems including measuring instruments, communications, and computers. Integrated circuits are used to demonstrate the digital techniques of gating, counting, storing, shifting, and converting. (CAIE-205)

Class 3, Lab 4, Credit 4

CAIC-218 **Linear Circuits**
Registration #0275-218
The properties of linear integrated circuits and their applications in power supplies, regulators, amplifiers, oscillators, and multivibrators will be studied. (CAIC-216)

Class 1.5, Lab 3, Credit 2

CAIC-220 **Computer Systems**
Registration #0275-220 **Troubleshooting**
Hands on experience will be given in diagnosing and repairing faults in computers using documentation and test equipment. A specific fault analysis approach will be taught that emphasizes a systematic approach to troubleshooting. (CAIC-203, CAIC-216)

Lab 15, Credit 5

CAIC-295 **Independent Research**
Registration #0275-295 **Project**
To allow the student to use the knowledge that he/she has learned in the Computer Service Program. Students will demonstrate this knowledge by doing a research project concerning computers and/or computer maintenance. Emphasis will be placed on not only the accomplishment of the experiment/project, but skills in writing a report documenting progress throughout the experiment/project. The student and faculty member(s) involved will submit, no later than ten class days, a project proposal with goals, tasks, and objectives for review and approval by the department chair and the director. The student will be expected to complete the assignment with minimal faculty supervision. The amount of credit awarded is dependent on the lab time and the amount of outside work required. (Must have department head approval)

Credit 1-4

Graduate Courses

Statistics

CQAS-701 **Statistical Concepts**
Registration #0280-701
A service course designed for non-concentrators which emphasizes statistical thinking instead of mathematical manipuladons. This is an intuition-based introduction to the subject. Topics include: exploratory data analysis, methods for collecting data, statistical inference, regression analysis, and analysis of variance. This course does not count as credit for the MS degree in statistics. (None)

Credit 4

CQAS-711 **Fundamentals of Statistics I**
Registration #0280-711
For those taking statistics for the first time. Covers the statistical methods used most in industry, business, and research. Essential for all scientists, engineers, and administrators. Topics: organizing observed data for analysis and insight; learning to understand probability as the science of uncertain events; concepts of random variables and their associated probability models; meaning and practical use of the Central Limit Theorem.

Credit 3 or 4

CQAS-712 **Fundamentals of Statistics II**
Registration #0280-712
Continuation of CQAS-711. Topics: concepts and strategies of statistical inference for making decisions about populations on the basis of sample evidence; tests for independence and for adequacy of a proposed probability model; learning how to separate total variability of a system into identifiable components through analysis of variance; regression and correlation models for studying the relationship of a response variable to one or more predictor variables. (Fund, of Statistics I CQAS-711 or Consent of the Department)

Credit 3 or 4

CQAS-721 **Statistical Quality Control I**
Registration #0280-721
A practical course designed to give depth to practicing quality control personnel. Topics: statistical measures; theory, construction, and application of control charts for variables and attributes; computerization procedures for control charts; tolerances, specifications, and process capability studies; basic concepts of total quality control, and the management of the quality control function.

Credit 3

CQAS-731 **Statistical Quality Control II**
Registration #0280-731
Investigation of modern acceptance sampling techniques with emphasis on industrial applications. Topics: single, double multiple, and sequential techniques for attributes sampling, variables sampling; techniques for sampling continuous production. The course highlights Dodge-Romig plans, Military Standard plans, and recent contributions from the literature.

Credit 3

CQAS-742 **Statistical Computing**
Registration #0280-742
An advanced course in statistical computing using SAS statistical software. The course will cover basic SAS procedures; the creation, manipulation, and analysis of data bases; graphical display techniques; and the development and writing of custom numerical analysis procedures. (Design of Experiments II CQAS-802 and Regression Analysis I CQAS-841)

Credit 3

CQAS-761 **Reliability**
Registration #0280-761
A methods course in reliability practices: What a reliability engineer must know about reliability predictions, estimation, analysis, demonstration, and other reliability activities. Covers most methods presendy being used in industry. Topics: applications of normal, binomial, exponential, and Weibull graphs to reliability problems; hazard plotting, reliability confidence limits and risks; strength and stress models; reliability safety margins; truncated and censored life tests; sequential test plans; Bayesian test programs. (Fund, of Statistics II CQAS-712)

Credit 3

CQAS-781 **Quality Management**
Registration #0280-781
A course designed to cover concepts and methods of quality management. Topics include: basic concepts, history of quality control, quality policy, economics of quality, quality costs, organization for quality, design for system effectiveness, manufacturing planning for quality, and quality data systems.

Credit 3

CQAS-782 **Quality Engineering**
Registration #0280-782
A course designed to cover important elements of quality engineering. Topics include: specifications, statistical tolerancing, measurement, vendor relations, process control, motivation, customer relations, diagnostic techniques, process improvement studies, and quality planning. (Consent of the Department)

Credit 3

CQAS-783 **Quality Engineering by Design**
Registration #0280-783
The Taguchi Method of off-line control including parameter design and tolerance design leading to improved products and processes at lower costs. (Design of Experiments IICQAS-802)

Credit 3

CQAS-791 **Statistical Methods**
Registration #0280-791 **in Health Sciences**
A course designed as an introduction to statistical methods for those involved in the health sciences. Topics include: types of biological data, descriptive statistics, tests of significance, experimental design, tests of association, relative risk, diagnostic tests. (Fund, of Statistics H CQAS-712)

Credit 3

CQAS-792 **Biological Assays**
Registration #0280-792
An advanced course in biostatistics which deals with the important research concerns of identifying and verifying drug-dose response. Topics include: parallel-line assays, slope-ratio assays, quantal response assays. (Design of Experiments II CQAS-802)

Credit 3

CQAS-801 **Design of Experiments I**
Registration #0280-801
How you design and analyze experiments in any subject matter area; what you do and why. Topics: basic statistical concepts, scientific experimentation, completely randomized design, randomized complete block design, nested and split plot design. Practical applications to civil engineering, pharmacy, aircraft, agronomy, photo-science, genetics, psychology, and advertising. (Fund, of Statistics II CQAS-712)

Credit 3

CQAS-802 **Design of Experiments II**
Registration #0280-802
Continuation of CQAS-801. Topics: factorial experiments; fractional, three-level, and mixed factorial designs; response surface exploration. Practical applications to: medical areas, alloys, highway engineering, plastics, metallurgy, animal nutrition, sociology, industrial and electrical engineering. (Design of Experiments I CQAS-801)

Credit 3

CQAS-821 **Theory of Statistics I**
Registration #0280-821
Provides a sound theoretical basis for continuing study and reading in statistics. Topics: constructs and applications of mathematical probability; discrete and continuous distribution functions for a single variable and for the multivariate case; expected value and moment generating functions; special continuous distributions. (Fund, of Statistics II CQAS-712 or consent of the Department)

Credit 3

CQAS-822 **Theory of Statistics H**
Registration #0280-822
Continuation of CQAS-821. Topics: supporting theory for and derivation of sampling distribution models; applications and related material; point estimation theory and applications; the multivariate normal probability model, its properties and applications; interval estimation theory and applications. (Theory of Statistics I CQAS-821)

Credit 3

CQAS-824 **Probability Models**
Registration #0280-824
An introduction to probability theory and stochastic processes. Topics include: random variables, conditional probability and expectation, Markov chains, renewal theory, queuing theory, and reliability. (Theory of Statistics I CQAS-821)

Credit 3

CQAS-830 **Multivariate Analysis I**
Registration #0280-830
This course deals with the summarization, representation, and interpretation of data sampled from populations where more than one characteristic is measured on each sample element Usually the several measurements made on each individual experimental item are correlated and certainly one should not apply univariate analysis to each measurement separately. This course covers the use of the basic multivariate techniques. Computer problem solving will be emphasized. Topics will include: multivariate t-tests, ANOVA, MANOVA, regression analysis, repeated measures, quality control, and profile analysis. (Design of Experiments n CQAS-802)

Credit 3

CQAS-831 **Multivariate Analysis II**
Registration #0280-831
A continuation of CQAS-830, this course covers the use of advanced multivariate techniques. Topics include: principal component analysis, cluster analysis, multi-dimensional contingency tables, discrete discriminant analysis, multi-dimensional scaling, and regression with errors in the independent variable. Practical applications will be emphasized. (Multivariate Analysis **I** CQAS-830)

Credit 3

CQAS-841 **Regression Analysis I**
Registration #0280-841
A methods course dealing with the general relationship problem. Topics include: the matrix approach to simple and multiple linear regression; analysis of residuals; dummy variables; orthogonal models; and computational techniques. (Design of Experiments n CQAS-802)

Credit 3

CQAS-842 **Regression Analysis II**
Registration #0280-842
A continuation of CQAS-841. Topics: selection of best linear models; regression applied to analysis of variance problems; nonlinear estimation; and model building. (Regression Analysis **I** CQAS-841)

Credit 3

CQAS-851 **Nonparametric Statistics**
Registration #0280-851
Distribution-free testing and estimation techniques with emphasis on applications. Topics: sign tests; Kolmogorov-Smirnov statistics; runs tests; Wilcoxon-Mann-Whitney test; chi-square tests; rank correlation; rank order tests; quick tests. (Fund, of Statistics n CQAS-712)

Credit 3

CQAS-853 **Managerial Decision Making**
Registration #0280-853
Statistical decision analysis for management Topics: utilities; how to make the best decision (but not necessarily the right one); normal and beta distributions; Bayesian theory, many action problems; optimal sample size; decision diagrams. Applications to marketing; oil exploration; portfolio selection; quality control; production; and research programs. (Bayesian Statistics CQAS-881)

Credit 3

CQAS-856 **Interpretation of Data**
Registration #0280-856
Advanced topics related to use of statistics in investigational analysis, including: narrow limit gauging, practical design of experiments, analysis of small sample data, analysis of means, identifying assignable causes, and other methods for troubleshooting with statistical methods. (Design of Experiments **I** CQAS-801)

Credit 3

CQAS-864 **Advanced Acceptance**
Registration #0280-864 **Sampling**
An advanced course in acceptance control techniques including; basis of acceptance sampling; attributes plans; variables plans for process parameters; variables plans for proportion non-conforming; sampling schemes including MIL-STD-105D and MIL-STD-414; plans for special applications; rectification and continuous procedures; cumulative results plans; compliance sampling; reliability sampling; and administration of sampling plan. (Statistical Quality Control II, CQAS-731)

Credit 3

CQAS-871 **Sampling Theory and**
Registration #0280-871 **Applications**
An introduction to sample surveys in many fields of applications with emphasis on practical aspects. Topics: review of basic concepts, sampling problem elements; sampling; random, stratified, ratio, cluster, systematic, two-stage cluster; wild life populations, questionnaires, sample sizes. (Fund, of Statistics II, CQAS-712)

Credit 3

QAS-873 **Time Series Analysis**
Registration #0280-873
A methods course in modeling and forecasting of time series with emphasis on model identification, model fitting, and diagnostic checking. Topics: survey of forecasting methods, regression methods, moving averages, exponential smoothing, seasonality, analysis of forecast errors, Box-Jenkins models, transfer function models, case studies. (Regression Analysis ICQAS-841)

Credit 3

CQAS-875 **Empirical Modeling**
Registration #0280-875
A course'in model building based on the application of empirical data gathered through appropriate experimental design and analyzed through regression techniques. Topics: response variable construction, experimental design methods, and related analysis techniques. (Design of Experiments IICQAS-802 and Regression Analysis I CQAS-841)

Credit 3

CQAS-881 **Bayesian Statistics**
Registration #0280-881
An introduction to Bayesian statistics and decision making which explores Bayes' Theorem in its relation to classical and Bayesian methodology. Topics: probability, Bayes' Theorem, assessment of prior probabilities and likelihoods, hypothesis testing, and the multivariable case. (Fund, of Statistics II CQAS-712)

Credit 3

CQAS-886 **Sample Size Determination**
Registration #0280-886
The question most often asked of an industrial statistician is "What size sample should I take?" This course answers that question for a wide variety of practical investigational projects. Techniques for the full use of the optimal sample evidence are also offered. (Fund, of Statistics II CQAS-712 and Design of Experiments ICQAS-801)

Credit 3

CQAS-891,892, 893 **Special Topics in**
Registration #0280-891, 892,893 **Applied Statistics**
These courses provide for the presentation of subject matter of important specialized value in the field of applied and mathematical statistics not offered as a regular part of the statistics program, (Consent of the department)

Credit 3 each course

CQAS-895 **Statistics Seminar**
Registration #0280-895
This course or sequence of courses provides for one or more quarters of independent study and research activity. This course may be used by other departments or other colleges at RIT to provide special training in statistics for students who desire an independent study program in partial fulfillment of graduate degree requirements. (Consent of all departments involved)

Credit 3

CQAS-896, 897, 898 **Thesis**
Registration #0280-896, 897, 898
Thesis for students working for the MS degree in Applied and Mathematical Statistics for one to nine credits. (Consent of the department)

Credit Variable 1-9

CQAS-899 **Individual Achievement Project**
Registration #0280-899
Research project under faculty supervision for students working for the MS in Applied and Mathematical Statistics. (Consent of the department)

Credit Variable 1-9

Department of Career and Human Resource Development

CHRD-700 **Introduction to Career**
Registration #0290-700 **and Human Resource Development**
As a result of this course, students will better understand the CHRD program and its courses/options as well as related RIT and community resources; better understand the general concepts of human resource development, career development and organizational development as they apply to individuals and groups in a wide variety of settings and structures; and better understand the past, present and future significance of social, economic, technological factors influencing organizations and occupational categories as well as the corresponding role and activities of the human resource professional.

Credit 3

CHRD-705 **Empirical Methods**
Registration #0290-705
This course will enable professionals in the fields of career development, organizational development and human resource development to accurately describe groups of people and their characteristics of interest to career and human resource development (e.g., skills, performance, background, attitudes, etc.). Topics include techniques of empirical investigation, questionnaire and test design, interviewing, and evaluations of training, counseling and development. (Note: following this course, students should take CQAS-701.)

Credit 3

CHRD-710 **Theory of Organizational Development**
Registration #0290-710
This course introduces the student to organizational development theories and their application in an organizational setting. Consideration will be given to the sociological and historical constructs upon which the field is based. Students will become familiar with the philosophical foundations for the key theories, as well as the practical work of the theorists upon which their philosophies are based. This course also will demonstrate how the theories of organizational development can be applied in organizations to foster change, innovation, and the revitalization of the organization.

CHRD-711 Futures Research and Simulation
Registration #0290-711
In this course students will learn to understand the techniques, theories, and advantages/limitations of simulation and futures research methods, and the application of simulation and futures research methods for facilitating individual and organizational decision making. (CHRD-710)

Credit 3

CHRD-712 Planning & Evaluation
Registration #0290-712 in Organizational Development
In this course students will learn to understand the techniques, theories, and advantages/limitations of systematic planning strategies and the application of methods for strategic and tactical planning, and the decision making that assure accountability. (CHRD-710)

Credit 3

CHRD-713 The Practice of Consultation in OD
Registration #0290-713
Students will develop an understanding of the various roles that organizational development practitioners play in applying their knowledge and skill in organizational settings, e.g., serving as internal consultants, process consultants, and change agents. Students will learn those skills and practices that pertain to the field of organizational development including: organizational performance analysis, group dynamics, problem solving, intervention techniques, dealing with resistance to change, implementing change, stress management, and approaches that foster employees' acceptance of change and organizational transformation, revitalization and renewal. (CHRD-710)

Credit 3

CHRD-720 Theories of Career Development
Registration #0290-720
Career Development Theories provide mechanisms to examine and define the needs of the work place in relationship to the needs and abilities of the worker. This course will emphasize the structure of selected theories and explore their relationship to the individual's decision-making process.

Credit 3

CHRD-721 Individual Career Counseling Techniques
Registration #0290-721
This course will introduce selected theories and techniques that may be used in individual career counseling situations. Students will practice techniques and develop their own style of career counseling. This course is not meant for individuals seeking to develop clinical therapeutic skills. (CHRD-720)

Credit 3

CHRD-722 Career Counseling Techniques for Groups
Registration #0290-722
This course will introduce students to small group theory and the use of small groups to assist individuals in identifying and implementing their career goals. Students will participate in a small group as they learn and practice group leadership and membership tasks as well as develop career counseling skills. This course is not meant for individuals seeking to develop clinical therapeutic skills. (CHRD-720)

Credit 3

CHRD-723 Information Use in Career Planning
Registration #0290-723
This course will explore the role of information in the educational, work, and leisure aspects of individuals' lifelong career and personal development Students will be introduced to the following areas that may be useful in the development of career development and planning services: career planning models, selection and use of standardized tests and personal assessment intruments, career information data resources, research issues, and community resources. (CQAS-701, CHRD-720)

Credit 3

CHRD-730 Theories of Human Resource Development
Registration #0290-730
Professionals in the fields of career counseling, organizational development and human resource development require an organized plan of human learning and development This course presents recent investigations, both theoretical and empirical, into human learning research, and will emphasize the information-processing model of learning and memory. Students will acquire, through readings and group activities, an intellectually consistent basis for the practical procedures of human resource development

Credit 3

CHRD-731 Techniques of Human Resource Development
Registration #0290-731
This course is designed for future trainers in industrial settings and educators in college and university environments. The course is based on the theory that future trainers and educators must first identify and clarify the value systems within themselves and others prior to organizing a content to be learned. There then must be a self-need assessment by exploring what one knows and must know about learning, curriculum design, information delivery and the assessment of that learning. With this data, the future trainer/educator will seek out the resources to satisfy those needs by mastery of the management of learning principles and skills. With these needs satisfied, the next phase is to create a demonstration of this mastery by developing, facilitating, and evaluating a real course or training experience. The course will provide participants with a model experience that can serve as the basis for developing additional learning/training packages in future work and educational settings. (CHRD-730)

Credit 3

CHRD-732 Design & Development of Training
Registration #0290-732
Students will gain practical experience in human resource development by designing, producing, teaching and evaluating a workshop, seminar or training session. Students will select a needed training module from the broad areas of personal and professional development, skills training and career development and carry out the necessary design, production and delivery steps. Students may take this course more than once in order to gain practical HRD experience and to add competencies to their resumes. (CHRD-730, 731)

Credit **2**

CHRD-733 Needs Assessment and
Registration #0290-733 Problem-Solving Techniques
Students will learn techniques to foster innovation and problem solving within organizations, through strategies to help themselves and others define problems, state goals, identify solutions and make decisions. Topics considered will include general systems theory, barriers to creativity, strategic plans, intrapreneuring, product development, and technology-driven worker training. (CHRD-730)

Credit 3

CHRD-750 Microcomputer Applications in CHRD
Registration #0290-750
Professionals in the fields of human resource development and career development make frequent use of computer technology to write proposals, track clients, design training, monitor budgets, evaluate services and produce reports. In this course, students will learn to utilize MS-DOS software for word processing, file management, spreadsheets and communications. After completing this course, students will have a general understanding of these classes of software, be moderately competent using such software and be experienced using this software to produce products appropriate to their intended professions.

Credit 3

CHRD-850 **Special Projects**
Registration #0290-850
This course provides for independent study, investigation, or research activity in subject matter areas not included in any existing course in the degree program, but having specialized value to students. Proposals approved by a supervising faculty member and the department director are required prior to registration. This course may be taken more than once, but for no more than a total of 6 credit hours.

Credit variable

CHRD-891, 892,893 **Selected Topics**
Registration #0290-891, 892, 893
Selected Topics are innovative courses not reflected in the curriculum. Tides will appear in the course listing each quarter. The course may be taken more than once as topics change, but for no more than a total of 6 credit hours.

Credit 3

CHRD-877 **Internship**
Registration #0290-877
The internship is required of all students* The course consists of two parts: a) at least 20 hours per week of professional experience in appropriate setting, and b) attendance at a seminar that will meet at various times throughout the quarter. Students should meet with their advisors at least two months before planning to take the internship. Proposals for the internship must be approved and on file before registration. *For students with appropriate professional experience, special projects or additional course work may be substituted for the Internship. Departmental approval is required.

Credit 6

College of Engineering

Computer Engineering

Required Courses

EECC-200 **Introduction to Computer**
Registration #0306-200 **Engineering**
The purpose of this course is to briefly describe the field of computer engineering and to provide a frame of reference for the sequences of computer engineering, computer science, and electrical engineering courses that appear in the computer engineering curriculum. Topics will include an introduction to computers and computing, basic concepts, nomenclature, historical background, and some elements of data representation.

Class 1, Credit 1 (F)

EECC-341 **Introduction to Digital**
Registration #0306-341 **Systems for Computer Engineers**
The course covers the specification, analysis, and design of digital systems. The rapid growth of digital computers, digital control devices, digital instruments, and digital communication equipment requires a basic knowledge and general methodology that can be adapted to rapidly evolving changes and constraints. The study of combinatorial and sequential systems will consider the use of standard modules such as decoders, encoders, multiplexers, shifters, ROMs, PLAs, adders, comparators, registers, and counters. The laboratory will provide more detail into the physical and circuit aspects of the design and implementation of digital systems using commercial state-of-the-art SSI, MSI, and LSI components. (SMAM 265-concurrent)

Class 3, Lab 3, Credit 4 (W)

EECC-452 **Linear Control Systems**
Registration #0306-452
This course provides a comprehensive introduction to the essential theories and techniques for the analysis and design of both continuous and discrete linear systems. The modeling and control of dynamic systems will be studied using the classical topics of the frequency domain approach which has proven to be so useful in practice. Students will be required to verify their linear control system design projects using computer simulation techniques. (EEEE-352 and SMAM-306)

Class 4, Credit 4 (S, SR)

EECC-550 **Computer Organization**
Registration #0306-550
This course provides the understanding of the information transfer and transformations which occur in a computer with emphasis on the relations between computer architecture and organization. Topics to include: design levels and their respective primi-tives; modules and descriptive media; register transfer and microoperations; basic computer organization and design; central processor organization; control unit and microprogramming; memory organization; input-output organization; computer architecture—defining the hardware software interface; and from architecture to organization (one to many). (EECC-341, ICSS-440)

Class 4, Credit 4 (S, SR)

EECC-551 **Computer Architecture**
Registration #0306-551
This course provides knowledge about many important architectural issues of a computer system, with emphasis on the interaction between software and hardware. Student projects will be required. Topics to include: the impact of VLSI on computer architecture; the influence of software and applications on computer architecture; data representations; instruction set (the introduction of instructions to enhance operating system performance and high-level language processing will be emphasized); stack machines; control design; channels and I/O processors; memory hierarchy and memory protection; multiprocessor computer systems; and fault-tolerant computer systems. (EECC-550)

Class 4, Credit 4 (F,W)

EECC-553 **Digital Control Systems**
Registration #0306-553 **Design**
This course deals with the design of linear control systems using signals that are sampled in time and quantized in amplitude. The classical transform methods are first described and then applied to illustrative design examples. This course will focus briefly on the topics of the modern state space approach for designing control systems directly in the discrete time domain. Laboratory design projects will be assigned to demonstrate digital control using microprocessors. (EECC-452; EECC-560-concurrent)

Class 3, Lab 3, Credit 4 (F, W)

EECC-560 **Interface and Digital**
Registration #0306-560 **Electronics**
Introduction to some common transducers, transformations from raw measured quantity to transducer output Instrumentation amplifiers, analog switching for applications in multiplexors and sample and hold circuits. The analog to digital and digital to analog conversions processes. Logic families including TTL, ECL, MOS, and their interfaces to each other. (4th year status in Computer Engineering)

Class 3, Lab 3, Credit 4 (F, W)

EECC-561 **Digital System Design for**
Registration #0306-561 **Computer Engineers**
This course covers the specification, analysis, design, and implementation of digital systems. The hierarchical and structured design methodology is introduced. It covers MSI/LSI modules and their use in design. It introduces the structure of a digital hardware problem solution from the architecture view, through data flow concepts and control flow concepts, to implementation. (EECC-341, EECC-560)

Class 3, Lab 3 (S, SR)

EECC-630 **Introduction to VLSI Design**
Registration #0306-630
An introduction to the design and implementation of Very Large Scale (VLSI) systems. Basic NMOS devices and circuits are described. From this base, a variety of methods for designing both combinational logic and state machines is developed, with emphasis on the use of regular structures such as programmed logic arrays. System architecture and use of Computer Aided Design (CAD) tools will be stressed. (EECC-341 or ICSS-400 or EEEE-240; Basic Electronics; fourth- or fifth-year standing)

Class 4, Credit 4 (F, S, SR)

EECC-655 **Projects in Computer**
Registration #0306-655 **Engineering**
Several detailed projects involving the design of hardware and software will be posed to exercise the students' engineering design creativity and ability to integrate concepts from throughout the curriculum. Some lectures will be presented on real time programming techniques such as interrupt handlers, multitasking concepts, process synchronization, response time considerations, input noise reduction, and debugging techniques. Other topics will also be presented. (Fifth-year standing in Computer Engineering)

Class 3, Lab 3, Credit 4 (F, W)

EECC-694 **Data and Computer**
Registration #0306-694 **Communications**
This course provides a unified view of the broad field of data and computer communications. Emphasis will be on the basic principles underlying the technology of data and computer communications. These critical design issues in data communication networks as well as the current and evolving standards in computer communication architecture will be discussed. Alternative approaches to meeting user requirements will be explored. (Fifth-year standing in Computer Engineering or with permission of instructor)

Credit 4, Class 4 (S)

Technical Electives

EECC-605 **Introduction to the**
Registration #0306-605 **Theory of Computation**
This course deals with the basic mathematical, logical and linguistic concepts that underlie the formal aspects of computation. It provides a first acquaintance with the theoretical framework that is essential to the later, more detailed study of advanced topics in computer science and computer engineering. (SMAM-265)

Class 4, Credit 4 (S)

EECC-620 **Design Automation of Digital**
Registration #0306-620 **Systems**
Design automation deals with the use of computers as a tool or aid in the design and manufacturing of digital systems. Topics covered will include methods for digital design, hardware description languages, simulation techniques at system level, register-transfer level, and logic element level, partitioning of digital systems, placement, routing, and fault test generation. (EECC-550 or ICSS-520, or 720)

Class 4, Credit 4 (F, W)

EECC-631 **Advanced VLSI Design**
Registration #0306-631
A second course in the design and implementation of Very Large Scale (VLSI) systems. CMOS devices will be studied. System architecture and the use of Computer Aided Design (CAD) tools will be stressed. Extensive laboratory projects will be required, including the testing of chips fabricated in the first course. (EECC-630)

Class 4, Credit 4 (W)

EECC-683 **A Survey of Electronic Document/**
Registration #0306-683 **Digital Image Processing**
This course serves as an introduction to the several topics involved in electronic document processing—input scanning, output printing, digital image processing, and computer communications. It provides a framework for showing the relationships among these various topics in electronic document processing. The course includes image scaling, halftoning, compression, and feature extraction. (Fifth-year standing in computer engineering)

Class 4, Credit 4 (S)

EECC-699 **Independent Study**
Registration #0306-699
The purpose of this course is to allow senior-level undergraduate and first-year graduate students an opportunity to independendy investigate, under faculty supervision, aspects of the field of computer engineering that are not sufficiently covered in existing courses. Proposals for independent study activities must be approved by both the faculty member supervising the independent study and by the department head. (Permission of the supervising faculty member and the department head required.)

Credit variable: 1 to 4 quarter credits

EECC-722 **Advanced Computer**
Registration #0306-722 **Architecture**
This course will emphasize the impact of VLSI and communication issues on computer architecture. Topics covered will include highly concurrent, multiprocessor and fault-tolerant computer systems as well as data flow architectures. Modeling techniques for system verification will also be included. (EECC-551 or ICSS-720)

Class 4, Credit 4 (W)

EECC-730 **VLSI Design**
Registration #0306-730
An introduction to the design and implementation of Very Large Scale (VLSI) systems. Basic NMOS devices and circuits are described. From this base, a variety of methods for designing both combinational logic and state machines is developed, with emphasis on the use of regular structures such as programmed logic arrays. System architecture and use of Computer Aided Design (CAD) tools will be stressed. Extensive laboratory projects will be required.

Class 4, Credit 4 (F, S, SR)

EECC-731 **VLSI Design Projects**
Registration #0306-731
A second course in the design and implementation of Very Large Scale (VLSI) systems. CMOS devices will be studied. System architecture and the use of Computer Aided Design (CAD) tools will be stressed. A major laboratory design project will be required. In addition the students will test chips fabricated in the first course. (EECC-730 or EECC-630)

Class 4, Credit 4 (W)

EECC-740 **Analytical Topics for**
Registration #0306-740 **Computer Engineers**
This course begins by reviewing signal and system analysis techniques for analyzing linear systems. It includes Fourier techniques and moves on to present fundamental computational techniques appropriate for a number of applications areas of computer engineering. A section on numerical linear algebra will include techniques for analyzing discrete time signals and systems. Other major course areas are symbolic logic and discrete optimization techniques, including computer representations of networks, shortest-path problems and minimum spanning tree problems.

Credit 4, Credit 4 (F)

EECC-756 **Multiple Processor Systems**
Registration #0306-756
This course will cover the general guidelines, methodology, and approaches for the design, development, and use of single and multi, micro or minicomputer systems. The 16-bit microprocessors have vast address spaces and virtual memory capability, incorporate complex I/O facilities, and permit rapid execution of cost-saving, high-level languages. The hardware and software support available for 16-bit microprocessors also makes them a cost-effective alternative to minicomputers. Distributed systems based on microcomputer technology will be investigated with emphasis on interconnect structures, intercommunications, software and hardware. The course will include a laboratory workshop in which each student will be required to design, implement, and test one or more parts of a practical system. Emphasis will be placed on engineering ability and management skill to meet proposed technical goals on time and within budget. (Graduate standing in Computer Engineering with at least three core courses completed or permission of instructor)

Class 4, Credit 4 (S)

EECC-758 **Fault-Tolerant Digital**
Registration #0306-758 **Systems**
Formal models and concepts in fault diagnosis. Test generation and minimization. Redundant and self-checking systems. Fault-tolerant hardware- and software-based computer systems. (ICSS-400 or EEEE-650 or EEEE-750, EECC-550 or ICSS-720)

Class 4, Credit 4 (S)

College of Engineering

Computer Engineering

Required Courses

EECC-200 **Introduction to Computer**
Registration #0306-200 **Engineering**
The purpose of this course is to briefly describe the field of computer engineering and to provide a frame of reference for the sequences of computer engineering, computer science, and electrical engineering courses that appear in the computer engineering curriculum. Topics will include an introduction to computers and computing, basic concepts, nomenclature, historical background, and some elements of data representation.

Class 1, Credit 1 (F)

EECC-341 **Introduction to Digital**
Registration #0306-341 **Systems for Computer Engineers**
The course covers the specification, analysis, and design of digital systems. The rapid growth of digital computers, digital control devices, digital instruments, and digital communication equipment requires a basic knowledge and general methodology that can be adapted to rapidly evolving changes and constraints. The study of combinatorial and sequential systems will consider the use of standard modules such as decoders, encoders, multiplexers, shifters, ROMs, PLAs, adders, comparators, registers, and counters. The laboratory will provide more detail into the physical and circuit aspects of the design and implementation of digital systems using commercial state-of-the-art SSI, MSI, and LSI components. (SMAM 265-concurrent)

Class 3, Lab 3, Credit 4 (W)

EECC-452 **Linear Control Systems**
Registration #0306-452
This course provides a comprehensive introduction to the essential theories and techniques for the analysis and design of both continuous and discrete linear systems. The modeling and control of dynamic systems will be studied using the classical topics of the frequency domain approach which has proven to be so useful in practice. Students will be required to verify their linear control system design projects using computer simulation techniques. (EEEE-352 and SMAM-306)

Class 4, Credit 4 (S, SR)

EECC-550 **Computer Organization**
Registration #0306-550
This course provides the understanding of the information transfer and transformations which occur in a computer with emphasis on the relations between computer architecture and organization. Topics to include: design levels and their respective primi-tives; modules and descriptive media; register transfer and microoperations; basic computer organization and design; central processor organization; control unit and microprogramming; memory organization; input-output organization; computer architecture—defining the hardware software interface; and from architecture to organization (one to many). (EECC-341, ICSS-440)

Class 4, Credit 4 (S, SR)

EECC-551 **Computer Architecture**
Registration #0306-551
This course provides knowledge about many important architectural issues of a computer system, with emphasis on the interaction between software and hardware. Student projects will be required. Topics to include: the impact of VLSI on computer architecture; the influence of software and applications on computer architecture; data representations; instruction set (the in traduction of instructions to enhance operating system perform ance and high-level language processing will be emphasized) stack machines; control design; channels and I/O processors memory hierarchy and memory protection; multiprocessor computer systems; and fault-tolerant computer systems. (EECC-550)

Class 4, Credit 4 (F, W)

EECC-553 **Digital Control Systems**
Registration #0306-553 **Design**
This course deals with the design of linear control systems using signals that are sampled in time and quantized in amplitude. The classical transform methods are first described and then applied to illustrative design examples. This course will focus briefly on the topics of the modern state space approach for designing control systems direcdy in the discrete time domain. Laboratory design projects will be assigned to demonstrate digital control using microprocessors. (EECC-452; EECC-560-concurrent)

Class 3, Lab 3, Credit 4 (F, W)

EECC-560 **Interface and Digital**
Registration #0306-560 **Electronics**
Introduction to some common transducers, transformations from raw measured quantity to transducer output. Instrumentation amplifiers, analog switching for applications in multiplexors and sample and hold circuits. The analog to digital and digital to analog conversions processes. Logic families including TTL, ECL, MOS, and their interfaces to each other. (4th year status in Computer Engineering)

Class 3, Lab 3, Credit 4 (F, W)

EECC-561 **Digital System Design for**
Registration #0306-561 **Computer Engineers**
This course covers the specification, analysis, design, and implementation of digital systems. The hierarchical and structured design methodology is introduced. It covers MSI/LSI modules and their use in design. It introduces the structure of a digital hardware problem solution from the architecture view, through data flow concepts and control flow concepts, to implementation. (EECC-341, EECC-560)

Class 3, Lab 3 (S, SR)

EECC-630 **Introduction to VLSI Design**
Registration #0306-630
An introduction to the design and implementation of Very Large Scale (VLSI) systems. Basic NMOS devices and circuits are described. From this base, a variety of methods for designing both combinational logic and state machines is developed, with emphasis on the use of regular structures such as programmed logic arrays. System architecture and use of Computer Aided Design (CAD) tools will be stressed. (EECC-341 or ICSS-400 or F.F.F.F.-240; Basic Electronics; fourth- or fifth-year standing)

Class 4, Credit 4 (F, S, SR)

EECC-655 **Projects in Computer**
Registration #0306-655 **Engineering**
Several detailed projects involving the design of hardware and software will be posed to exercise the students' engineering design creativity and ability to integrate concepts from throughout the curriculum. Some lectures will be presented on real time programming techniques such as interrupt handlers, multitasking concepts, process synchronization, response time considerations, input noise reduction, and debugging techniques. Other topics will also be presented. (Fifth-year standing in Computer Engineering)

Class 3, Lab 3, Credit 3 (offered each year)

EECC-694 **Data and Computer**
Registration #0306-694 **Communications**
This course provides a unified view of the broad field of data and computer communications. Emphasis will be on the basic principles underlying the technology of data and computer communications. These critical design issues in data communication networks as well as the current and evolving standards in computer communication architecture will be discussed. Alternative approaches to meeting user requirements will be explored. (Fifth-year standing in Computer Engineering or with permission of instructor)

Credit 4, Class 4 (S)

Technical Electives

EECC-605 **Introduction to the**
Registration #0306-605 **Theory of Computation**
This course deals with the basic mathematical, logical and linguistic concepts that underlie the formal aspects of computation. It provides a first acquaintance with the theoretical framework that is essential to the later, more detailed study of advanced topics in computer science and computer engineering. (SMAM-265)

Class 4, Credit 4 (S)

EECC-620 **Design Automation of Digital**
Registration #0306-620 **Systems**
Design automation deals with the use of computers as a tool or aid in the design and manufacturing of digital systems. Topics covered will include methods for digital design, hardware description languages, simulation techniques at system level, register-transfer level, and logic element level, partitioning of digital systems, placement, routing, and fault test generation. (EECC-550 or ICSS-520, or 720)

Class 4, Credit 4 (F, W)

EECC-631 **Advanced VLSI Design**
Registration #0306-631
A second course in the design and implementation of Very Large Scale (VLSI) systems. CMOS devices will be studied. System architecture and the use of Computer Aided Design (CAD) tools will be stressed. Extensive laboratory projects will be required, including the testing of chips fabricated in the first course. (EECC-630)

Class 4, Credit 4 (W)

EECC-683 **A Survey of Electronic Document/**
Registration #0306-683 **Digital Image Processing**
This course serves as an introduction to the several topics involved in electronic document processing—input scanning, output printing, digital image processing, and computer communications. It provides a framework for showing the relationships among these various topics in electronic document processing. The course includes image scaling, halftoning, compression, and feature extraction. (Fifth-year standing in computer engineering)

Class 4, Credit 4 (S)

EECC-699 **Independent Study**
Registration #0306-699
The purpose of this course is to allow senior-level undergraduate and first-year graduate students an opportunity to independently investigate, under faculty supervision, aspects of the field of computer engineering that are not sufficiently covered in existing courses. Proposals for independent study activities must be approved by both the faculty member supervising the independent study and by the department head. (Permission of the supervising faculty member and the department head required.)

Credit variable: 1 to 4 quarter credits

EECC-722 **Advanced Computer**
Registration #0306-722 **Architecture**
This course will emphasize the impact of VLSI and communication issues on computer architecture. Topics covered will include highly concurrent, multiprocessor and fault-tolerant computer systems as well as data flow architectures. Modeling techniques for system verification will also be included. (EECC-551 or ICSS-720)

Class 4, Credit 4 (W)

EECC-730 **VLSI Design**
Registration #0306-730
An introduction to the design and implementation of Very Large Scale (VLSI) systems. Basic NMOS devices and circuits are described From this base, a variety of methods for designing both combinational logic and state machines is developed, with emphasis on the use of regular structures such as programmed logic arrays. System architecture and use of Computer Aided Design (CAD) tools will be stressed. Extensive laboratory projects will be required.

Class 4, Credit 4 (F, S, SR)

EECC-731 **VLSI Design Projects**
Registration #0306-731
A second course in the design and implementation of Very Large Scale (VLSI) systems. CMOS devices will be studied. System architecture and the use of Computer Aided Design (CAD) tools will be stressed. A major laboratory design project will be required. In addition the students will test chips fabricated in the first course. (EECC-730 or EECC-630)

Class 4, Credit 4 (W)

EECC-740 **Analytical Topics for**
Registration #0306-740 **Computer Engineers**
This course begins by reviewing signal and system analysis techniques for analyzing linear systems. It includes Fourier techniques and moves on to present fundamental computational techniques appropriate for a number of applications areas of computer engineering. A section on numerical linear algebra will include techniques for analyzing discrete time signals and systems. Other major course areas are symbolic logic and discrete optimization techniques, including computer representations of networks, shortest-path problems and minimum spanning tree problems.

Credit 4, Credit 4 (F)

EECC-756 **Multiple Processor Systems**
Registration #0306-756
This course will cover the general guidelines, methodology, and approaches for the design, development, and use of single and multi, micro or minicomputer systems. The 16-bit microprocessors have vast address spaces and virtual memory capability, incorporate complex I/O facilities, and permit rapid execution of cost-saving, high-level languages. The hardware and software support available for 16-bit microprocessors also makes them a cost-effective alternative to minicomputers. Distributed systems based on microcomputer technology will be investigated with emphasis on interconnect structures, intercommunications, software and hardware. The course will include a laboratory workshop in which each student will be required to design, implement, and test one or more parts of a practical system. Emphasis will be placed on engineering ability and management skill to meet proposed technical goals on time and within budget. (Graduate standing in Computer Engineering with at least three core courses completed or permission of instructor)

Class 4, Credit 4 (S)

EECC-758 **Fault-Tolerant Digital**
Registration #0306-758 **Systems**
Formal models and concepts in fault diagnosis. Test generation and minimization. Redundant and self-checking systems. Fault-tolerant hardware- and software-based computer systems. (ICSS-400 or EEEE-650 or EEEE-750, EECC-550 or ICSS-720)

Class 4, Credit 4 (S)

EECC-759 Principles of Digital Interfacing
Registration #0306-759
Standard bus interface—parallel and serial. LSI interface devices. Interface design—peripherals and memory. Data acquisition—A/D & D/A converters, multiplexing. Remote control. Error detection and correction. (EECC-560 or permission of instructor)

Class 3, Lab 3, Credit 4 (F)

EECC-772 Special Topics in Computer
Registration #0306-772 Engineering
Topics and subject areas that are not among the courses listed here are frequently offered under the title of Special Topics. Such courses are offered in a normal format, that is, regularly scheduled class sessions with an instructor.

Credit variable (no regular course schedule)

EECC-784 Digital Image
Registration #0306-784 Processing Algorithms
This is a graduate-level course which emphasizes the computational and algorithmic techniques required for processing digitized pictorial images. The acquisition and quantization of digital images is described, followed by analysis and filtering techniques. Segmentation, projection, and reconstruction techniques are discussed. Finally, bi-level image processing is discussed, including contour filling and thinning techniques. Programming projects will be required. (Competence in calculus, engineering math, and structured programming are required.)

Class 4, Credit 4 (SR)

EECC-890 Thesis
Registration #0306-890
An independent engineering project or research problem to demonstrate professional maturity. A formal written thesis and an oral defense are required. The student must obtain the approval of an appropriate faculty member to guide the thesis before registering. A thesis may be used to earn a minimum of 5 and a maximum of 9 credits.

Credit variable

Electrical Engineering

EEEE-200 Electrical Engineering
Registration #0301-200 Graphics
A two-hour per week graphics laboratory which stresses elementary graphic communication techniques. The accent is on the graphical description rather than on drafting methods.

Class 0, Lab 2, Credit 1 (F)

EEEE-240 Introduction to Digital
Registration #0301-240 Systems
Survey of digital circuits and systems. It will describe these circuits operation and typical uses in terms of the external connections to commercially available circuit packages. Laboratory work in the form of home lab assignments is included in the course.

Class 3, Lab 1, Credit 3 (F, S, Ext. day F)

EEEE-310 Numerical Methods
Registration #0301-310
The objective of this course is to develop the ability to solve common engineering equations by means of the digital computer. Specific topics include making a table of values from a formula; obtaining a formula from a table of values; solving linear, nonlinear and transcendental equations; solving systems of equations; finding the solution of an ordinary differential equation; numerical differentiation. (ICSA-220)

Class 2, Lab 0, Credit 2 (W, SR, Ext. day S)

EEEE-351 Circuit Analysis I
Registration #0301-351
Voltage, current, power, and energy; linearity. Kirchhoffs Laws; series, parallel and series-parallel circuits. Ladder networks. Branch current method of circuit analysis. Nodal, loop and mesh analysis. Thevenin's and Norton's theorems; maximum power transfer, superposition and reciprocity theorems. Inductance and capacitance. Response of RL and RC circuits to step input Characteristics of common magnetic materials; analysis of magnetic circuits. (SMAM-253)

Class 4, Recitation 1, Lab 2, Credit 4 (S, SR, Ext day F)

EEEE-352 Circuit Analysis II
Registration #0301-352
Sinusoidal steady state; time domain solution of simple circuits. Power in AC circuits. Complex exponential functions; phasors; impedance and admittance. Nodal, loop and mesh analysis. Network theorems. Transfer functions. Three phase networks; balanced three phase systems. Two-port networks; z, y and h parameters of two-ports. Mutual induction and coupled coils. Linear and ideal transformers. Resonance in parallel and series circuits. (EEEE-351)

Class 4, Recitation 1, Lab 2, Credit 4 (F, W, Ext day F)

EEEE-364 Microcomputers for
Registration #0301-364 Microelectronics
A special version of Introduction to Microcomputers (EEEE-365) for microelectronic engineering majors.

Class 4, Lab 2, Credit 4 (W)

EEEE-365 Introduction to
Registration #0301-365 Microcomputers
Introductory course on microcomputers. Begins with Computer Architecture, including detailed discussions of the memory unit, the central processing unit, its registers and their functions. This is followed by a study of Computer Arithmetic, Logic Operations, Number Systems and Codes. Computer programming is then introduced at the machine and assembly language levels with emphasis on computer instruction sets and addressing modes. Straight line, branching and looping programs are studied and compared. The student is next introduced to computer input/output with emphasis placed on programmed controlled input/output. The course requires extensive hands-on exercise, ranging from simple computational programs to complex programs using the microcomputer as a digital controller. (EEEE-240)

Class 4, Lab 2, Credit 4 (F, W, Ext. day W)

EEEE-441 Electronics I
Registration #0301-441
PN junction. Semiconductor diodes and applications. Bipolar junction transistors and transistor amplifiers. Biasing and small signal analysis. Op amps and linear applications. Junction field effect transistors and amplifiers. Biasing and small signal analysis. (EEEE-351)

Class 3, Lab 3, Credit 4 (F, W, Ext. day S)

EEEE-442 Electronics II
Registration #0301-442
Continuation of EEEE-441. Differential amplifiers. Nonlinear op amp circuits. Frequency and pulse response of amplifiers. Feedback amplifiers. MOSFET amplifiers. Biasing and small signal analysis. Active loads. (EEEE-352, 441)

Class 3, Lab 3, Credit 4 (S, SR, Ext. day F)

EEEE-453 Linear Systems I
Registration #0301-453
Introduction to signal analysis and concepts of linear systems, Fourier series; evaluation of Fourier coefficients. Circuit analysis with periodic inputs.

Exponential form of Fourier series. Relationship between the exponential and trigonometric forms. Differentiation and integration of Fourier series. Fourier transforms; evaluation of Fourier transforms, Linear, series; input and output FT. Energy spectrum and energy spectral density. Laplace transform; evaluation of Laplace transform. Inverse LT through partial fraction expansion; application of LT to circuits and systems. Transfer functions (Bode diagram). (EEEE-352, SMAM-306, SMAM-420)

Class 4, Credit 4 (S, SR, Ext. day F)

EEEE-455 Linear Systems for Microelectronics
Registration #0301-455
Introduction to signal analysis and concepts of linear systems. Fourier series, evaluation of Fourier coefficients. Exponential form of Fourier series. Relationship between the exponential and trigonometric forms. Linear systems, input and output FT. Energy spectrum and energy spectral density. Two dimensional FT. Applications to linear optical systems. (The course cannot be used by EE majors as a substitute for EEEE-453) (SMAM-306, EEEE-352)

Class 4, Credit 4

EEEE-461,462 Electrical Engineering I, II
Registration #0301-461,462
A course for nonelectrical engineering majors. Circuit analysis, electronics, switching circuits, logic and digital systems. (SPSP-311, SMAM-306)

EEEE-461: Class 3, Lab 3, Credit 4 (F, W, S)

EEEE-462: Class 3, Lab 3, Credit 4 (F, W)

EEEE-471,472 Electromagnetics Fields I, II
Registration #0301-471,472
Vector analysis electrostatics and dielectrics, conduction current fields, magnetics, time-varying fields. Maxwell's equations and wave equations. Concepts of retarded potentials. Electromagnetic propogation in waveguides, free space and transmission lines. Concepts of reflection, transmission and impedance matching. (SMAM-328, SPSP-313)

EEEE-471: Class 4, Credit 4 (S, SR, Ext day S)

EEEE-472: Class 3, Lab 3, Credit 4 (F, W, Ext day F)

EEEE-513 Introduction to Automatic
Registration #0301-513 Control
A study of linear control systems and their physical behavior including stability and transient response. This is approached through the classical methods of the Laplace domain; Routh's Criterion, Nyquist, Bode and Nichols charts and root-locus. Lead and lag compensators are introduced using these tools. (EEEE-453)

Class 3, Lab 3, Credit 4 (S, SR, Ext. day F)

EEEE-531 Electromechanical Energy
Registration #0301-531 Conversion
A development of the basic relationships of field energy, magnetic force, torque and generated voltage in an electromechanical device. Expansion of these fundamentals into an understanding of the operational characteristics of the electrical machine. (EEEE-352)

Class 3, Lab 3, Credit 4 (F, W, Ext day S)

EEEE-534 Introduction to
Registration #0301-534 Communication Systems
Review of linear systems as applied to communication signal processing. Non-linear devices in communication systems. Introduction to Fourier transform and its role in spectral analysis of signals and systems. Introduction to amplitude modulation DSB-SC, AM, SSB, VSB and their applications. Introduction to frequency and phase modulation techniques. Noise theory and the role of noise in communication systems. (SMAM-351, EEEE-453)

Class 4, Credit 4 (S, SR, Ext day W)

EEEE-535 Introduction to Power
Registration #0301-535 Electronics
This course provides an introduction to the theory of thyristor circuits with emphasis on applications. The course builds upon the theory of static switching, SCR characteristics, triggering and control. This leads the way to the study of controlled and uncontrolled rectification and inversion. AC and DC line control and frequency conversion using thyristors. The laboratory is an integral part of the course where the experiments complement the classroom lectures by providing exposure to the device characteristics, testing and measuring techniques and various thyristor systems. (EEEE-441, EEEE-531 or concurrent registration for EEEE-531)

Class 3, Lab 3, Credit 4 (offered on sufficient demand)

EEEE-544 Physics of Electronic Devices
Registration #0301-544
This course will provide an understanding of the physical mechanisms which govern the operation of semiconductor devices. The relationships between the physical and structural parameters of the device and its electrical performance will be studied. Topics include semiconductor fundamentals, pn junction diodes, bipolar transistors, FET and MOSFET. (EEEE-442, SPSP-315)

Class 4, Lab 0, Credit 4 (F, W, Ext day F)

EEEE-545 Digital Electronics
Registration #0301-545
The objective of this course is to teach students how to analyze digital electronic circuits. Topics include transistors in the saturation, active and cutoff regions; normal and inverse models. JFET and MOSFET in saturation and triode regions. The following logic families are covered in detail: TTL, ECL, NMOS, PMOS, and CMOS. A discussion of the applications and characteristics of analog switches concludes the course. (EEEE-240, 544, 472)

Class 3, Lab 3, Credit 4 (S, SR, Ext day S)

EEEE-554 Linear Systems II
Registration #0301-554
Review of (continuous) linear systems concepts and techniques. Time-frequency signal and system relationships; time-bandwidth products; convolution in time and frequency. Discrete representation of continuous signals: sampling theorem, sample and hold action, A/D and D/A conversion. Elements of discrete signal processing: conceptual view, special sequences, linearity and shift invariance, difference equations, impulse response sequence and the convolution sum. Linear discrete shift invariant discrete system analysis: general input-output difference equation, response to exponential sequences, the Z transform, the inversion integral, the transfer function, transforms of common sequences, basic theorems, partial fraction expansions."Frequency response" of discrete systems sinusoidal input/output, frequency response, relations between Z plane and S plane; frequency response in Z plane; aliasing effects. Introduction to Digital filters; difference equations and transfer functions, block diagram realizations FIR and IIR systems. Central sum, central shift, partial fraction, cascade effects on algorithms, aliasing effects and the bilinear transform, FIR filters and windows. Frequency domain methods; continuous system analogy, the discrete Fourier transform, processing in the frequency domain, intro to FFT. Quantization, effect: single quantization coefficient quantatization, arithmetic quantization, signal scaling and overflow. (EEEE-453)

Class 4, Credit 4 (every year, F) Class 4, Credit 4 (F, W)

EEEE-590 **Thesis**
Registration #0301-590
A research or development project to be carried out under the general supervision of a faculty member. The project need not be of the "state of the art" type, but a reasonable problem of theoretical and/or experimental investigation. To be arranged with an individual faculty member.

Credit 4

EEEE-605 **Robotic Vision**
Registration #0301-605
An introductory course on computer vision with special emphasis on the use of it in a manufacturing environment. The course will develop an understanding of how information obtained from these images is used for industrial automation. Topics include: image formation and sensing, dicretization, effect of lighting, image recognition, binary images, geometrical properties, image segmentation, image processing, edge detection, differential operators, template matching, correlation techniques, control of robots, and industrial vision systems. (EEEE-554 and EEEE-513 or equivalent)

Class 4, Credit 4

EEEE-614 **Design of Control Systems**
Registration #0301-614
This course adds to the analytical skills developed in EEEE-513 to sampled data systems and digital control systems. The stress in this course is on classical design techniques based on the Z-Transform. Root locus, Bode, and the direct method of design are discussed and examples are presented. The student is expected to utilize available computer-aided design packages (ACSL, CNTRL-C, etc.) in both class assignments and in laboratory projects. Each student is required to participate in the design of a digital control system or detailed design of a system component as the laboratory portion of the course. (EEEE-513, 554)

Class 3, Lab 3, Credit 4 (F)

EEEE-621 **Microwave Engineering**
Registration #0301-621
Review of basic electromagnetic theory. TEM transmission lines. Microwave waveguides. Microwave passive components. Ferrite components. Microwave solid-state devices. Microwave integrated circuits. (EEEE-472)

Class 3, Lab 3, Credit 4 (offered on sufficient demand)

EEEE-622 **Antenna Design**
Registration #0301-622
This is a design oriented course in antenna. The primary objective is to study the fundamental principles of antenna theory and apply them to analysis and design of antennas. Emphasis will be on the design procedures for the basic, practical and popular antenna configurations, e.g., linear dipoles, arrays, horns, reflectors, and microstrip antennas. The student will also be exposed to the state-of-the art methods used in the measurement of antenna characteristics, such as radiation pattern, gain, directivity, and input impedance. The primary part of this course will be a design project involving the design of an antenna which will include construction and testing of the antenna. The project will require a report and a presentation to the class with a demonstration. (EEEE-472)

Class 3, Lab 3, Credit 4 (offered on sufficient demand)

EEEE-623 **Piezoelectricity and**
Registration #0301-623 **Pyroelectricity**
Practical uses of piezoelectric and pyroelectric materials. Anisotropic materials including crystal symmetry. Tensor analysis. Electric polarization. Stress tensor. Strain tensor. Piezoelectricity. Pyroelectricity and thermodynamics and equilibrium properties of crystals. The course will include a laboratory to find creative new or improved uses for the piezoelectric and pyroelectric material: polyvinylidene fluoride (PVOF) (EEEE-472, 442)

Class 3, Lab 2, Credit 4 (offered on sufficient demand)

EEEE-635 **Linear Algebra and**
Registration #0301-635 **Linear Vector Space**
This course is a fifth-year professional elective intended for seniors who intend to go on to graduate school in engineering or science. It will provide the student with the background in Linear Algebra which is frequently assumed in graduate courses in Communications, Controls, and E & M Fields. (SMAM-328, EEEE-453)

Credit 2

EEEE-645 **Special Semiconductor**
Registration #0301-645 **Devices**
This course covers devices and applications not normally encountered in the required electronic sequence. Four-layer devices such as the SCR, PUT, and Triac are discussed in some detail along with typical power conversion applications. Auxiliary services like the UJT and optocouplers are included. The use of bipolar power transistors and power MOSFETS in switching applications, especially as switching regulators, is described; and the performance of these devices is compared with that of the four-layer devices. The laboratory portion of the course consists of experiments to delineate the devices along typical applications. Following this, each student team designs and evaluates a switching power supply, then constructs and tests a design project of his/her choice. (EEEE-442)

Class 3, Lab 3, Credit 4 (offered on sufficient demand)

EEEE-650 **Design of Digital Systems**
Registration #0301-650
This course deals with top-down design of medium to large digital systems using state diagrams and state machine charts. Design implementations include use of ROMs, PALs, PLAs, etc. Special consideration is given to minimization techniques, hazard elimination, synchronization, and synchronous sequential design. (EEEE-240)

Class 3, Lab 2, Credit 4 (W, S)

EEEE-665 **Microcomputer-Based**
Registration #0301-665 **Systems Design**
This course will cover the effective applications of 8-bit microprocessors in the design of digital systems. Hardware and software organizations and design tools will be discussed. Memory system design including dynamic RAMS and DMA control will be studied. Serial and parallel I/O techniques including interrupts will be considered. LSI interface devices for interfacing peripherals will be discussed. Interfacing microcomputers with the analog world using A/D and D/A converters will be considered. Design case-studies of typical microcomputer-based systems will be discussed. (EEEE-365)

Class 3, Lab 3, Credit 4 (F, SR)

EEEE-666 **16-Bit Microcomputer**
Registration #0301-666 **Systems**
This course will cover both hardware and software aspects of 16-bit family microcomputers. The architecture details, timing and instruction sets will be discussed. Memory, serial and parallel I/O interfacing techniques including standard interface chips will be used. Multiprocessor concepts will be introduced. (EEEE-365)

Class 3, Lab 3, Credit 4 (W, S)

EEEE-670 **Introduction to**
Registration #0301-670 **Microelectronics**
Introduction to the physics and chemistry of fabricating integrated circuits. Topics include mask making, epitaxial layer growth, diffusion, oxidation, ion implantation, and metallization. The course includes a design project where the student designs an integrated circuit including the circuit layout and process specification. Students will also use computer modeling and simulation programs such as SPICE, BISIM, and SUPREME. This course is a prerequisite for EEEE-676, IC processing, laboratory, in which integrated circuits are actually made. (EEEE-544)

Class 4, Credit 4 (SR, F)

EEEE-672 Optical Devices and Systems
Registration #0301-672
An introductory applied optics course designed not only to familiarize and review optical fundamentals but to introduce state-of-the art concepts and applications. Fundamental aspects of laser operation, lens system analysis, optical modulation, optical detection, and noise problems associated with optical components will be discussed. Applications to fiber optics, integrated optics, and solar systems will be considered. A demonstration lab complements the lectures. (SPSP-315, F.FF.F.-471, 472, concurrently)

Class 3, Lab 3, Credit 4 (F, W)

EEEE-674 Fiber Optics: Theory and
Registration #0301-674 Application
To familiarize the engineer with the basic concepts involved in dealing with an ever-expanding field fiber optics. Fundamentals as well as design applications will be discussed: light wave characteristics; fiber optical waveguide fundamentals and selection; fiber optical coupling. Source and detector characteristics and selection will be considered. Examples of practical optical systems will be analyzed. A project lab assignment will be part of the course. (SPSP-312, EEEE-472)

Class 3, Lab 3, Credit 4 (S)

EEEE-676 I. C. Processing Laboratory
Registration #0301-676
This is a laboratory course designed to introduce the student to integrated circuit processing. The following topics will be investigated; safety, vacuum technology and evaporation of metals, artwork generation, photoreduction, photoresist technology, water characterization, water cleaning metal semiconductor fabrication, diffusion, MOS device fabrication, I. C. fabrication, wire bonding and packaging. Each laboratory exercise requires extensive preparation on the part of the student, in the form of research, reading, computations and device design. (EEEE-670)

Class 2, Lab 6, Credit 4 (S)

EEEE-677 Digital Filters and Signal
Registration #0301-677 Processing
Topics include the design of digital IIR filters, and the analysis and design of digital air filters and the significance of linear phase. The DFT is reviewed and FFT algorithms are studied in depth. Special high-speed signal processing computer chips are considered and reference is made to machine language programming of these and other microcomputers. Applications of digital signal processing are then considered including speech processing, linear predictive coding and fast algorithms for special matrix inversion. The course concludes with an introduction to two-dimensional signal processing with applications to image processing. Class demonstrations are given and several computer assignments will be required. (EEEE-554)

Class 4, Credit 4 (F, S)

EEEE-679 Active and Passive Filters
Registration #0301-679
The first half of this course deals with the filter transfer functions, poles and zeros, and concepts of filter amplitude and phase response. Butterworth, Chebyshev and elliptic filters are considered as well as low-pass/high-pass and low-pass/band-pass transformations. The second half of the course deals with methods of practical filter design with emphasis placed on active filters. (EEEE-453)

Class 4, Credit 4 (W)

EEEE-693 Digital Data Communications
Registration #0301-693
This course develops and applies the principles of modern communications theory to the design of digital communication systems. The impact of bandwidth, signal power and noise power on system performance is thoroughly discussed and related to PSK, FSK and OOK signal waveforms. The student will apply the concepts learned to the study of satellite communication systems. (EEEE-534, 554, SMAM 351)

Class 4, Credit 4 (S)

EEEE-694 Information Theory and Coding
Registration #0301-694
The course introduces the student to the notion of quantitative measures of source entropy, information, equivocation, and mutual information leading to the topics of efficient source encoding, and communication channel capacities. The effects of random channel disturbances are described leading to the requirements for error-detection and error-protection coding. Linear block coding concepts are introduced followed by a description of cyclic codes and their underlying algebraic structure. (EEEE-453, 534; SMAM-351)

Credit 4

EEEE-695 Introduction to Audio
Registration #0301-695 Engineering
A course based on topics from dynamics, acoustics and audio systems. Topics include; electro-mechanical equivalents, plane and spherical acoustic waves, radiators and resonators, loudspeaker systems, equalization in recording and playback, and an introduction to the application of digital techniques to audio. (EEEE-453, 442, 472)

Class 4, Credit 4 (S)

EEEE-696 Communication Circuit
Registration #0301-696 Design
A design course based on circuits used in radio communication systems. Design projects include: directional couplers, broadband matching transformers, phase-locked loops, narrow-band amplifiers, oscillators, and antennas. Computer simulation is used in some tasks. In all cases, circuit or device analysis is used to develop "design-equations" with which to realize operating specifications. Finished circuit, working simulation programs, or computed antenna patterns are generally the end products. (F.F.F.F.-442, 554,472)

Class 3, Lab 3, Credit 4 (offered on sufficient demand)

Graduate Courses

EEEE-723 Semiconductor Physics
Registration #0301-723
An introductory course in semiconductor physics for engineering students. The emphasis in this course is semiconductor materials rather than semiconductor devices. Topics include: band tap theory, equilibrium carrier concentrations, transport mechanisms, deep and shallow impurities and properties of silicon, GaAs, Ge and other semiconductors.

Credit 4

EEEE-724 Physics of Semiconductor
Registration #0301-724 Devices I
A basic course dealing with the physics of semiconductor devices. Topics include: evaporation, sputtering, epitaxial growth, diffusion, ion implantation, oxidation of silicon, photolithography, pattern generation, layout of silicon integrated circuits, resistors, MOS capacitors, isolation techniques, and in-process measurement and testing. (EEEE-723)

Credit 4

EEEE-725 Physics of Semiconductor
Registration #0301-725 Devices II
An intermediate level course in semiconductor device physics for engineering students. Limitations of bipolar and field effect transistors are studied. The physics of pnpn devices, solid-state optical devices, interface devices, and others are also discussed. (EEEE-724).

Credit variable: 1 to 4 quarter credits

EEEE-726 **Analog IC Circuits**
Registration #0301-726
A course in the analysis and design of bipolar and MOS analog integrated circuits. Topics include: device models, amplifiers, current sources and active loads, output stages, operational amplifiers, and analog circuit design in MOS-LSI. Course will involve circuit design and computer simulation projects.

Credit 4

EEEE-727 **VLSI Design**
Registration #0301-727
Design of very large scale integrated circuits at the level of Mead and Conway's VLSI Design. Topics include MOS devices and circuits, n-channel MOS process, data and control flow in systematic structures, implementing integrated system design, system timing, and examples of LSI computer systems. (EEEE-724, 670, and a course in computer architecture)

Credit 4

EEEE-730 **Advanced Analog I. C. Design**
Registration #0301-730
An advanced course in analog integrated circuit design. Students will study bipolar and MOS realization of op amps, analog multipliers, A to D and D to A convenors, and more. The students will participate in design projects including circuit design, layout, and SPICE simulation (EEEE-726)

Credit 4

EEEE-742 **Advanced Microprocessor**
Registration #0301-742 **Software Design**
An introduction to the theory and application of top-down design, structure, abstraction, segmentation, high-level languages, and operating systems to real-time programs for microprocessors. The students will become proficient in a structured high level language. Topics include: Structure diagrams, separate module compilation, data types, data structures, self documenting code, procedures, meaningful variable names, linkage with other languages, object code libraries, operating system calls, multitasking, concurrent and re-entrant programs, and symbolic debugging. (EEEE-365 or a high-level programming language)

Credit 4

EEEE-744 **Advanced Microprocessor**
Registration #0301-744 **Systems Design**
The effective application of microprocessors in the design of digital systems requires a knowledge of both hardware and software. This course will develop an understanding of assembly language programming and hardware design techniques. The role of macro-assemblers, editors, linking loaders, and other system software aids used in microcomputer development systems to produce efficient modular code will be covered. Several aspects of hardware/software organization of input/output programs will be considered including interrupts and direct memory access. The use of special LSI interface devices to allow a microcomputer to operate with peripheral devices such as *AID* and D/A converters, CRT terminals, floppy disks, etc. will be studied. Laboratory sessions will be used to provide experience in the use of software development systems, and logic analyzers in developing and testing a microcomputer system design. (EEEE-365, 742)

Credit 4

EEEE-745 **Topics in Digital Systems**
Registration #0301-745
Topics will be selected on different aspects of digital systems design. Some of the proposed topics are signature analysis, bit slice processors, timing problems, reliable systems design, and designing for maintainability. (EEEE-650)

Credit 3 or 4

EEEE-747 **Topics in Switching Theory**
Registration #0301-747
A selection of topics on various theoretical aspects of switching circuits will be presented. Topics such as decomposition of combinational switching functions, experiments on sequential circuits, and regular expressions will be covered. (EEEE-650)

Credit 4

EEEE-748 **Microcomputers in Control**
Registration #0301-748 **and Instrumentation**
The use of microcomputers in process control and instrumentation to achieve intelligent industrial operations will be discussed. Topics include: concepts of control, analog vs. digital controllers, sensors, A/D and D/A convenors, dc motor and stepper motor controllers, real-time systems, microcomputer bus standards, and the local networks. Lab work may include temperatures, pressure, and optical controllers, stepper motor controllers, and robotics control. Intel 8086 microcomputer is used. (EEEE-744)

Credit 4

EEEE-754 **Analytical Techniques I**
Registration #0301-754
Complex variable theory including conformal mapping; the Laurent expansion; Cauchy's theorem; the evaluation of contour integrals; advanced topics in continuous time Fourier series and transforms; The Laplace transforms, its existence and convergence; inversion integral; branch points; applications.

Credit 4 (F)

EEEE-755 **Analytical Techniques II**
Registration #0301-755
Discrete time signals and systems; The z transform and its applications; solution of difference equations; concepts of stability, Discrete Fourier analysis; DFT; FFT algorithms; topics in Matrix theory: eigen values and eigen vectors; functions of a matrix; transformations; differentiation, integration, and exponentiation of matrices; matrix polynomials; Cayley-Hamilton theorem; concept of state variables; relationship between transfer functions and state variable representation for LTI systems; State Transition Matrix and its determination. (EEEE-754)

Credit 4 (W)

EEEE-756 **Analytical Techniques HI**
Registration #0301-756
Review of probability theory; conditional probability and Baye's theorem; 1 random variables, distribution and density functions; functions of one and several random variables; sequences of random variables and central limit theorem; elements of statistics: sampling theory, sampling distribution and confidence interval, tests of hypothesis, linear and nonlinear regression; introduction to random processes; response of linear systems to random inputs. (Graduate standing; AT I and AT II are NOT prerequisites)
Credit 4 (S)

EEEE-761 **Modern Control Theory**
Registration #0301-761
Review of state-space formulation of SISO systems; solution of state equations; STM and its properties. Application of state-space concepts; state variable design. Multivariate systems; preliminaries; systems of least order; stability and control. (EEEE-754, 755, 513)

Credit 4

EEEE-762 **Nonlinear Control Systems**
Registration #0301-762
An introduction to the physical nature and mathematical theory of nonlinear control systems' behavior using phase plane techniques. Liapunov theory (including Aizerman's method, variable gradient methods, and the Lure forms), perturbation methods, describing function techniques, and Popov's criterion. Analysis of switching and relays. These are applied to both piecewise-linear and analytical nonlinear systems. (EEEE-761)

Credit **3**

EEEE-763 **Stochastic Estimation and Control**
Registration #0301-763
Stochastic control and optimization; estimation and filtering techniques; such as Wiener filtering and Kalman filtering, stochastic stability; applications. (EEEE-756, 761)

Credit 4

EEEE-764 **Digital Control Systems Design**
Registration #0301-764
Introduction to the analysis and design of control systems in which microcontroller plays a principle role. Topics include: sampled data systems, Z and W-place analysis and design, algorithm generation, and the effect of computer word length on noise and stability. The student will be expected to make use of the digital computer in the implementation of design procedures. (EEEE-755)
Credit 4

EEEE-765 **Optimal Control**
Registration #0301-765
Introduction of calculus of variations; conditions of optimality, optimizing transient performance by statistical and variational procedures, dynamic programming and by Pontryagin's maximum principle; design of optimal linear systems with quadratic criteria. (EEEE-761)

Credit 4

EEEE-767 **Power Semiconductor Circuits**
Registration #0301-767
The objective of this course is to provide an adequate, application-oriented knowledge to those interested in the areas of control, power, and power electronics. Topics to be discussed; preliminaries, basic principles of static switching thyristor theory, triggering, commutations; rectifiers; principles of controlled rectification, analysis of single and three-phase controlled rectifiers; inverters; series and parallel SCR inverters, design of inverters, sine wave filters; forced commutated inverter. McMurray inverter; DC systems; principles of DC-DC conversion, choppers, DC motor control, single phase DC motor drives, three phase DC motor drives, dual converter; cyclo-converter; frequency conversion using SCR's phase-controlled cyclo-converters; cyclo-converter controls. Modeling and simulation of thyristor circuits; thyristor models approximations, digital simulation of choppers, inverters and cyclo-converters, areas of further research. Demonstration experiments will be set up. Also individual projects by interested students will be encouraged.

Credit 4

EEEE-772, 773, 774 **Special Topics in Electrical Engineering**
Registration #0301-772, 773, 774
Topics and subject areas that are not among the courses listed here are frequently offered under the tide of Special Topics. Such courses are offered in a normal format, that is, regularly scheduled class sessions with an instructor.

Credit 4 per course (No regular course schedule)

EEEE-775 **Optical Engineering I**
Registration #0301-775
An introduction to the properties of optical components and their combination into systems, primarily from a geometrical optics point of view, but with reference to the wave nature of light where appropriate. Refracting and reflecting components. Radiation sources. Object-image relations. Stops and energy ray tracing and matrix methods of analysis and design. Discussion of common optical devices and instruments.

Credit 3 or 4

EEEE-776 **Electro-optics**
Registration #0301-776
An advanced treatment of optical systems through the use of Maxwell's equations describing light interaction will be considered. Lens systems, optical modulation, laser operation, optical detection and associated noise problems will be discussed. Classroom work will be complemented by demonstrators. (EEEE-775, 471)

Credit 4

EEEE-778 **Fiber Optics**
Registration #0301-778
The objective of this course is to educate the engineer in the applied optics field. Fundamentals of the fiber waveguide are treated using geometrical optics and Maxwell's equations. Other topics include design criteria, practical coupling techniques, discussion of optical sources and dectors used in fiber optical systems. Applications to communications and other areas will be discussed. (EEEE-472 or equivalent)

Credit 4

EEEE-779 **Digital Image Processing**
Registration #0301-779
This is an introductory course in digital image processing. The course begins with a study of two dimensional signal processing and transform methods with applications to images. Image sampling is discussed followed by gray level description of images and methods of contrast manipulation including linear/nonlinear transformations and histogram equalization and specification. Image smoothing methods are considered including spatial and frequency domain low pass filtering, AD-HOC methods of noise removal and median filtering. Following this, methods of image sharpening are studied including derivative methods and high pass filtering. Edge and line detection methods are discussed using masks and hough transforms and methods of image segmentation are degradation and methods of image restoration including deblurring. Several extensive computer assignments are required. (EEEE-755, 554 or permission of instructor)

Credit 4

EEEE-780 **Independent Study**
Registration #0301-780
This course number should be used by students who plan to study a topic on an independent study basis. The student must obtain the permission of the appropriate faculty member before registering for the course.

Credit 4

EEEE-781 **Electromagnetic Fields**
Registration #0301-781
Development of electromagnetic theory from basic postulated leading to Maxwell's equations for the plane waves, transmission lines, wavelengths, and antennas.

Credit 4

EEEE-782 **Boundary Value Problems**
Registration #0301-782
Techniques for solving boundary value problems. Numerical methods, analog and relaxations methods. Green's function, special methods making use of symmetries, images, inversion, and conformal mapping introduction to integral equations. Wiener-Hopf and Watson transformations Saddlepoint integration. Variational techniques. (EEEE-754, 755, 756)

Credit 4

EEEE-783 **Antennas and Antenna Systems**
Registration #0301-783
Theoretical and practical characteristics of electromagnetic radiators. Equivalent circuits and radiating properties of antenna elements. Dipoles, slots, small loops, helical and dielectric radiators. Pattern analysis, primary and secondary patterns. Theory of phased antenna arrays, reflectors, and horns. (EEEE-781)

Credit 3

EEEE-784 Advanced Electromagnetic Engineering
Registration #0301-784
Time varying electromagnetic fields. Field theorems, propagation and reflection of plane waves, transmission theory, waveguides, resonators, radiation and diffraction. Microwave networks. (EEEE-781)

Credit 4

EEEE-785 Special Topics in Electromagnetic Theory
Registration #0301-785
Advanced and current topics in electromagnetic theory. Topics vary each time and may include; array theory, electromagnetic compatibility, numerical methods, propagation and radiation in ionized media, moving media, and random media. May be repeated for additional credit. (Permission of instructor)

Credit 4

EEEE-786 Microwave Devices
Registration #0301-786
Theory of interaction between electron beams and electromagnetic waves. Microwave tubes; klystron, magnetron, traveling-wave tubes. Solid state devices: microwave transistors, tunnel diodes, Gunn diodes. IMPATT diodes LSA diodes.

Credit 4

EEEE-787 Radar Engineering
Registration #0301-787
Radar system and radar equations; electronic scanning radar systems, microwave radar antennas. Atmospheric effects in radio wave propagation, synthetic aperture radar. Signal detection and parameter estimation for radar applicadons. (EEEE-754, 755, 756)

Credit 4

EEEE-790 Random Signals and Noise
Registration #0301-790
Functions of two random variables. Mean square estimation. Orthogonality principle. Sequences of random variables. Central limit theorem. Random processes; correlation functions; spectrum of periodic functions and periodic random processes; spectral densities; the Gaussian random process; noise through linear systems. (EEEE-755, 756)

Credit 4

EEEE-791 Topics in Signal Analysis and Processing
Registration #0301-791
Signal representation of orthogonal functions; analytic signals and Hilbert transforms; optimum filters (matched, maximum fidelity, Wiener); discrete representation of continuous signals (sampling theorems); the discrete Fourier transform; linear discrete filters, introduction to homomorphic signal processing. (EEEE-790)

Credit 4

EEEE-793 Error Detecting and Error Correction
Registration #0301-793
This course covers linear block codes and convolutional codes. The major linear block codes to be covered are Hamming, BCH, Golay, and Reed-Solomon codes. The fundamentals structure of linear block codes will be developed and applied to performance calculations. The structure of cyclic codes will be developed and applied to encoders and decoders. The major error correction methods, including error trapping, majority logic decoding and the BCH algorithm will be developed and the Viterbi and sequential decoding algorithms will be studied. Questions of system performance, speed, and complexity will be examined. (EEEE-756)

Credit 4

EEEE-794 Information Theory
Registration #0301-794
An introduction to the fundamental concepts of information theory; entropy, equivocation, transinformation, and redundancy; coding for binary channels; measurement of signal parameters in the presence of noise; bandwidth vs. accuracy. (EEEE-756)

Credit 4

EEEE-795 Optical Engineering II
Registration #0301-795
This course emphasizes the application of wave optics to optical systems. Interference and interferometers. Thin films, diffraction, partial coherence, Fourier optics. Discussion of holophy, optical data processing, imaging and other topics of current interest. (No prerequisites other than graduate standing)

Credit 4

EEEE-800 Graduate Paper
Registration #0301-800
This course number is used to fulfill the graduate paper requirement under the non-thesis option for the MS degree in electrical engineering. The student must obtain the approval of an appropriate faculty member to supervise the paper before registering for this course.

Credit 5

EEEE-890 Thesis
Registration #0301-890
An independent engineering project or research problem to demonstrate professional maturity. A formal written thesis and an oral defense are required. The student must obtain the approval of an appropriate faculty member to guide the thesis before registering for the thesis. A thesis may be used to earn a minimum of 6 credits and a maximum of 12 credits. The usual is **9** credits.

Credit variable.

Industrial Engineering

The following courses are required of Industrial Engineering students and are offered at least once a year.

EIEI-201 Introduction to Industrial Engineering
Registration #0303-201
A first course in industrial engineering for freshmen. The course describes what engineering is, what current and projected opportunities exist for engineers. The course material is concerned with the general principles of engineering design.

Class 3, Lab 1, Credit 4 (F)

EIEI-202 Computing for Industrial Engineers
Registration #0303-202
A first course in computer programming for engineers and in particular industrial engineers. The course involves extensive development of programming skills required in the engineering disciplines.

Class 4, Credit 4 (W)

EIEI-301 Computer Tools for Increased Productivity
Registration #0303-301
This course is designed to expose the student to the range of computer software tools and packages that are available on the VAX. The student will learn how to use this software to improve his/her productivity in all the courses that will follow. It will also review and sharpen the student's skills in using the VAX/VMS system and the FORTRAN language. (EIEI-202 or consent of instructor)

Class 2, Credit 2 (W)

EIEI-401 **Introduction to Operations**
Registration #0303-401 **Research I**
An introduction to the methodology of mathematical problem formulation. Investigation of mathematical programming techniques including linear programming and special types of linear programming problems such as the transportation and assignment algorithms. (SMAM-328 or permission of instructor)

Class 4, Credit 4 (F)

EIEI-402 **Introduction to Operations**
Registration #0303-402 **Research II**
A survey of elementary mathematical models within the field of systems and industrial engineering. Areas of study include queuing theory, network analysis, and inventory theory. (SMAM-351, SMAM-306 or permission of instructor)

Class 4, Credit 4 (F)

EIEI-415, 516 **Human Factors I, II**
Registration #0303-415, 516
A survey of human factors from 1) physiological constraints of the human; 2) behavioral/psychological characteristics of the human; and 3) the psycho-motor skills ability of the human. Emphasis is placed on practical applications of each area. (SMAM-352 or permission of instructor)

Class 3, Lab 2, Credit 4 (F-516, S-415)

EIEI-420 **Work Measurement and**
Registration #0303-420 **Analysis I**
Methods of measuring and analyzing work, human capabilities, micromotion, memomotion study, process and operation analysis. Emphasis placed on methods of operation analysis as applied to the design and evaluation of man-machine systems. (Permission of instructor)

Class 3, Lab 2, Credit 4 (F)

EIEI-422 **Systems & Facilities Planning**
Registration #0303-422
A basic course in plant layout Topics covered include project-quantity analysis, flow of materials, relationship charts, activity charts, material handling systems, and factors influencing the layout design. The course includes basic drafting application as well as state of the art computer aided layout design. (EIEI-401 or permission of instructor)

Class 3, Lab 2, Credit 4 (S)

EI EI-481 **Management Theory and**
Registration #0303-481 **Practice**
Development of the fundamental principles of the industrial enterprise. Internal organization as well as general economic conditions are considered. Emphasis is placed on the role of behavior science. (Permission of instructor)

Class 4, Credit 4 (S)

EIEI-503 **Simulation**
Registration #0303-503
A first course in simulation emphasizing the role of the computer in developing simulation models. The SLAM simulation language is emphasized. (EIEI-202, SMAM-351 or equivalent)

Class 4, Credit 4 (F)

EIEI-510, 511 **Applied Statistics I, II**
Registration #0303-510, 511
An applied approach to statistics utilizing theoretical tools acquired in other math-stat courses. Heavy emphasis on understanding and applying statistical analysis methods in real-world situations in engineering. Topics include quality control, reliability, analysis of variance, and regression. (SMAM-351, 352)

Class 4, Credit 4 (F-510, S-511)

EIEI-520 **Engineering Economics**
Registration #0303-520
Time value of money, methods of comparing alternatives, depreciation and depletion, income tax consideration, replacement, retirement and obsolescence, and capital budgeting. (SMAM-351 or permission of instructor)

Class 4, Credit 4 (F)

EIEI-530 **Engineering Design**
Registration #0303-530
A case study approach of ten real world experiences in engineering design. (Permission of instructor)

Class 4, Credit 4 (W, S)

EIEI-560 **Project Design**
Registration #0303-560
A design course oriented to the solution of on-site industrial engineering problems. Each student group will attempt to define, analyze, design, and implement a solution to actual ongoing problems in the Rochester community. (Permission of instructor)
Class 4, Credit 4 (S)

The following courses can be used as professional electives within industrial engineering and are offered subject to sufficient demand. You should consult with your advisor for advice on professional electives outside of the industrial engineering discipline.

EIEI-450 **Applied Human Factors**
Registration #0303-450 **Design of Experiments**
An applied approach to the problem of how one goes about running a study or experiment in human factors. (EIEI-511 or permission of instructor)

Class 4, Credit 4

EIEI-482 **Production Control I**
Registration #0303-482
A basic course in production control emphasizing the systems approach. Topics covered include forecasting, mathematic inventory models, material requirements planning and scheduling including PERT. (EIEI-511 or permission of instructor)

Class 4, Credit 4

EDEI-483 **Production Control II**
Registration #0303-483
A design course in production control. Each student is asked to design, test, and implement a complete production control system for an operating plant (EIEI-482)

Class 4, Credit 4

EIEI-504 **Introduction to Operations**
Registration #0303-504 **Research m**
A course intended to provide an integrated view of advanced programming techniques and their applications to industrial problems. Selected topics might include a working knowledge of PGERT, QGERT, etc. (EIEI-401, 402 or permission of instructor)

Class 4, Credit 4

EIEI-505 **Simulation ModellingTechniques**
Registration #0303-505
This course is intended to increase simulation modelling skills primarily in the areas of network and discrete event simulations. Emphasis will be placed on methods of model construction, design of simulation experiments, model validation and output data analysis. Students will utilize these techniques to analyze the performance of productions systems. (EIEI-503, SMAM-352 or permission of instructor)

Class 4, Credit 4 (SR)

EIEI-512 **Reliability**
Registration #0303-512
Concepts of reliability, basic failure laws, reliability measurement, structural analysis reliability, repair problems, surveillance problems, maintenance problems. (EIEI-510, 511 or permission of instructor)

Class 4, Credit 4

EIEI-540 **Introduction to Operations**
Registration #0303-540 **Research IV**
An introduction to some advanced topics in operations research and industrial engineering. Areas of study may include game theory, Markov chains and their applications, decision analysis, network analysis. (Fifth-year I.E. standing or permission of instructor)

Class 4, Credit 4

EIEI-545 **Techniques of Systems**
Registration #0303-545 **Engineering**
LaPlace, Fourier and Z transforms; transform methods for solving differential, difference and differential-difference equations; feedback networks; classical optimization techniques; search techniques; theory of graphs. (Fifth-year I. E. standing or permission of instructor)

Class 4, Credit 4

EIEI-550 **Safety Engineering**
Registration #0303-550
To acquaint students with practical aspects of safety engineering. Students will acquire a working knowledge of legal and technical aspects of safety. Recent developments in this area will be stressed, such as OSHA, Consumer Product Safety Commission, and the Federal Highway Safety Act Students will also be exposed to research methodology and ways of evaluating safety programs and related research. Reference sources will be oudined.

Class 4, Credit 4

EIEI-599 **Independent Study**
Registration #0303-599
A supervised investigation within an industrial engineering area of student interest. (Permission of instructor)

Class variable, Credit variable

EIEI-625 **Computer-Aided**
Registration #0303-625 **Manufacturing I**
To introduce the area of Computer Aided Manufacturing (past present and future). Emphasis will be placed on advantages/ disadvantages, methods, applications and availability of current systems. Topics include Numerical Control Language, Group Technology, Flexible Manufacturing Systems, Robotics, Automatic Process Planning and Adaptive Control. (Permission of instructor)

Class 4, Credit 4

EIEI-630 **Computer-Aided**
Registration #0303-630 **Manufacturing II**
To familiarize students in Industrial Engineering with the basic concepts and techniques needed to specify, design, and implement systems that are computer controlled. Emphasis is on real-time data acquisition and process control as related to Computer-Aided Manufacturing. Physical Simulations relate to real-world systems such as automated storage and retrieval systems, material handling systems, flexible manufacturing systems using robots. Topics include real-time programming, interface electronics, and microprocessor-based data acquisition systems and programmable controllers. (EIEI-503, permission of instructor)

Class 3, Lab 3, Credit 4

EIEI-690 **Seminar in Computer**
Registration #0303-690 **Integrated Manufacturing**
This course is designed to provide a broad overview of current technology and management practice and trends related to the evolving factory of the future. It is designed as a multi-disciplinary offering for upper-division undergraduate and graduate students enrolled in any RTT program. The course follows a seminar format Topics of discussion include Quality Assurance, Robots, CAD, Group Technology, MRP, Flexible Manufacturing Systems, Material Handling, and Systems Integration through Computer Application.

Class 3, Credit 3

Graduate Courses

The following courses are recommended as part of the Master of Engineering program in Industrial Engineering and Engineering Management They are offered on sufficient demand.

EIEI-620 **Engineering Economy**
Registration #0303-620
Time value of money, methods of comparing alternatives, depreciation and depletion, income tax consideration, replacement, retirement and obsolescence, and capital budgeting.

Credit 4

EDEI-715, 716 **Statistical Analysis for**
Registration #0303-715, 716 **Engineering I & II**
A basic two-quarter course in probability and statistics designed to give the student a foundation for further study in areas such as design of experiments, stochastic systems, and simulation.

Credit 4

The following courses can be used as part of the Master of Engineering program in Industrial Engineering and Engineering Management. The courses are generally offered in alternating years and/or as demand dictates.

EIEI-601 **Value Analysis**
Registration #0303-601
This course examines the nature and measurement of value. The concept and construction of a value index, representing average value is related. Numerical estimation methods such as ranking, pair comparison, magnitude estimation, and criteria analysis are explained and used to measure the value of diverse items. The methods used are applicable to the study of a wide variety of problems and have special utility in engineering design studies.

Credit 4

EIEI-701 **Principles of Operations**
Registration #0303-701 **Research I**
Applied linear programming. Computational techniques for solving constrained optimization problems. Linear programming, the Simplex method and variations, duality and sensitivity testing.

Credit 4

EIEI-702 **Mathematical Programming**
Registration #0303-702
Application of non-linear programming techniques. Classical optimization techniques; quadratic, stochastic, integer programming and dynamic programming. Applications to industry. (EIEI-701)

Credit 4

EIEI-705 **Survey of Operations**
Registration #0303-705 **Research**
A survey course designed to introduce the student to such topics as waiting line analysis, inventory, scheduling, replacement, and simulation. This course is intended to present an integrated view of the field of operations research to students who will take more specialized courses as well as those in other disciplines desiring only a limited exposure to the field.

Credit 4

EIEI-710 Systems Simulation
Registration #0303-710
Methods of modeling and simulating man-machine systems. Model validation, design of simulation experiments, variance reduction techniques, random number generation and distribution generation are discussed. However, emphasis is placed on the G. P. S. S. simulation language.

Credit 4

EIEI-718 Inventory Design
Registration #0303-718
Overview of inventory problems. Single period models under risk and uncertainty, dynamic models under certainty, dynamic models under risk and uncertainty. Forecasting, inventory system analysis.

Credit 4

EIEI-720 Production Control
Registration #0303-720
A systems approach to the design of production control operations. Investigation of forecasting, operations planning, inventory control, and scheduling. Case studies and the design of actual production systems is encouraged.

Credit 4

EIEI-723 Facilities Planning
Registration #0303-723
Principles of plant layout and material handling. Topics covered include criterion selection, cost elements, the layout design process, SLP, computerized plant layout and quantitative plant layout and material handling techniques relating to operations research.

Credit 4

EIEI-725 Technological Forecasting
Registration #0303-725
Technological forecasting is concerned with the Delphi method, SOON charts, trend extrapolation, relevancy trees, cross input analysis, internally consistent scenarios, and decision matrices. The course will provide a thorough introduction to the basic concepts and techniques of technological forecasting.

Credit 4

EIEI-730 Biotechnology and Human
Registration #0303-730 Factors I
Basic functional anatomy and physiology. Human body systems. Anthropometry. Applications on the design for man and man-machine systems. Work physiology, Industrial biomechanics.

Credit 4

EIEI-731 Biotechnology and Human
Registration #0303-731 Factors II
Effect of mechanical and physical environment on: physiology, behavior, performance of man. Design considerations to protect man against environmental effects (thermal environment, noise, vibration, acceleration, light, altitude).

Credit 4

EIEI-732 Biotechnology and Human
Registration #0303-732 Factors m
Theoretical fundamentals of human body mechanics. Development applications of biomechanics and biomechanical models. Kinematics of the link system of the body and extremity joints.

Credit 4

EIEI-733 Biotechnology and Human
Registration #0303-733 Factors IV
Measurements of human performance. Functions that man performs in man-machine systems. Techniques to quantify man's behavior at work.

Credit 4

EIEI-734 Systems Safety Engineering
Registration #0303-734
Accident study of the human component in occupational systems. Product systems safety analysis. Approaches in accident prevention.

Credit 4

EIEI-740 Numerical Control and
Registration #0303-740 Manufacturing
Numerical control is the technique of programming a machine (such as a mill) to manufacture a part with minimum operator interaction. Several levels of NC programming will be studied: manual programming, computer assisted programming and interactive graphics. Students will participate in extensive hands-on work using a mill and a lathe. In addition, the role that NC machines play in the Factory of the Past, Present, and Future will be discussed and analyzed.

Credit 4

EIEI-747 Microprocessor Applications
Registration #0303-747
Automated manufacturing processes demand effective computer-microprocessor interfacing. This course will provide the necessary knowledge of assembly language programming and digital hardware interfacing techniques. The role of macro-assembles, high level languages and system software aids to develop efficient modular programs will be discussed. One or more specific manufacturing related applications will be implemented. Microprocessor architectures and interfacing to several hardware elements such as VART, PIA *AID,* D/A and other LSI chips will be covered. A greater emphasis will be placed on software aspects such as modularity, data structures, interrupt handling, communication protocols to design efficient hierarchical control systems for Computer Integrated Manufacturing.

Credit 4

Special courses related to a particular student's interest can be arranged via the following course:

EIEI-771, 772, 773, 774, 775 Special Topics in Industrial
Registration #0303-771, 772, Engineering
773,774,775
This is a variable credit, variable topics course which can be in the form of regular courses or independent study under faculty supervision.

Credit variable (maximum 4 per course number)

EENG-777 Engineering Internship
Registration #0302-777
This course number is used by students in the master of engineering degree program for earning internship credits. The actual number of credits is to be determined by the student's faculty advisor and subject to the Graduate Committee of the College of Engineering.

Credit variable

EENG-801 Design for Manufacture
Registration #0302-801
This is a required course in the manufacturing option of the Master of Engineering degree program. The course is offered jointly by the departments of Industrial and Mechanical Engineering and presents an overview of the factors influencing product design and the manufacturing cycle. Topics include component design and analysis, design for manufacturability as well as function and design for manual and automated assembly. Students will gain hands-on experience with the Boothroyd/Dewhurst system to quantify design efficiency through a term project. The various manufacturing processes as they relate to modern trends in DFM are covered in detail.

Class 4, Credit 4 (W)

Mechanical Engineering

The prerequisites are listed after each course description. A course which does not list a prerequisite may be taken by any student matriculated in the BSME program. When senior- or upper-level standing is specified as prerequisite, it means such standing in the BSME program.

EMEM-210 Introduction to Graphics
Registration #0304-210
The freshman course is designed to introduce the student to engineering in general and also to develop fundamental skills in engineering graphics communications. The course is intended for students with little or no engineering drawing experience. Students having engineering drawing experience in school or the equivalent may take a qualifying examination for an exemption from this course. The course work conforms to A.N.S.I. standards.

Class 2, Lab 2, Credit 3 (F, W)

EMEM-310 Advanced Graphics
Registration #0304-310
A continuation of engineering graphics to study intermediate topics. The topics studied are auxiliary views, geometric dimensioning and tolerancing, tolerances of form, mating part fits, shop processes, working and assembly drawings. Several classes are devoted to an introduction to computer graphics. The course work conforms to A.N.S.I. standards. (EMEM-210 or equivalent)

Class 2, Lab 4, Credit 4 (W, S)

EMEM-331 Mechanics I
Registration #0304-331
This course is intended for students majoring in electrical and industrial engineering. Statics: Newton's Laws, the principle of transmissibility of forces, couples, centroids, trusses, frames, machines, and friction. Introduction to strength of materials: axial stresses and strains, statically indeterminate problems, thin-walled pressure vessels, direct shear, torsion, and bending. (Prerequisite: SPSP-311; corequisite: SMAM-253)

Class 4, Credit 4 (F, W)

EMEM-332 Mechanics II
Registration #0304-332
This course is meant for students majoring in industrial engineering. Topics include dynamics of particles and rigid bodies with an introduction to mechanical vibrations, kinematics and kinetics of particles and rigid bodies, work, energy, impulse momentum, and vibrations. Emphasis is on problem solving (EMEM-331)

Class 4, Credit 4 (S)

EMEM-335 Elements of Statics
Registration #0304-335
This two credit-hour course is intended as an introduction to the principles of statics for non-mechanical engineering students with a view to providing adequate background for a subsequent course in dynamics. This basic course treats the equilibrium of particles and rigid bodies under the action of forces. Topics include forces, couples, equilibrium, centroids, and friction. (Prerequisite: SPSP-311; corequisite: SMAM-253)

Class 2, Credit 2 (W)

EMEM-336 Statics
Registration #0304-336
This basic course treats the equilibrium of particles and rigid bodies under the action of forces. It integrates the mathematical subjects of calculus, vector algebra, and simultaneous algebraic equations with the physical concepts of equilibrium. Topics covered include concepts of force and moment, trusses, frames, machines, shear force and bending moment diagrams and equations, friction, fluid statics, centroids and moments of inertia. (Prerequisite: SPSP-311 and SMAM-252; corequisite: SMAM-253 and SMAM-305)

Class 4, Credit 4 (SR, F)

EMEM-337 Strength of Materials I
Registration #0304-337
This basic course in statics of deformable bodies integrates fundamentals of mathematics with those of physics to study the mechanics of deformation of solids in equilibrium. Topics covered include stress-strain relationships, stresses and strains due to axial loads, torsion and bending moments. (EMEM-336)

Class 3, Lab/Rec. 2, Credit **4** (W)

EMEM-338 Strength of Materials II
Registration #0304-338
A continuation of Strength of Materials I to include pressure vessels, superposition of stresses, transformation of stress, Mohr's Circle, failure theories, energy techniques, and column theory. (EMEM-337)

Class 3, Lab/Rec. 2, Credit **4** (S, F)

EMEM-341 Introduction to FORTRAN
Registration #0304-341 Programming
This course introduces the students to the fundamentals of programming through the learning of the FORTRAN language. Topics covered include structured programming techniques using sequential IF-THEN-ELSE and DO WHILE structures. Various forms of the input/output are learned including formatted I/O and END-OF-FILE detection. Writing programs using Function and Subroutine subprograms is stressed. Proper documentation techniques along with efficient usage of the computer systems is also covered.

Class 2, Credit 3 (S)

EMEM-343 Materials Processing
Registration #0304-343
This course involves a study of the application of machine tools and fabrication processes to engineering materials in the manufacture of products. Topics covered include cutting processes, casting, forming, powder metallurgy, welding, and processing of plastics.

Class 3, Lab 2, Credit **4** (F, W)

EMEM-344 Materials Science
Registration #0304-344
This course deals with the structure and properties of metallic, organic, and ceramic materials as related to structural imperfections, atom movements, and phase changes. The intent of the course is to develop a basic understanding of the structure/properties relationship in materials and their behavior in service environments. (SCHG-208)

Class 3, Lab 2, Credit **4** (W, S)

EMEM-349 Elements of Dynamics
Registration #0304-349
This is a basic course for non-mechanical engineering students in the fundamentals of dynamics of particles and rigid bodies with introduction to mechanical vibrations. Topics include kinematics and kinetics of particles and rigid bodies, work, energy, momentum and vibrations. (EMEM-331 or EMEM-335)

Class 3, Credit 3 (W, S)

EMEM-410 Three-Dimensional
Registration #0304-410 Computer-Aided Design
This is an elective course which introduces third-year mechanical engineering students to three-dimensional computer-aided design using the Integraph CAD system. Topics include design file creation and manipulation, element construction and manipulation, levels, text placement, cells, graphic groups and working sets, and dimensioning. A student completing this course becomes an experienced system user and qualified for related co-op work and/or further study of the interactive analysis software packages. (EMEM-310)

Class 3, Lab 2, Credit 4 (offered on sufficient demand)

EM EM-413 Thermodynamics I
Registration #0304-413
This is a basic course that introduces the classical theory of thermodynamics. After the complete first law analysis of air standard cycles (Carnot, Otto, Diesel, etc.) the Clausius and Kelvin-Planck statements of the second law are correlated with the concept of entropy. Both real and reversible processes are studied on the pressure vs. specific volume and the temperature vs. entropy coordinate systems. Also, the students are introduced to the properties of pure substances, and open systems. (SMAM-306, EMEM-336)

Class 4, Credit 4 (F, W)

EM EM-414 Thermodynamics II
Registration #0304-414
The second thermodynamics course begins with a study of phase space and the properties of real gases, liquids and solids. Using a control volume analysis, we use the basic fluid properties, the first and second law of thermodynamics to study and design gas turbine power plants, steam power plants, and vapor compression refrigeration systems. The properties of gaseous mixtures and combustion shall also be considered. (EMEM-413)

Class 3, Lab/Rec. 2, Credit 4 (S, SR)

EMEM-415 Fluid Mechanics I
Registration #0304-415
Physical characteristics of a fluid: density, stress, pressure, viscosity, temperature, vapor pressure, compressibility. Descriptions of flows: Lagrangian and Eulerian; stream lines, path lines, streak lines. Classification of flows. Fluid Statics: hydrostatic pressure at a point, pressure field in a static fluid, manometry, forces on submerged surfaces, buoyancy, standard and adiabatic atmospheres. Flow fields and fundamental laws: the flux vector, systems and control volumes, Reynolds Transport theorem, integral control volume analysis of basic equations for stationary and moving control volumes. Inviscid Bernoulli and the Engineering Bernoulli equations, some applications. Incompressible flow in pipes; Laminar and turbulent flows, separation phenomenon. Dimensional analysis: Buckingham's Pi-theorem, similitude,, model studies. (EMEM-413)

Class 3, Lab/Rec. 2, Credit 4 (S, SR)

EM EM-431 Thermodynamics
Registration #0304-431
A basic course in thermodynamics and heat transfer for Electrical Engineering students. Applications of the first and second law to closed and open systems; elementary heat transfer considerations for electrical engineers. (SPSP-312)

Class 4, Credit 4 (F, W, W—Ext day schedule)

EMEM-437 Introduction to Machine
Registration #0304-437 Design
The analysis and theory of machine design and applications to systems design problems; particular emphasis is placed on the design and analysis of machine elements. A discussion of engineering professionalism and ethics. (EMEM-338)

Class 4, Credit 4 (F, W)

EMEM-439 Dynamics
Registration #0304-439
A basic course in the plane kinematics and kinetics of particles, and plane kinematics of rigid bodies. Newton's Laws, the Energy Method, and the Method of Impulse-Momentum are applied to a variety of particle problems. Systems of particles are used to introduce the student to rigid bodies. Absolute and relative motion are used to investigate the kinematics of systems of rigid bodies. (EMEM-336, SMAM-306)

Class 4, Credit 4 (S, SR)

EMEM-440 Numerical Methods
Registration #0304-440
This course involves a study of the numerical methods for modelling and solving engineering problems using computers, and to interpret and analyze the numerical results obtained. Topics include roots of algebraic and transcendental equations, solutions of homogeneous and non-homogeneous systems of linear algebraic equations, numerical integration and differentiation, and ordinary differential equations. Problems will be taken from the student's background in statics, strength of materials, dynamics, mathematics and thermodynamics. Students are expected to write a number of programs. (EMEM-341 or equivalent computer experience, SMAM-306, and third-year standing)

Class 4, Credit 4 (S, SR)

EMEM-501 Mechanical Engineering
Registration #0304-501 Laboratory
A course in instrumentation and mechanical measurement techniques, with emphasis on laboratory experiments to verify and extend the lecture material. Topics include the generalized theory of instrumentation systems for mechanical measurements including static and dynamic output characteristics of first and second order measurement systems and theory and methods of processing the output of these transducer elements. Also discussed are methods of determining and handling experimental uncertainty including accuracy and precision of instruments, propagation of error, and statistical evaluation of experimental results. Laboratory work utilizes various types of instrumentation to provide the student with first-hand experience in the calibration of instruments, error analysis, and determining the static and dynamic response characteristics of instrumentation systems. (EMEM-440, EMEM-514, EMEM-516, and EMEM-543)

Class 3, Lab 2, Credit 4 (F, W)

EMEM-514 Heat Transfer I
Registration #0304-514
This is a basic course in the fundamentals of heat transfer by conduction, convection, and radiation, together with applications to typical engineering systems. Topics covered include one-dimensional steady state and transient heat conduction, radiation between black bodies and gray bodies, correlations for the Nusselt number in forced and natural convection, and an introduction to heat exchanger design by LMTD and NTU methods. (EMEM-413)

Class 4, Credit 4 (F, W)

EMEM-516 Fluid Mechanics D
Registration #0304-516
This course is a continuation of Fluid Mechanics I. However, the analysis is developed with emphasis on the differential rather than the integral approach. Continuity and momentum equations in differential form: vorticity, fluid rotation and viscosity. Integration of Euler's equation along a streamline for steady flow. Parallel Flows: Analytical solution of Plane Poiseuille, Couette, and pipe flows. Pipe design: Major and minor head loss, pipe-line problems. Boundary layer concepts elucidated from vorticity transport and order analysis. Boundary layer thicknesses, Von-Karman momentum integral equation and solutions for laminar and turbulent boundary layers over a flat plate. Pressure and friction drag, streamlining. Lift and drag calculations for external flow. One-dimensional compressible flows: review of thermodynamic fundamentals, stagnation properties, speed of sound, mach cones, critical mach number, nozzle flows, normal shock waves. (EMEM-415, SMAM-306)

Class 3, Lab/Rec. 2, Credit 4 (F, W)

EMEM-543 **Response of Dynamic Systems**
Registration #0304-543
This course deals with the plane kinetics of rigid bodies, the modeling of lumped parameter systems, and the system reponse of first- and second-order systems. Newton's Laws, the work-energy principle, and the method of impulse-momentum are applied to a variety of rigid body problems. The dynamics of mechanical, electrical, thermal, and fluid lumped parameter systems are investigated. Mathematical models of first- and second-order systems are defined and used to study their system response. A laboratory associated with the course introduces students to the use of the ACSL software. Students are required to generate ACSL models and execute them for various system parameters. Various particle and rigid body dynamics experiments also are included. (EMEM-439)

Class 3, Lab/Rec. 2, Credit 4 (F, W)

EMEM-599 **Independent Study**
Registration #0304-599
An assigned project encompassing both analytical and experimental work integrating the student's education in mechanical engineering. (Upper-level standing)

Class variable, Credit variable (F, W, S, SR)

Group I Courses

EMEM-605 **Applications in Fluid**
Registration #0304-605 **Mechanics**
This Group I course deals with specific design-oriented applications of fluid mechanics. The course will cover one of the following topics: (a) hydrodynamics, (b) dispersion and diffusion in the environment, (c) aerodynamics, and (d) two-phase flows. Students are required to design, and sometimes to build a prototype. Use of digital computer is encouraged in the design process. (EMEM-440, EMEM-516, EMEM-514)

Class 4, Credit 4 (F, W)

EMEM-615 **Robotics**
Registration #0304-615
This is an applied course in the fundamentals and applications of industrial robots. Topics include microprocessors, computer vision, drive systems, sensors, gripper design, safety, economics, design for assembly, flexible manufacturing systems, and case studies. A major emphasis is placed in a term project involving an actual industrial problem. (EMEM-437, EMEM-440, and EMEM-543)

Class 4, Credit 4 (F, W)

EMEM-618 **Computer-Aided Engineering**
Registration #0304-618 **and Design**
This course introduces the mechanical engineering student to the procedures and techniques used to integrate the computer into the engineering and design cycle. The student is exposed to the computer hardware and software used in mechanical design, that is, mechanical drawing, solids modeling, finite elements, etc. The student will use software on the academic computing system, the Intergraph CAD laboratory, and personal computers. Concepts associated with the design of interactive graphics display programs for design applications will be presented. A design project is selected from one or more of the topics covered. (EMEM-437, 440, 543)

Class 3, Lab 2, Credit 4 (S)

EMEM-635 **Heat Transfer H**
Registration #0304-635
The course considers numerical solution of heat transfer problems requiring the use of digital computer programming. It also investigates forced and natural convection heat transfer to single phase fluids and fluids with phase change. It includes a major design project, homework assignments, one hour classroom tests and a comprehensive final examination. (EMEM-440 and EMEM-514)

Class 3, Lab 2, Credit 4 (S, SR)

EMEM-652 **Fluid Mechanics of**
Registration #0304-652 **Turbomachinery**
This course examines the basic principles applicable to all turbomachinery as well as the consideration of the operating and design characteristics of several basic classes of turbomachinery. It includes a major design project, homework assignments, one hour classroom tests and a comprehensive final examination. (EMEM-415, EMEM-413)

Class 4, Credit 4 (S, SR)

EMEM-658 **Engineering Vibrations**
Registration #0304-658
A design-oriented course in mechanical vibrations and noise control with emphasis on design applications and instrumentation. Free and force vibrations of one-degree of freedom systems are covered including machinery unbalance and isolation, Fourier Analysis, numerical and experimental analysis and design methods. Modal analysis of multi-degree of freedom systems is introduced. Industrial acoustics and noise control techniques are also covered. In addition to laboratory exercises in each area of vibration, a design project is assigned. (EMEM-543)

Class 3, Lab 2, Credit 4 (F, W)

EMEM-660 **Refrigeration and Air**
Registration #0304-660 **Conditioning**
A basic course in the principles and applications of refrigeration and air conditioning involving mechanical vapor compression and absorption refrigeration cycles, associated hardware, psychrometrics, solar radiation, heat transmission in buildings, and thermodynamic design of air conditioning systems. Students are expected to do a design project. (EMEM-414, EMEM-514)

Class 4, Credit 4 (S)

EMEM-672 **Dynamics of Machinery**
Registration #0304-672
This course treats the fundamentals of dynamic design of machinery. Topics include dynamic analysis of mechanisms, graphical kinematics, the method of virtual work applied to dynamical systems, cam design and balancing. The digital computer and machine plotting are used. A major emphasis is placed on a term project (EMEM-543)

Class 4, Credit 4 (S, SR

EMEM-694 **Stress Analysis**
Registration #0304-694
This course deals with numerical and experimental analyses of stressed mechanical components. The governing state properties are reviewed and definitions and relationships between stress, strain, and deformations; two- and three-dimensional coordinate transformations are discussed. The Finite-Element method is introduced and the student is presented with simple instructional software programs which demonstrate the Finite-Element analysis and computer graphic pre- and post-processing of data files. Commercial Finite-Element programs are discussed and demonstrated. A design project is assigned. Experimental methods are presented including strain gages, photoelasticity, and brittle coating. (EMEM-437 and EMEM-440)

Class 4, Credit 4 (S, SR)

Group II Courses

EMEM-608 **Thermal Fluids Design &**
Registration #0304-608 **Engineering Management**
The course consists of an open-ended thermal fluids system design project and classroom lectures and discussion of engineering organizational and management practices. (EMEM-414, 440, 516 and either EMEM-635 or 652)

Class 4, Credit 4 (F, W)

EMEM-610 **Thermal Fluids Design** *Se*
Registration #0304-610 **Optimization**
The course consists of an open-ended thermal fluids system design project and classroom lectures and discussion of the optimization of thermal fluid systems both from a design and operational viewpoint (EMEM-414, 440, 516 and either EMEM-635 or 652)

Class 4, Credit 4 (S)

EMEM-620 **Introduction to Optimal**
Registration #0304-620 **Design**
This course is an introduction to some basic optimization techniques for engineering design synthesis. Topics covered include: basic concepts, the general problem statement, necessary conditions of optimization, numerical techniques for unconstrained optimization, constrained optimization through unconstrained optimization, and direct methods. Numerical solutions are obtained by interfacing with available software. A major design project is required. (EMEM-440, EMEM-543, EMEM-437)

Class 4, Credit 4 (F, W)

EMEM-625 **Creative Design of**
Registration #0304-625 **Mechanical Devices and Assemblages**
A study of basic techniques of creative design, and how to stimulate creative action in mechanical design. The course will include presentation of examples from industrial applications. There will be a significant portion devoted to ***WAIVE*** activities and there will be a project relating to this. Both group and individual activities will be covered. Techniques for establishing design goals will be explored as well as methods for measuring achievement of these goals. A key concept covered by the course is selection of optimum configuration in cases where several viable ideas have been generated. (EMEM-543, EMEM-437)

Class 4, Credit 4 (TBA)

EM EM-632 **Advanced Mechanical**
Registration #0304-632 **Systems Design**
Procedures and techniques for designing complex dynamic mechanical systems are presented. Students apply these principles to the design of a specific system while working in small design groups. Each group may be assigned an independent design or a subsystem as part of design project assigned to the class. Determination of functional needs to meet system specifications, conceptual design, value analysis and evaluation of alternatives and computerized design are topics specifically covered for the systems related open-ended design problem. Knowledge from basic mathematics and engineering science is integrated with conceptual reasoning and practical aspects in solving the design problem. The professionalism and ethics of engineering are discussed. (EMEM-437, EMEM-440, EMEM-543, and EMEM-672 or EMEM-694)

Credit 4 (F,W,S)

Elective Courses

These are offered at least once every three years.

EM EM-637 **Laser Engineering**
Registration #0304-637
Laser Engineering studies the applications of lasers as engineering tools. Background physics relevant to the operation of a laser and the interaction of light with matter is given. Safety regulations are discussed and specific applications in industry are covered. (SPSP-314)

Class 4, Credit 4 (S, SR)

EMEM-643 **Control Systems**
Registration #0304-643
This course uses the background developed in Response of Dynamic Systems to study the control of various systems. Topics include transfer functions, Laplace Transforms, feedback controls, and control system design and modeling using the graphical methods of Root Locus and Bode Plots. A laboratory associated with the course reinforces the basic control principles presented in the classroom. (EMEM-543)

Class 3, Lab/Rec. 2, Credit 4 (S, SR)

EMEM-650 **Gas Dynamics**
Registration #0304-650
An intermediate course in compressible fluid flows. One-dimensional isentropic flows through a nozzle, normal shocks, moving shocks, shock tubes, supersonic inlets, diffusers, wind tunnels. Oblique shocks and applications. Prandtl Meyer expansion fan and reflections of shocks. Two- and three-dimensional compressible flows. Theory of characteristics. Linearized flows. Thin airfoil theory, supersonic nozzle design. (EMEM-516)

Class 4, Credit 4 (TBA)

EMEM-651 **Viscous Flows**
Registration #0304-651
A course in fluid mechanics covering incompressible laminar and turbulent boundary layers. General properties of Navier-Stokes equations, some exact solutions. Boundary layer equations, some exact and approximate solutions for two-dimensional steady flows. Boundary layer controls. Three-dimensional boundary layers. Transition of boundary layers. Theories of turbulence. (EMEM-516)

Class 4, Credit 4 (TBA)

EMEM-680 **Advanced Thermodynamics**
Registration #0304-680
This course involves an in depth study of the second law of thermodynamics and its consequences. The course further deals with thermodynamics of reacting and non-reacting mixtures, chemical equilibrium, thermochemistry, Nernst theorem, and Onsager relations. (EMEM-414)

Class 4, Credit 4 (TBA)

EMEM-685 **Advanced Strength of**
Registration #0304-685 **Materials**
Statically indeterminate problems for beams; frames; continuous beams; beams of variable cross section, reinforced-concrete beams; beams on elastic foundation; stability of columns; plastic deformation in bending and torsion; limit analysis; energy methods with applications to beams, curved bars, and frames; rotating disks; introduction to composite materials. (EMEM-437 and EMEM-440)

Class 4, Credit 4 (TBA)

EMEM-687 **Engineering Economy**
Registration #0304-687
This elective course deals with a study of cost concepts, nominal and effective interest rates, and selection among alternatives using present annual, and future worth methods as well as rate of return methods. Depreciation and income taxes are also considered. (Fifth-year standing)

Class 4, Credit 4 (TBA)

EMEM-690 Environment and the Engineer
Registration #0304-690
This course will study the role of engineers in society and in particular their responsibility in the analysis and solution of the problems facing the environment in an increasingly technological society. Problems to be studied from a "case study" standpoint will include such things as air, water, and noise pollution, thermal pollution, and the effects of population growth. The course will include field trips, outside expert speakers, and each student will be expected to participate in the in-depth study of one problem of particular interest to him or her and to submit a formal report to the class. Use of the digital and analog computing facilities as a systems simulation tool will be encouraged. (Senior standing in engineering)

Class 4, Credit 4 (TBA)

EMEM-692 Analysis for Engineers
Registration #0304-692
Partial differentiation, chain rule, total differential and optimization problems; multiple integration and manipulation of multiple integrals; linear constant coefficient ordinary differential equations; matrix algebra; and vector calculus or complex variables. (SMAM-306 or equivalent)

Credit 4 (F)

EMEM-698 Independent Study Design Project
Registration #0304-698
This is a design-oriented independent study requiring a major design project (Senior standing)

Credit 4

Graduate Courses

The courses EMEM-870, EMEM-871, EMEM-872, EMEM-874 and EMEM-877 are offered every year. The other courses (except those listed as "offered on sufficient demand") are typically offered every other year.

EENG-801 Design for Manufacture
Registration #0302-801
This is a required course in the manufacturing option of the master of engineering degree program. The course is offered jointly by the Departments of Industrial and Mechanical Engineering and presents an overview of the factors influencing product design and the manufacturing cycle. Topics include component design and analysis, design for manufacturability as well as function, and design for manual and automated assembly. Students will gain hands-on experience with the Boothroyd/Dewhurst system to quantify design efficiency. This includes a project. The various manufacturing processes as they relate to modern trends in DFM are covered in detail. (Graduate standing)

Class 4, Credit 4 (every year, W)

EMEM-810 Introduction to Continuum Mechanics
Registration #0304-810
A rigorous basis for the study of advanced fluid mechanics and theory of elasticity is presented. Cartesian tensors. Analysis of stress and deformation. Motion of a continuous medium. Applications to theory of elasticity, thermoelasticity, viscoelasticity, and fluid mechanics. (EMEM-871)

Class 4, Credit 4 (even year, F)

EM EM-811 Theory of Elasticity
Registration #0304-811
Stress-strain relations and formulation of boundary value problems. State of plane strain, state of plane stress. Solutions by potentials, Airy stress function. Torsion of bars with circular, elliptic, rectangular cross-sections. Stresses and displacements in thick cylinders, disks, and spheres. Contact stress problems. Energy principles. (Graduate standing)

Class 4, Credit 4 (every year, W)

EMEM-812 Theory of Plates and Shells
Registration #0304-812
Theory of thin plates for small deflections. Rectangular and circular plates with various boundary conditions, elliptic and triangular plates. Navier and Levy solutions. Thermal stress in plates. Membrane theory of shells. Cylindrical shells and shells of revolution. (EMEM-685 or equivalent)

Class 4, Credit 4 (odd year, S)

EMEM-813 Theory of Plasticity
Registration #0304-813
The analysis of stress and strain. Criteria for yielding. Stress-strain relations of the theory of plasticity. Elastoplastic problems of spheres and cylinders. Torsion, Creep. (Graduate standing)

Class 4, Credit 4 (even year, W)

EMEM-815 Experimental Stress Analysis
Registration #0304-815
Experimental methods of analysis of structural machine members, including strain gages and instrumentation, photoelastic methods, brittle coating, Moire fringe method, holographic techniques; and the hydrodynamic, electrical, and membrane analogs. Different methods will be demonstrated. (EMEM-694 or equivalent)

Class 4, Credit 4 (even year, S)

EMEM-816 Finite Elements
Registration #0304-816
Boundary value problems in mechanical engineering are discussed and presented through the development of the governing field equations of a continuum in structural mechanics, heat transfer and fluid mechanics. The process of discretization of a continuum by the finite element method is presented using energy principles, and applied to the field equations outlined above. In the course of application, various line, surface, and solid elements are defined and developed. Numerical considerations presented include topics such as solution time, optimization, condensation methods, computer characteristics, etc. Commercial codes such as NASTRAN, ANSYS, GIFTS, and SAP will be discussed. However, the students will solve problems using fundamental approaches that will involve hand calculations and writing some individual computer programs. (EMEM-870, EMEM-871, EMEM-440 or equivalent)

Class 4, Credit 4 (every year, F)

EMEM-820 Advanced Optimal Design
Registration #0304-820
Topics from nonlinear programming as applied to automated optimal design. Use of penalty functions for the transformation of constrained nonlinear optimization problems. Multivariate pattern and gradient based algorithms, such as the method of steepest descent, Newton's method, quasi-Newton methods, and generalized conjugate gradient techniques. Algorithms for the univariate subproblem of the line search. Applications to the solution of practical nonlinear optimization problems using the digital computer. (EMEM-871 and EMEM-874)

Class 4, Credit 4 (odd year, S)

EMEM-821 Vibration Theory and Applications
Registration #0304-821
Vibration of discrete multi-mass systems using matrix methods. Normal mode theory, and matrix eigenvalue extraction procedures. Matrix forced response. Practical examples using two-and-three degrees of freedom. Vibration of continuous systems. Computer simulations. (EMEM-871, EMEM-874)

Class 4, Credit 4 (every year, S)

EMEM-823 **Applied System Dynamics**
Registration #0304-823
Review of ordinary differential equations and their applications to the mathematical modeling of dynamic systems. The LaPlace and Fourier transforms and their applications to the modelling of dynamic systems both experimentally and analytically. The known input-known output concept and the transfer function concept for system identification. Overview of analytical and experimental methods to obtain the dynamic characteristics of mechanical systems. Deterministic versus Stochastic inputs. Auto-correlation and cross-correlation functions and their Fourier Transforms. Stationary and non-stationary processes. The Frequency Response Function (FRF) and its relationship with the Transfer Function. Instrumentation and sensors: accelerometers, velocity sensors, displacement sensors, shakers, vibration tables, power amplifiers, force sensors, signal generators, signal conditioning devices, and data acquisition systems. Mid-term exam. Data reduction and analysis of results. Curve fitting techniques. Graphical techniques, Bode and Nyquist plots. Time domain versus frequency domain. The use of Model Analysis software and its advanced simulation features. Non-linear systems, feedback control applications, or other areas of interest for the students. Laboratory experience consisting of understanding and using frequency analyzers to determine the FRF, experimental setup, and data gathering procedure for the identification of the dynamic characteristics of a mechanical system or structure. Presentation of term projects. (Graduate standing)

Class 4, Credit 4 (every year, F)

EMEM-827 **Computer Graphics in Design**
Registration #0304-827
The course emphasizes the current role of computer graphics in computer-assisted design and design analysis. Subjects include: components of CAD systems, methods of geometric modeling, visualization methods, techniques of interactive communication, and design applications utilizing available software packages for multidimensional graphic display, pre- and post-processing modelers for finite element analyses, and three-dimensional solids modeling. (Graduate standing)

Class 4, Credit 4 (even year, S)

EMEM-828, 829 **Special Topics in Applied I**
Registration #0304-828, 829 **Mechanics**
In response to student and/or faculty interest, special courses which are of current interest and/or logical continuations of regular courses will be presented. These courses will be structured as ordinary courses with specified prerequisites, contact hours, and examination. A listing of topics for special courses is found at the end. (Graduate standing)

Credit variable (maximum of 4 credits/quarter) (TBA)

EMEM-833 **Heat Exchanger Design**
Registration #0304-833
This course covers analytical models for forced convection through tubes and over surfaces, experimental correlations for the Nusselt number and pressure drop, design of single and multiple pass shell and tube heat exchangers; compact baffled, direct contact, plate, and fluidized bed heat exchangers; radiators, recuperators, and regenerators. (EMEM-514 and instructor's approval)

Class 4, Credit 4 (odd year, W)

EMEM-838 **Ideal Flows**
Registration #0304-838
This graduate course introduces the students to the analysis of ideal flows from an advanced mathematical as well as engineering viewpoint Steady acyclic motion, superposition of flows, vorticity dynamics; the theory of complex variables; airfoil and wing theories. (EMEM-871, EMEM-516 or equivalent)

Class 4, Credit 4 (every year, S)

EMEM-848, 849 **Special Topics in Thermo**
Registration #0304-848, 849 **Fluid Systems**
In response to student and/or faculty interest, special courses which are of current interest and/or logical continuations of regular courses will be presented. These courses will be structured as ordinary courses with specified prerequisites, contact hours, and examination. A listing of topics for special courses is found at the end. (Graduate standing)

Credit variable (maximum of 4 credits/quarter) (TBA)

EMEM-864 **Production Tool Design**
Registration #0304-864
This is a course in the core group, CAD, of the manufacturing engineering option in the master of engineering degree program. Design of production tooling, jigs and fixtures for the economical manufacture of modern parts is covered in detail. The student must do research in current publications, and complete and present a project. Project selection can usually be arranged to incorporate an assembly of parts from the student's normal work. There will be field trips to local specialty firms. (Graduate standing)

Class 4, Credit 4 (even year, F)

EMEM-865 **Computer Implementation**
Registration #0304-865 **of Finite Elements**
This is a course in the core group, CAD, of the manufacturing engineering option in the master of engineering degree program. This course emphasizes the application of the finite element method to problems in the area of static and dynamic structural analysis, heat transfer, and analogous solutions. A standard commercial software package is used for these applications where the general structure, operating characteristics, and use of a complex program are presented. Topics include: the finite element method; shape factors, element formulations, and the element library; program sequencing, general modeling methods (loads, constraints, material factors, mesh generation, interactive graphics, model conditioning, etc.); convergence, error analysis, and the "patch" test; vibration and heat transfer analysis, and analogous analysis such as acoustics, illumination, etc. (EMEM-816)

Class 4, Credit 4 (odd year, W)

EMEM-870 **Mathematics for Engineers I**
Registration #0304-870
A concise introduction to the concepts of matrix and linear algebra, including determinants, eigenvalues, systems of linear equations, vector spaces, linear transformations, diagonalization, orthogonal sub-spaces and the Gram-Schmidt orthonormalizing procedure. (Graduate standing)

Class 4, Credit 4 (every year, F)

EMEM-871 **Mathematics for Engineers II**
Registration #0304-871
Topics covered are orthogonal functions including Fourier Series, Fourier Integrals, Bessel functions, Legendre Polynomials, Sturn-Liouville problems and eigenfunction expansions; an introduction to calculus of variations, including problems with constraints; vector analysis including the directional derivative, the gradient, Green's Theorem, the Divergence Theorem and Stokes' Theorem. (Graduate standing)

Class 4, Credit 4 (every year, F, W)

EMEM-872 **Mechanics**
Registration #0304-872
Variational principles are developed and applied to the area of solid mechanics. Exact and approximate solution techniques are applied to the solutions of static and dynamic structural problems. Although static analysis is emphasized, dynamic problems will be introduced. Topics presented include: Calculus of Variations, Virtual Work, minimum potential energy, Castigliano's method, the Rayleigh-Ritz method, Galerkin's method. Hamilton's principle, and Lagrange's equations. (EMEM-871 and EMEM-543 or equivalent)

Class 4, Credit 4 (every year, W)

EMEM-873 **Convective Heat Transfer**
Registration #0304-873
This course deals with mechanisms and applications of forced convection heat transfer. Governing equations are analyzed and applied to practical situations such as single phase heat transfer during flow inside tubes, cooling of electronic components, flow boiling, and augmentation of single phase and two phase heat transfer. (EMEM-877)

Class 4, Credit 4 (odd year, F)

EMEM-874 **Numerical Analysis**
Registration #0304-874
The course emphasizes both the development of the current numerical methods that are available to solve engineering problems and the use of the digital computer to implement these techniques. The methods are developed for Algebraic and transcendental equations in single variable; system of linear algebraic equations by both direct and iterative techniques; system of nonlinear equations, interpolation and approximation theory; numerical differentiation and integration, initial value problems for ordinary differential equations; boundary value problems for ordinary linear and nonlinear differential equations; and partial differential equations; discussion on convergence and stability of methods, effect of truncation and round off errors. Extensive use of the computer will be required. (Graduate standing; knowledge of FORTRAN, experience in the use of digital computers and EMEM-870)

Class 4, Credit 4 (every year, W)

EMEM-877 **Fluid Dynamics**
Registration #0304-877
This is an introductory course at the graduate level in fluid dynamics intended to give the students a broad exposure to incompressible flows. This course lays the foundation, and is a prerequisite for a study of advanced topics in heat transfer, advanced aerodynamics, computational fluid dynamics, wave mechanics, and geophysical fluid dynamics. This course includes conservation laws and boundary conditions, potential flows, highly viscous flows, boundary layer theory, flow stability and transition to turbulence. (EMEM-871, Graduate standing)

Class 4, Credit 4 (every year, W)

EMEM-880 **Independent Study**
Registration #0304-880
An opportunity for the advanced student to undertake an independent investigation in a special area under the guidance of a faculty member. A written proposal is to be forwarded to the sponsoring faculty member and approved by the department head prior to the commencement of work. (Graduate standing)

Credit variable (maximum of 4 credits/quarter)
(every year, F, W, S)

EMEM-890 **Thesis, Design Project, or**
Registration #0304-890 **Literature Search**
In conference with an advisor, a topic is chosen. The work may involve a thesis, design project, or literature search. Periodic progress reports and a final written document with an oral examination are required. (Four of the five graduate core courses)

Credit variable (5 to 12 credits total) (F, W, S, SR)

SESM-701 **Introduction to Materials**
Registration #1028-701 **Science**
The course provides an understanding of the relationship between structure and properties for development of new materials. Topics include: atomic and crystal structure, crystalline defects, diffusion theories, strengthening mechanisms, ferrous alloys, cast irons, structure of ceramic and polymeric materials, and corrosion principles. (SCHG-208 or equivalent)

Class 4, Credit 4 (every year, F)

SESM-710 **Properties and Selection of**
Registration #1028-710 **Engineering Materials**
This course deals with effective material selection which requires that a designer be familiar with many material systems and be acquainted with a nominal number of specific materials in these systems. The course contains theory not found in handbooks and practical information not covered in materials science or metallurgy courses. Emphasis is placed upon the application of materials according to the properties and principles of material behavior. Ferrous, nonferrous and nonmetallic materials are covered. (SESM-701 or equivalent)

Class 4, Credit 4 (TBA)

Special topic courses will be offered in the following areas if there is a sufficient demand:

Energy Methods in Mechanics
Advanced Vibration Theory
Lubrication
Advanced Heat Transfer
Advanced Thermodynamics
Control Systems
Thermal Stresses
Aerodynamics
Wave Mechanics
Computational Fluid Dynamics
Geophysical Fluid Dynamics

Microelectronic Engineering

EMCR-201 **Introduction to**
Registration #0305-201 **Microelectronics**
This course will provide the student with introductory and career information about the profession of microelectronic engineering. Students use the Integrated Circuit Facility for the laboratory portion of the course.

Class 3, Lab 3, Credit 4 (F)

EMCR-215 **Introduction to**
Registration #0305-215 **Microelectronics—Transfer**
This course contains approximately 75 percent of the material covered in EMCR-201 and EMCR-350. For transfer students.

Class 3, Lab 3, Credit 4 (F)

EMCR-350 **Integrated Circuit**
Registration #0305-350 **Technology**
An introduction to integrated circuit technology and the physics, chemistry and metallurgy of manufacturing with an emphasis on photolithography. The laboratory includes safety, laboratory techniques, processing and testing. Students design and build an integrated circuit. (EMCR-201)

Class 3, Lab 3, Credit 4 (S)

EMCR-520 **VLSI Design**
Registration #0305-520
A study of transistors in saturation, active and cutoff regions, including normal and inverse operation. T2L, I2L, ECL, PMOS, NMOS, and CMOS logic. VLSI design methodologies are discussed and simple design projects are completed. (EMCR-560, EEEE-442)

Class 4, Credit 4 (S, SR)

EMCR-530 **Electromagnetic Fields I**
Registration #0305-530
A study of electrostatics and magnetostatics important to the understanding of the physics of semiconductor devices and microelectronic processing. (SMAM-328, SPSP-313)

Class 4, Credit 4 (F, W)

EMCR-540 Electromagnetic Fields II
Registration #0305-540
A study of time varying electromagnetic fields important to optical and- electrical systems. Topics include Maxwell's equations, wave equations, electromagnetic propagation in free space and guided structures, concepts of reflection, transmission and matching. (EMCR-530)

Class 3, Lab 3, Credit 4 (S, SR)

EMCR-560 Device Physics
Registration #0305-560
A basic course dealing with the physics of semiconductor devices. Topics include physics of semiconductor materials, metal-semiconductor contacts, PN junctions, bipolar transistors, MOS structures and field effect transistors. (EEEE-441, SPSP-315)

Class 4, Credit 4 (F, W)

EMCR-573 Microlithography I
Registration #0305-573 Laboratory
Laboratory course to be taken concurrently with PIMG-563. Topics emphasize photolithographic process characterization techniques. (PIMG-221, EMCR-350)

Lab 3, Credit 1 (S, SR)

EMCR-575 Microlithography II
Registration #0305-575 Laboratory
Laboratory course to be taken concurrently with PIMG-565. Topics emphasize advanced lithographic processes. (PIMG-563, EMCR-573)

Lab 3, Credit 1 (F, W)

EMCR-630 Advanced Microelectronic
Registration #0305-630 Chemistry
A selection of topics from physical and plasma chemistry important to the understanding of integrated circuit processing, including plasma etching, chemical vapor deposition, and related technologies. (PIMG-563, EMCR-573, EMCR-350)

Class 3, Lab 3, Credit 4 (F, W)

EMCR-640 Microelectronics
Registration #0305-640
An intermediate course in the study of integrated circuit processing. Topics include diffusion, ion implantation, bipolar and MOS processes. Extensive use of CAE tools such as SUPREM and SPICE. (EMCR-350, 560, 573; EEEE-442; PIMG-563)

Class 4, Credit 4 (S, SR)

EMCR-650 Integrated Circuit
Registration #0305-650 Processing Lab
A laboratory course in which the student designs and builds an integrated circuit. Required lab work includes MOS C-V, PMOS I.C. fabrication, and safety. (EMCR-640)

Class 2, Lab 6, Credit 4 (F, W)

EMCR-660 Seminar/Research
Registration #0305-660
An investigation of a problem in microelectronic processing. Seminars by experts from the various phases of the microelectronics industry. (EMCR-650)

Class 2, Lab 6, Credit 4 (S)

EMCR-670 Advanced Microlithography
Registration #0305-670
A study of the characteristics of image-forming and image-recording elements and their matching for optimum performance. Spread and transfer functions, partial coherence in image systems, limitations imposed by the wave and particle nature of radiation. Interferometric evaluation techniques. Techniques and instruments for the exposing and evaluation of images. (EMCR-540, 575; EEEE-455, PIMG-543, 565)

Class 3, Lab 3, Credit 3 (offered each year)

College of Fine and Applied Arts

School of Art and Design

FADC-301, 302, 303 Introduction to Graphic
Registration #0402-301, 302, 303 Design
An introduction to the field of graphic design through explorations of formal and perceptual understanding and control; deals with point, line, shape, color, pattern, organizational systems, Gestalt principles, dimension interaction and communications. The relationship of typography and photography to graphic design is included. (Foundation program or equivalent)

Recommended course work also includes concentrated work in typography, photography, and art for reproduction methods. No special sequence required. Prerequisite for major in Graphic Design.

Lab 9, Credit 4 (offered each year)

FADC-401, 402, 403 Graphic Design (Junior Major)
Registration #0402-401, 402,403
Creative problem solving experiences relating to visual communication imagery based on strong emphasis of formal design values and their utilization for the communication of ideas and information. Assignments oriented to building a working knowledge of communication media areas such as print, photography, typography, etc. Media Center facility available for extension and application of studio experiences. (FADC-301, 302, 303 or equivalent)

Lab 12, Credit 6 (offered each year)

FADC-411,412,413 Graphic Design
Registration #0402-411,412,413
An elective providing the opportunity to carry on problem solving in graphic design. Each quarter concentrates on a specific design topic of study (such as design for reproduction, design of self-promotional material, typography, or computer graphics).

Lab 6, Credit 3 (offered each year), Elective

FADC-501, 502, 503 Graphic Design (Senior Major)
Registration #0402-501, 502,503
Advanced creative problem solving experiences relating to visual communication imagery based on a strong emphasis of formal design values and their utilization for the communication of ideas and information. Assignments oriented to include thematic graphic design applications such as visual identity, signage, audio-visual, packaging, photography, marketing, or computer graphics.

Lab 18, Credit 9 (offered each year)

FADC-511, 512, 513 Graphic Design
Registration #0402-511, 512, 513
A professional elective providing the opportunity to work in aspects of graphic design. Each quarter concentrates on specific topics of design study.

Lab 6, Credit 3 (offered each year), Elective

FADC-520 Professional Design Business
Registration #0402-520 Practices and Ethics
Ethical principles will be discussed along with sound business practices; setting up in business; invoicing and costing, the designer and the law; professional associations.

Class 3, Credit 3 (offered every other year)

FADD-301, 302,303 Industrial and Interior Design
Registration #0403-301, 302, 303 (Sophomore Core)
An introduction to the fields of industrial and interior design. Emphasis on basic processes for design conceptualization and development
301—Graphic Visualization
302—Spatial Form
303—Object Form

Lab 6, Credit 4 (offered each year)

FADD-311,312,313 Industrial and Interior Design
Registration #0403-311, 312,313
An elective offering basic instruction and involvement in industrial and interior design projects. Each quarter concentrates on a specific topic of design study.

Lab 6, Credit 3 (offered each year), Elective

FADD-320 Graphic Visualization
Registration #0403-320
Graphic visualization techniques for the development and presentation of concepts for three-dimensional designs. Familiarization with various media in developing and improving graphic communication skills of value to the designer.

Lab 6, Credit 3 (offered on sufficient demand)

FADD-401,402,403 Industrial and Interior Design
Registration #0403-401, 402,403 (Junior Major)
The acquisition of a technical and theoretical base in industrial and interior design. Application of communicative and problem-solving skills to comprehensive design projects involving form.
401—Industrial: Packaging—Graphics; Interior: Space—Materials
402—Industrial: Product—Human Factors; Interior: Space—Decorative Arts
403—Industrial: Product—Materials and Processes; Interior: Space — Environmental Control

Lab 12, Credit 6 (offered each year)

FADD-411,412,413 Design Applications
Registration #0403-411,412,413
An elective that provides basic instruction in three dimensional computer graphics applications for designers.

Lab 6, Credit 3, Elective

FADD-501, 502,503 Industrial and Interior Design
Registration #0403-501, 502,503 (Senior Major)
The application of design methods and skills to professional level projects in either industrial or interior design depending on individual choice. Partial concentration in:
501—Industrial: Product—Computer, Interior Space—Computer
502—Industrial: Product—Furniture; Interior Space—Furniture
503—Industrial: Product—Professional Practices; Interior Space — Professional Practices

Lab 18, Credit 9 (offered each year)

FADF-205, 206, 207 Creative Sources
Registration #0404-205, 206, 207
This course is designed to make students aware of their environment, their physical being and their experiences as tools for creative problem solving. This will be accomplished through lectures, individual and group assignments and demonstrations.

Class 1, Lab 1, Credit 2 (offered each year)

FADF-210, 211, 212 Drawing
Registration #0404-210, 211,212
A basic foundation in drawing as a form of creative expression and a means to communicate information. Through the use of organic and inorganic materials attention is given to individual response to "seeing" as interspersed with all sensory conditioning. The figure is utilized in the analysis of action, structure, and gesture through quick sketches.

Lab 9, Credit 4 (offered each year)

FADF-221, 222, 223 Design for Photo I
Registration #0404-221, 222,223
Study of principles of two- and three-dimensional design as a means of communication and expression.

Class 1, Lab 2, Credit 2 (offered each year)

FADF-231,232, 233 2-D Design
Registration #0404-231, 232, 233
The elements of design and color and their structural relationship as applied to problems in two dimensions using a variety of media.

Lab 6, Credit 3 (offered each year)

FADF-241, 242, 243 3-D Design
Registration #0404-241, 242, 243
The elements of design, and color and their structural relationship as applied to problems in three dimensions. A variety of media are used.

Lab 6, Credit 3 (offered each year)

FADF-261, 262, 263 Drawing (Crafts Majors)
Registration #0404-261, 262, 263
Drawing in a variety of media. Introduction to line form, and color as elements of pictorial expression. Organic and inorganic materials are used.

Lab 6, Credit 3 (offered each year)

FADF-321,322,323 Design for Photo II
Registration #0404-321, 322, 323
Emphasis upon problems which are related to visual phenomena, fundamentals, and communications. Expression through image making viewing and discussion.

Class 1, Lab 2, Credit 2 (offered each year)

FADP-301,302,303 Introduction to Fine Arts
Registration #0405-301, 302, 303 (Sophomore Core)
Fine arts core for painting, painting-illustration, printmaking and printmaking-illustration. Emphasis is placed on drawing and the objective mastery of form and space from a variety of visual sources including the human figure. Development of basic techniques, materials and concepts for further study in painting, printmaking and illustration.

Lab 9, Credit 4 (offered each year)

FADP-311,312,313 Medical Illustration
Registration #0405-311,312,313 (Sophomore Major)
Emphasis is placed upon drawing and the objective mastery of form and space from a variety of visual sources including the human figure during fall and winter quarters. For spring quarter carbon dust illustration techniques will be introduced, thus beginning a sequence of illustrative techniques leading to mastery of medical illustration.

Lab 9, Credit 4 (offered each year)

FADP-320 Color
Registration #0405-320
One-quarter course dealing with the examination of basic color phenomena by visual comparison. Study the differences between light and pigment Class problems exploring such relationships as intensity, vibration, temperature, after-image, spatial effects and image-ground distortion.

Class 3, Lab 3, Credit 3 (offered each year)

FADP-321,322,323 Illustration
Registration #0405-321, 322, 323
One-quarter course exploring the art of illustrators; their relation to audience, publishers, and media. Studio problems will develop and expand basic concepts of illustration.

Studio sessions will be devoted to illustrative problems that reflect the class study for that period. Class critiques at appropriate times.

Class 3, Lab 3, Credit 3 (offered each year)

FADP-401,402,403 Painting (Junior Major)
Registration #0405-401, 402,403
Second year of Painting in a three-year degree sequence. Development of mastery of painting media. Emphasis placed upon individual solutions and expression. Completion of a specialized project during the Spring Quarter.

Lab 12, Credit 6 (offered each year)

FADP-404,405,406 Painting-Illustration
Registration #0405-404,405,406 (Junior Major)
One day of painting and one day of illustration per week. Emphasis is on development of media and concept through creative problem solving relating to painting, illustration and drawing.

Lab 12, Credit 6 (offered each year)

FADP-411,412,413 Painting
Registration #0405-411,412,413
An elective providing the opportunity for exploration of personal expression through a painting medium.

Lab 6, Credit **3** (offered each year), Elective

FADP-421,422,423 Medical Illustration
Registration #0405-421, 422,423 Applications (Junior Major)
Development of range and mastery of medical illustration techniques. Laboratory sessions scheduled in bio-medical illustration. (Lab orientation sessions to be scheduled in operating room facilities.)

Lab 12, Credit 8 (F) (offered each year)

Lab 6, Credit 5, (W, S) (offered each year)

Medical Illustration Gross Anatomy
Dissection and study of the human body is presented with such topics as developmental comparative and applied anatomy. Emphasis is directed toward osteology, radiographic anatomy, and photography of the cadaver.

Required of all students in the medical illustration program, offered through the University of Rochester Medical Center, with a tuition surcharge.

FADP-450 Drawing Problems
Registration #0405-450
Study of traditional and contemporary means of developing form and space in drawing. Individual drawing projects exploring drawing as a conceptual tool or as a fine art medium.

Lab 6, Credit **3** (offered each year)

FADP-501, 502, 503 Painting (Senior Major)
Registration #0405-501, 502,503
The third year of advanced painting completing a major course of study in the fine arts. Concentrated studio production focused upon individual creative solutions. Individual and group presentations of work in an exhibition format is encouraged, as is the development of a visual portfolio of one's work. Advanced drawing incorporated into studio procedure.

Lab 18, Credit 9 (offered each year)

FADP-504, 505, 506 Painting/Illustration Option
Registration #0405-504, 505,506 (Senior Major)
Continuation of third-year painting and illustration. **Painting:** Emphasis is focused upon individual creative solutions. Individual and group presentations of work in an exhibition format is encouraged, as is the development of a portfolio. **Illustration:** Emphasis is on craft and problem solving, through such topics as book and juvenile illustration, research material and drawing approach. The student will be encouraged to expand in a personal direction and will be helped in the preparation of a portfolio.

Lab 18, Credit 9 (offered each year)

FADP-511, 512, 513 Painting
Registration #0405-511, 512, 513
An elective that provides further exploration of personal expressive styles through a painting media.

Lab 6, Credit 3 (offered on sufficient demand), Elective

FADP-531, 532, 533 Advanced Medical Illustration
Registration #0405-531, 532, 533 (Senior Major)
Advanced medical illustration techniques. Graphic design related to illustrative and photographic practice. Lab sessions to be scheduled in operating room facilities. Jointly sponsored between RIT and the University of Rochester.

Lab 12, Credit 6 (offered each year)

FADR-401, 402, 403 Printmaking (Junior Major)
Registration #0406-401, 402, 403
A three quarter sequence in printmaking. Specific technical assignments, individual growth and development through personal statements is stressed in lithography, intaglio and relief printing. Expansion and development in combined and complex print forms are encouraged. A limited edition portfolio project is developed with the participation of all students.

Lab 12, Credit 6 (offered each year)

FADR-404, 405,406 Printmaking-Illustration
Registration #0406-404,405,406 (Junior Major)
One day of printmaking and one day of illustration per week. Emphasis is on development of media and concept through creative problem solving relating to printmaking, illustration and drawing.

Lab 12, Credit 6 (offered each year)

FADR-411,412,413 Printmaking
Registration #0406-411,412,413
An elective providing the opportunity to explore personal statements through one of the following: lithography, etching, woodcut, papermaking.

Lab 6, Credit 3 (offered each year), Elective

FADR-501, 502, 503 Printmaking (Senior Major)
Registration #0406-501, 502, 503
Continuation of third-year printmaking. Expanding the technical involvement in paper making, photo etching and photo litho. Opportunity is presented for involvement in developing a more concentrated and personal art form through any singular technique or combination. A limited edition portfolio project is developed with the participation of all students. Encouragement is offered for students to exhibit professionally in regional and national exhibitions. Emphasis is placed on preparing a strong professional body of prints.

Lab 18, Credit 9 (offered each year)

FADR-504, 505, 506 Printmaking/Hlustration
Registration #0406-504, 505, 506 Option (Senior Major)
Continuation of third year printmaking and illustration. **Printmaking:** Expanding the technical involvement with paper making, photo etching and photo litho. The student has the opportunity to specialize in the direction of natural ability and interest A limited edition portfolio project is developed with the participation of all students. **Illustration:** Emphasis is on craft and problem solving, through such topics as book and juvenile illustration, research material and drawing approach. The student will be encouraged to expand in a personal direction and will be helped in the preparation of a portfolio.

Lab 18, Credit 9 (offered each year)

FADR-511,512,513 Printmaking
Registration #0406-511, 512, 513
An elective that provides further exploration of printmaking with emphasis on personal statement.

Lab 6, Credit 3 (offered on sufficient demand)

FADS-411,412,413 Sculpture
Registration #0407-411,412,413
The course develops formal sculptural concepts through a variety of processes and materials. Studio practice involving work in paper, wood, fabrics, metal, stone, clay, and plastics.

Lab 15, Credit 5 (offered each year)

FADK-301, 302,303 Packaging Design
Registration #0440-301, 302,303 (Sophomore Major)
An introduction to the field of packaging design. Emphasis is placed on basic processes for design conceptualization and development.

Lab 6, Credit 3 (offered each year)

FADK-401,402,403 Packaging Design D
Registration #0440-401,402,403 (Junior Major)
The course progresses through a series of interrelated experiments, covering analysis and visual translation of package form and function, package structure, production processes, package trends, materials, and package graphics.

Lab **9,** Credit **4** (offered each year)

FADK-501,502, 503 Packaging Design m
Registration #0440-501, 502, 503 (Senior Major)
The course will further investigate analysis and visual translation of package form and function, package structure, production processes, package trends, construction, materials and package graphics. A strong emphasis will be placed on preparation of a portfolio.

Lab **9,** Credit 4 (offered each year)

School for American Craftsmen

FSCC-200 Ceramics Materials and
Registration #0409-200 Processes (Freshman Major)
Sequential course for three quarters stressing the design and wheel thrown fabrication of the basic pottery forms. Includes firing kilns, clay preparation and use, along with the history of pottery.

Lab 15, Credit 5 (offered each year)

FSCC-251, 252,253 Ceramics Elective I
Registration #0409-251, 252, 253
An elementary course in design and techniques in ceramics. Each quarter different techniques are taught including wheel, hand building, glaze, and decorating.

Lab 6, Credit 3 (offered each year)

FSCC-500 Ceramics Materials and
Registration #0409-300 Processes (Sophomore Major)
Sequential course for three quarters that stresses problem solving with the use of ceramic processes. The emphasis will be on developing conceptual attitudes and a wide scope of creativity. The curriculum also includes clay and glaze chemistry.

Lab 15, Credit 5 (offered each year)

FSCC-351, 352,353 Ceramics Craft Elective H
Registration #0409-351, 352,353
An elective course providing an opportunity for more advanced study in ceramics. Wheel and hand built pottery, along with glaze information, will be studied.

Lab 6, Credit 3 (offered on sufficient demand)

FSCC-400 Ceramics Materials and
Registration #0409-400 Processes (Junior Major)
Sequential course stressing industrial forming methods such as mold making, slip casting, and giggering and jolly. Projects will include multiples, limited editions, designing for industry and architectural applications. The third quarter will be the planning, design and execution of the "Journeyman's Piece." To include a course on kiln type fuels and construction.

Lab 15, Credit 5 (offered each year)

FSCC-500 Ceramics Techniques and Thesis
Registration #0409-500 (Senior Major)
Sequential course for three quarters focusing on thesis development of a body of work that reflects self expression, and a personal direction in clay. This research and thesis project will stress a high level of aesthetic content and skilled execution.

Lab 15, Credit 5 (offered each year)

FSCF-225,226,227 Art and Civilization
Registration #0410-225, 226, 227
Survey of the history of art from prehistory to the present, with particular attention given to the social and cultural backgrounds of art production and to the relationship between the arts: architecture, sculpture, painting, and decorative arts and crafts. Lectures, independent study, discussion groups, assigned gallery visits, papers, reports.

Class 3, Credit 3 (offered each year)

FSCF-300 History of Design
Registration #0410-300
Explores the historical precedents of two and three dimensional design including fine arts, industrial, graphic and environmental design. The course will provide a foundation for individual decisions on planning and designing to complement and enhance present and future environments.

Class 3, Credit 3 (offered each year)

FSCF-310 History of Crafts
Registration #0410-310
Explores creative thinking and designing in the area of crafts through the ages with special emphasis on clay, fibers, glass, metal and wood. The course highlights the artistic achievements of the craftsmen of the past to enable present students to view their own time in its historical perspective and thereby understand more thoroughly their creative heritage and the efforts of contemporary craftsmen.

Class 3, Credit 3 (offered each year)

FSCF-320 History of Art Criticism
Registration #0410-320
A study of what makes art "good," (philosophical theories of art and the aesthetic experience) and what art criticism is and does (types and principles, of art criticism) with direct applications to the life and work of the artist and craftsman/designer.

Class 3, Credit 3 (offered each year)

FSCF-330 Philosophy in Art
Registration #0410-330
Traces the historical changes that art has undergone. Traces the interaction between philosophic thought and artistic styles throughout art history. Explores art as a reflection of human values.

Class 3, Credit 3 (offered each year)

FSCF-340 Symbols and Symbol-Making
Registration #0410-340
A concentrated study of symbols, legends and myths and their creation in the visual arts with emphasis on symbol making for communication.

Class 3, Credit 3 (offered each year)

FSCF-350 Asian Art
Registration #0410-350
A study of the art of India, China, and Japan in the area of painting, printmaking, sculpture, architecture and the crafts with emphasis on their implications for contemporary artists, designers and craftsmen.

Class 3, Credit 3 (offered each year)

FSCF-360 18th & 19th Century Art
Registration #0410-360
The development of the arts in these two centuries in the areas of painting, printmaking, sculpture, architecture, and the crafts with emphasis on their influence of 20th century styles and focusing on their impact on the artist/craftsman/designer.

Class 3, Credit 3 (offered each year)

FSCF-370 20th Century Art
Registration #0410-370
The development of the arts in the 20th century in the areas of painting, printmaking, sculpture, architecture, and the crafts with focus on their impact on the artist7craftsman/designer.

Class 3, Credit 3 (offered each year)

FSCF-380 Contemporary Art
Registration #0410-380
A study of the painting, printmaking, sculpture, architecture and crafts from the 1960s to the present year with focus on the current American scene.

Class 3, Credit 3 (offered each year)

FSCF-566 Special Topics
Registration #0410-566
Consideration of special art historical themes, areas, and topics not covered in regular courses.

Class 3, Credit 3 (offered each year)

FSCG-200 Glass Materials and
Registration #0411-200 Processes (Freshman Major)
A basic survey course of the properties, techniques and technology of glass, plus an overview of glass history. Individuals are encouraged to participate in a variety of hot and cold glass techniques: blowing basic shapes, stemware, color applications, stained/leaded glass, lamination, polishing, sand casting, and slumping/fusing. Basic knowledge of technique lays the foundation for concept development.

Lab 15, Credit 5 (offered each year)

FSCG-251, 252,253 Glass Elective I
Registration #0411-251, 252,253
A survey course emphasizing furnace glassblowing and stained glass as a means of personal expression and appreciation. A portion of the course is a basic investigation of the history, chemistry, techniques and technical aspects of glass.

Lab 6, Credit 3 (offered each year)

FSCG-300 Glass Materials and
Registration #0411-300 Processes (Sophomore Major)
Techniques of stationary/multi-sectional mold blowing, color overlay, graphal, and latticino are examples of continued emphasis on blown glass. Neon bending, sealing and bombarding, gravity casting, pate-de-verre, engraving, fabrication and architectural stained glass are offered. In-depth history of glass and the decorative arts, plus practical chemistry of glass, batching and LEC will be learned.

Lab 15, Credit 5 (offered each year)

FSCG-351, 352, 353 Glass Elective II
Registration #0411-351, 352,353
Prerequisite: Glass Elective 251, 252, or 253. This course provides an opportunity for more advanced work in both hot and cold glass. Emphasis is placed upon individual expression with glass and may involve slumping, casting, blowing, cutting, polishing or sculptural construction.

Lab 6, Credit 3 (offered on sufficient demand)

FSCG-400 Glass Materials and
Registration #0411-400 Processes (Junior Major)
Design projects from decorative arts companies are undertaken. Knowledge of glass studio design/construction, equipment and business practices is acquired. The Journeyman's series piece is planned, designed and executed. Techniques of enameling, electroforming and advanced casting processes are investigated. The conceptualization process is further developed through spatial/ environmental projects.

Lab 15, Credit 5 (offered each year)

FSCG-500 Glass Techniques and Thesis
Registration #0411-500 (Senior Major)
Based upon the three previous years of investigation, the senior-level glass student will present a proposal which will be offered as evidence of qualification for the baccalaureate degree. The senior will present a resume, portfolio and a research paper related to his/her exhibition at the end of the academic year.

Lab 24, Credit 8 (offered each year)

FSCG-520 Stained Glass
Registration #0411-520
An elective relating advance individual exploration using structural elements of color design and visual expression. Fabricating techniques involve cutting, shaping, soldering, leading, foiling, glazing stained glass.

Lab 6, Credit 3 (offered each year)

FSCM-200 Metalcrafts Materials and
Registration #0412-200 Processes (Freshman Major)
Sequential course for three quarters, introducing basic exercises in the use of equipment and metalcrafts techniques through hollowware and jewelry design in various metals. Included will be the discussion of metal design utilizing the techniques of fabrication, forging, raising and basic gem setting.

Lab 15, Credit 5 (offered each year)

FSCM-251, 252,253 Metalcrafts Elective I
Registration #0412-251,252, 253
An elective course providing an opportunity for introductory study in metals in the area of either hollowware or jewelry.

Lab 6, Credit 3 (offered each year)

FSCM-300 Metalcrafts Materials and
Registration #0412-300 Processes (Sophomore Major)
Sequential course for three quarters, introducing gold work, repousse and chasing and moldmaking. Analysis of design and production problems relating to hollowware and jewelry.

Lab 15, Credit 5 (offered each year)

FSCM-351, 352, 353 Metalcrafts Elective II
Registration #0412-351, 352, 353
An elective course providing an opportunity for more advanced study in metals either hollowware or jewelry.

Lab 6, Credit 3 (offered on sufficient demand)

FSCM-400 Metalcrafts Materials and
Registration #0412-400 Processes (Junior Major)
Sequential course for three quarters, introducing flatware, spinning and machine tool processes. Introduction to industrial manufacture and lapidary work.

Lab 15, Credit 5 (offered each year)

FSCM-500 Metalcrafts Techniques and
Registration #0412-500 Thesis (Senior Major)
Sequential course for three quarters, providing individual research in technique and design. A final presentation, to include a resume, photographs and renderings of work, is required.

Lab 24, Credit 8 (offered each year)

FSCT-200 Textile Materials and
Registration #0413-200 Processes (Freshman Major)
Sequential course for three quarters, providing fundamentals of fabric design, yarn calculation, and pattern drafting. Analysis of equipment and problems. Practice in basic weaves. Experiment in design and weaving of sample warps of drapery, linens, upholstery, and suiting fabrics. Study of qualities and color combinations of various yarns. Yardage weaving. Printing procedures; silk screen techniques.

Lab 15, Credit 5 (offered each year)

FSCT-251, 252, 253 Textile Elective I
Registration #0413-251, 252, 253
A basic course in design and techniques in textiles. Each quarter a different area of study is undertaken in basketry, stitchery and other non-loom processes.

Lab 6, Credit 3 (offered each year)

FSCT-300 Textile Materials and
Registration #0413-300 Processes (Sophomore Major)
Sequential course for three quarters, providing an analysis of fabrics. Advanced pattern drafting. Study and analysis of fibers. Advanced techniques of weaving, with related problems in design. Continued experience in sample warps and yardage weaving. Practice in the use of various types of eight to ten harness looms. Experiments and research with novelty fibers, papers, reports.

Lab 15, Credit 5 (offered each year)

FSCT-351,352,353 Textile Elective H
Registration #0413-351, 352,353
An elective course providing an opportunity for more advanced study in textiles. Each quarter a different area of study is undertaken in printing, basketry, non-looms, stitchery or tapestry.

Lab 6, Credit 3 (offered on sufficient demand)

FSCT-400 Textile Materials and
Registration #0413-400 Processes (Junior Major)
Sequential course for three quarters, providing an analysis of new development in fabrics both handwoven and power-loomed, and their appropriate use. The design of fabrics within specific price ranges, and for specific uses, papers, reports.

Lab 15, Credit 5 (offered each year)

FSCT-500 Textile Techniques and
Registration #0413-500 Thesis (Senior Major)
Sequential course for three quarters, covering the design of fabrics in selected fields such as household fabrics, fashion fabrics or accessories with concentration on items having production merit A thesis is included.

Lab **24,** Credit 8 (offered each year)

FSCT-520 Business Practices for the
Registration #0413-520 Craftsperson
Fundamental craft business practices, including setting up a business, basic record keeping, banking, pricing, government regulations, insurance, marketing, and studying operations.

Class 3, Credit 3 (offered every other year)

FSCW-200 Woodworking Materials and
Registration #0414-200 Processes (Freshman Major)
Sequential course for three quarters, covering function and care of hand and machine woodworking tools. Wood as a material: history, kinds, qualities, sources. Fundamental techniques of wood fabrication, including basic joinery, turning, and finishing.

Lab 15, Credit 5 (offered each year)

FSCW-251,252, 253 Wood Elective I
Registration #0414-251, 252, 253
An elementary course in design and techniques in woodworking. Hand and power tools will assist in the small scale making of wood objects.

Lab 6, Credit 3 (offered each year)

FSCW-300 Woodworking Materials and
Registration #0414-300 Processes (Sophomore Major)
Sequential course for three quarters, covering advanced design, layout and construction. Plywood construction, chairmaking and chest of drawers technique. Limited production of small accessories including jigs, and pricing. Historical development of furniture; papers, and reports.

Lab 15, Credit 5 (offered each year)

FSCW-351, 352, 353 **Wood Elective II**
Registration #0414-351, 352,353
An elective course providing an opportunity for more advanced study in wood. Hand and power tools will assist in the small scale making of wood objects.

Lab 6, Credit 3 (offered on sufficient demand)

FSCW-400 **Woodworking Materials and**
Registration #0414-400 **Processes (Junior Major)**
Sequential course for three quarters covering advanced concepts in furniture and woodworking, wood sculpture, and veneering. Analysis of construction problems in both traditional and contemporary furniture.

Lab 15, Credit 5 (offered each year)

FSCW-500 **Woodworking Techniques**
Registration #0414-500 **and Thesis (Senior Major)**
Sequential course for three quarters, allowing each student, with the approval of the instructors to specialize in that branch of woodworking/furniture design that he/she intends to pursue following graduation. The thesis, culminating in the final quarter, consists of a body of work including at least one commissioned piece, and a complete business promotion package including a portfolio, resume and stationery.

Lab 24, Credit 8 (offered each year)

School of Art and Design

Graduate Courses

Beginning September 1982, the Communication Design program name has been changed to Graphic Design, and Environmental Design has been changed to Industrial and Interior Design.

Courses for the education concentration of the MST program are offered through the College of Liberal Arts, and course descriptions are given under that heading with a Liberal Arts call number.

Art Education

FADA-701, 702 (MST) **Methods and Materials in Art**
Registration #0401-701, 702 **Education (Major)**
Intensive study of curriculum in terms of teaching materials for both studio and appreciation aspects of elementary, early secondary and high school art education. Includes studio and elementary school teaching experience.

Class 2, Lab 9, Credit 5 (F, W) (offered on sufficient demand)

FADA-820 (MST) **Seminar in Art Education**
Registration #0401-820 **(Major)**
Evaluation and study of the practice teaching experience. Discussion of the professional role of the art teacher in terms of professional associations, supervision, teacher training, and research. A final project on some intensively studied aspect of art education Is required.

Lab 25, Credit 3 (S) (offered on sufficient demand)

FADA-860 (MST) **Practice Teaching in Art**
Registration #0401-860 **(Major)**
A seven-week full-time practice teaching experience in secondary school, including professional duties of the art teacher in humanities courses, publication advising, audiovisual work, and supervision. Supplements the studio-theoretical education. Meets the state education requirements.

Credit 9 (S) (offered on sufficient demand)

Graphic Design

FADC-750 **Graphic Design (Minor, Elective)**
Registration #0402-750
Advanced creative problem-solving experiences in graphic design imagery. Professional problems in visual techniques for communication media. Media Center facility available for extension of studio problems.

Lab 6, Credit 3 (offered every quarter)

FADC-780 **Graphic Design (Major)**
Registration #0402-780
Advanced creative problem-solving experiences relating to graphic design imagery. Formal design values are emphasized and utilized in communications applications. Studio involvement is directed toward the solution of individual, group and assigned graphic design problems. Specification of the program is developed in accordance with the professional goal of the individual student and work leading toward the master's thesis. Media Center facilities are available for application of studio imagery.

Lab 9-27, Credit 3-9 (offered every quarter)

Computer Graphics Design

FADG-780 **Introduction to Computer**
Registration #0432-780 **Graphics Design (MFA Major)**
An introduction to computer graphics. Basic familiarity with using the keyboard, CRT, disk drive, tablet, printer, plotter and image digitizer to create imagery.

Lab 9, Credit 3 (offered each year)

FADG-781 **Two-Dimensional Computer**
Registration #0432-781 **Graphics Design (MFA Major)**
Exposure to computer graphic algorithms, design heuristics, design methodology, and program structures for two-dimensional imagery. Projects involve programming.

Lab 9, Credit 3 (offered each year)

FADG-782 **Three-Dimensional Computer**
Registration #0432-782 **Graphics Design (MFA Major)**
Extension of previous experience to include three-dimensional objects, hidden lines and surfaces, solid modelling, perspective. Projects involve complex programming.

Lab 9, Credit 3 (offered each year)

FADG-783 **Visual Semiotics/Graphic**
Registration #0432-783 **Design (MFA Major)**
The application of syntactic, semantic and pragmatic levels of visual design activities. These concepts will be applied to creative projects utilizing the computer as the primary tool.

Lab 9, Credit 3 (offered each year)

FADG-784 **Digital Typography(MFA Major)**
Registration #0432-784
A study of the evolution of typography, typesetting and typesetting systems from metal type through photo typesetting to today's digital typesetting. Hands-on experiences in. production typesetting including photo typesetting, digital typesetting, word processing and prepress planning for accurate typographic reproduction.

Lab 9, Credit 3 (offered each year)

FADG-785 **Computer-Generated Slide**
Registration #0432-785 **Design (MFA Major)**
The design of slides for business graphics and audio-visual presentations. Hands-on experience with a sophisticated computer graphics system for the generation of high resolution slides. Emphasis on both commercial production concerns and creative problem solving.

Lab 9, Credit 3 (offered each year)

FADG-786 **Computer-Generated**
Registration #0432-786 **Animation (MFA Major)**
Extension of computer generated slide design using keyframe animation techniques to automatically create frames for film, video or multi-image slide presentations.

Lab 9, Credit 3 (offered each year)

FADG-787 **Advanced Computer**
Registration #0432-787 **Graphics Design (MFA Major)**
Advanced explorations of computer graphic applications. Projects include such topics as computer generated layout, digital type development, computer-aided instruction lessons, TV and electronic mail promotions and computerized animation.

Lab 27, Credit 9 (offered each year)

Industrial and Interior Design

FADD-750 **Industrial and Interior Design**
Registration #0403-750 **(Minor, Elective)**
The reasoned application of theoretical and practical background to advanced projects in industrial and interior design.

Lab 6, Credit 3 (offered every quarter)

FADD-780 **Industrial and Interior Design**
Registration #0403-780 **(Major)**
Selected projects in industrial or interior design which allow individual application of design methodology and technical skills toward professional goals. Selection of the projects is directed at providing an adequate background for development of the master's thesis.

Lab 9-27, Credit 3-9 (offered every quarter)

Painting

FADP-750 **Painting (Minor, Elective)**
Registration #0405-750
Study of present techniques and concepts in painting and their relation to the tradition of painting. Development of painting skills in a chosen medium.

Lab 6, Credit 3 (offered every quarter)

FADP-750 **Illustration**
Registration #0405-750 **(Painting Minor, Elective)**
An elective exploring the art of illustrators, their relation to audience, publishers, and media. Studio problems will develop and expand basic concepts of illustration.

Class 3, Lab 3, Credit 3 (offered each year)

FADP-751 **Drawing Problems**
Registration #0405-751 **(Painting Minor, Elective)**
Individual drawing projects related to graduate students' major area of study. Opportunity to refine drawing skills on the graduate level.

Lab 6, Credit 3 (offered each year)

FADP-780 **Painting (Major)**
Registration #0405-780
Development of mastery of a permanent painting medium and related preparatory study. Examination of ideas and relationships in the field of painting with emphasis upon individual creative solutions.

Lab 9-27, Credit 3-9 (offered every quarter)

Printmaking

FADR-750 **Printmaking (Minor, Elective)**
Registration #0406-750
Advanced techniques in etching, lithography and woodcutting, as well as in many experimental areas including color processes, photoetching, photo-lithography, paper making and combination printing. Students are expected to develop along independent lines, and direction is offered in contemporary thought and concept. The emphasis is toward developing a complete respect for the printmaking craft and profession.

Lab 6, Credit 3 (offered every quarter)

FADR-780 **Printmaking (Major)**
Registration #0406-780
Contemporary and historical printmaking concepts are presented as stimulant and provocation for the development of an individual approach to expression. Advanced techniques are demonstrated in intaglio, relief and lithography with resources available in non-silver photo processes, paper making and combinations. A complete understanding of the development and maintenance of the print studio is supportive for the professional artist. The work leads toward the master's thesis.

Lab 9-27, Credit 3-9 (offered every quarter)

Sculpture

FADS-750 **Sculpture (Elective)**
Registration #0407-750
Sculptural concepts are approached through a variety of processes and materials. The studio work is executed in paper, wood, fabrics, metal, stone, clay and plastics.

Lab 6, Credit 3 (offered each year)

Medical Illustration

FADM-781 **Medical Illustration Topics I**
Registration #0408-781 **(MFA Major)**
This is an introductory course, designed to acquaint the illustration student with art techniques commonly used in medical illustration, and with the medical library and audio-visual television supporting milieu in which the medical illustrator works.

Lab 6, Credit 3 (offered each year)

FADM-782 **Medical Illustration Graphics**
Registration #0408-782 **and Exhibits (MFA Majors)**
A course emphasizing the use of tides, animation, charts and graphs, schematics, and illustrative procedures as vehicles for meeting instructional and communicative needs. Students will learn the various techniques available and will apply those techniques while constructing three dimensional illustrations for in-house presentation or for traveling displays. In addition, students will learn to plan and cost analyze their illustrative exhibits.

Lab 6, Credit 3 (offered each year)

FADM-783 **Medical Illustration**
Registration #0408-783 **Anatomical Studies (MFA Major)**
A study of pathological specimens and human dissection using colored pencil, pen and ink, carbon dust, and airbrush. Emphasis will be on rapid but accurate sketching and observation in the laboratory with a representation of form and structure in living tissue for the preparation of surgical procedures.

Lab 6, Credit 3 (offered each year)

FADM-784 **Medical Illustration Topics II**
Registration #0408-784 **(MFA Major)**
A course emphasizing photographic techniques as employed in medical illustration. Students will learn to use the copystand and various films to reproduce continuous tone, black and white, and color artwork. The copystand and other lighting techniques will be introduced for photographing anatomical specimens, models, and surgical instruments. Combining photographic images and processes with illustrative techniques also will be explored.

Lab 6, Credit 3 (offered each year)

FADM-785 Medical Illustration Surgical
Registration #0408-785 Procedures I (MFA Major)
The application of illustrating and photographing in the operating room. The student will become familiar with the organization of operations and with his or her role as a medical illustrator. Sketches are to be drawn directly from the observation of surgery, consulting with the surgeon for accuracy of detail and development The final preparation of the art work will be submitted for publication or portfolio.

Lab 6, Credit 3 (offered each year)

FADM-786 Medical Illustration Surgical
Registration #0408-786 Procedures II (MFA Majors)
A continuation of the concepts begun in 785; specifically, combining anatomical knowledge with surgical observation to construct a concise and accurate surgical series. Students will concentrate on communicating essential surgical concepts to a specific audience, as well as ensuring that their artwork will meet the demands of reproduction.

Lab 6, Credit 3 (offered each year)

Thesis

FAD (C, D, P, R, M or G)-890 Research and Thesis
Registration #040 (2,3,5,6, 8, or 32)-890 Guidance (MFA Major)
The development of a thesis project initiated by the student and approved by a faculty committee and the Special Assistant to the Dean for Graduate Affairs. Primary creative production, the thesis must also include a written report and participation in a graduate thesis show.

Lab 27, Credit 3-14 (offered every quarter)

FASA-785 Forms of Inquiry
Registration #0420-785 (Required for MFA)
The exploration and organization of forms of inquiry in the fields of art, craft and design.

Class 2, Credit 2 (offered each year)

FASA-790 Graduate Forum
Registration #0420-790 (Required for MFA)
The presentation and discussion of issues in aesthetics, criticism, creativity and perception as they relate to art, design and craft will be undertaken. Points of view will be clarified through critical writing. Required for MFA; to be taken prior to Thesis.

Class 2, Credit 3

School for American Craftsmen

Graduate Courses

Ceramics and Ceramic Sculpture

FSCC-750 Ceramics and Ceramic
Registration #0409-750 Sculpture (Minor, Elective)
Basic instruction and experience in ceramic design, fabrication and production of ceramic forms is undertaken. This study provides ceramic technology and terminology and gives experience with clays along with fundamental forming techniques. The development of design awareness is encouraged through lectures and critiques.

Lab 6, Credit 3 (offered every quarter)

FSCC-780 Ceramics and Ceramic
Registration #0409-780 Sculpture (Major)
A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. There will be a strengthening of ceramic techniques, design fundamentals and encouragement of personal ceramic expression. The student will be encouraged to evaluate new techniques, materials and concepts. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

Glass

FSCG-720 Stained Glass (Minor, Elective)
Registration #0411-720
An elective providing exploration of personal approaches to visual expression and techniques in flat glass. Technical processes may incorporate all hot and cold processes used in glass.

Lab 6, Credit 3 (offered each year)

FSCG-750 Glass (Minor, Elective)
Registration #0411-750
Collaborative work with the student's major area of study and glass fabrication is encouraged. Various techniques, both hot and cold will be considered: casting, slumping, fusing, blowing, cutting, electroplating, lamp working and sculptural construction. Course emphasis on personal, independent development encouraging contemporary thought and concept.

Lab 6, Credit 3 (offered every quarter)

FSCG-780 Glass (Major)
Registration #0411-780
A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. All technical processes and techniques are to be considered relevant. The course is structured to provide a foundation for professional activity and to encourage exploration of personal concepts relating to the presentation of a body of visual work. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

Metalcrafts and Jewelry

FSCM-750 Metalcrafts and Jewelry
Registration #0412-750 (Minor, Elective)
This is the study and manipulation of metals for hollowware/ jewelry. Design sensitivity and concepts are approached through the raising, forming and planishing or casting, forging, and fabricating techniques.

Lab 6, Credit 3 (offered every quarter)

FSCM-780 Metalcrafts and Jewelry
Registration #0412-780 (Major)
A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. Both hollowware and jewelry areas will be explored. It is designed to give the student a broad exposure to metalworking techniques, expand the student's knowledge of applied design, strengthen perceptual and philosophical concepts and develop an individual mode of expression. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

Weaving and Textile Design

FSCT-750 **Weaving and Textile Design**
Registration #0413-750 **(Minor, Elective)**
This is the study and appreciation of weaving and textile techniques, soft sculpture, off loom weaving and printing. Design approaches are stressed.

Lab 6, Credit 3 (offered every quarter)

FSCT-750 **Business Practices for the**
Registration #0413-750 **Craftsperson (Elective)**
Fundamental craft business practices, including setting up a business, basic record keeping, banking, pricing, government regulations, insurance, marketing, and studying operations.

Class 3, Credit 3 (offered every other year)

FSCT-780 **Weaving and Textile Design**
Registration #0413-780 **(Major)**
A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. Techniques offered are combination weaves and pattern design, double weave, embroidery and stitchery, finnweave, Ikat, multiple layer, dyeing, non-loom, pile rug, printed surface, silkscreen, tapestry, and soft sculpture. Design concepts are complements to the techniques. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

Woodworking and Furniture Design

FSCW-750 **Woodworking and Furniture**
Registration #0414-750 **Design (Minor, Elective)**
This is a course in woodworking techniques and procedures. It enables the student to gain design competency through wood and an individual solution to wood projects based on suggested needs.

Lab 6, Credit 3 (offered every quarter)

FSCW-780 **Woodworking and Furniture**
Registration #0414-780 **Design (Major)**
A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. This provides an opportunity for technical, aesthetic and design competency to grow through the exploration of hand and machine tools; solid wood theory, joinery and practice; veneer theory, and practice; production theory; chair, table, cabinet design and construction. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

Thesis

FSC (C, G, M, T, or W)-890 **Research and Thesis**
Registration #04 (09, 11,12, **Guidance (Major MFA only)**
13, or 14)-890
Research and presentation of an acceptable thesis with a focus on technique, design, and/or production. The thesis subject will be chosen by the candidates with the approval of the faculty advisor. The thesis will include a written summation or report of the research and participation in the graduate thesis show.

Lab 27, Credit 3-14 (offered every quarter)

College of Graphic Arts and Photography

School of Photographic Arts and Sciences

All courses in the School of Photographic Arts and Sciences are offered at least once annually, except as noted.

Fine Art Photography

PPHA-207 **Still Photography**
Registration #0921-207
In the First quarter students become familiar with the 35mm camera, processing and printing. The work is restricted to black-and-white photography. The aesthetics and basic understanding of photographic practice is covered. The second and third quarters deal with more advanced techniques and principles of photography. This series of courses is available for students who are not majoring in photography.

Class 1, Lab 6, Credit 3

PPHA-208 **Still Photography H**
Registration #0921-208
A basic studio course for the hobbyist or someone who occasionally uses photography in his or her work. Covers how to light and photograph 2-D work (copy) such as drawings, paintings, or old photographs; and how to light and photograph 3-D objects (inanimate) and people. Ideas of portraiture are discussed and explored in a natural (rather than commercial) manner, both of one person and then of two people. The idea of self-portrait also is discussed and explored. (PPHA 207 or a working knowledge of developing film and making enlargements)

Class 1, Lab 4, Studio 2, Credit 3

PPHA-209 **Still Photography m**
Registration #0921-209
A one-quarter course in which students determine their own theme, develop and shape it into picture book form with the use of some words. (PPHA 207 or a working knowledge of developing film and making enlargements; permission of the professor)

Class 1, Lab 6, Credit 3

PPHA-301,302,303 **History and Aesthetics of**
Registration #0921-301, 302, 303 **Photography**
Covering the history and aesthetics of photography from 1839 to the present, with special emphasis on the development of photographic seeing, and its related effect on other media. A survey of the numerous processes and how their development affected the imagemaking of their particular period, i.e., daguerreotypes, collotypes, ambrotypes, etc. Student projects are designed to illuminate phases of photographic history best understood by personal visual exploration.

Class 3, Credit 3

PPHA-313 **Introduction to Fine Art**
Registration #0921-313 **Photography**
The meaning of fine art photography will be discussed and then explored by doing various fine art assignments which will lead the student to discover personal solutions to personal concerns. The faculty will provide surveys of fine art photographers, their work and the non-silver processes sometimes used. The class will be supplemented with field trips to museums, galleries, and artists' studios.

Class 2, Lab 8, Credit 4

PPHA-323 **Photo Media Survey**
Registration #0921-323
Students will experiment with image combinations and alterations such as collage, montage, hand-coloring, xerox, hand-coated emulsions, etc. Lectures will introduce historical perspective on artists using these techniques and also will feature demonstrations of various imaging systems and their integration.

Class 1, Lab 4, Credit 3

PPHA-401,402,403 **Photography as a Fine Art I**
Registration #0921-401, 402,403
The major emphasis is placed on the individual's learning to identify and articulate personal response to his or her environment through the medium of photography. Students design their own projects and work under the guidance of the professor. Traditional silver, as well as non-silver, photography techniques may be utilized. (PPHL-313)

Class 3, Field Trip 2

PPHA-411,412,413 **Contemporary Issues**
Registration #0921-411,412,413
An examination of many thought-provoking and/or controversial issues in photography from 1950 to the present through a series of lectures, readings and discussions. Topics to be covered include—post-modernism, genderism, pornography, censorship, altered images, connoiseurship, and others. The course format allows review and exploration of such themes as the landscape, the nude, portraiture, conceptual art, trompe l'oeil and so on. Students will prepare an oral debate or a written term paper.

Class 2, Credit 2

PPHA-460 **Photography for Printers**
Registration #0921-460
A workshop in black-and-white and color photography for non-photography majors. Technical and aesthetic information will be given to enhance non-vocational photographers' use of their equipment. Darkroom work will be limited to the black-and-white negative and print. Color work will emphasize improvement of camera techniques.

Class 2, Lab 4, Credit 4

PPHA-501, 502,503 **Photography as a Fine Art II**
Registration #0921-501, 502, 503
Emphasis is placed on the student's setting of goals, selection of assignments and projects, and expansion of work on his or her own terms. Lectures and experiences are oriented to encourage awareness of shared concepts in the other arts, goals set by working artists, and the relevance of the history of the visual arts, to the student's work. (PPHA-403)

Class 2, Lab 8, Credit 4

PPHA-506, 507,508 **Photo Media Workshop**
Registration #0921-506, 507, 508
Photo Media Workshop emphasizes visual problem solving utilizing alternative photographic processes. The first quarter features work with emulsions on various surfaces; the second deals with visual books; and the third quarter covers generative systems including electrostatic, offset printing and other methods of altering images. The course is best when taken in order, but students may join at any quarter.

Class 2, Lab 4, Credit 4

PPHA-521, 522, 523 **Color Photography Workshop**
Registration #0921-521,522, 523
Emphasis is on the creative and aesthetic aspects of color photography and other color imaging systems. Students are provided an opportunity to explore the variety of ways in which color photographs can be produced, reproduced, sequenced, displayed and preserved. A personal portfolio of work presented as color prints, color transparencies, a slide presentation, an exhibition, or as an art book is required for each quarter. (Basic color course)

Class 2, Lab 4, Credit 4 (not offered every year)

PPHA-531 Picture Researching
Registration #0921-531
An introductory course surveying current practices, procedures, techniques and resources employed in picture researching for collections, exhibitions, publications, motion pictures, and television. Students explore the variety of ways pictures are used in communications, establish what pictures are needed for specific projects, discover how they may be found (or produced), and make arrangements to obtain reproduction rights. A case history in picture researching and a personal picture researching project will be produced by each student. (Basic course in History of Photography or equivalent)

Class 2, Critique 2, Field Research 4, Credit 4

PPHA-535 Gallery Management
Registration #0921-535 and Display
A basic, hands-on course in gallery operation to include gallery management and aesthetics. Course work is done with actual shows in the RIT photo gallery and other galleries where appropriate.

Class 2, Credit 1 (not offered every year)

PPHA-538 Photographic Careers
Registration #0921-538 Seminar
This seminar examines career options available to photography graduates. Students develop skills in resume preparation, interview practices and techniques, and personal goal setting. Students attend three special sessions offered by the Center for Cooperative Education and Career Services. (Third- and fourth-year with visual studies background)

Class 3, Credit 3

PPHA-551, 552,553 Special Topics Workshop
Registration #0921-551, 552, 553
Topics of current or special interest designed to broaden and intensify the students' ability to use photography as a means of communication and expression.

Class 1-2, Lab 4-15, Credit 3-9

PPHA-560 Semiotics and Advertising
Registration #0921-560 Photography
An introductory course which emphasizes the application of selected semiotic principles to the practice of photography. Semiotics is the study of signs and symbols and what they signify.

Class 2, Lab 4, Credit 4

PPHA-599 Independent Study
Registration #0921-599
Learning experiences not provided by formal course structure may be obtained through use of an independent study contract

Credit 1-9

Master of Fine Art Photography

PPHG-701, 702, 703 History and Aesthetics of
Registration #0903-701, 702, 703 Photography
The course will survey the major issues throughout the development of the medium: pre-history up to the 19th century; fin de siecle to present

Credit 3

PPHG-704 Minor White Seminar
Registration #0903-704
A study of the photography and philosophy of Minor White and his contribution to photographic publications, photographic education and photography as an art form.

Credit 3 (not offered every year)

PPHG-705, 706 Graduate Seminar
Registration #0903-705, 706
The seminar provides an opportunity for all MFA students to develop a sense of community and to openly discuss matters of concern, to discuss each other's photographs, to meet with visiting artists on campus and to participate in a thesis sharing from time to time.

Credit **2**

PPHG-707, 708, 709 Film History and Aesthetics
Registration #0903-707, 708, 709
An extended comparative survey of the history and aesthetics of film that will explore the four basic forms of the medium: Fiction, Documentary, Animated and Experimental. Emphasis is on determining the unique characteristics of the medium and how those characteristics are used as a means of interpretation and expression.

Credit 4

PPHG 711-01 The Landscape as Photographs
Registration #0903-711-01
A first-year graduate course in the major artistic, mythological, political, and economic issues influencing the development and use of landscape photography in America from 1840s to the 1980s. The student will be introduced to a diverse group of historical and contemporary image makers. (No prerequisite; open as an elective pending enrollment by majors)

Class 3, Credit 3 (F)

PPHG-712 Dadaism, Surrealism and Photography
Registration #0903-712
A first-year graduate course that examines the work of a group of artists, known as the Dadaists, who rejected the social order and values that produced World War I. The student will, in turn, explore surrealism, the art movement, that moved beyond the "destructive program of Dada" and replaced it with a more creative approach to human values and life.

Credit 3

PPHG-715 Photographic Extensions
Registration #0903-715
Strip photography, slit/scan photography and stroboscopy are used to probe and artistically manipulate spacial and temporal dimensions in order to create unseen poetic expressions of a space/time continuum. Perceptual principles and technical problems associated with the production and exhibition of such images are studied.

Credit 4

PPHG-719 Preservation Issues with Fine Art and
Registration #0903-719 Historical Photographs
This is a non-laboratory technical course which surveys the structure and deterioration mechanisms of major historical photographic processes. It examines the technical basis of preservation strategies within a museum or archive, and presents an approach to preservation which is integral with collection management and curatorial functions.

Credit 4

PPHG-720, 721, 722 Photographic Workshop
Registration #0903-720, 721, 722
Each faculty member offers a different opportunity for students to explore the multiplicity of ways that photography can be used as a vehicle for expression and for communication. Visual research, group critiques, seminars, field trips, studio and laboratory practice are used.

Credit 3 each course

PPHG-725, 726, 727 Photography Core
Registration #0903-725, 726, 727
Major emphasis is placed on the individual's learning to generate and intensify his or her personal statement through photography. Some of the projects are assigned while others are selected by the candidate. Work is critiqued weekly by the instructor.

Credit 4

PPHG-730, 731, 732 Cinematography
Registration #0903-730, 731, 732
Filmmaking workshop; individually planned studies in cinematography, as determined by faculty-student consultation, group critiques, seminars, studio and laboratory practice, field trips.

Seminar 2, Lab 26, Credit 3-9 (not offered every year)

PPHG-733 Animation and Graphic Film
Registration #0903-733 Production
An introduction to the techniques and practice of graphic and animated film production. This course provides training and practical experience in a wide variety of approaches to single frame motion picture production. Students produce a number of short film exercises utilizing both existing and original artwork. Some techniques covered in the course are: direct modification of the film surface, eel, ink and paint animation, and kinestasis. Screenings of professionally made films will illustrate each technique. Proficiency in drawing is not required. No prerequisites.

Class 2, Discussion 1, Lab 2; Credit 4 (F, W)

PPHG-734 Animation and Graphic Film
Registration #0903-734 Production
A continued introduction to the techniques and practice of graphic and animated film production. This course provides training and practical experience in a number of approaches to single-frame film making in addition to those covered in PPHG-733. Some techniques covered in the course are: Three-dimensional animation; optical printing; computer animation; and hand-drawn sound. Screenings of professionally made films will illustrate each technique. Proficiency in drawing is not required. (PPHG-733)

Class 2, Discussion 1, Lab 2; Credit 4 (W, S)

PPHG-735 Animation and Graphic Film
Registration #0903-735 Production
This course provides practice in all phases of single-frame film production. Students produce a 16mm 90-second graphic film with sound utilizing one or more techniques learned in the preceding two quarters. (PPHG-734)

Class 2, Discussion 2, Lab 2; Credit 4 (S, F)

PPHG-740, 741, 742 Photographic Museum
Registration #0903-740, 741, 742 Practice
Museum internship workshop, still or motion picture; research, assigned projects, seminars in history, function and administration of museums, with emphasis on photographic curatorial duties; practice in exhibition planning and development; field trips. This cannot be selected as a minor concentration. (Graduate status as museum major)

Class 2, Lab 4, Credit 4

PPHG-750, 751, 752 Special Topics Workshop
Registration #0903-750, 751, 752
Advanced topics of current or special interest designed to broaden and intensify the student's ability to use photography as a means of communication and expression.

Credit 3 or 4

PPHG-753 Photographic Workshop for
Registration #0903-753 Teachers
A graduate course in the principles and practices of photography designed especially for the high school or community college teacher, counselor or advisor, who may be involved in instruction or career guidance in photography.

Both black and white and color photography are presented and applied in actual picture-making experiences. Both the aesthetic and the technical aspects of photography are stressed. Teaching methods, course development, and ideas in visual communications are examined. Teaching technique relevant to the instruction of photography will be stressed. Career opportunities in photography will be explored.

Credit 6 (not offered every year)

PPHG-754 Teaching Photography
Registration #0903-754
A graduate course concerned with the art and craft of teaching photography in a formal and informal setting. Emphasis is on the practice of teaching photography based on accepted learning principles.

Credit **4** (not offered every year)

PPHG-755 Applied Sensitometry
Registration #0903-755
This course presents relevant sensitometric and photographic theory, principles and practices in a manner sensitive to the background and needs of a fine art photographer.

Credit **4** (not offered every year)

PPHG-756 Zone System Principles
Registration #0903-756
An applied course of selected sensitometric statistical and perceptual principles to the understanding and practice of the Zone System. The principles are taught so that they can be generalized and transferred to the understanding and practice of other image-forming systems such as film making, video, graphic arts printing, screen printing, etc.

Credit **4**

PPHG-760 Perception & Photography
Registration #0903-760
An advanced course which provides an applied psychological framework for the ways we select, code, organize, store, retrieve and interpret visual images and explores how photographs relate to art and perception.

Credit **4** (not offered every year)

PPHG-762, 763, 764 Alternative Processes
Registration #0903-762, 763, 764
An advanced course in the production and presentation of images using historical and contemporary visual imaging processes. Emphasis is on extending the students' experience in image making by incorporating alternatives to conventional photography into their work. Processes to be covered include various light sensitive emulsions, the production of visual books, and generative systems such as electrostatics and offset lithography.

Credit **4**

PPHG-767, 768, 769 Contemporary Issues
Registration #0903-767, 768, 769
A study of current issues relevant to fine art photography, how they relate to broader historical/cultural issues, and how they might suggest future directions.

Credit **2**

PPHG-799 Independent Study
Registration #0903-799
Learning experiences not provided by formal course structure may be obtained through the use of an independent study contract.

Credit 3

PPHG-877 **Museum Internship**
Registration #0903-877
Experiential learning is provided in collections management, cataloguing and classification, exhibition preparation and exhibitions, research and critical writing.

Credit 1-8

PPHG-887, 888, 889 **Research Seminar**
Registration #0903-887, 888, 889
The seminar serves as a planning stage for preparing a research thesis proposal and for an ongoing critique and discussion of the research in progress. Issues related to exhibitions, publications, copyright, and gallery also are covered.

Class 2, Credit 2

PPHG-890 **Research and Thesis**
Registration #0903-890
The thesis is designed and proposed by the candidate. It is considered his culminating experience in the program, involving research, a creative body of work, an exhibition or suitable presentation, and a written illustrated report.

Credit 112

Biomedical Photography

PPHB-201, 202, 203 **Biomedical Photography I**
Registration #0901-201, 202, 203
Basic photography course for biomedical photographers with emphasis on theory, craftsmanship and visual communication. Patient photography, close-up and other photography as a foundation for future biomedical photography.

Class 4, Lab 4, Studio 4, Credit 6

PPHB-211 **Survey of Biomedical**
Registration #0901-211 **Photography**
Career opportunities, typical biomedical photography settings, types of photography performed. Ethical, professional, and personal relationships with patients, physicians, research and staff personnel.

Class 1, Credit 1 (S only)

PPHB-301, 302,303 **Biomedical Photography II**
Registration #0901-301, 302,303
Further study and practice of theory and principles used in biomedical photography, including photomacrography, photomicrography, hospital photography techniques, infrared and ultraviolet radiation, biological field studies. (PPHB-203)

Class 2, Lab 10, Credit 5

PPHB-331, 332,333 **Preparation of Biomedical**
Registration #0901-331,332, 333 **Visuals**
Study of basic principles of effective visual communication and design. Student will produce slide presentations and exhibition displays as well as anatomical demonstrations using cell animation techniques. (Biomed Photo I)

Lecture 2, Lab 2, Credit 3

PPHB-401, 402 **Advanced Photography in**
Registration #0901-401, 402 **Biomedical Communications**
Sophisticated and creative applications of photography serving the needs of the scientific community. Students explore a variety of specialized photographic techniques and a variety of philosophies. Assignments are performed which are similar to those encountered in biomedical and research institutes. (PPHB-301; basic color course)

Class 2, Lab 6, Credit 4

PPHB-501, 502, 503 **Senior Thesis Production**
Registration #0901-501, 502, 503
An investigation, planning, organization and production of an audiovisual presentation, a learning package or an informational program for a biomedical communications client. (Completion of biomedical photographic communications AAS degree requirements; at least one upper-division photo elective in media; permission of the instructor)

Class 2, Lab 8, Credit 4

PPHB-551, 552, 553 **Special Topics in**
Registration #0901-551, 552, 553 **Photography**
A seminar approach offered on demand when adequate numbers of students and faculty desire to investigate specialized topics not normally offered in the regular curriculum. Available to upper-level students.

Credit variable

PPHB-599 **Independent Study**
Registration #0901-599
A student proposed advanced project sponsored by an instructor. Approval of the proposal by the department chairperson and the director of the school. Available to upper-level students with a GPA of 3.0 or greater.

Credit variable

Film/Video

PPHF-201 **Introduction to Filmmaking**
Registration #0902-201
A fundamental course in film production. Filmmaking as a means of interpretation and expression. A combined theoretical-practical approach to media continuity. Production will be in Super 8 (non-sync) format. Students furnish film, tape and processing. Equipment is furnished by the department

Class 3, Lab 4, Credit 5

PPHF-202 **Introduction to Filmmaking**
Registration #0902-202
A fundamental course in narrative film production. Filmmaking as a means of interpretation and expression with emphasis on the narrative. A combined theoretical-practical approach to the film medium. Production will be in super 8 (non-sync) format Students furnish film, tape and processing. Equipment is furnished by the department

Class 3, Lab 4, Credit 5

PPHF-203 **Introduction to Fiction and**
Registration #0902-203 **Dramatic Moving Image Production**
Moving image production as a process of interpretation and expression with an emphasis in the narrative moving image form as applied to dramatic fictional shorts. Included will be the nonfictional narrative and conceptual form. Application of the elements of structure and organizational principles appropriate to the main area of emphasis. A combined theoretical-practical approach to the dynamics of the moving image medium. The student is expected to demonstrate technical and theoretical knowledge of the moving image process through a series of assignments. Production will be in super 8 (non-sync) format Students furnish film and processing; equipment is furnished by the department (PPHF 302 or 202 or a satisfactory equivalent)
Class 3, Lab 4, Credit 5

PPHF-204, 205, 206 **History and Aesthetics of the**
Registration #0902-204, 205, 206 **Moving Image**
A non-scholarly exploration of the history and aesthetics of film. Emphasis is on determining the unique characteristics of the medium, how those characteristics are used as a means of interpretation and expression, and their relevance to other kinds of non-verbal image making.

Class 3, Credit 3

PPHF-207 **Introduction to Portable**
Registration #0902-207 **Video I**
A basic course for novices. Emphasis is on video taping and the use of the medium as an interpretive and expressive medium. A combined theoretical/practical approach to the dynamics of the medium.

Two short video projects are required. 1/2' beta equipment, including editing facilities, is provided by RIT. Students must purchase a minimum of two 60-minute, 1/2" video cassettes.

Class 3, Lab 3, Credit 4 (F, W, S)

PPHF-208 **Introduction to Portable**
Registration #0902-208 **Video II**
In this course the student applies the basic video skills acquired in PPHF-207 to the design and realization of mature narrative imagery. Progress is supervised by the instructor through regular screenings and conferences with the student (PPHF-207)

Class 3, Lab 3, Credit 4 (W)

PPHF-210 **Materials and Processes of**
Registration #0902-210 **the Moving Image I**
This course is primarily designed to familiarize students with the basic technical concepts of film making. By taking this course, students should gain an understanding of the technical procedures required to commit an image to the medium of film in a professional manner.

Lec. 1, Demo 2, Credit 2 (F)

PPHF-310 **Materials and Processes of**
Registration #0902-310 **the Moving Image D**
A technical survey of the tools and materials used in video production. (PPHF-210, PPHF-203)

Lec. 2, Credit 2 (F)

PPHF-311 **Portable Video Production**
Registration #0902-311
An examination of the practical, technical and aesthetic considerations of portable video production. Work involves single system 3/4" shooting and editing. Skills are developed in visual continuity, storyboarding, graphics, camera work, lighting, sound and offline insert editing. Viewings and discussion of the works of video artists and documentarians, critiques of student work, application workshops, outside readings and viewings supplement lecture presentations and production work. (PPHF-203, **208)**

Class 2, Lab 4, Credit 4 (F)

PPHF-312 **Documentary and**
Registration #0902-312 **Multi-Camera Video**
In addition to continuing the documentary work of the first quarter, lab meetings will introduce and develop real-time television skills. This includes the scripting, staging and directing of a multi-camera unedited productions. Lectures include broadcast history, ratings, cable and satellite television along with additional viewings and discussions of documentary work. Each student will produce a studio interview show as well as a "mini-documentary." (PPHF-311)

Class 2, Lab 4, Credit 4 (W)

PPHF-313 **Electronic Field Production**
Registration #0902-313
Lab work examines and applies the professional skills needed to shoot a complex location production, a trip to an affiliate station or production house and experimentation with electronic image manipulation. Lectures include the film/video interface, copyrights, production budgeting, grants, computer interfacing, and the job market. The student's major responsibility is to produce a "year-end project" which is meant to test his/her ability to professionally apply all that has been learned. (PPHF-312)

Class 2, Lab 4, Credit 4 (S)

PPHF-321 **Writing for Film**
Registration #0902-321 **and Television**
This course explores the writing of non-fiction and fiction for theatrical and non-theatrical films and television. Experience in the writing of fiction concentrates on the elements of dramatic construction. The exploration of non-fictional writing examines information gathering techniques and methods of investigation. Both non-fiction and fiction are treated as expository, story-telling forms. Students are responsible for writing film or television scripts on subjects of their own choosing and for completing several brief written exercises in areas such as character, dialogue, the interview, suspense, and plot. Although this course is designed primarily to meet the needs of film and television majors, it is not restricted to those students.

Class 2, Lab 3, Credit 3 (W)

PPHF-322 **Writing for Film and**
Registration #0902-322 **Television II**
Continuation of PPHF-321. (PPHF-321 or consent of instructor)

Class 2, Lab 3, Credit 3 (S)

PPHF-324 **Introduction to Animation and**
Registration #0902-324 **Graphic Film Production I**
An introduction to the techniques and practices of graphic and animated film production. This course provides training and practical experience in a wide variety of approaches to single frame motion picture production. Students produce a number of short film exercises utilizing both existing and original artwork. Some techniques covered in the course are: direct modification of the film surface, cell, ink, and paint animation, and kinestasis. Screenings of professionally made films will illustrate each technique. Proficiency in drawing is required. No prerequisites.

Class 3, Lab 2, Credit 4 (F)

PPHF-325 **Introduction to Animation and**
Registration #0902-325 **Graphic Film Production II**
A continued introduction to the techniques and practice of graphic and animated film production. This course provides training and practical experience in a number of approaches to single frame film making in addition to those covered in PPHF-324. Some techniques covered in the course are: three-dimensional animation; optical printing; computer animation; and hand-drawn sound. Screenings of professionally made films will illustrate each technique. Proficiency in drawing is **not** required. (PPHF-324)

Class 3, Lab 2, Credit 4 (W)

PPHF-326 **Animation and Graphic Film**
Registration #0902-326 **Production**
This course provides practice in all phases of single frame film production. Students produce a 16mm 60-second film with sound utilizing one or more techniques learned in the preceding two quarters. (PPHF-325)

Class 3, Lab 2, Credit 4 (S)

PPHF-404 **Senior Project Seminar**
Registration #0902-404
A required course for 3rd year film/video majors and is the prerequisite for PPHF-541, Senior Project. Students will discuss and generate a written plan for their senior film and/or video projects and will select an advisor from among the film/video faculty. (PPHF-412)

Class 1, Credit 1 (S)

PPHF-405 **Advanced Video**
Registration #0902-405
A thorough survey of the state-of-the-art methods and the hardware involved with electronic imaging. Large format computer editing and field recording, digital frame grabbing and store, computer imaging and animation are some of the topics covered. (PPHF-303, PPHF-310)

Class 3, Credit 3

PPHF-406 **Solving Directorial Problems**
Registration #0902-406
An in-depth penetration into the role of the film/video director. (PPHF-203, 413 or equivalent)

Class 2, Credit 3

PPHF-410 **Materials and Processes of**
Registration #0902-410 **the Moving Image m**
The course introduces the student to 16mm film technology and production systems that apply to other media production as well. (PPHF-203, 310)

Class 1, Lab 2, Credit 2 (F)

PPHF-411 **Visualization and Commercial**
Registration #0902-411 **Film Production**
A general review of professional production methods and the theory and practice of visualizing an expressive film continuity. Basic synchronous sound recording is included. (PPHF-203 or permission of the instructor)

Class 2, Lab 6, Credit 5 (F)

PPHF-412 **Film Planning and**
Registration #0902-412 **Studio Operations**
Introduction to studio crew work and editing systems for professional film. Budgeting and an elementary view of the economics of production are also included. Film writing is introduced and related to production planning. Camera, lighting and editing equipment are provided, but students are expected to provide sensitized goods and processing. (PPHF-411 or permission of the instructor)

Class 2, Lab 6, Credit 5 (W)

PPHF-413 **Film Project with**
Registration #0902-413 **Synchronous Sound**
A short (5-10 min. suggested) film is produced by student teams. Advanced sound editing, sound mixing and A&B roll conforming are included. Cameras, lighting and editing equipment are provided but students are expected to provide sensitized goods and processing.

Class 2, Lab 6, Credit 5 (S)

PPHF-420 **Sound Recording**
Registration #0902-420
Specialized information and work in sound. To give information and lab work beyond the regular course. To encourage the beginning of vocational level work in sound. Each student prepares a mixed sound track to professional quality standards.

Lec. 1, Lab 2, Credit 3 (F)

PPHF-427 **Microcomputer Animation I**
Registration #0902-427
This course provides an introduction to animation created through the use of a digital computer, rather than with traditional motion picture techniques. A survey of various computer animation hardware/software combinations precedes actual production of animated sequences, both with and without sound, which are then recorded on computer disk, motion picture film, or video. (PPHF-324)

Class 2, Lab 4, Credit 4 (W)

PPHF-428 **Microcomputer Animation II**
Registration #0902-428
This course provides practice in microcomputer animation. Students produce a finished animated project on film or video tape with sound. Emphasis is placed upon various postproduction strategies which involve such techniques as combining computer animation with live action, the addition of film and video special effects, and combining computer animation with existing film or video imagery. (PPHF-327)

Class 2, Lab 4, Credit 4 (S)

PPHF-434 **Advanced Video**
Registration #0902-434
A thorough survey of the state-of-the-art methods and the hardware involved with electronic imaging. Large format computer editing and field recording, digital frame grabbing & store, computer imaging and animation are some of the topics covered. (PPHF-203, 310)

Class 3, Credit 3

PPHF-442 **Film/Video Internship**
Registration #0902-442
This course is designed to provide the students with on-the-job experience in the field of Film/Video. The student will seek and acquire a school approved internship position in a business or industry. The working environment will provide the forum for learning more about the student's chosen career. A final interview with the internship coordinators will assist the student in evaluating the experience. The coordinator should be the faculty member most familiar with the student's internship field. (Permission of internship coordinator)

Credits 1-6/Qtr. (F, W, S)

PPHF-511 **Motion Picture Workshop I**
Registration #0902-511-01
Moving image production as a means of interpretation and expression. A combined theoretical-practical approach to the dynamics of the moving image medium. The student is expected to demonstrate technical and theoretical knowledge of die structuring of the moving image through a series of film assignments. Production will be in super 8 (non-sync) format Students furnish film and processing; equipment is furnished by the department (Basic photography course or equivalent experience)

Class 9-4 p.m., Credit 9 (SR)

PPHF-512 **Motion Picture Workshop II**
Registration #0902-512
Filmmaking as a means of expression, clarification and intensification, with emphasis on the non-fictional narrative and dramatic fiction film (not excluding the conceptual film form). Application of structural and organizational factors involving purpose, content style, elements, principles, techniques and technology appropriate to the main area of emphasis. A combined theoretical-practical approach to the dynamics of the film medium. The student is expected to demonstrate technical and theoretical knowledge of the filmmaking process through a series of film assignments and examinations. Production will be in super 8 (non-sync) format Students furnish film and processing; equipment is furnished by the department (Motion Picture Workshop I or equivalent)

Class 9-4 p.m., Credit 9

PPHF-541 **Senior Production I**
Registration #0902-541 **(Film/Video)**
Continuation of the introduction to business and legal factors begun in the basic film and Video Production activities. The course assists the student in detailed budgeting and shooting, script preparation and breakdown. Final project shooting begins in this quarter. (PPHF-413)

Class 1, Lab 6, Credit 6 (F)

PPHF-542 **Senior Production II**
Registration #0902-542 **(Film/Video)**
Continuing the senior project shooting phase to completion. Production teams meet as sections with faculty whose experience matches the kind of production involved. (PPHF-541)

Class 1, Lab 6, Credit 6 (W)

PPHF-543 **Post Production**
Registration #0902-543 **(Film/Video)**
Completion of senior projects. Includes a review of post production techniques. (PPHF-542)

Class 1, Lab 6, Credit 4 (S)

PPHF-551, 552,553 **Special Topics in**
Registration #0902-551, 552, 553 **Film/Video**
A seminar approach offered on demand when adequate numbers of students and faculty desire to investigate specialized topics not normally offered in die regular curriculum. Available to upper level students.

Credit variable

PPHF-599 **Independent Study**
Registration #0902-599
A student proposed advanced project sponsored by an instructor. Approval of the proposal by the department chairperson and the director of the school. Available to upper level students with a GPA of 3.0 or greater.

Credit variable (F, W, S)

PPHF-704 **History of Animation**
Registration #0902-704
This course is based upon the belief that a knowledge of the history of animation will enable students to make better informed creative decisions. The four divisions of the subject studied are: origins and early experiments in animation; the industrialization of the process, independent and experimental animation; and computer animation. Students are responsible for writing a paper drawn from an independent investigation of some aspect of the subject, topic to be approved by instructor. The course format is lectures, discussions, and screens of historically significant films.

Credit 4 (F)

PPHF-710 **Film/Video Tools for**
Registration #0902-710 **Computer Animation**
A hands-on review of the various methods of copying and manipulating computer-generated animation. This includes the transfer of images and sound to 16 mm film or videotape, the skills needed to edit these formats and the technical manipulations available once the images have been transferred.

Credit 3

PPHF-721 **Scriptwriting for Animation**
Registration #0902-721
This course explores the principles of dramatic structure and storytelling in both fiction and non-fiction animated film and video. Students prepare short scripts suitable for production and prepare finished storyboards from those scripts.

Credit 4

PPHF-724 **Introduction to Animation**
Registration #0902-724 **and Graphic Film Production**
This course is designed to introduce students to the expressive potential of single frame film and video making. The course does not use computers and does not concentrate on traditional eel and character animation. Students use a professional animation stand to complete several short film or video disc sequences in response to a variety of creative problems and technical challenges. Screenings of numerous professionally produced films accompany and illustrate the lectures.

Credit 4 (F)

PPHF-727 **Microcomputer Animation I**
Registration #0902-727
Students in this course create animated sequences and projects using a commercial animation software package for a popular microcomputer. In addition to mastering specific software, students learn the principles of digital computer operation and how those principles apply to the problems of animation with computers.

Credit 4 (W)

PPHF-728 **Microcomputer Animation II**
Registration #0902-728
This course focuses on the integration of computer animation into film and video. Students produce a finished animated project on film or videotape with sound, which can be used as a portfolio piece. Emphasis is placed upon various postproduction strategies which involve such techniques as combining computer animation with live action, the addition of film and video special effects, and combining computer animation with existing film or video imagery. (PPHF-727)

Credit 4 (S)

General Photography

PPHG-200 **Photography I**
Registration #0903-200 **(Summer transfer)**
An intensive 10-week summer course for students entering the transfer programs, in Professional Photographic Illustration and Imaging and Photographic Technology. This is the minimum photographic education needed to gain entry to second year standing and replaces PPHL- and PPHT-201, 202, 203. Since this course is such an intensive offering, some previous photographic experience is highly advisable.

Class 10, Lab 20, Credit 12

PPHG-290 **Introductory Photographic**
Registration #0903-290 **Workshop**
A basic credit course in photographic techniques designed for the college student. The course will be directed to meet the needs of a variety of students: the industrial or business student desiring accurate visual records, the art and design student, as well as the hobbyist. Units of work to be covered include basic camera handling; 35mm and roll film processing; projection printing and controls; contact proofs; photographic lighting elements and techniques of successful photographs; and best methods of using black-and-white and color films. Field trips for developing outdoor techniques will be offered.
Students will be expected to furnish their own supplies and cameras.

Credit 6

Professional Photographic Illustration

PPHL-201, 202, 203 **Applied Photography I**
Registration #0904-201, 202, 203
An introduction to the major in Applied Photography which will give the student broad experience in various areas of photography, to assist in making vocational decisions and understanding visual communications. The curriculum emphasizes both craft and visual problem solving during the first two quarters. The third quarter continues the attitudes of the previous quarters and allows the student to concentrate in an area of interest from an offering of courses established by the Department.

Class 4, Studio 4, Lab 4, Credit 7

PPHL-205, 206 **Creative Problems**
Registration #0904-205, 206
This course is designed to make students aware of their own creative problem solving potential. Emphasis is placed on students' personal environments, enthusiasms and experiences. Attention is given to individual thinking and seeing. This will be accomplished through lectures, individual group assignments and demonstrations.

Class 3, Credit 3

PPHL-207 **Introduction to Color**
Registration #0904-207
A one-quarter course introducing color as a new element in making photographs. The course will offer a theoretical, technical and aesthetic foundation in color photography. The student will gain familiarity with the materials through shooting assignments. Emphasis will be placed on developing printing skills.

Class 2, Lab 4, Credit 3

PPHL-300 Photography D, BFA Transfer
Registration #0904-300
A concentrated 10-week summer course for students entering the transfer program in photographic illustration. Students must have had previous photography, design and an AAS degree (or its equivalent) from another institution. All selections will be verified by portfolio. This course is designed for exclusive admission into the complete third-/fourth-year BFA program.

Credit 15 (SR)

PPHL-311, 312, 313 Applied Photography II
Registration #0904-311,312, 313
Advanced applied photography in black and white and color with emphasis on craftsmanship, problem solving, and visual communications. Major technical emphasis and introduction to studio electronic flash and large format photography. Further emphasis is placed on the development of the student's ability to apply creative thinking and contemporary techniques in executing meaningful and effective photographs. (Applied Photo I)

Class 4, Studio 5, Credit 5

PPHL-315 Colloquia
Registration #0904-315
A lecture/presentation offering the specific interests and passions of the faculty. The range is academically wide and varied. (Second-year status)

Class 1, Credit 1 (W)

PPHL-340 Narrative/Documentary/
Registration #0904-340 Editorial Workshop
A major course in photojournalism and editorial photography. Emphasis will be placed on the development of intuitive photographic responses.

The objective of this five-week workshop will be to orient as well as challenge the students to photographically explore the nature of their subject matter and to visually communicate in a contemporary editorial spirit those responses and feelings to daily and weekly assigned projects that will be made in color slides and black-and-white prints.

A majority of these projects will be photographed on locations throughout Western New York and perhaps other not so distant environments including NYC. The educational direction of the workshop will be to visually explore photographic attitudes in approaching and solving photographic/photojournalism problems. The historic and aesthetic nature of photojournalism through documentation, recording, and personal responses will be applied as well as discussions through slide presentation and lecture on the nature of editorial magazines in the United States, Europe, and South America.

Critiques will be held after each project is edited and presented, enabling the student to obtain direct feedbacks from his peers and the instructor. The eagerness to learn, work hard, explore, and care is very important.

Students will be expected to furnish their own 35mm cameras and supplies. Several publications may be used.

This course may be used by BFA photo students for major credit Limit 12 students.

Credit 8 (SR)

PPHL-416,417,418 Narrative/Documentary/
Registration #0904-416,417,418 Editorial Photography I
This course will explore the use of the photographic image in narrative, documentary and editorial form. The emphasis of the course will allow the students a variety of experiences. There will be emphasis on publication and public need. (Applied Photo II)

Class 4, Field 5, Credit 5

PPHL-434 Advertising Photography
Registration #0904-434
A course built stricdy to the standards of professional photography. Only those students who seriously aspire to be professional craftspeople should enroll. The assignments are specific and vary from stricdy commercial to advertising illustration. In addition, the student is encouraged to specialize in the direction of his or her own natural ability and interests. Approximately 2/3 of the photography will be in color. (PPHL-441,442, 443)

Lec. 1, Critique 2, Studio 6, Credit 4 (F)

PPHL-437,438,439 Visual Communications
Registration #0904-437, 438, 439 Workshop
Primarily a photographic course; however, emphasis is placed on experimental approaches to communications. Visual and psychological purpose of media will be explored. This course presupposes a basic background in design, as well as in photography.

Class 2, Lab 8*, Credit 4

* Lab hours may not be scheduled and are to be completed in available time.

PPHL-441,442,443 Contemporary, Illustrative and
Registration #0904-441, 442,443 Commercial Photography I
A course in visual problem solving with photography. Studio and other controlled environments are stressed. Advertising and editorial solutions and applications are explored. The skills involved with both product rendering and concept illustration will be covered. (Applied Photo II)

Class 4, Studio 5, Credit 5

PPHL-451,452 Portrait Photography I & II
Registration #0904-451, 452
The lecture period is devoted to discussion of the current portrait project and its problems, to lighting demonstrations, posing and draping models, composition and make-up. Basic, advanced, contemporary lighting is stressed, with a special emphasis on more advanced repeatable lighting techniques. Professional quality portraits are analyzed for lighting and finishing, as well as composition. Students are encouraged to orally analyze their own work and their shortcomings.

The studio period allows students the opportunity to work on projects under the supervision of the instructor. Students also are encouraged to create something beyond the basic project and to choose the proper models for the project. Students are taught to "see the lightings," and are permitted to use either mazda or speed lighting. These "lightings" are very adaptable to commercial, illustration, and fashion photography. Professional quality is required throughout the course. Work of inferior quality will not be accepted. (PPHL-313 or equivalent)

Class 3, Studio 2, Credit 4 (F, W)

PPHL-453 Advanced Portrait
Registration #0904-453 Photography
This course brings together the skills of the first two terms and encourages the student to develop a personal approach to portrait photography through a term long self-directed project Prerequisite: (PPHL-452 or equivalent)

Lec. 2, Studio 4, Credit 4 (S only)

PPHL-455 Studio Photo/Still Life
Registration #0903-455
A summer session course in visual problem solving with photography, emphasizing still life techniques. Studio and other controlled environments are stressed. Advertising and editorial solutions and applications are explored. The skills involved with both product rendering and concept illustration will be covered. Students may enroll in this course and PPHL-456 together, as an alternative for CIC-441, (with department chairperson's approval; note that this is one credit less than CIC-441) or take one or both sessions as photo electives. (PPHL-311, 312, 313, or equivalent)

Credit 7 (SR)

PPHL-456 **Studio Photo/People**
Registration #0904-456
A summer session course in visual problem solving with photography, emphasizing people in the studio. Studio and other controlled environments are stressed. Advertising and editorial solutions and applications are explored. The skills involved with both product rendering and concept illustration will be covered. Students may enroll in this course and PPHL-455 together, as an alternative for CIC-441, (with department chairperson's approval; note that this is one credit less than CIC-441) or take one or both sessions as photo electives. (PPHL-311, 312, 313, or equivalent)

Credit 7 (SR)

PPHL-461 **Studio Operations**
Registration #0904-461
A one-quarter business course for all photography school students. This course will cover basic business concepts necessary for the operation of a small studio or free-lance business on a practical level. Job hunting, self-promotions, business promotions, bookkeeping, and legal aspects of business will be addressed.

Class 2, Lab 2, Credit 4

PPHL-462 **The Personal Document**
Registration #0904-462
A combination studio and location class that introduces the student to the concepts of using personal experience and lifestyle as information and inspiration towards image making and taking. A variety of issues will be dealt with such as public and personal events, cultural, social, personal and intercultural symbols. The course will cover the written word and its effect and influence on the photograph, and advanced black and white printing. Layout and presentation, and their affect on the audience the work is designed to serve will be included. (PPHL-311, 312, 313, or permission of instructor)

Credit 7 (SR)

PPHL-465 **On Location Photo**
Registration #0904-465
This course will cover the techniques and equipment necessary to complete an "on location" assignment for a corporate report, brochure, or audio-visual presentation. Students will be encouraged to meet professional standards while developing a strong personal point of view. (PPHL-311, 312, 313, or equivalent)

Credit 6 (SR)

PPHL-505 **History of Applied**
Registration #0904-505 **Photography**
A chronological investigation into many areas of applied photography, including advertising, documentation, illustration, news, portraiture, scientific, and travel. The works of major photographers and the influence of specific publications and events upon the style and use of photography will be examined.

Class 3, Credit 3

PPHL-516, 517,518 **Narrative/Documentary/**
Registration #0904-516, 517,518 **Editorial Photography II**
This course will explore and expand the use of the photographic image in the narrative/documentary and editorial point of view. Emphasis will be upon publication and professional use of the image. (PPHL-416,417, 418)

Class 4, Field 5, Credit 5

PPHL-535,536 **Advanced Color Seminar**
Registration #0904-535, 536
This is a portfolio preparation course. It concentrates on the shooting, structure, and presentation of a body of work. Completion of a four part thematic assignment and three individual photographic assignments are required. All assignments are non-specific in nature, allowing the student the freedom of his or her own direction. As part of the course requirements, each student will choose an appropriate portfolio format and will begin to show a portfolio. (Fourth-year standing or instructor's permission; PPHL-443, 418 or instructor's permission)

Class 3, Studio 4, Credit 4 (W, S)

PPHL-541, 542, 543 **Contemporary, Illustrative and**
Registration #0904-541, 542, 543 **Commercial Photography II**
A course that brings together the artistic and technical input of the first three years of the program and directs the student towards the application of the acquired skills through a series of professionally oriented assignments. (PPHL-443 or equivalent)

Class 4, Studio **5,** Credit **5**

PPHL-551 **Special Topics**
Registration #0904-551
Advanced topics of current or special interest, varying from quarter to quarter, selected from the field of professional photographic illustration. Special topics announced in advance. (Not offered every quarter. Consult coordinator of the Professional Photographic Illustration Program.)

Credit variable

PPHL-599 **Independent Study**
Registration #0904-599
A student-proposed advanced project sponsored by an instructor. Approval of the proposal by the department chairperson and the director of the school. Available to upper level students with a GPA of 3.0 or greater.

Class, Credit variable

Photographic Processing and Finishing Management

PPHM-201, 202, 203 **Basic Principles of**
Registration #0905-201, 202, 203 **Photography**
The program of study is designed to provide photographic marketing students with a thorough knowledge of the basic photographic process in order that they may have an understanding of how photographies products work. The course will include units of study in film characteristics, lighting, optics, photographic chemistry, sensitometry and color theory. Each of these will be related to the actual practice of photography.

Class 2, Lab 6, Credit 4

PPHM-204 **Orientation to Production**
Registration #0905-204 **Photographic Finishing Management**
This course is designed to provide the photo management Freshman with an orientation to the facilities, equipment, practices and procedures of the Processing and Finishing Management Lab prior to having to assume responsibility of working in the lab. This course will also introduce the freshman to some of the basic problems of the processing and finishing industry. Prerequisite: freshman standing in the Photographic Processing and Finishing Management program.

Class 1, Lab 3, Credit 1 (F only)

PPHM-300 **Production Processing and**
Registration #0905-300 **Finishing**
A 10-week summer course which provides an opportunity for students who have completed basic photography to gain an understanding of all aspects of production processing and finishing. They will be involved with machine processing on a full production basis. A hands-on-type of learning experience will be the method most often employed in this course. (Permission of the instructor)

Class 2, Lab 30, Credit 12 (SR)

PPHM-301 **Film Processing**
Registration #0905-301
Part of a three-quarter sequence of student involvement in automated processing and finishing on a full production basis. This course covers the theory and practice of film processing. (PPHM-213, PPHS-203, or PPHT-213)

Class 2, Lab 8, Credit 4

PPHM-302 **Automated Printing**
Registration #0905-302
Part of a three-quarter sequence of student involvement in automated processing and finishing on a full production basis. This course covers the theory and practice of automated printing. (PPHM-213, PPHS-203, or PPHT-213)

Class 2, Lab 8, Credit 4

PPHM-303 **Custom and Professional**
Registration #0905-303 **Finishing**
Part of a three-quarter sequence of student involvement in automated processing and finishing on a full production basis. This course covers the theory and practice of custom and professional printing. (PPHM-213, PPHS-203, or PPHT-213)

Class 2, Lab 8, Credit 4

PPHM-310 **Survey of Production**
Registration #0905-310 **Processing and Finishing**
Provides the non-photographic processing and finishing major with an opportunity to become knowledgeable in the operational procedures and services of a processing and finishing laboratory. (PPHM-203)

Class 2, Lab 2, Credit 2 (S)

PPHM-313 **Introduction to Color Science**
Registration #0905-313 **and Appearance**
A survey course exploring the basic principles of color perception, the interaction of light and objects, the effects of illumination on color appearance, the specification of illuminating sources, colorimetry, and instrumentation used for colorimetry and photographic quality control.

Class 4, Credit 3

PPHM-320, 321 **Mechanics of Photographic**
Registration #0905-320, 321 **Hardware**
The course will cover causes, effects and benefits of the application of basic principles of optics, mechanisms and electronics embodied in the type of hardware handled by retail and wholesale photographic establishments catering to the general public. (PPHM-203)

Class 4, Credit 4 (W, S)

PPHM-401, 402 **Photographic Process**
Registration #0905-401, 402 **Control**
Statistical methods of studying repetitive processes, with special application to photographic processing; methods of obtaining data about process, including chemical and physical factors; methods of making process adjustments, including automatic control methods. (PPHM-303 or PPHM-300)

Class 2, Lab 6, Credit 4

PPHM-410,411,412 **Training and Supervision of**
Registration #0905-410, **Photographic Processing and**
411,412 **Finishing Laboratory Personnel**
Provides an opportunity for the processing and finishing management students to experience supervisory and training techniques as they prepare and use training aids and techniques in the actual supervision of the various work areas in the processing and finishing laboratory. (PPHM-303, or PPHM-300 and permission of instructor)

Class 2, Lab 8, Credit 4

PPHM-418 **Color Transparency Processing**
Registration #0905-418 **Techniques**
The fundamentals of slide duping, internegatives from slides and reversal processing for small laboratories are addressed in this course. The emphasis is placed on establishing a quality control system including densitometry, chem mix, control charts, chemical control, use of quality control computers and the operation of several types of processing equipment.

Credit 4

PPHM-420 **Applied Statistical Quality**
Registration #0905-420 **Control**
The basic concepts of quality control and the role of applied statistics are addressed using examples from the photographic and graphic arts industries. Examples will include the use of such statistical tools as process capability studies, conformance to specification analysis, control charts, attribute and acceptance sampling plans as well as the use of nonparametric techniques for the subjective evaluation of image quality. Although many of the topics covered are statistically based, attention is given to the ingredients necessary for a successful company-wide quality control program.

Class 2, Lab 2, Credit 3

PPHM-430 **Technical Writing**
Registration #0905-430
This introduction to technical writing will review the fundamentals of good syntax, punctuation and usage as well as provide the student with writing exercises designed to increase the student's proficiency in technical report writing. In addition to stressing the structural elements of scientific and technical literature, each student will learn to use the RIT VAX system for text editing and processing.

Class 2, Lab 2, Credit 3

PPHM-501, 502, 503 **Senior Seminar in Production**
Registration #0905-501, 502, 503 **Processing and Finishing Management**
This course is designed to help the photo management student make last minute preparations for entering the world of work. Procedures for obtaining employment, i.e., preparing resumes, taking interviews, plant visitations, etc., will be covered in detail. Information on the latest business practices and procedures will be discussed in depth as well as the current condition of the processing and finishing market. (Senior standing) Students will register each quarter, but credit will only be assigned in spring quarter.

Class three times a quarter for three quarters, Credit 1

PPHM-506 **Theory of Corrective**
Registration #0905-506 **Color Printing**
A study of characteristics of color negatives as they relate to corrective color printing. Theory and methods of color and density correction levels will be discussed. Various approaches to automatic classification will be studied. The students will be introduced to matrix control of color printing as utilized in digital computer controlled printing equipments. (PPHM-303)

Class 2, Credit 2 (S)

PPHM-510 **Finishing Lab Operations**
Registration #0905-510 **Management**
This course is designed to provide Photographic Processing and Finishing Management students with the background knowledge which is necessary to plan, set up, and operate a finishing laboratory. Included in this course will be a study of production methods, work flow, layout, and equipment complements which lead to efficient operation. Cost analysis of a laboratory operation will be presented and optimization techniques for cost reduction and scheduling will be discussed. (PPHM-211, 213, 301, 302, 303)

Class 4, Credit 4

PPHM-511, 512, 513 **Advanced Production**
Registration #0905-511, 512, 513 **Processing and Finishing**
This course taken during the last year of study provides the student with an opportunity to study in depth, on an independent basis, those areas of processing and finishing which the student finds most interesting. This course may also be used to strengthen those areas of interest in which the student feels a weakness. (PPHM-303 or PPHM-300)

Lab 12, Credit 4

PPHM-520 **Operation, Care and Maintenance**
Registration #0905-520 **of Photofinishing Equipment**
This course will provide students with an opportunity to gain a thorough understanding of the mechanical, optical, and electrical aspects of major pieces of photofinishing equipment The course will employ the latest techniques in programmed learning, demonstrations, "hands-on" experience and lectures so that students will be able to operate and perform basic care and maintenance on major pieces of processing and finishing equipment Broad principles learned here will be applicable over a wide range of equipment (PPHM-412)

5 full days at Kodak Marketing Education Center, Credit 1

PPHM-551, 552, 553 **Special Topics in**
Registration #0905-551, **Photographic Processing and**
552, 553 **Finishing Management**
A seminar approach offered on demand When adequate numbers of students and a faculty member agree to study a subject not normally offered in the regular curriculum. Available to upper level students.

Credit Variable

PPHM-599 **Independent Study**
Registration #0905-599
A student-proposed advanced project sponsored by an instructor. Approval of the proposal by the department chairperson and the director of the school. Available to upper level students with a GPA of 3.0 or greater.

Credit variable

Imaging and Photographic Technology

PPHT-201,202, 203 **Photography I**
Registration #0920-201, 202, 203
A study of the fundamentals of photography with emphasis on the development of the necessary creativity, craftsmanship, theory and visual communications to undertake advanced study in the medium. The theory and technical aspects are taught as they relate to solving photographic problems.

Class 4, Studio 4, Lab 4, Credit 7

PPHT-205 **Photography For**
Registration #0920-205 **Non-Photo Majors**
A course in basic photographic techniques for non-photography students. The material will assist the student in understanding the controls of light and film. Emphasis is placed on the use of photography in the student's career field. A 35mm camera is required.

Class 4, Credit 4

PPHT-210 **Materials and Processes**
Registration #0920-210 **of Photography**
An intensive 10-week summer course for students entering a transfer program in Biomedical Photographic Communications or Imaging and Photographic Technology. This course replaces PPHT-211,212,213. (Either this course or the PPHT-211,212,213 sequence is also a requirement in the Professional Photographic Illustration program.)

Class 9, Credit 6 (SR)

PPHT-211, 212,213 **Materials and Processes**
Registration #0920-211, 212, 213 **of Photography**
A basic study of the technology of photography, with the emphasis on applications to real photographic problems. Among the topics studied are image formation and evaluation, photosensitive materials, exposure, processing, tone reproduction, visual perception, color theory, variability, quality control, and photographic effects. An independent study project is required.

Class 3, Credit 3

PPHT-220 **Survey of Imaging and**
Registration #0920-220 **Photographic Technology**
This course is designed to provide students with information concerning career opportunities within the field of imaging and photographic technology and subdivisions of specialization, and includes presentations by experienced professionals representing a variety of positions.

Class 1, Credit 1

PPHT-301 **Photographic Sensitometry**
Registration #0920-301
Principles of sensitometric methods as applied to the selection and use of photographic emulsions. Problems in exposure, processing, densitometry, and data interpretation will be addressed. The characteristics of commercially available sensitometers and densitometers will also be reviewed. The laboratory work will consist of practical comparisons of currently marketed photographic materials upon which the student is required to prepare written and oral reports. (PPHT-211, 212, 213)

Class 2, Lab 3, Credit 3

PPHT-302 **Technical Photographic**
Registration #0920-302 **Chemistry**
The basic chemistry of black-and-white and selected color processes is presented. Developer, short stop, fixation, bleaching and reversal are investigated. Student designed investigations are carried out Technical notebook and report preparation are required.

Class 2, Lab 3, Credit 3

PPHT-303 **Photographic Optics**
Registration #0920-303
The principles of geometrical optics as applied to image formation, lens types, lens aberrations, lens testing, and optical instruments, including the human eye, and radiometric applications to optical systems. (SMAM-204, SPSP-211, 212, 271, 272)

Class 2, Lab 3, Credit 3

PPHT-305 **Portrait Retouching**
Registration #0920-305
The study and application of different techniques, materials and processes used in portrait retouching of negative and prints. Projects making use of these techniques, materials and processes will be required.

Class 1, Lab 4, Credit 3

PPHT-306 **Commercial Retouching**
Registration #0920-306
The study and application of the techniques, materials and processes used in commercial retouching. Projects making use of these techniques, materials and processes will be required.

Class 1, Lab 4, Credit 3

PPHT-307 **Basic Airbrushing**
Registration #0920-307
Study of the different types of airbrushes and their uses. A series of lessons will develop skill in the handling of the airbrush and an understanding of when and how the airbrush is used to retouch photographs.

Class 1, Lab 4, Credit 3

PPHT-311 **Color Photography/Photographic Design**
Registration #0920-311
The exploration of images through the application of visual elements, principles and attributes, including the key and quality of light in the making of photographs, color contrast and rendition, and comparison of rendition from different materials.

Class 2, Lab 4, Credit 4

PPHT-312 Color Printing/Theory
Registration #0920-312
This course provides an introduction to color theory and the exploration of color processes utilizing practical laboratory procedures and photographic color reproduction processes. This will support lectures and readings on applied color theory relating to both color photography and to its applications. Important topics, in addition to color materials and processes, include color vision, psychological aspects of color, color terminology, and color measurement and specification.

Class 2, Lab 4, Credit 4

PPHT-313 Color Measurement
Registration #0920-313
Equipment and methods used for the measurement of color will be discussed and demonstrated in the laboratory. Topics covered include light sources, radiometry, spectrophotometry, color order systems, and reproduction of color. Pascal programming will be presented and programming assignments will be required. (PPHT-321 or equivalent)

Class 2, Lab 4, Credit 4

PPHT-321 Applied Computing for
Registration #0920-321 Technical Photography
Current timesharing computer facilities will be introduced with emphasis on specific hardware and software packages available on these facilities including word processing. Introductory material on Pascal programming will be presented. Programming assignments will be required. (Limited to Imaging and Photographic Technology students or by the permission of the instructor)

Class 2, Credit 3

PPHT-340 Introduction to Scientific and
Registration #0920-340 Technical Applications of Photography
Introduction to special or unusual methods particularly useful in technical, scientific, or research photography. Emphasis is on the student's development of innovative solutions to a set of photographic problems. Topics covered include high-speed photography, strip photography, velocity and time measurement cameras, polarization, time lapse, astrophotography, and others. Firsthand experience is encouraged by participation in simulated and simplified approaches to more complex specialties.

Class 2, Lab 4, Credit 4 (F)

PPHT-341 Introduction to Photography
Registration #0920-341 for Publications
An introduction to the use of photography in specialized publications in science, industry, business and education. Skill-building assignments to improve competence and an introduction to the problems of the art director, editor, printer, layout person, and writer form the basis of the course content. (PPHL-313, PPHT-312 or the permission of the instructor)

Class 2, Lab 4, Credit 4

PPHT-395 Photo Electronics Workshop
Registration #0920-395
Introductory hands-on course covering basic electronic devices particularly useful in photographic applications. The emphasis is on learning to read circuits, to understand the basic electronic symbols and principles, to learn to make printed circuit boards. Using assembly techniques such as soldering, wire wrap, and proto board to construct a few projects of the student's choice from an available list which includes: light meter, flash meter, slave trigger, sound trigger, timer, intervalometer, basic electronic flash, counter and time delay, etc.

Class 1, Lab 4, Credit 3

PPHT-401,402,403 Photoinstrumentation
Registration #0920-401,402,403 Applications Seminar
The student will be exposed to a variety of technical, industrial, and/or applied photographic experiences in order to gain a fuller understanding of the scope of photography and its applications. Simplified approaches to photographic instrumentation applications are emphasized. Photographic topics are discussed that emphasize scientific and technical applications where photography functions as a tool of measurement and visualization of events that are beyond the range of normal photographic equipment

Class 1 1/2, Lab 4, Credit 4

PPHT-404,405,406 Seminar in Photography for
Registration #0920-404,405,406 Publications
A survey of this type of publication with particular emphasis on the photographic problems involved. Skill-building assignments to improve competence and an introduction to the problems of the art director, editor, printer, layout person, and writer form the basis of the course content (PPHL-313, PPHT-312 or permission of the instructor)

Class 2, Lab 4, Credit 4

PPHT-410 Architectural Photography
Registration #0920-410
An image-making course for advanced students with a specific interest in interior and exterior architectural photography. Assignments are designed to emphasize the development and exploration of professional attitudes and techniques while providing a comprehensive study of the subject. All required work will be on color transparency materials. (PPHL-313, PPHT-312 or permission of the instructor)

Class 3, Credit 9 (SR only)

PPHT-411 Preparation of Visuals
Registration #0920-411
Study of the basic principles and techniques of effective visual communication and design; including charts, graphs, creative 35mm slide techniques, graphic design, and mechanical art requirements for printing. Assignments are compatible with situations in graphic design and AV studio facilities. (Photo I or equivalent)

Class 2, Lab 2, Credit 3

PPHT-412 Photomacrography/
Registration #0920-412 Photomicrography
Basic principles of photomacrography and photomicrography with major emphasis on illumination techniques and image formation, with lectures, demonstrations, and projects. (Tech Photo II)

Class 2, Lab 4, Credit 3

PPHT-421 Holography I
Registration #0920-421
This course is intended to be an introduction to holography theory and techniques. Lectures and demonstrations will cover the materials, processes, and applications of the fundamental types of holograms. Labs will give hands-on experience with the construction and playback of transmission, reflection, and focused image hologram types. (Algebra and physics)

Class 2, Lab 4, Credit 4

PPHT-422 Applications of Holography
Registration #0920-422
This course is designed to give the student a range of experiences in the production and evaluation of holograms as applied to scientific and engineering problems. Instruction is given in both the theoretical and practical aspects of holographic interferometry and nondestructive testing as well as holographic optical elements, computer-generated holography and coherent optical processing. The student is expected to have previous experience in basic display holography.

Credit 4

PPHT-425,426,427 **Nature Photography**
Registration #0920-425, 426,427
Students will learn the fundamentals of professional nature photography as exhibited by such magazines as ***Audubon*** and ***National Wildlife.*** Topics include selection and care of equipment, use of strobes, adapting to adverse weather conditions, sales of photographs, copyright law, free-lance, and more. Students will be required to spend a minimum of several hours per week shooting in natural environments. (Photo **I** or have instructor permission)

Class 4, Field 4, Credit 4

PPHT-441 **Introduction to Dye Transfer**
Registration #0920-441
An introduction to the Dye Transfer process using pan matrix film with emphasis on the understanding of its theoretical principles, and on the mastery of basic transfer techniques. This includes the preparation of transfer prints from the student's color negatives. (PPHT-312 or equivalent)

Class 1, Lab 6, Credit 4

PPHT-442 **Advanced Dye Transfer I**
Registration #0920-442
A continuation of the Dye Transfer Process with emphasis on the understanding and mastery of masking and color separation (analysis) of a color transparency. The synthesis is accomplished by the making of a dye transfer print (PPHT-441, PPHT-312 or equivalent)

Class 1, Lab 6, Credit 4

PPHT-443 **Advanced Dye Transfer II**
Registration #0920-443
This quarter of the Dye Transfer program is devoted to the variations of standard techniques and further extension of improvement of procedures. Difficulty of procedure will determine number of assignments required. (PPHT-442 or equivalent)

Class 1, Lab 6, Credit 4

PPHT-444 **Reversal Color Printing**
Registration #0920-444
A one-quarter course on reversal color printing procedures, printing and processing. The student will gain proficiency in using reversal print material. (PPHT-312 or permission of the instructor)

Class 1, Lab 4, Credit 3

PPHT-446,447,448 **Advanced Color**
Registration #0920-446, 447,448 **Printing I, II, HI**
This course is designed to give the student an advanced study in color techniques and theory in relation to quality and creative use of photographic materials. The student may choose a section for intensive study such as the dye transfer process, quality control methods in printing and processing and special masking. (PPHT-312 or equivalent and permission of the instructor)

Lecture 1, Lab 6, Credit 4

PPHT-450 **Photographic Scanning Systems**
Registration #0920-450
The student will receive instruction and make photographs related to the ever-increasing application of scanning imaging systems in industry, especially as these relate to industrial, scientific, and technical applications. Simplified and experimental equipment will be demonstrated and used. Primary emphasis will be on demonstrating a thorough understanding of the imaging processes and controls at work in systems such as peripheral, photofinish, strip enlarging, and panoramic recording methods. (For upper-division PPHT students; others with permission of the instructor)

Credit 4

PPHT-460 **Special Effects Photography**
Registration #0920-460
A course designed for practicing photographers and students in which photographic effects beyond those encountered in everyday situations in illustrative, commercial and advertising photography are discussed and practiced. Among the topics to be covered are stroboscopic, peripheral, scanning, high-speed flash, matte box, and combination flash/tungsten photographic techniques. (For upper-division SPAS students)

Credit 4

PPHT-499 **Co-op**
Registration #0920-499
This course is designed to provide students with on-the-job experience in the field of imaging and photographic technology. After completing the prerequisite Co-op Seminar (PPHT-511), the student will seek and acquire a school-approved co-op position in business or industry. The working environment will provide the forum for learning more about the student's chosen career. A final interview with the co-op coordinator will assist the student in evaluating the experience. (PPHT-511)

Credit 0

PPHT-501 **High-Speed/Time-Lapse**
Registration #0920-501 **Photography**
This is a course in the theory and practice of photographic systems designed to permit analysis of events of very short or of extended duration. Included are operational characteristics of time-lapse cameras, sequencing and timing control devices, time magnification relationships. Also, characteristics of intermittent and rotating prism cameras, rotating mirror and drum cameras, synchronization systems and timing controls and high speed flash and spark gap systems. Students gain experience not only in the use of the basic equipment but also in proper planning, set-up and data reduction techniques through a series of practical experiments. (For upper-division PPHT students; others with permission of the instructor)

Class 2, Lab 4, Credit 3

PPHT-502 **Introduction to Research**
Registration #0920-502
This course leads to a completed Proposal in preparation for the Senior Project (PPHT-503). It guides the students in preparing formal proposals for their projects, including selection of topics, searching the literature, and proposal evaluation.

Class 1, Credit 1

PPHT-503 **Research Project**
Registration #0920-503
Investigation of a topic in the area of applied, technical, or scientific photography, involving camera and/or laboratory work, evaluation, oral presentation of the results, and a written report in a standard format. (PPHT-502)

Class 1, Lab 4, Credit 3

PPHT-504 **Survey of Nonconventional**
Registration #0920-504 **Imaging**
A survey of imaging methods and imaging systems not normally encountered in other technical photography courses, including UV, IR, 3D, Holography, Electro-Photography, X-ray, and Non-silver applications. (For upper-division PPHT students. Others with permission of the instructor)

Class 1 1/2, Lab 3, Credit 3

PPHT-511 **Co-op Seminar**
Registration #0920-511
This course is designed to prepare third-year Imaging and Photographic Technology students for the co-op experience and career decisions. Classroom instruction and outside work will be aimed towards helping the student effectively utilize the co-op experience. Topics such as resume preparation, interviewing techniques, application procedures, career tracking, and co-op evaluation will be addressed in the course. Students completing the course will gain a thorough understanding of the co-op experience and be better prepared for career decisions.

Class 1, Credit 1

PPHT-512 **Co-op Internship**
Registration #0920-512
This course is designed to provide students with on-the-job experience in the field of imaging and photographic technology. After completing the prerequisite Co-op Seminar (PPHT-511), the student will seek and acquire a school-approved co-op position in business or industry. The working environment will provide the forum for learning more about the student's chosen career. A final interview with the co-op coordinator will assist the student in evaluating the experience. (PPHT-511)

Credit 3

PPHT-520 **Color Photography Workshop**
Registration #0920-520-01
A creative color workshop with the goal to produce visually effective color photographs. The student is free to choose from a large variety of assignment suggestions or to structure a program individually as an independent study. Besides creativity, principles of design and photographic controls will be important. Most photographs will be produced on color transparency material. The last two weeks can be spent color printing for those wishing this experience.

Students are expected to furnish their own small or medium format cameras and supplies. Large format cameras and chemicals are furnished. Color film and paper expenses can be expected to run as high as $75 to $100. (Some previous photographic experience required. Registration limited; permission of the instructor)

Credit 9 (SR)

PPHT-551, 552,553 **Special Topics in Imaging and**
Registration #0920-551, 552, 553 **Photographic Technology**
A seminar approach offered on demand when adequate numbers of students and a faculty member agree to study a subject not normally offered in the regular curriculum. Available to upper-level students.

Credit variable

PPHT-599 **Independent Study**
Registration #0920-599
A student-proposed advanced project sponsored by a faculty member. Approval of the proposal by the department chairman and the school director required. Available to upper level students with a GPA of 3.0 or higher.

Credit variable

Storage Applications Design

PPHV-731 **Storage Applications Design I**
Registration #0922-731
An exploration of the technology, psychology, and aesthetics of modern storage applications with their massive image-information-delivery capacities, including an analysis of the hardware and software of videodiscs and optical discs as image banks with attendant databases and the effects of interactivity on system design. (Completion of undergraduate degree or equivalent; some background in computers or communication arts or science)

Class 4, Credit 4

PPHV-732 **Storage Applications Design II**
Registration #0922-732
An experiential laboratory working with existing interactive software, authoring systems, original image retrieval programs, for existing image banks primarily on videodisc and optical disc; also involving experience with interactive input devices such as key board and touchscreen. (PPHV-731)

Class 4, Credit 4

PPHV-733 **Storage Applications Design HI**
Registration #0922-733
Having already acquired an understanding of the theory and practice of modern storage applications, primarily in the area of videodisc and optical disc, students will be assigned to project teams in such a way that a balanced blend of artistic and scientific backgrounds is achieved where possible. The project team will be assigned an application which will be taken from the assessment of the end user's need right through final production; and software design which will include, in some shared projects, actual production on "Draw" disc or videodisc; so that an up-and-running system is the product of the project team rather than a paper design. (PPHV-732)

Class 4, Credit 4

PPHV-734 **Image Bank Management**
Registration #0922-734
An adaptation of database concepts to the special problems of the massive, randomly-accessible signal stores now possible with optical storage. (PPHV-736)

Class 4, Credit 4

PPHV-735 **Communication Theory**
Registration #0922-735
Analysis of all communication forms in terms of a taxonomy which divides communication forms into immediate and mediate, and then further subdivides in terms of channel capacity and characteristics* such as one-way systems, two-way interactive systems, etc. Within the mediate class, the course shall consider, among other things, the comparative effects on expression and impression processes of the television medium, computer storage, interactive video, and so forth. (Permission of instructor)

Class 4, Credit 4

PPHV-736 **Microcomputer Control**
Registration #0922-736
A survey of current computer-driven videodisc playback systems, involving both microcomputers and superminicomputers. Topics covered include hardware configurations, videodisc instruction sets, software interfaces, and system utilization. The course requires computer and video literacy.

Class 4, Credit 4

Center for Imaging Science

All courses in the Center for Imaging Science are offered at least once annually, except as noted.

Imaging Science

PIMG-220 **Introduction to Imaging Science I**
Registration #0925-220
This course is offered during Summer Quarter to students who wish to transfer to the Imaging Science BS degree program at the sophomore level. Prerequisites for the course include one year each of physics, calculus and chemistry (with lab) at the college level. Topics include basic materials and methods of imaging science, an introduction to RIT's computer system and the FORTRAN language. Laboratory experiments include image sampling and quantization, optical imaging, densitometry and sensitometry.

Credit 8

PEMG-221 Photoscience for Microelectronic
Registration #0925-221 Engineers
This course provides an introduction to the fundamentals of imaging and photographic science. Topics include: radiometry and photometry, exposure, silver halide materials, photoresists, speed and spectral sensitivity, sensitometry, optics, resolving power, limits of optical microlithography, measurement and control of linewidth, special exposure effects, and contact and projection printing systems.

Credit 4

PIMG-225 Introduction to Imaging Science II
Registration #0925-225
This is an intensive course covering material from the first two years of the Imaging Science curriculum. Topics include: interaction between light and matter, optics, advanced mathematics for imaging science, and chemical imaging systems. The course will prepare students with backgrounds in chemistry, calculus, and physics to enter the third-year curriculum in Imaging Science.

Credit 18

PIMG-231 Basics of Imaging Science
Registration #0925-231
Basics of Imaging Science is the first course in the curriculum. It describes the field of Imaging Science and introduces students to the component parts of any imaging system.

Credit 3

PIMG-232 Imaging Science Seminar
Registration #0925-232
Imaging Science Seminar consists of a series of lectures by faculty and invited speakers designed to introduce students to various areas in the field.

Credit 1

PIMG-233 Introduction to Imaging Science
Registration #0925-233
Introduction to Imaging Science continues the work begun in PIMG-231 and PIMG-232, introducing students to several nonconventional imaging systems. The student designs and performs an independent project.

Credit 2

PIMG-241 Introduction to VAX/VMS and
Registration #0925-241 FORTRAN for Imaging Science
Introduction to VAX/VMS and FORTRAN is a course for freshmen in the Imaging Science program designed to provide new students in the program with the necessary computer use and programming skills.

Credit 2

PIMG-345 Interactions Between Energy
Registration #0925-345 and Matter
This course emphasizes the interaction of energy (electromagnetic spectra) with states of matter. Topics covered include: electromagnetic energy, interaction of light with atoms, energy in isolated molecules, geometry and physical properties of ground and excited states, photochemical mechanisms, solid state interactions, and scattering theory.

Credit 4

PIMG-351, 352 Advanced Math for Imaging
Registration #0925-351, 352 Scientists
This two-quarter course covers mathematical topics of special importance and relevance **to** imaging science. **Topics** include: vector analysis, matrix analysis, complex variables and analysis, linear algebra, differential equations, and Fourier analysis.

Credit 4

PIMG-361 Geometrical Optics
Registration #0925-361
An introduction to the characteristics of optical components and optical imaging systems; refracting and reflecting surfaces and components; stops, pupils, and the propagation of energy through optical systems. Discussion of lenses, cameras, collimators, telescopes, and other instruments. Limitations on system performance.

Credit 4

PIMG-362 Physical Optics
Registration #0925-362
An introduction to the principles of wave optics. Topics include one- and two-dimensional vibrations; wave motion; superposition of waves; polarization; interference and interferometry; single, double, and multiple slit diffraction; and coherence. (SMAM-251, 252, PIMG-231, 232, 233, or permission of instructor)

Credit 4

PIMG-365 Chemical Imaging Principles
Registration #0925-365
This course is a rigorous mathematical and quantitative treatment of the chemical principles underlying selected imaging systems. Lectures will emphasize both physical chemistry and organic chemistry principles involved in emulsion chemistry, polymer chemistry, surface chemistry, and electrochemistry. Laboratory sessions will emphasize instrumental analysis and spectroscopy.

Credit 4

PIMG-401 Radiometry
Registration #0925-401
The course serves as an introduction to the physics of light, its generation, propagation, absorption and measurement. This is combined with an introduction to the human visual process, to general photometry and radiometry, to light sources and to light receivers. (SMAM-205, SPSP-313)

Class 3, Lab 6, Credit 4

PIMG-402 Image Microstructure
Registration #0925-402
Introduction to image formation and structure; mathematical models for spread functions of image-forming elements and detectors; superposition and convolution; noise; sinusoidal response functions; figures of merit; characteristics of instruments used for small-scale image measurements. Laboratory work in microdensitometry and subjective image evaluation. (SMAM-305, PIMG-203, SPSP-313)

Class 3, Lab 5, Credit 5

PIMG-404 Technical Communications
Registration #0925-404
A course for third-year students in Imaging Science to develop communications skills in preparation for the fourth-year research project. Literature searches; project selection; research notebooks; scientific databases; proposal writing; written and oral presentations. (Third-year status in Imaging Science, or permission of the instructor)

Class 2, Credit 2

PIMG-409 Color Appearance and
Registration #0925-409 Technology
An in-depth course dealing with the proper methodologies to quantify the chromatic and surface properties of objects. Topics include colorimetry, glossimetry, color tolerancing, metrology problems, visual scaling techniques using color order systems, and the effects of viewing and illuminating conditions on color appearance. Accompanying laboratory will concentrate on visual measurements and experimental techniques. (PIMG-313 or PPHT-313 and instructor's approval)

Class 3, Lab 4, Credit 4

PIMG-411 Statistical Inference
Registration #0925-411
An introduction to the theory and application of statistical methods. The course begins with a discussion of events and sample spaces along with fundamental probability concepts. The mathematical foundations of discrete probability functions and continuous probability density functions are developed. The concept of moments is presented along with moment generating functions as a means for studying the properties of probability functions. The concepts of central tendency and dispersion of probability functions are introduced. Fundamental examples of random processes encountered in imaging systems are used to illustrate the mathematical and statistical techniques developed. FORTRAN programming assignments are required. (SMAM-305, SMAM- 306, ICSP-220)

Class 2, Lab 2, Credit 3

PIMG-412 Design of Experiments
Registration #0925-412
Introductory hypothesis testing of means and variances is developed in the context of developing an evaluation of experimental objectives. The concepts and fundamental theoretical background behind linear regression analysis is presented. Techniques of analysis of variance are introduced as a method for evaluating the precision of a regression model. Analysis of variance is then developed as a general experimental tool. Methods of experimental error propagation are developed. Programming assignments are required. Statistical software packages are presented and analysis problems using the BMDP system are assigned. Advance topics such as spline fitting, simplex analysis, and principal components are discussed. (PIMG-411, FORTRAN experience)

Class 3, Credit 3

PIMG-413 Statistical Quality Control
Registration #0925-413
The statistics of process control are introduced using examples from the photographic and imaging industries. Techniques such as control charts are examined from both a theoretical and a practical point of view. Attribute and acceptance sampling techniques are discussed including MILSTD-105D and CSP-1 sampling statistical techniques are developed including techniques to measure subjective image quality. Programming assignments may be required. (PIMG-412)

Class 3, Credit 3

PIMG-421, 422,423 Photographic Chemistry
Registration #0925-421,422,423
The chemistry and photographic properties of photographic emulsions and developer solutions at the intermediate level; topics in physical, organic, and analytical chemistry necessary to the continued study of photographic science. (PIMG-312, SCHG-207)

Class 3, Lab 3, Credit 4

PIMG-446 Statistics I
Registration #0925-446
An introduction to the theory and application of statistical methods; events and sample spaces; fundamental probability concepts; mathematical foundations of discrete probability functions and continuous probability density functions; moments and moment generating functions as a means for studying the properties of probability functions; central tendency and dispersion of probability functions. Fundamental examples of random processes encountered in imaging systems are used to illustrate the mathematical and statistical techniques developed. Programming assignments are required. (Junior status in CIS)

Credit 4

PIMG-447 Statistics H
Registration #0925-447
Introductory hypothesis testing of means and variances is developed in the context of evaluation of experimental objectives. Linear regression analysis, techniques of analysis of variance, regression models. Analysis of variance is then developed as a general experimental tool. Methods of experimental error propagation are developed. Programming assignments are required, and statistical software packages are presented. Advanced topics such as spline fitting, simplex analysis, and principal components are discussed.
Credit 3

PIMG-451, 452,453 Digital Image Processing
Registration #0925-451, 452,453
The principles, techniques, and applications of digital image processing are introduced. The course considers formation of digital images, sampling and quantization, image input/output devices, image statistics and descriptors (e.g. histograms). Geometrical, point, neighborhood, and global mathematical operations on digital images will be considered, including kernel operators and discrete convolution. Other mathematical representations of discrete image information will be introduced, including the discrete Fourier transform. Applications of image processing will be described. Emphasis is placed on mathematical implementation of image operations.

Credit 3

PIMG-461 Radiometry
Registration #0925-461
This course considers the generation, propagation, absorption and measurement of electromagnetic radiation. Sources, detectors, spectrometers, and measurement devices are treated with an emphasis on approaches to quantification of electromagnetic radiation levels.

Credit 4

PIMG-462 Vision, Color and Psychophysics
Registration #0925-462
An intensive course covering aspects of the human visual system, psychophysics, and colorimetry which are fundamental to the field of imaging science. Topics include: spatial vision, temporal vision, color vision, machine "vision," psychophysical techniques, scaling, and colorimetry. (PIMG-452)

Credit 4

PIMG-463 Macroscopic Imaging
Registration #0925-463 Systems Analysis
This course consolidates the understanding gained in the previous three courses in this series (345, 461, 462), and develops a general description for the way in which the macroscopic (large-scale) input/output properties may be defined and related. Image input/output variables are developed which are relevant for black-and-white and color imaging systems, for continuous and discrete imagery, for hardcopy and soft display. Understanding of how these variables are related to the basic parameters used in image processing is developed. Methodology examples are given for chemical, optical and electronic imaging systems, and input/output models are derived for a selection of these systems.

Credit 3

PIMG-501, 502, 503 Research
Registration #0925-501, 502, 503
An investigation of a problem in imaging science of engineering including planning and execution of experiments, statistical data analysis, and reporting results orally and in a written paper. (PIMG-404, 413)

Class 2, Lab 2 (F) Credit variable

Class 2, Lab 6, Credit 4 (W, S)

PIMG-511, 512,513 Optical Instrumentation
Registration #0925-511, 512, 513
Principles of geometrical and physical optics, image evaluation, optical instruments, and instrumentation. (SMAM-305, SPSP-313, PIMG-303)

Class 3, Credit 3

PIMG-521, 522,523 Image Systems and
Registration #0925-521,522, 523 Evaluation
An analytical approach to analysis and evaluation of photo-optical and other images recording systems; objective and subjective evaluation techniques and their correlation. The use of convolution, correlation, autocorrelation, and Fourier methods in the analysis of the image-recording systems. Laboratory work in the design of photo-optical systems. (PIMG-402, SMAM-305, SPSP-313)

Class 2, Lab 6, Credit 4 **(F)**

Class 2, Credit 2 (W, S)

PIMG-541 Fundamentals of Optics
Registration #0925-541
An introduction to the principles of optics which form the basis for further study in the field. Topics include one- and two-dimensional vibrations, wave motion, superposition of waves, interference and interferometry, single, double, and multiple slit diffraction, and polarization. Lenses, mirrors, prisms, diffraction gratings, lasers and other radiation sources are described as fundamental components in optical systems. (SPSP-313)

Class 3, Lab 3, Credit 4

PIMG-543 Optical Engineering
Registration #0925-543
An introduction to the characteristics of optical components and their combination into instrument and imaging systems. Radiation Sources. Refracting and reflecting optical components. Stops, pupils and the propagation of energy through optical systems with both image forming and image recording elements. Radiation measurement techniques and apparatus. Discussion of lenses, cameras, collimators, telescopes, alignment and measurement apparatus, and other instruments. Limitations on system performance. (PIMG-541)

Class 3, Lab 3, Credit 3

PIMG-551, 552,553 Special Topics in Imaging
Registration #0925-551, 552,553 Science
Topics of special interest, varying from quarter to quarter, selected from the field of imaging science and not currendy offered in the division's curriculum. Specific topics are announced in advance. (Not offered each quarter. Consult director of the Imaging Science Center)

Class, Credit variable

PIMG-561, 563, 565 Microelectronic
Registration #0925-561, 563, 565 Chemistry I, II, m
Selected topics from organic, polymer, physical, and photographic chemistry important to the understanding of silver-halide, diazo and photo resist materials. (EMCR-340, PIMG-207, PIMG-543)

Class 3, Lab 3, Credit 4

PIMG-566 Imaging Systems Analysis
Registration #0925-566
An analytical approach to evaluating imaging systems using linear systems theory. The concepts of convolution and Fourier methods and the use of frequency analysis and Fourier methods are emphasized.

Credit 3

PIMG-567 Quantum Limitations of
Registration #0925-567 Imaging Processes
The effects of random variations in collected radiant energy and/or detector response on image quality; characterizing stochastic processes and noise; film graininess and granularity; propagation of quantum effects through a linear system to the image.

Credit 3

PIMG-568 Advanced Image Systems Analysis
Registration #0925-568
This course is a continuation of PIMG-566 and extends the linear-systems formalism for analyzing and characterizing imaging systems; point, line, and edge spread functions; optical, modulation, and phase transfer functions; coherent and incoherent optical systems.

Credit 3

PIMG-571,572 Photomicrolithography
Registration #0925-571, 572
A course relating imaging and photographic science principles in optics, photographic and conventional chemistry and image evaluation to the field of photomicrolithography for integrated circuit and other microelectronic device fabrication.

Class 3, Lab 4, Credit 4

PIMG-599 Independent Study
Registration #0925-599
A student proposed advanced project sponsored by an instructor. Approval required by the department chairperson and the director of the school. Available to upper level students with a GPA of 3.0 or greater.

Class, Credit variable

Master of Science in Imaging Science

PIMG-701, 702 Basic Principles and Techniques
Registration #0925-701, 702 of Imaging Science
A rigorous quantitative treatment of the fundamental science undergirding the physical, chemical, electro-optical, and biological aspects of imaging science. The mean-level relationships that define the capture, processing, and reproduction of images are treated. The course will be taught in the context of imaging application with examples from the fields of medical imaging, remote sensing, etc.

Credit 3

PIMG703 Advanced Principles and Techniques
Registration #0925-703 of Imaging Science
This course incorporates the concepts of variance, noise and information theory as it impacts imaging concepts. It expands these concepts by bridging from simple theories to measurement and system-level studies of particular imaging processes.

Credit 3

PIMG-721, 722 Mathematics and Statistics
Registration #0925-721, 722 for Photographic Systems
A special graduate course in mathematics and applied statistics involving those areas of direct concern in design, analysis, and evaluation of photographic systems.

Credit 4

PIMG-731, 732, 733 Optics
Registration #0925-731, 732, 733
This course includes the fundamental laws of geometrical and physical optics: paraxial refraction and reflection through axially centered systems, pupils and stops, photometry, principles of optical instruments, gradient index optics, polarization, interference and diffraction, finite raytracing, geometrical and diffraction theory of aberrations, optical systems concepts, measures of image quality.

Credit 4 (F, S) 3 (W)

PIMG-741, 742, 743 **Analysis and Evaluation of**
Registration #0925-741,742,743 **' Imaging Systems**
Complex variables and Fourier analysis with application to the evaluation of imaging systems; properties of optical images, structure of photographic images; methods of photo-optical system evaluation.

Class 2, Lab 6, Credit 4 (W)

Class 3, Credit 3 (F, S)

PIMG-746, 747 **Digital Image Processing**
Registration #0925-746, 747
The characteristics and properties of digital images: sampling, quantization, and frame rate. Digital image input/output systems. Operations on digital imagery; point operations, geometric operations, neighborhood operations, and global operations on single and multiple images. The frequency-space representation, the discrete Fourier transform, image convolution and filtering. Applications of digital image processing; image enhancement and restoration; medical applications.

Credit 3

PIMG-751, 752, 753 **Special Topics in**
Registration #0925-751, 752, 753 **Photographic Science**
Advanced topics of current or special interest, varying from quarter to quarter, selected from the field of photographic science. Specific topics announced in advance. (Not offered every quarter. Consult coordinator of the Imaging Science graduate program)

Credit variable

PIMG-756, 757 **Principles of Electrophotography**
Registration #0925-756, 757 **Materials *8c* Processes**
The principles of electrophotographic and electrostatic imaging, with emphasis on charge variation and field variation electrophotography as applied to xerographic systems design, analysis, and characterization. Xerography, xerographic systems, raster output scanning systems, ionographic imaging systems, surface deformation imaging systems, particle migration imaging systems, and other related imaging systems are treated. Overall emphasis is given to the basic physics, chemistry, and engineering principles involved in these imaging systems.

Credit 3

PIMG-761, 762, 763 **Principles of Remote Sensing**
Registration #0925-761, 762, 763 **& Image Analysis**
The principles of electromagnetic imaging, image processing and image analysis as they apply to remotely sensed information is the basis of this series. Photogrammetry, aerial photography, aerial photometry, thermography, multispectral image analysis and satellite image analysis are treated. Overall emphasis is on extraction of quantitative information from remotely sensed data.

Credit 4

PIMG-766, 767, 768 **Silver Halide Science**
Registration #0925-766, 767, 768
Physical structure and optical properties of silver-halide emulsions and their relations to chemistry and preparation of emulsions; treatment of theory of sensitivity and latent image formation; chemistry and kinetics of processing; chemistry and physics of selected non-silver imaging systems.

Class 3, Credit 3

PIMG-890 **Research and Thesis**
Registration #0925-890 **Guidance**
Thesis based on experimental evidence obtained by the candidate in an appropriate field as arranged between the candidate and his or her advisor.

Credit 9, minimum for MS

Master of Science in Color Science, Appearance, and Technology

PIMC-701 **Colorimetry I**
Registration #0926-701
For those taking colorimetry for the first time, colorimetric procedures commonly used in industrial quality control and research and development are covered. The emphasis is on the spectral and colorimetric characterization of chromatic stimuli using modern instrumental methods, and deriving the relationships between appearance attributes and instrumental data. Accompanying laboratory stresses instrumental measurements.

Credit 4

PIMC-702 **Colorimetry H**
Registration #0926-702
A continuation of Colorimetry I, this course emphasizes visual methods to determine color tolerances, characterizing surface properties of objects, visual scaling techniques using color order systems, and the effects of viewing and illuminating conditions on color appearance. Accompanying laboratory stresses visual measurements.

Credit 4

PIMC-751 **Special Topics**
Registration #0926-751
Advanced topics of current interest, varying from quarter to quarter, selected from the field of color science. Specific topics announced in advance. (Not offered every quarter. Consult the color science graduate program coordinator.)

Credit varies

PIMC-801 **Advanced Colorimetry**
Registration #0926-801
A detailed treatment and evaluation of current research and development in color science. Topics include current developments in CIE technical committees, luminescent colorimetry, color rendering of light sources, observer metamerism, color differences, self-luminous displays, and color appearance specification.

Credit **3**

PIMC-802 **Colorimetric Instrumentation**
Registration #0926-802 **and Standardization**
This course covers current methods of precisely measuring the spectral properties of object colors, and of radiation sources. Proper procedures in calibration, standardization, data analyses, instrument maintenance, and standards selection are discussed. The use of standard reference materials in optical metrology are explored. Various measurement assurance programs are introduced for diagnostic evaluation of current colorimetric instrumentation.

Credit 4

PIMC-803 **Color Modeling**
Registration #0926-803
This course explores mathematical techniques for predicting the coloring of absorptive systems including polymers, textiles, paper (impact and non-impact), and coatings, and the modeling of additive systems such as self-luminous displays. Emphasis is placed on Kubelka-Munk turbid media theory for opaque and translucent systems and on Grassman's laws for additive systems. Accompanying laboratory stresses the use of commercial computer colorant formulation systems and the use of multivariate statistics to model colorant behavior.

Credit 4

PIMC-890 **Thesis**
Registration #0926-890
Thesis is based on experimental evidence obtained by the candidate in an appropriate topic as arranged between the candidate and the coordinator of the program.

Credit 9 (minimum for MS)

PIMC-899 Independent Study
Registration #0926-899
A student-proposed advanced project sponsored by a graduate faculty member. Approval required by the director of the program.

Class, Credit variable

School of Printing Management and Sciences

All courses in the School of Printing are offered at least once annually, except as noted.

Management Courses

PPRM-240 Printing Financial Controls
Registration #0910-240
Plant accounting systems covered as a tool for improving production management decisions. Topics include accounting's general philosophy and structure, inventory, equipment, job cost, standard cost and analysis of variance, budgeting and control techniques.

Class 4, Credit 4

PPRM-260 Printing Planning Concepts
Registration #0910-260
A required professional course designed to provide the student with the basic principles of price determination as it relates to marketing. Special emphasis on estimating will link those marketing concepts with practice to arrive at a selling price for printed materials. Class discussions, readings and problems will be directed toward a better understanding of the relationship of marketing and planning in a printing environment.

Class 4, Credit 4

PPRM-261 Standard Software Packages
Registration #0910-261
The purpose of the course will be to teach students how to use and adapt existing software packages to build models and solve problems relevant to the printing industry.

Class 2, Credit 2

PPRM-262 Technical Writing I
Registration #0910-262
A review of writing skills; an analysis of the purpose, problem, and audience of specific writing tasks. Consideration of the principles, techniques, organization, and appropriate format, style, tone, and word choice to achieve a desired writing purpose. Lectures presenting new material and reviewing assignments; and in-class writing, critiquing, and rewriting. (English Composition, GLLC-220)

Class 2, Credit 2

PPRM-263 Technical Writing II
Registration #0910-263
Discussion of fundamentals of modern technical and business writing brief review of writing skills, audience analysis, and discussion, and selection of appropriate style, tone, and format Discussion of research techniques, documentation, and presentation of a formal technical report (PPRM-262)

Class 2, Credit 2

PPRM-280 Printing Management
Registration #0910-280 Leadership Concepts
This required course is designed to give students basic knowledge of the systems approach to management by studying the management of functions in production organizations. Emphasis is on the people input to the system. Class sessions include lectures, films, discussions, etc., as appropriate. Homework includes reading and writing assignments.

Class 4, Credit 4 (offered every year) (W, S)

PPRM-302 Personnel Relations I
Registration #0910-302
An introductory study of human relations in the printing industry, emphasizing the personnel management aspects of a supervisor's job. Students study problems of individual behavior and how workers are affected by organizational influences. Case analysis is used extensively.

Class 3, Credit 3

PPRM-305 Magazine Writing and Design
Registration #0910-305
A discerning look at what goes on in the competitive world of magazine publishing. An overview of the history, the business side, and the production side of the magazine industry. The first week will be devoted mainly to writing techniques, and the second week to the design techniques.

Credit 3 (SR)

PPRM-320 Introduction to Magazine
Registration #0910-320 Publishing and Management
A survey course designed to give the student insights into the Editorial, Production, Management, Fulfillment and Distribution processes vital to success of any magazine. Leaders from the magazine publishing industry are invited to present 3-hour guest lectures on a major aspect of their profession. Graduates of the printing program who have attained prominence within the industry are often guest speakers, encouraging interaction between current and former students.

Class 3, Credit 3

PPRM-340 Electrostatic Reproduction
Registration #0910-340 Technology
The course will cover printing methods using electrostatic technology as practiced on high speed copier machines. Along with theory of operation, the course will include: how these devices fit in the inplant, commercial, and quick print installations, cost factors, quality, and profitability in comparison to offset Ink jet printing theory, types of basic equipment, limitations, and quality will also be discussed as well as electronic printing using lasers. Each student will have a training session on a modern high-speed, high-quality copier.

Class 3, Credit 3

PPRM-401 Estimating I
Registration #0910-401
An introductory course in current estimating practices; development of an understanding of all-inclusive hour costs; application of knowledge of production process to the determination of production standards and the optimum operating sequence for various types of printed materials.

Class 3 or 4, Credit 3 or 4

PPRM-402 Estimating II
Registration #0910-402
An extention of Estimating I which deals primarily with the use of the computer in estimating. Assignments will include two- and four-color process estimates in sheet and web configurations. Review of production standards used in commercial litho plants and cost comparisons will be made for various press sizes and types of imposition. (PPRM-401)

Class 4, Open Labs, Credit 4

PPRM-403 Printing Production
Registration #0910-403 Management I
Explores practical techniques that printing companies can use in the areas of methods improvement, work measurement and control, production standards and operations indicators, equipment evaluation, proposals and financial analysis.

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

PPRM-404 **Printing Production Management II**
Registration #0910-404
Explores certain analytical models which can be used practically in an ordinary printing company. Includes such topics as decision theory, probability concepts, mathematical modeling, break-even and economic-order analysis under conditions of risk, Markov chains, waiting line analysis, game theory, simulation. These topics are considered without emphasis on mathematics beyond college algebra. (PPRM-403)

Class 4, Credit 4

PPRM-415 **Advanced Ink and Color**
Registration #0910-415
Further study of ink and color with emphasis on relationship to printing processes and print qualities. Study of inks for special purposes as well as ink-jet and electrostatic printing. New types of inks such as acrylic ink, water based inks, etc. New ideas in inks such as IR drying. Study of materials used in ink manufacturing and the effects on printing processes and print qualities. Study of color with emphasis on color gamut system and problems in process color printing. Study of ink-paper relationship. Further study of ink rheology and other physical properties. The course will deal with inks for all the processes. (PPRT-315 or permission of instructor)

Class 4, Credit 4

PPRM-420 **Electronic Communications in the Printing and Publishing Industries I**
Registration #0910-420
Presentation of an overview of electronic communication theory and its application to the publishing industry. The course provides the student with the background necessary to relate publishing requirements to electronic system parameters. Several practical newspaper systems are discussed. (SMAM-204, College Algebra & Trigonometry)

Class 4, Credit 4

PPRM-450 **Expense & Capital Project Budgeting & Control**
Registration #0910-450
Studies plant accounting systems as a tool for improving production management decisions. Topics include inventory, equipment, job cost, standard cost and analysis of variance^ budgeting and control techniques, financial analysis of projects, proposal development.

Class 4, Credit 4

PPRM-460 **Dynamic Leadership and Committee Management**
Registration #0910-460
Leadership and leadership skills are considered the foundation stones for good management. This course is designed to examine the principles and apply them. There is a concentration of the priority skills of communications, motivation, and conference management. The course is structured as a "Conference on Leadership" with the details of managing a seminar running in parallel. The "Case Method" of study is followed. A review of three books and a short term papier are required.

Class 4, Credit 4 (SR)

PPRM-502 **Financial Controls II**
Registration #0910-502
Studies plant accounting systems as a tool for improving production management decisions. Topics include inventory equipment, job cost, standard cost and analysis of variance, budgeting and control techniques, financial analysis of projects, proposal development.

Class 4, Credit 4

PPRM-506 **Business Law**
Registration #0910-506
Elements of the laws of contracts, agency, sales, negotiable instruments, partnerships, corporations, taxes, insurance, libel, copyright, and other laws pertaining to business, printing and publishing.

Class 3, Credit 3

PPRM-507 **Computer Estimating Workshop**
Registration #0910-507
The design and implementation of computer estimating systems. The class will work as a systems design team with each student required to research, design, code, debug, and document an algorithm for a specific printing operation that will run within the framework of the overall system design. Classroom lectures will focus on the implementation of 1978 ANSI BASIC on business microcomputers, the MS DOS operating system, data structures, disk file handling techniques, and the creation of good error handling subroutines. (PPRM-402, a working knowledge of BASIC, and willingness to undertake a non-trivial programming project)

Class 4, Open Labs, Credit 4

PPRM-508 **Legal and Ethical Conduct of Printing Businesses**
Registration #0910-508
A study of the legal and ethical implications faced by printing companies when involved in making day-to-day and long-term business decisions. Students become acquainted with modern printing business ethics, as well as the various laws regulating competition in the printing industry marketplace. Students are shown the impact their various business decisions will have upon their companies, co-workers and themselves.

Class 4, Credit 4

PPRM-509 **Economics of Production Management**
Registration #0910-509
Microeconomic study of factors in printing production systems. Supply-and-demand theories are applied to printing system inputs and outputs.

Class 3 or 4, Credit 3 or 4

PPRM-510 **Personnel Relations D**
Registration #0910-510
Principles of supervision including discipline, hiring and firing, are studied from the viewpoint of management.

Class 4, Credit 4

PPRM-511 **Labor Relations in Graphic Arts**
Registration #0910-511
A study of the organization of the United States labor force through the impact of national legislation and the construction of the same by United States Supreme Court and National Labor Relations Board decisions. Study includes rights of employees, their free choice of representation, collective bargaining behavior, settlement of disagreements, right to strike, and future modification of the field.

Class 4, Credit 4

PPRM-512 **Collective Bargaining in the Graphic Arts**
Registration #0910-512
An elective for students who have successfully completed Labor Relations in the Graphic Arts (0910-511). Study includes selection of representatives for purposes of collective bargaining, negotiation of the agreement, and administration of the agreement. (PPRM-511)

Class 3, Credit 3

PPRM-513 **Sales in the Graphic Arts**
Registration #0910-513
Explores economic, psychological and sociological bases of selling, with emphasis on customer and salesman interplay as well as techniques and practices of creative salesmanship in graphic arts companies. This course aims at benefiting both students considering a career in sales and those who will otherwise work with salesmen, either by supporting their company's salesmen in plant action or by buying from outside salesmen.

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

PPRM-514 **Newspaper Management**
Registration #0910-514
Consideration of personnel, organization, finance, maintenance, advertising, circulation, and other sources of revenue as they pertain to the metropolitan press; problems and practices of plant supervision.

Class 4, Credit 4

PPRM-515 **Legal Problems in Publishing**
Registration #0910-515
A comprehensive review of United States Bill of Rights Supreme Court decisions as they relate to the unique rights granted to the graphic arts industry. Cases cover Article I, Section 8 of the United States Constitution and the First and other amendments thereto.

Class 4, Credit 4

PPRM-516 **Marketing in the Graphic Arts**
Registration #0910-516
Emphasizing a printing industry viewpoint, the class explores the marketing concept (finding out what customers want and organizing to produce it profitably). Marketing functions are studied in regard to practical application in the printing industry.

Class 4, Credit 4

PPRM-518 **Purchasing in the**
Registration #0910-518 **Graphic Arts**
Role of the purchasing agent in the printing plant. Methods of procurement, purchasing policies and sources of supply. Characteristics of graphic arts materials and supplies; quality assurance; inventory control; economic order quantity determination; make or buy decisions; blanket orders; capital investment decisions; the purchase order as a legal document.

Class 4, Credit 4

PPRM-530 **Establishing a Graphic Arts**
Registration #0910-530 **Operation**
This is an elective course for seniors only with permission of the instructor. The course is a study of the problems to be encountered in the establishment of a graphic arts operation. Students will organize their own printing-related operation as they study general planning, financing, physical requirements for operation, sales and merchandising, general management and operational problems. The purpose of the offering is to coordinate student's activities with a focus on the benefits and burdens of the responsibility of establishing a graphic arts business.

Class **3,** Credit **3**

PPRM-551 **Special Topics-Printing**
Registration #0910-551
A management, or management-related course used to present and investigate on a "one-time" basis special topics not normally covered in the curriculum. Guest lecturers such as industry leaders as well as regular faculty are used to conduct this course. Subject to be covered is announced in advance.

Credit variable

PPRM-590 **Senior Seminar**
Registration #0910-590
Consideration of related graphic arts areas not normally covered in regular courses; investigation of recent and possible future developments in technology, management, and scientific applications, and their implications and probable effects on the industry.

Class 2, Credit 2

PPRM-599 **Independent Study**
Registration #0910-599
Student selects and develops, with approval from a faculty sponsor, an independent study project of his or her own design. Project and amount of credit assigned must have final approval from the director of the School of Printing Management and Sciences. (Generally seniors with qualifying GPA)
Credit **1-5**

Technical Courses

PPRT-210 **Newspaper Presses**
Registration #0910-210
An introduction to the printing processes and press designs used in the production of newspaper products. Letterpress, offset and flexographic presses are considered along with modified processes now being adopted and tested for newspaper applications. (Newspaper Production I, PPRT-320)

Class 2, Lab 3, Credit 3

PPRT-213 **Principles of Copy**
Registration #0911-213 **Preparation**
A basic course involving fundamental methods and techniques of copy preparation. It stresses the assembly of copy for various printing specialty areas and compares their likenesses and differences. Lectures cover all aspects of copy as used in making the "mechanical" and how the "mechanical" relates to the entire production system.

Class 2, Lab 3, Credit 3

PPRT-230 **Printing Processes Concepts**
Registration #0911-230
This required professional course is designed to give students a broad overview of the underlying concepts and scientific principles that are common to both the printing processes and press systems. Class sessions will consist of lectures, including films and videotape presentations. Outside assignments will consist of reading assigned portions of textbooks, vendor literature and journal articles relative to the lecture topics.

Class 4, Credit 4

PPRT-232 **Ink and Substrates**
Registration #0911-232
Provides a basic understanding of the many different kinds of ink and substrates utilized by the various printing processes. Substrate composition, runability, printability, and end-use requirements are covered, as well as the different formulation of inks and their drying systems. Requirements of each printing process and the printed product as they relate to the ink and substrate properties are covered.

Class 3, Credit 3

PPRT-234 **Print-Finishing and Distribution**
Registration #0911-234
Most printed products require that they are finished into a marketable form and are distributed by various means. Print-finishing may be done in-line on web presses or in a conventional bindery. Planning for such post-press operations requires extensive knowledge from design to the finished product. This course is designed as an introduction to pre press planning for print-finishing and distribution.

The emphasis is on cost-effective planning and management, a familiarization of the mechanical limitations in print-production and as an introduction to modern tools and methods in distribution technologies.

Class 3, Credit 3

PPRT-250 **Concepts of Design and Typography**
Registration #0911-250
This course is an introductory course designed to acquaint students with the principles of two areas: (1) Printing Design; (2) Typography. Extensive use of slides, overhead materials, handouts and where appropriate, movies and videotapes will be shown.
Class 4, Credit 4

PPRT-270 Pre-press Imaging Concepts
Registration #0911-270
This required professional course is designed to give students a broad overview of the underlying concepts and scientific principles that are common to image generation, capture, processing, storage, display and transfer technologies used in the graphic arts industry. Class sessions will consist of lectures interspersed with films and videotaped lab demonstrations. Homework assignments will consist of reading assigned portions of textbooks, vendor literature, and journal articles related to the lecture topics. In addition, four written assignments consisting of paraphrasing of relevant technical articles will be required.

Class 4, Credit 4

PPRT-301 Typography II
Registration #0911-301
The student is expected to be able to design and produce finished typographic projects. Only the requirements and restrictions for each program are given to the student, who can interpret them any way, as long as it is within the prescribed limitations. Critiques will be held when each project is completed. Topics included in the lectures are: Typographers, and a look at their work; Typographic Style; Typographic Trends; review of Design Concepts; Typographic Movements; and Private Presses. The serious student of Typography will find this a challenging course. (PPRT-351)

Class 2, Lab 6, Credit 4

PPRT-303 Layout and Printing Design II
Registration #0911-303
Typical printing design problems with emphasis on typographic arrangements, pictorial arrangement with consideration of production follow through. Includes design of complete booklet dummy and other commercial items for black-and-white color reproduction from roughs to comprehensive layout. (PPRT-351, 352)

Class 2, Lab 6, Credit 4

PPRT-305 Advanced Gravure
Registration #0911-305
An advanced course on the gravure printing process. Areas of study include: detailed procedures in chemical imaging plus in-depth concepts and procedures of the electro-mechanical engraving of gravure cylinders; new imaging systems; electronic image processing; color proofing systems; quality assurance testing and evaluation of the printed product; and study of the economics of the gravure process. There will be lectures, laboratory exercises, guest lectures, and plant tours. (PPRT-339)

Class 2, Lab 3, Credit 3

PPRT-306 Tone Reproduction and
Registration #0911-306 Halftone Analysis
A comprehensive treatment of monotone graphic arts photography to an advanced level. Human visual perception, halftone sensitometry, and process control are emphasized as important factors for the aesthetic and consistency of printed pictorial reproduction. Topics include contact screens, flare, reciprocity law failure, two-point and three-point halftone exposure controls, electronic screening, film contacting and processing control, plate/press characteristics, dot gain, criteria for subjective tone reproduction, and the Jones diagram for objective tone reproduction analysis. (PPRT-372)

Class 2, Lab 3, Credit 3

PPRT-308 Lithographic Press Problems
Registration #0911-308
An advanced course in the theory, practice, and problems of offset presswork. Further development of technical knowledge of materials and equipment. Practice in running process color work. (PPRT-340)

Class 2, Lab 6, Credit 4

PPRT-309 Screen Printing II
Registration #0911-309
Further study of the theory and practice of screen printing covering areas such as experiments with fabrics or screens; stencil forming materials and the effects these have on finished product Further study into the inks and substrates that are common to the screen printer. Introduction to and running of screen printing presses, including automatic cylinder screen printing press, container press capable of printing cylindrical, conical and flat objects, and making positives and stencils with GSP Graphix 2. (PPRT-341)

Class 2, Lab 3, Credit 3

PPRT-311 Planning and Finishing
Registration #0911-311
The course is designed to understand printing production planning from design to finish. Topics include preparing production specifications for image assembly, printing and finishing. Laboratory experiments cover the operation of modern, including some computerized, bindery equipment to provide real world experiences. Problem solving projects are followed through with economical and quality considerations. Students learn how to implement modern tools, evaluate materials and test the physical structure of bound products.

Class 2, Lab 3, Credit 3

PPRT-313 Copy Preparation
Registration #0911-313
Preparation of copy for camera, working from layouts, making analysis of requirements; pasteup techniques, methods of preseparation mechanicals, "keyline" mechanicals, use of photographic and typographic copy. Relation to production is stressed by shooting copy on camera, stripping and proofing; proper instructional specification writing. Design and production of individual 4-color process pre-separation. (PPRT-352, 372, 373)

Class 2, Lab 6, Credit 4

PPRT-314 Advanced Flexography
Registration #0911-314
An advanced course in the principles and practices of the flexographic printing process. Expanded lab time allows students to get into greater depth in all phases of flexographic technology. Students perform all operations necessary to print a large variety of substrates on all lab presses. (PPRT-338)

Class 2, Lab 6, Credit 4

PPRT-315 Ink and Color
Registration #0911-315
Theory of light and color; basic theory of process color and correction; use of color comparator and spectrophotometer; the study of color systems and color matching systems; theory and application of various ink systems; practice in standard ink mixing and color matching emphasizing offset and letterpress processes; correlation of ink properties with applications; emphasis on relationship of ink to paper and press; study of ink problems and their correction.

Class 2, Lab 3, Credit 4

PPRT-317 Calligraphic Forms
Registration #0911-317
An introduction to the basics of calligraphy, exercises in use of broadedge pen to develop primary forms of Italic, Roman Capitals, and Uncial letter styles. Evolution of letter forms. Consideration of historical origins of letters, use of basic tools, understanding of methods and disciplines stressed.

Class 3, Credit 3

PPRT-319 Newspaper Design
Registration #0911-319
A study of the methods of designing modern newspaper pages; a look at a variety of front page design methods as well as inside pages; placement of editorial content and ads; problems involved in designing section pages and special pages and editions; the standard format vs. the tabloid format; page sizes, column widths, and space between columns; how a computer can be used in creating designs for newspaper pages.

Class 2, Lab 3, Credit 3

PPRT-320 Newspaper Production I
Registration #0911-320
A study of the methods of producing a newspaper by the use of photocomposition systems and the offset process. Students organize a staff, design a newspaper, set type, paste up paper, go to camera, make plates and go to press.

Class 2, Lab 3, Credit 3

PPRT-321 Web Offset
Registration #0911-321
An analytical study of the technological development in web offset. Emphasis on the interrelationship of procedures, materials, and equipment Practical laboratory projects on a commercial four-unit perfecting web offset press. (PPRT-340)

Class 2, Lab 2, Credit 3

PPRT-322 Circulation and Mailroom
Registration #0911-322
A study of the organization and functions of newspaper circulation departments. An overview of equipment and techniques used in modern newspaper mailrooms. A study of readership and how it relates to newspaper circulation.

Class 3, Credit 3

PPRT-329 Introduction to Book Design
Registration #0911-329
A course intended to give the student an understanding of how a book designer functions within a book publishing firm. Emphasis is placed upon the many factors involved in book design decisions, including the important relationship between book design and book production in producing a readable, functional book. (PPRT-301, PPRT-303) (Offered once each year)

Class 2, Lab 3, Credit 3

PPRT-330 Advanced Concepts of
Registration #0911-330 Newspaper Production Systems
The production of a newspaper by photocomposition methods and the offset process. A continuation of PPRT-320, Newspaper Production I, in more depth, with special emphasis on pre-press operations, and the production of special inserts. Also, emphasis will be made on the use of color in newspaper production. (PPRT-320)

Class 2, Lab 3, Credit 3

PPRT-331 Bookbinding
Registration #0911-331
An introductory course to the skills of bookbinding and contemporary preservation procedures used to save our printed heritage. Content will cover methods and techniques used in hand bookbinding, including sewing, adhesive binding, gilding and boxmaking. Basic conservation skills are taught. Library binding and enduse requirements of bound products are studied and tested in order to obtain thorough knowledge of the physical requirements of bound books. Course is designed for those who value good craftsmanship and have an interest in binding books. No prerequisite is required. However, a good dexterity is desired. Students should bring several books of their own for rebinding.

Class 4, Credit 4 (SR)

PPRT-333 Introduction to Book
Registration #0911-333 Production
A course designed to introduce the student to the many-faceted role of the production manager in a book publishing firm. Production's role throughout the publishing cycle from manuscript to bound books is examined, and detailed emphasis is placed upon determining production and purchasing requirements for producing a variety of books, including trade books, textbooks, juveniles and special editions.

Class 3, Credit 3

PPRT-335 The Printed Book
Registration #0911-335 in America
A course which traces the main currents in the development of the printed book in America by closely examining the books themselves. In addition, close study of the lives and works of the great printers, their equipment and available technology, and their aesthetic viewpoints is undertaken to determine their impact on their own times and their relevance for today. Classes are held in the Melbert B. Cary, Jr., Graphic Arts Collection.

Class 3, Credit 3

PPRT-337 Art of the Printed Book
Registration #0911-337 1455-1955
This course presents masterpieces of the printer's art from the past five centuries. The lives and works of great European printers from Gutenberg to Mardersteig are examined, and their historical impact on Western civilization discussed with a view toward determining new perspectives for today's graphic artisan and book printer. Classes are held in the Melbert B. Cary, Jr., Graphic Arts Collection.

Class 2, Lab 6, Credit 4

PPRT-338 Flexographic Process
Registration #0911-338
A fundamental course based on the principles and practices of the flexographic printing process. Continues on from the basic information given in the Printing Processes course. Emphasis is placed on the elements of the technology from artwork, plates, platemaking, inks and presswork. Lab offers hands-on work centered around platemounting, ink formulation and presswork. Students print on a wide variety of presses and substrates. (PPRT-230)

Class 2, Lab 3, Credit 3

PPRT-339 Gravure Process
Registration #0911-339
Building upon concepts of the gravure process learned in Printing Processes Concepts, PPRT-230, this course expands on the theories and practices of the gravure process. The course includes both cylinder imaging and presswork and involves information on related techniques, equipment, materials and supplies. The course is conducted by means of lectures, class discussions, demonstrations and laboratory exercises involving chemical etching of cylinders, Helio engraving of cylinders, and four-color printing on a four-unit web press. (PPRT-230)

Class 2, Lab 3, Credit 3

PPRT-340 Lithographic Process
Registration #0911-340
This course builds upon the material encountered in the Printing Processes Concepts course. More detailed discussion is made of the equipment and materials that make the Lithographic Process. Topics include press, the image carrier and its chemistry, inks and fountain solutions. (PPRT-230)

Class 2, Lab 3, Credit 3

PPRT-341 Screen Printing Process
Registration #0911-341
This course is designed to acquaint students with screen printing and how it is used as a commercial printing process, stressing recent technological advances. Areas of emphasis include: frame construction, fabric selection; stretching of fabric; photo-mechanical stencil systems; screen printing inks; substrates; also including an overview of modern screen printing presses. The economics of screen printing and its relationship to the total area of the graphic arts industry is stressed throughout the course. (PPRT-230)

Class 2, Lab 3, Credit 3

PPRT-351 Applications of Typographic Concepts
Registration #0911-351
An elective course that allows the students to apply the concepts of typography to practical applications. By utilizing the equipment of the typographic laboratory, each student will be expected to produce finished typographic projects. The intent of this course is to build confidence in students and sharpen their ability to be able to judge and produce works of a typographic nature. (PPRT-250)

Class 2, Lab 3, Credit 3

PPRT-352 Applications of
Registration #0911-352 Printing Design Concepts
An elective course that introduces students to the application of traditional rendering techniques and computer-aided technology as tools for creating visual solutions to printing design problems. Emphasis is placed on the arrangement of typographic and pictorial elements to illustrate and expand on the concepts gained from the prerequisite course. (Concepts of Design and Typography, PPRT-250)

Class 2, Lab 3, Credit 3

PPRT-372 Image Capture and Conversion
Registration #0911-372
This elective professional course introduces the student to the materials and processes used by the graphic arts industry to capture and store images. It also examines both optical and electronic methods of converting those images to forms suitable for producing the image carriers required by the major printing processes. A system approach is used to prepare students to make sound business decisions in the development and management of prepress facilities. (PPRT-270)

Class 2, Lab 3, Credit 3

PPRT-373 Techniques of Image Assembly
Registration #0911-373
An introductory course in black-and-white and color-image assembly. Lab projects are assigned with the purpose of covering a wide variety of layouts requiring different techniques and often the creation of necessary contact or duplicating films of the roomlight variety. In addition to standard practices the student also works with the latest model line-up tables, a Micromodifier for spreads and chokes and receives basic instruction in electronic page make-up (Autoprep 5000). Other automated prepress imposition systems are covered in the form of slide-lectures. (PPRT-270)

Class 2, Lab 3, Credit 3

PPRT-375 Electronic Composition Systems
Registration #0911-375
An elective course in photocomposition. Formatting and code structures are utilized for typographic problems. Specialized typesetting hardware and software are analyzed for electronic composition systems with digital type storage. (PPRT-250, PPRT-270)

Class 2, Lab 3, Credit 3

PPRT-401 Typographic Workshop
Registration #0911-401
Allows students to create and solve typographic problems of their own choice. Complete freedom is given and experimentation is encouraged, giving the student opportunities to meet their own objectives and satisfaction.

Class 2, Lab 6, Credit 4

PPRT-403 Layout and Printing Design III
Registration #0911-403
A project course with design problems which involves students in converting their designs into the actual camera copy, trying various media, learning to identify art techniques and printing processes; more individualized approaches emphasized, more advanced principles applied. Less structured class sessions—more individual initiative required. (PPRT-313 or 213 and 303 and instructor permission)

Class 2, Lab 6, Credit 4

PPRT-406 Color Separation Systems
Registration #0911-406
A study of basic color theory, materials and methods used in the printing industry for the reproduction of color originals. Emphasis is placed on color separation systems and the requirements for producing good quality color. Topics include the major separation methods, color proofing, electronic color scanning, production methods, quality color, and an introduction to color electronic prepress systems. (PPRT-372)

Class 2, Lab 3, Credit 3

PPRT-410 Properties of Paper
Registration #0911-410
This course begins with a discussion of papermaking fibers, pulping procedures, papermaking machines, and proceeds to show how they affect paper properties and printing characteristics. Laboratory experiences include stock preparation, making paper and paperboard, sizing and coating paper, physical and optical testing of paper and paper identification.

Class 3, Lab 2, Credit 3

PPRT-415 Techniques in Hand
Registration #0911-415 Papermaking
This course offers a practical introduction to the many techniques used in hand papermaking. The class will begin by collecting natural raw materials that can be used in papermaking, and then proceed thru the preparation of the pulp. The student will make a deckle box, design a watermark, and then make handmade paper. Fiber identification, pulp dyeing, paper layering, embedding objects into paper, adding pulp selectively to paper surfaces, molding and casting paper will provide the students with a very broad exposure to hand papermaking techniques. We will experiment with beating pulp, blending pulps, sizing paper, and coating paper.

Credit 3 (SR)

PPRT-500 Quality Control in the
Registration # 0911-500 Graphic Arts
A study of what is quality and quality control in printing. Emphasis will be placed on how elementary statistics, management participation, and graphic arts "know-how" offer sensible approaches to quality control in printing. Topics include the conceptual aspect of quality and quality printing, establishment of the process capability via sampling and elementary statistics, the use of control chart in process monitoring, management role in quality control, densitometry, ANSI standards on color viewing, industry standards such as SWOP, FOGRA, and FIPP on color printing, use of quality control devices, and case studies on implementing quality improvement programs in various printing environments.

Class 3, Credit 3

PPRT-501 Development of
Registration #0911-501 Printing Types
Historical Development, Identification, and Classification. A lecture course that looks at the historical development of the typefaces that we use every day. Classification methods are discussed and analyzed. With slides we look at representative typefaces, learn their visual characteristics for identification. Who the designers are and the foundries, etc., that created them.

Class 3, Credit 3

PPRT-506 Electronic Color Imaging
Registration #0911-506 and Color Control
An analytical study of color reproduction systems will give data to produce good quality color reproductions consistently. Requirements and capabilities of electronic pre-press integrated color systems will be studied to help in the design and management of a color system whether it be in-house or part of a network. (PPRT-406)

Class 2, Lab 3, Credit 3

PPRT-551 Special Topics-Printing
Registration #0911-551
This course presents and investigates technological topics which normally are not covered in the regular curriculum on a one-time basis. Guest lecturers such as industry leaders as well as regular faculty are used to conduct this course. Topics to be covered are announced in advance.

Credit variable

PPRT-560 Chemistry Preparation for
Registration #0911-560 Printing Graduate Study
Basic principles of chemistry intended for students who have had no previous chemistry and who are making up deficiencies prior to entering the MS program. Not for credit for undergraduates of School of Printing.

Class 4, Credit 4 (SR)

PPRT-591 Reproduction Photography
Registration #0911-591
An intensive course designed for the photography major with the emphasis placed on the problems involved in achieving optimum tone and color reproduction from their photographs. A general understanding of the printing industry, basic printing processes, line and halftone photography, tone reproduction and color separation techniques are covered through lecture and laboratory experiences.

Class 2, Lab 3, Credit 3

Graduate Courses

PPRM-702 Computers in Management
Registration #0910-702
An applications workshop which covers printing requirements in relation to computer systems configurations; applications of computers to management and production control problems; investigation of computer-oriented production control techniques.

Credit 4

PPRM-705 Estimating and Analyzing in Graphic
Registration #0910-705 Communications
Course content covers the application of information from other management and technical courses to comprehensive situations in estimating. Its aim is to provide the student with an understanding of the relationships between estimating, pricing and the supply and demand forces which occur in the marketplace, and to expose students to several printing specialties so they may appreciate the various cost advantages and disadvantages involved in the use of particular technologies.

Class sessions include lectures, discussions, labs and project presentations by students. In addition to normal reading assignments, the student will be required to prepare and deliver an oral report on a written term paper on a computerized solution, of the student's own design, to an estimating, pricing, time study or other cost-related problem of special interest to the student.

Class 4, Credit 4

PPRM-706 Operations Management
Registration #0910-706 in Graphic Arts
Designed to give the student a broad perspective of the many topics related to managing a printing facility. Topics include an examination of the systems approach to production management, the use of statistics and other quantitative techniques in methods and decision analysis, the cost-volume-price relationship in printing production, and the effect of organizational structure on decision making, line-staff relationships, and managing personnel.

Class 4, Credit 4

PPRM-708 Marketing and Economic Applications in
Registration #0910-708 Graphic Communications
The role, importance, and principles of marketing are combined with selected topics from microeconomics that relate to a printing company's plans for the future. Extensive outside reading is required to facilitate the use of class time for practice and discussion of the material.

Class 4, Credit 4

PPRM-850 Project Design
Registration #0910-850
The student selects, plans, organizes, and investigates a topic in the field of graphic arts systems and produces a suitably documented, tangible report of thesis quality. The student is responsible not only for originating and doing the project, but also for obtaining a faculty sponsor for the project.

Class 4, Credit 4

PPRT-701 Research Methods in the
Registration #0911-701 Graphic Arts
The theory and applications of the principles of scientific research in the graphic arts will be covered, including a systematic study of the scientific method, hypothesis generation, the nature of theory, types of research, research design and measurement. The study of problems in the graphic arts including ink and paper, reproduction methods, and quality control.

Class 4, Credit 4

PPRT-702 Graphic Reproduction Theory
Registration #0911-702
Analysis of the basic theories of graphic reproduction and study of the principles underlying prevalent and proposed printing processes; special topics such as classification and description of the various light-sensitive systems as applied to the graphic arts, ink transfer theory, present and proposed systems of printing based on electrostatics; electrolysis, magnetism and lasers; study of hybrid systems and the significance and application of interdisciplinary methods. The Neugebauer and color correction equations.

Class 3, Credit 4 (offered on sufficient demand)

PPRT-703 Statistical Inference
Registration #0911-703
The purpose of this course is to provide graduate students in the School of Printing Management and Sciences with an introduction to the field of statistics and its application to graduate research projects. In addition, current uses of statistics in the printing industry are examined.

Class 4, Credit 4

PPRT-708 Introduction to Systems Analysis
Registration #0911-708
Problems of systems analysis in printing operations for the highest quality product at the minimal cost including optimal floor designs and methods of study. (PPRM-301)

Class 4, Credit 4

PPRT-709 Trends in Printing Technology
Registration #0911-709
An examination of the environmental and social forces that have affected the development of printing technology to the present time, as well as those forces, present and predicted that will affect the state of printing technology in the future.

Class 4, Credit 4

PPRT-711 Tone and Color Analysis
Registration #0911-711
A study of the methods and instrumentation necessary for the evaluation of printed materials for product quality assurance. The ultimate objective being the optimization of the production processes and the control of those processes.

Class 4, Credit 4

PPRT-713 Phototypography Procedures
Registration #0911-713
Utilizing phototypesetting equipment, the student shall learn to develop typographic skills necessary to plan and mark-up typesetting jobs so that the end results will closely match the original concept. Coding, format planning and development shall be taught so that the student will feel at ease in the creation and completion of the projects. The lectures include the aesthetics and the technical information on phototypesetting equipment. Mark-up; system analysis of equipment; and front end systems.

Class 4, Credit 4

PPRT-722 Ink, Color and Substrates
Registration #0911-722
A study of the physics of light and color basic color theory, color measurements and color systems. Included are applications of color theory to the graphic arts. The chemistry and physics of ink and substrates, and their interaction, are covered. Emphasis is given to the problem of ink, color and substrates in each printing process.

Class 4, Credit 4

PPRT-723 Contemporary Publishing
Registration #0911-723
An overview of contemporary book, magazine and newspaper publishing with emphasis on comparative editorial, production, circulation and marketing strategies. Analysis of advantages and disadvantages of the various kinds of publishing are discussed relevant to meeting the needs of society. Cost structures of the various publishing industries are explored as are strategies of new acquisitions.

Class 3, Credit 3

PPRT-725 Typefaces: Their Development,
Registration #0911-725 Classification and Recognition
This in-depth course deals with the historical development of typefaces to the present time. Proposed classifications systems are discussed. Students will be encouraged to develop a system to suit their own needs. A system for substituting typefaces also will be a major consideration of this course. Factors that aid in the identifying of typefaces are shown through the extensive use of slides. Students will be expected to write two papers. (PPRT-713)

Class 3, Credit 3

PPRT-727 Typographic Style Development
Registration #0911-727
A course created with the idea that students will develop a corporate style manual. At the end of the course students will make a presentation of their style manuals and show examples of its implementation.

Categories that will be included, but not limited to, are: "Looks," editorial style, terminology, typefaces, illustrations, and document structures. Extensive library research will be expected. Examples of style manual implementation will be produced during the lab time. (PPRT-713)

Class 3, Credit 3

PPRT-729 Computer-Aided Printing Design
Registration #0911-729 and Copy Preparation
An in-depth study of methods of preparing camera-ready copy. Applications of these methods to line and continuous tone images for reproduction, leading to considerations and implications for use of electronic advancements in the pre-press area. Page make-up (pagination) and grid systems will be incorporated into copy assembly, facilitating multipage, color reproduction and special effects. Extensive utilization of slides and other visual aids including professional samples and demonstrations of various methods and equipment.

Class 4, Credit 4

PPRT-730 History of the Book
Registration #0911-730
The "book" or codex, in manuscript and printed form, has served for over a thousand years as the principle record of human imagination and achievement This course will begin with a discussion of early methods of preservation of information, but will concentrate on post-15th Century developments in the techniques and technology of printing and illustrating books. An important printer will be selected from each century (beginning with the 15th and concluding with the 20th) and thoroughly discussed, including an analysis of the cultural and technological influences which shaped the products of his press, as well as those of his contemporaries.

Class 3, Credit 3

PPRT-732 The Editorial Function
Registration #0911-732
An examination of the historic forces that have helped to shape the structure of magazines today, and how this structure has affected the administrative and editorial functions of these magazines. The future of magazines also will be considered. Course conducted by lecture and discussion.

Class 3, Credit 3

PPRT-733 Production Function
Registration #0911-733
An examination of the various operations involved in the production of a magazine along with designing the optimum system of production for a given magazine. The interrelatedness of the various production operations also will be studied. Course conducted by lecture and discussion.

Class 4, Credit 4

PPRT-734 **Advertising, Circulation,**
Registration #0911-734 **and Fulfillment**
An examination of magazine advertising, circulation, fulfillment, and distribution functions as they affect the marketing of magazines. The impact of the legal aspects of publishing upon advertising and distribution will be examined. Course conducted by lecture and discussion.

Class 3, Credit 3

PPRT-737 **Book Production**
Registration #0911-737
The many-faceted role of production is explored in the examination of the publishing cycle from manuscript to bound books. Emphasis is placed on an understanding of the production and editorial systems and the interaction between them. Production and cost requirements for composition, printing, binding and distribution for trade books, textbooks, journals and special editions are thoroughly discussed.

Class 3, Credit 3

PPRT-738 **Machine Typesetting**
Registration #0911-738
An introduction to hot metal typesetting in which students will become familiar with the mechanisms of the Linotype, Monotype and Ludlow systems. Emphasis on developing a good background in machine operation and ability to select proper equipment for private press use.

Class 4, Credit 4

PPRT-739 **Paper and Binding**
Registration #0911-739 **for the Fine Printer**
The first half of this course is a study of the papers—handmade, fine mould or machine-made—suitable for fine printing with an emphasis on those which may be used in relief processes, through papers suitable for offset printing.

The second half of the course will cover contemporary binding techniques used for limited editions. Sewn and adhesive bound structures with various endpaper constructions will be studied and practiced. Full-, half- and quarter-case bindings, including slipcase making will allow a student to become competent in making those important decisions on bindings used in book manufacture.

Class 4, Credit 4

PPRT-740 **Relief Printing**
Registration #0911-740
An introduction to the techniques of relief printing as applied to type and illustration. Basic operational procedures and individual make-ready and lock-up techniques will be demonstrated and practiced for printing press that will include Washington Handpress, Heidleberg platen press and the Vandercook Proof Press.

Class 4, Credit 4

PPRT-741 **Image Processing Systems**
Registration #0911-741
This course will introduce the student to the concepts underlying the digital representation and manipulation of images. Students will be evaluated based on examinations and a term project.

Class 4, Credit 4

PPRT-742 **Document Processing Languages**
Registration #0911-742
This course will introduce the student to the concepts underlying modern document processing systems. Students will be evaluated by examination and will be required to complete a term research project.

Class 4, Credit 4

PPRT-743 **Markets for Electronic Publishing**
Registration #0911-743
An examination of the various product and market segments of the electronic publishing industry from corporate, commercial and vendor viewpoints, along with the effects of market forces upon the various segments. Course conducted by lecture and discussion.

Class 4, Credit 4

PPRT-745 **Management Strategies for**
Registration #0911-745 **Corporate and Commercial**
Publishing Enterprises
An examination of the strategies in the operation and management of both corporate and commercial publishing enterprises, including organization and administration, employee considerations, work flow, marketing and sales, and financial matters including chargeback systems. Course conducted by lecture and discussion.

Class 4, Credit 4

PPRT-760 **Advertising**
Registration #0911-760
This course will examine the origins of advertising and its development into the major force it exerts on our lives today. An inquiry of the various media will be pursued with primary attention focused on print advertising. The role of the advertising agency will be explored. The different types of advertising and the various stages of advertising will be examined. The course will include several weekly quizzes and both a mid-term and final examination.

Class 3, Credit 3

PPRT-765 **Corporate/Electronic**
Registration #0911-765 **Composition Systems**
A combination lecture and laboratory course dealing with the image processing systems and in electronic publishing. A comparative study from a technical as well as aesthetic perspective. Specialized hardware and software are analyzed in three class projects.

Class 4, Credit 4

PPRT-767 **History of Letters**
Registration #0911-767
This course will examine the origins of man's desire to record graphically events that were important in his life. It will trace man's first crude attempts scratched on bone and' rock to the sophisticated sound/symbol alphabets of the present. The main evolutionary steps in this process will be emphasized. The tools used and how they influenced the forms will be stressed. Technology's influence also will be part of this process. Periodic quizzes and both a mid-term and final examination will be utilized.

Class 3, Credit 3

PPRT-850 **Research Projects**
Registration #0911-850
Individual research projects in which independent data is collected by the student, followed by analysis and evaluation. A comprehensive written report is required. Consent of advisor is required.

Credit variable 1-4

PPRT-890 **Research and Thesis**
Registration #0911-890 **Guidance**
An experimental survey of a problem area in the graphic arts.

Credit 8

College of Liberal Arts

Criminal Justice

GCJC-201 **The Criminal Justice System**
Registration #0501-201
The principles of the criminal justice system; administration and management within various agencies, including the relationship of the police to the courts; the courts to the probation, correction and parole functions. Consideration will also be given to specific problems within the branches of the criminal justice system.

Class 3, Credit 4 (offered annually)

GCJC-203 **Criminology**
Registration #0501-203
A survey of the field of criminology with emphasis on major forms of contemporary crime, definition of crimes and criminality, theories of criminality, the extent of crime, criminal typologies, and fundamental aspects of the social control of crime.

Class 3, Credit 4 (offered annually)

GCJC-204 **Public Administration**
Registration #0501-204
This course presents the principles of management and organizational theory as they relate to public agencies in general and criminal justice agencies in particular. Case studies, as well as descriptive information concerning the classic issues involved in the administering of public institutions, will be offered to the student. (GCJC-201)

Class 3, Credit 4 (offered annually)

GCJC-206 **Administrative Concepts in**
Registration #0501-206 **Law Enforcement**
The course is intended to provide the student with an overview of the fundamental concepts of organization and administration, and to provide also the criteria and/or standards by which municipal police agencies may be evaluated or improved administratively. (GCJC-203, 303)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-207 **Corrections**
Registration #0501-207
The course is designed to introduce the student to the basic organizations of the correctional system, their functions and performance. Prisons and jails, as well as probation and parole agencies, will be discussed within the context of historical and contemporary philosophy. Attention will also be focused on decision making functions, the role of various personnel within the correctional system and the population of offenders within it Strategies for rehabilitation and their effectiveness will be surveyed. (GCJC-201)

Class 3, Credit 4 (offered annually)

GCJC-301 **Concepts in Criminal Law**
Registration #0501-301
The subject matter of this course consists of an introduction to the fundamental principles upon which substantive criminal law is based. The basic characteristics and requirements of criminal conduct are examined. Included in the scope of this course are the following topics: the nature of criminal conduct, the meaning of criminal mental state, the requirement of concurrence between action and intent, and the requirement of legal causation. The elements of the principal defenses to criminal liability, such as insanity, entrapment, and self-defense, are also discussed. (GCJC-201)

Class 3, Credit 4 (offered annually)

GCJC-302 **Organized Crime**
Registration #0501-302
This course provides a critical assessment of the structures of organized crime, its historical development, and the areas in which organized crime operates. Special emphasis will be placed upon how the character of organized crime has changed during the last thirty years, including the movement of organized crime into a variety of legitimate business enterprises. In addition current enforcement strategies will be studied and evaluated. (GCJC-201, 203)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-303 **Law Enforcement in Society**
Registration #0501-303
The social and historical origins of the various police systems, police culture, role and career, police in the legal system, social and legal restraints on police practices, police discretion in practice, police and the community, police organization and community control mechanisms. (GCJC-201)

Class 3, Credit 4 (offered annually)

GCJC-304 **The Judicial Process**
Registration #0501-304
Judicial process is designed to provide the student with an overview of the structure and function of the Federal and State Court systems. Emphasis will be placed on the relationship between the Federal and State Courts, judicial review, judicial decision making, and the Courts as interpreters of constitutional rights. (GCJC-201)

Class 3, Credit 4 (offered annually)

GCJC-306 **Para-Legals**
Registration #0501-306
The course deals with criminal and civil law, matrimonial law, legal research, counseling, problem solving techniques, and lawyers' ethics as well as a study of community resources available to assist the client. (GCJC-201)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-307 **Investigative Techniques**
Registration #0501-307
The course examines the investigative function and process in the public and private sectors, which would include the history and theory of criminal investigation, crime scene searches, collection and presentation of physical evidence, the obtaining of testimony and confessions, scientific laboratory methods and the admissibility of evidence in a court of law. (GCJC-303)

Class 3, Credit **4** (offered on sufficient demand)

GCJC-309 **Juvenile Justice**
Registration #0501-309
The philosophical, historical and operational aspects of the juvenile justice system; evaluation of the social and personal factors related to juvenile delinquency; the role of police, the courts, corrections and community programs in delinquency prevention, control and treatment

Class 3, Credit **4** (offered annually)

GCJC-401 **Scientific Methodology**
Registration #0501-401
This course provides a foundation in the uses of quantitative social science research methods with special reference to utilization of data bases and examples from criminal justice, human services and public policy. Stress will be on the deducting hypotheses from theoretical frameworks, identification of the relationships among variables, establishment models, creation of null hypothesis, quantitative methods of data collection and analysis using both parametric and nonparametric methods. Research methods presented range from traditional questionnaires to computer based information and techniques.

Class 3, Credit 4 (offered annually)

GCJC-403,404 **Field Experience**
Registration #0501-403,404 **and Field Seminar**
This course is an internship practicum for all pre-service criminal justice students. The course is designed to give the student first-hand experience in the field of criminal justice in an appropriate organization which meets the needs of the student's career objectives. Students will be closely supervised at selected organizations developing their pre-professional skills while learning the organization's programs and methods. The student also will be required to attend a seminar which will run concurrently with field work.

Class variable, Credit 4 each (offered annually)

GCJC-405 **Major Issues in the Criminal**
Registration #0501-405 **Justice System**
This course will focus on contemporary issues and topics not otherwise distinctly incorporated in established criminal justice courses. The course will concentrate on student discussion and interaction surrounding required readings on topics such as deviance, crime prevention, issues in the prosecution/court system, deterrence, female criminality, and computer applications. Topics may vary from offering to offering.

Class 3, Credit 4 (offered on sufficient demand)

GCJC-406 **Computer Application in**
Registration #0501-406 **Criminal Justice**
This course is designed to introduce students to the use of computer-related terminology, historical, current and potential uses of computers, the classification and the use of various types of computer application programs on both super mini- and micro-computers. Standard application software packages and computer hardware systems will be discussed as they can be utilized in criminal justice settings. In addition, students will have practical experience that will include the use of text processing, data base and spreadsheet software commonly used in criminal justice agencies and academic settings.

Class 3, Credit **4** (offered annually)

GCJC-408 **Constitutional Law**
Registration #0501-408
This course has been designed to provide the student with a basic understanding of the constitutional principles frequently encountered in the criminal justice profession. Landmark court decisions relating to due process, equal protection, unlawful arrest, unreasonable search and seizure, compulsory self-incrimination, the assignment of counsel and fair trial guarantees are discussed and critically evaluated. (GCJC-201,301)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-409 **Legal Rights of Convicted**
Registration #0501-409 **Offenders**
This course is designed to present an in-depth study of the substantive and procedural law as it affects convicted offenders. Considerable attention is devoted to the study of constitutional rights and privileges, how they apply to convicted offenders, and the methods employed to secure these rights. Conviction and its consequences are explored, as is the sentencing process. The rights of prisoners, probationers, and parolees are reviewed. In addition, the various remedies for enforcement of these rights are discussed, including direct appeals, collateral attacks, and a variety of post-conviction remedies. The course is intended for students who wish to pursue a career in law enforcement, corrections, probation, parole or law. However, students interested in some other aspect of criminal justice, which deals with convicted offenders, may find this course useful.

Class 3, Credit 4 (offered on sufficient demand)

GCJC-410 **Correctional Administration**
Registration #0501-410
This course presents the history and development of the principles of management and organizational theory as they developed the field of corrections. This developmental evaluation is followed by a presentation of certain principles and philosophies concerning agency administration which have proved effective in business, industry, and many elements of government, with the intention of discussing their applicability to prisons, probation, parole, and other community correctional programs. (GCJC-201, 207)

Class 3, Credit **4** (offered on sufficient demand)

GCJC-411 **Seminar in Corrections**
Registration #0501-411
This course is a sequel to Corrections. It presents a critical evaluation of the contemporary correctional programs in the United States. Programs discussed include: jails, prisons, probation, parole, halfway houses, study release, work release, prison furloughs and various community-based correctional techniques. Emphasis is placed upon the theories of penology and rehabilitation, which provide direction to the correction system today, and the theoretical positions which may affect the future corrections. (GCJC-201, 207)

Class 3, Credit **4** (offered annually)

CGJC-412 **Social Control of Deviant**
Registration #0501-412 **Behavior**
Designed as a professional elective for criminal justice majors interested in studying the major themes explaining the phenomena of deviance; how it is created and labeled through the process of definition and social sanction. Emphasis will be on that type of behavior which elicits societal response in the form of criminal or civil action and on deviance from the perspective of the deviant who may be placed under some form of legalized social control. (GCJC-201, 203)

Class 3, Credit **4** (offered on sufficient demand)

GCJC-413 **Civil Disobedience and**
Registration #0501-413 **Criminal Justice**
A survey of the philosophy and history of civil disobedience, civil disobedience as a political tactic, differentiation between civil disobedience and "ordinary crime," civil disobedience and "non-criminals," civil disobedience within the criminal justice system, and the role of riot commissions. (GCJC-201, 203)

Class 3, Credit **4** (offered on sufficient demand)

GCJC-415 **Domestic Violence**
Registration #0501-415
This course is designed for social work students, criminal justice students, and professionals who are interested in examining the problems related to domestic conflict and violence. Included will be a study of the dynamics of violence as reflected in child abuse, incest, marital rape, spouse and parental abuse, and violence among siblings.

Credit **4** (usually offered summers for one week)

GCJC-416 **Forensic Photographic**
Registration #0501-416 **Evidence**
Basic photographic techniques applicable to the law enforcement profession or other investigative applications. The course will cover photographic fundamentals as they apply to the investigative photographer. This will lead to the more involved techniques of the police and fire photographer. Topics include photographing homicides and other deaths, tool mark and document photography, court presentations, surveillance and identification photography, and arson investigation.

Class 3, Credit 4 **(offered annually)**

GCJC-505 **White Collar Crime**
Registration #0501-505
An examination of the extent and character of white collar crime with special emphasis upon business and professional deviance. (GCJC-201, 203)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-506 **Evidence**
Registration #0501-506
This course is designed to provide the student with an awareness of what types of evidence are admissible in a criminal trial. The course includes a comprehensive analysis of the most frequently used rules of evidence. There are readings and discussions pertaining to the nature of real, testimonial, hearsay, and circumstantial evidence. The course examines rules concerning the cross-examination of witnesses, exceptions to the exclusion of hearsay evidence, the burden of proof, the provinces of the judge and of the jury, legal presumptions and the exclusion of illegally obtained evidence. (GCJC-201)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-507 **Computer Crime**
Registration #0501-507
This course examines the multifaceted issues associated with computer crime from a variety of perspectives. Topics include: techniques employed by offenders, etiology of behaviors, crime prevention, techniques of investigation, epidemiology, current and proposed legislation, civil/criminal statutory, and evidentiary issues. Computer crime, computer criminals, and victims are analyzed from a criminological foundation.

Class 3, Credit 4 (offered annually)

GCJC-510 **Counseling in the Criminal**
Registration #0501-510 **Justice System**
This course is designed to instruct the student in the various, accepted contemporary dynamics of interviewing and counseling criminal justice and related human service clients. Issues to be discussed will revolve around counseling and supervision strategies and conflicts among agencies, between administrators and staff, and clients. This course will present both the practical and theoretical aspects of these issues as well as devote attention to surveying prospective counseling strategies for accomplishing desired behavioral change. (GCJC-201)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-511 **Alternatives to Incarceration**
Registration #0501-511
The course analyzes possible sentencing options available to the criminal courts as well as pre-adjudicatory alternatives for both adults and juvenile offenders. The variety of dispositions evaluated include: probation, parole, halfway houses, work-release, study-release, prison furloughs, pre-trial release, pre-probation alternatives (fines, suspended sentences, conditional discharge, and a variety of diversion programs). Special emphasis is placed on a critical evaluation of the alternatives as they compare to the more traditional methods of handling offenders. Field trips and guest lecturers from non-traditional programs are typically included in the course. (GCJC-207,411)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-512 **Minority Groups and the**
Registration #0501-512 **Criminal Justice System**
The course will examine the role traditionally attributed to the members of minority groups as criminals and analyze their interaction with the criminal justice system. Heavily relying on the conflict perspective, the course will review the literature on the creation of laws, the breaking of laws, and the processing of minority members in the criminal justice system (GCJC-201, 203)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-514 **Planning and Change in the**
Registration #0501-514 **Criminal Justice System**
It is the objective of this offering to expose the student to issues of planning within the criminal justice system. Police, courts and corrections will be discussed in view of current and proposed changes. The planning of change will be emphasized with regard to organizational issues. In addition, attention will be given to surveying various strategies for accomplishing change. This course is designed to give the advanced student the opportunity to intensely scrutinize the prospective shape of the criminal justice system. (GCJC-204)

Class 3, Credit 4 (offered annually)

GCJC-516 **Court Administration**
Registration #0501-516
A course designed to explore the management aspects of the court and court process. There is a focus on the structure of the several levels of court that typically exist in modern urban America. Related to this structure are the various other criminal justice agencies that interact with the court at various stages of the process. In addition, operational problems such as the bail process, record keeping, jury service and selection methods, and calendar management will receive significant attention.

Class 3, Credit 4 (offered on sufficient demand)

GCJC-517 **Comparative Criminal Law**
Registration #0501-517
The course examines, in a comparative analysis, the criminal system and the penal methods of Europe and the United States. Major emphasis will be given to the issues of intent, criminal responsibility, individual and public interests, purposes and modes of prevention, repression and punishment, methods of trial, punishment and pardon. (GCJC-201)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-518 **Criminal Justice/Community**
Registration #0501-518 **Relations**
This course examines the goals and objectives of agencies operating within, or directly related to, the criminal justice system in relation to mutual expectations, the community and the agency, in the delivery of services. Emphasis will be on intergroup responsibilities in exploring strategies to reduce conflict in the solving of public problems within the sphere of the criminal justice system. (GCJC-201)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-520 **Sentencing Process**
Registration #0501-520
This course is intended to provide the student with a broad overview of the law of sentencing and the alternatives presently available in this area. Emphasis will be placed on the traditional methods of punishment now available in the courts, including, but not necessarily restricted to: fines, imprisonment, probation and suspended sentences. The course will also look to the power of the court in exercising its discretion in the sentencing process. (GCJC-201, 207, 304)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-522 **Victimless Crime and the Law**
Registration #0501-522
The course is designed to familiarize the student with many of the implications and ramifications of efforts to control "victimless" crimes. Course discussions concentrate on the illegal activity associated with prostitution, gambling, homosexuality, drug use and pornography. In this course the social, moral, legal and practical consequences of legalizing such activities are examined and evaluated. (GCJC-201, 203, 301)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-523 Crime and Violence
Registration #0501-523
This course focuses on the outbreak and increase of violent crime and criminal trends in the United States as one of the more serious realities of this century. In addition to an historical review, contemporary problems are explored, covering such topics as violence in the streets, terrorism, riots, vigilantism, and the role of various criminal justice agencies in attempting to control these problems. (GCJC-201)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-526 Seminar in Law Enforcement
Registration #0501-526
A critical analysis of some of the current issues, problems and concerns in the area of law enforcement; emphasis on basic police functions in regard to the courts, corrections and the community. Conflicts between theory and practice are examined and analyzed, and future trends in law enforcement will be explored. (GCJC-303)

Class 3, Credit 4 (offered annually)

GCJC-527 Seminar in Law
Registration #0501-527
This course will focus on the nature, function and limits of the rule of law. Attention will be paid to areas of substantive and procedural criminal law to illustrate the nature and limits of the idea of law. Readings will draw from both the classical and modern view of law. (GCJC-301,304)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-528 Etiology of Crime
Registration #0501-528
This course is a comprehensive survey of the sociological, psychological, and psychiatric views of the etiology of crime and other forms of deviant behavior. With major emphasis on the sociological forms of explanation, the course will undertake a historical review of criminality theory and progress to present-day concerns of both etiological origins. (GCJC-201,203)

Class 3, Credit 4 (offered annually)

GCJC-529 Physical Security and Safety
Registration #0501-529
The course examines, through survey techniques, the complex problems confronting business and industry in the protection of assets. The use of electronic and non-electronic anti-intrusion systems and other hardware is examined and evaluated. Safety and accident prevention, health hazard prevention methods, and fire prevention and control, also are examined. (GCJC-201)

Class 3, Credit 4 (offered annually)

GCJC-530 Women and Crime
Registration #0501-530
This course will deal with women as criminal offenders and as victims of crime, focusing upon theories about women in crime, types of crimes committed, patterns of criminality, and the treatment of women offenders. The course, also, will examine the role of women as law enforcement officers, judges, lawyers, and correctional officers in the criminal justice system.

Class 3, Credit 4 (offered annually)

GCJC-532 Retail Security
Registration #0501-532
This course provides an analysis of major security problems found within retail operations. Subjects examined include internal and external theft prevention and detection, shoplifting techniques, the use of undercover personnel and shopping services, security audit, and training of security and non-security personnel. Warehousing and cargo controls are examined. Emphasis will be placed upon methods, techniques and programs to protect assets.

GCJC-535 Security Management
Registration #0501-535
This course will focus on the management skills required in the security function and the corresponding administrative, legal and technical problems. Emphasis will be given to purchasing, cost benefit analysis, proprietary versus contract guard forces, personnel management and the relationship between security and non-security employees, and security awareness training programs.

Class 3, Credit 4 (offered on sufficient demand)

GCJC-536 Seminar in Security
Registration #0501-536
This course, designed for seniors completing criminal justice degree requirements with a concentration in security, will focus on critical issues, problems, and concerns in the area of security that are not otherwise covered directly or in depth in established security courses. Topics are expected to vary from offering to offering.

Class 3, Credit 4 (offered on sufficient demand)

GCJC-537 Legal Aspects of Security
Registration #0501-537
An examination of the federal and state case law and statutory provisions that regulate the private security field. The distinction between public and private enforcement; as well as the possible criminal and civil liabilities of private security personnel under the law of Willful Torts including false arrest and imprisonment; nuisance; defamation; and invasion of privacy.

Class 3, Credit 4 (offered on sufficient demand)

GCJC-541 Field Research
Registration #0501-541
Through lecture, discussion, and activities associated with a field research project, the techniques and methods of data collection and analysis are presented. Students will acquire the skills necessary to conduct criminal justice research in field settings and the ability to prepare a formal research/evaluation report. The required research projects typically include data gathering and coding procedures, entry and the data to a file on the VAX/VMS, the use of application software (e.g., SPSS, MINITAB, DATAPLOT), and preparation of a final report. (GCJC-401)

Class variable, Credit 4 (offered annually)

GCJC-542 Field Research Techniques
Registration #0501-542
The course combines the use of both qualitative and quantitative research methods and applies them to the collection and analysis of data from field settings. Emphasis is placed on the use of multiple samples and the techniques of multivariate analysis. Students will draw upon social science theory to develop a research design, analyze data and prepare a report on a topic from Human Services, Criminal Justice or Public Policy. (GCJC-401)

Class 3, Credit 4 (offered on sufficient demand)

GCJC-599 Independent Study
Registration #0501-599
A combined student/faculty member effort on a chosen topic beyond the normal sequence of course selections. It provides the qualified self-motivated student with a creative, orientation, the opportunity to develop an autonomous and personal sense of academic growth and achievement

Class variable, Credit variable (offered annually)

Class 4, Credit 4 (offered every year) (F, W, S, SR) Class 4, Credit 4 (offered every year) (S, SR)

Social Work

Core Courses

GSWS-099 Social Work Program Seminar
Registration #0516-099
This seminar is designed to give the social work student the opportunity to meet and exchange ideas with other social work students, faculty, and practitioners. It is also designed to foster an identification and cohesion among the students as future or current social work professionals.

Class 1, Credit 0 (F, W, S)

GSWS-210 The Professional
Registration #0516-210 Social Work Role
This course explores social work as a profession, the various fields in which social workers practice and the differing philosophies of human services and social work approaches. Also covered are strategies for developing self-awareness and professional self-assessment.

Class 3, Credit 4 (F)

GSWS-212 Self-Awareness
Registration #0516-212 in the Helping Role
This course helps to develop students' helping skills in essentially three broad areas: 1) Skills in noticing or observing; 2) Observing one's professional use of self in the helping relationship and evaluating the appropriateness of such behavior; and 3) Observing the client and evaluating the effect one's response has on her/him.

Students are expected and required to increase their awareness skills, and this course offers a unified learning experience where students can concentrate on the theory and practice of awareness skills. (GSWS-210)

Class 3, Credit 4 (W)

GSWS-216 Community Services I
Registration #0516-216
This course is designed as a beginning social work practice course. Its purpose is to introduce social work students to basic generalist helping skills.

Students will become more aware of their current skills in attending, responding, personalizing and initiating. They will further develop these skills by learning the theory behind the skills, doing worksheets related to these skills, and practicing the skills in class through role plays and direct experience. These skills will later be developed in the course Interviewing and the Helping Relationship. (GSWS-210)

Class 3, Credit 4 (W)

GSWS-217 Community Services II
Registration #0516-217
This beginning social work practice course is designed to develop students' basic helping skills, and introduce them to service delivery systems and client systems. As volunteers, students will have the opportunity to observe professional practice, be exposed to a social work setting, and interact with agency clientele. (GSWS-216)

Class 3, Credit 4 (S)

GSWS-302 History of Social Welfare
Registration #0516-302
This course is designed to acquaint the student with the historical roots of our present system of social welfare, emphasizing its development in the United States, and the concurrent development of social work as a profession. It will examine the value bases and the economic, social and political factors of each era as reflected in the social welfare programs of that time and their effects on people. (GSWS-210, 217)

Class 3, Credit 4 (F)

GSWS-305 Structure and Function
Registration #0516-305 of Social Welfare
Examines the provision of current social services in five major fields of social welfare: public welfare, traditional voluntary agencies, voluntary social movements, mental health and the legal system. Course also will explore organization theory as it applies to the structure of these services, as well as major patterns and sources of funding. (GSWS-302 or concurrent)
Class 3, Credit 4 (W)

GSWS-405 The Family from a Social
Registration #0516-405 Work Perspective
The course is designed to give the social work student a basic understanding of die family as client. Students will look at the family from die perspective of an outside observer whose purpose is to analyze family interaction to assess problems and plan interventions. Emphasis will be on the contemporary American family including its structure, functions and roles of family members and the family's role in society. (GSSP-210,440, GSSS-210)

Class 3, Credit 4 (F)

GSWS-435 Computer Applications to
Registration #0516435 Social Work Research
Introduction to the methodology of research in behavioral and social sciences. Emphasis will be on an introduction to bibliographic search procedures, becoming a practitioner/researcher, evaluation of one's own professional practice, formulation of research, the environmental contexts of research, ethics and confidentiality, research methods and design, sampling, measurement, validity, reliability, indexes, scales, instrument design and basic descriptive statistics. Instruction, practical demonstration and hands-on experience are provided in computer applications ranging from electronic communication including submission of assignments, storage of information, text formatting, ethics and confidentiality of electronically stored information, data processing and report writing. (SM AM-204)

Class 3, Credit 4 (W)

GSWS-456 Group Theory in Social Work
Registration #0516-456
This course covers the theoretical foundations of group dynamics and group behavior within the context of social work. Such concepts as types of groups (prevention, rehabilitation), group development, composition, group processes (problem-solving, decision-making, affection), program, leadership, communication, structure and modes of intervention are covered. The course provides the knowledge and initial experiential base for the development of practice skills in working with groups. (GSWS-405, third-year standing)

Class 3, Credit 4 (W)

GSWS-465 Assessing Community Needs
Registration #0516-465
A study of assessment techniques for identifying the strengths and weaknesses of services provided within a community. Involves analysis of data using a computer statistical package. Topics covered include program evaluation, quality assurance procedures and community networking. Attention will be given to programs for minority groups, the disabled, the elderly, youth, persons with mental health problems and other special populations. (GSWS-435,456, GSSS-210, third-year standing)

Class 3, Credit 4 (S)

GSWS-475 Interviewing and the Helping Relationship
Registration #0516-475
This course is the first in a three-course sequence offered concurrently with laboratory or field instruction dealing with generalist social work practice. All three courses emphasize the differential use of social work techniques (e.g., interviewing skills, assessment, data-collection and problem-solving) and interventive skills in a variety of client systems.

Through lectures, discussions, reading, lab simulations and case analysis, it is the overall objective of die sequence to provide the student with the knowledge, skill and self-awareness for beginning professional social work practice. The development of this knowledge, skill and awareness is seen as a progressive process underlying the three-course sequence. (GSWS-435, 456)

Class 3, Credit 4 (S)

GSWS-505 Assessment and Problem-Solving
Registration #0516-505
See GSWS-475 (GSWS-435, 465, 475; corequisite with GSWS-506, 527, 535)

Class 3, Credit 4 (F)

GSWS-506 Field Instruction I
Registration #0516-506
Field Instruction I and II comprise a 20-week, 30-hour per week supervised field placement Under the guidance of an instructor the student is placed in a cooperating social, governmental, health or educational agency in order to gain direct experience with its organization, programs and client services. Closely supervised work at the agency is supplemented by seminars designed to integrate theory and practice. (GSWS-435,465,475; corequisite with GSWS-505, 527, 535)

Field 300, Credit 5 (F)

GSWS-527 The Supervisory Process
Registration #0516-527
The Supervisory Process is a practicum seminar taken during the first quarter of field instruction. Students and instructor will discuss topics related to field experiences and concerns. The seminar will study the supervisory process and topics to be analyzed will include: staff structure; work loads and distribution; the responsibilities of supervisor and supervisee; the ethics of supervision and professional growth.

This practicum is taken concurrently with Field Instruction I, Assessment and Problem Solving, and Computer Applications to Social Work Research. It is intended to help students integrate field experiences with their pre-field course content and the concurrently taken courses. (GSWS-435, 465, 475; corequisite with 412,421,535)

Class 3, Credit 4 (F)

GSWS-535 Advanced Social Work Research
Registration #0516-535
For social work students who are in their first quarter of field instruction. Building upon the first social work research course and upon knowledge of statistical analysis, this course considers the integration of practice and research, especially in relation to the evaluation of one's own professional practice and agency programs. The continued use of the computer as a research tool is explored, in particular the statistical packages MINITAB and SPSS-X. Specialized analytic techniques, common to social work (e.g., quantitative: Chi-Square, Pearson's Correlation, Spearman's Rho, t-test) and qualitative: research (field), are studied in relation to actual data collected by students in their concurrent field placement. Grant writing, ethics of research, and the relationship of research and minority populations also are covered. (GSWS-435, 465, 475; SMAM-309; corequisite with GSWS-505, 506, 527)

Class 3, Credit 4 (F)

GSWS-550 Social Intervention
Registration #0516-550
See GSWS-475 (GSWS-505, 506, 527,535; corequisite with GSWS-551, 560)

Class 4, Credit 4 (offered every year) (W, S)

GSWS-551 Field Instruction II
Registration #0516-551
See GSWS-506 (GSWS-505, 506, 527, 535; corequisite with GSWS-550, 560)

Field 300, Credit 5 (W)

GSWS-560 Managing Community Services
Registration #0516-560
A weekly seminar, taken during the second quarter of field placement, in which students continue to read, write, think about and discuss issues directly related to their field practice and social work education. Continuing with the work of the first quarter seminar for field students, this course will focus on students' experiential and professional needs. Community service agency management issues will be explored, for example, the management of human resources through supervision, "accountability" and "termination" issues, and how they relate to agency morale and human service delivery.

The seminar is taken concurrently with Field Instruction II, and Social Intervention. All three courses share common objectives as well as the study of the Social Work Competencies and the generalist practice model. Effort will be made by faculty to ensure that students in this field education sequence successfully integrate course content and objectives. (GSWS-505, 506, 527, 535; corequisite with GSWS-550, 551)

Class 3, Credit 4 (W)

GSWS-595 Policy and Planning Processes
Registration #0516-595
For social work students who have completed field instruction. Course will explore the development of social welfare services as it proceeds from the determination of social need through program design to implementation. Concepts of policy process, large system change, and grant and proposal writing are considered. (GSWS-550, 551, 560)

Class 3, Credit 4 (S)

GSWS-598 Professional Seminar
Registration #0516-598
For social work students who have completed field instruction. Purpose of this course is to serve as a capstone in the student's social work education and to facilitate the integration of all content areas in the curriculum. This integration is achieved through presentations by faculty, practitioners and invited experts in order to cover the interrelationships between values and ethics of the profession; human behavior and the social environment; needs assessment and research techniques; methods of intervention; and policy, planning and funding processes. This integration is demonstrated by students through a major paper which combines these areas with the student's chosen field of application, using a primary, secondary and tertiary prevention approach for a specifically chosen target population-at-risk and underserved population. (GSWS-550, 551, 560)

Class 3, Credit 4 (S)

Professional Elective Courses

GSWS-314 The Social Worker as Advocate
Registration #0516-314
This course will examine the role of social workers in advocating with and on behalf of clients and others for negotiating or bringing about needed change in institutions or policies of our society. Discussion of the forces in the social, economic and political environment today that directly affect poverty, racism and other issues will be related to examining techniques for achieving change.

Class 3, Credit 4 (offered on sufficient demand)

GSWS-320 **Alcoholism: Physiology**
Registration #0516-320 **and Psychology**
This course presents the chemistry of alcohol and its effect on the body and brain, as well as signs, symptoms, addiction and withdrawal. The study of normal and abnormal personality development and the psychological and social mechanisms of alcohol use and alcoholism in our society are emphasized. (GSWS-302, GSHH-547, GSSP-210, 440, GSSS-210, 526, 527, SBIG-211, 212)

Class 3, Credit 2 or 4 (W, every other year)

GSWS-321 **Alcoholism: Interventive**
Registration #0516-321 **Skills and Techniques**
Teaches a variety of interventive skills used by those giving care to alcohol abusers, their families and communities. Emphasis is on the method of use of these skills. Role play, videotaping and case study will be included. (GSWS-302, GSHH-547, GSSP-210, 440, GSSS-210, 526, 527, SBIG-211, 212)

Class 3, Credit 2 or 4 (every other year)

GSWS-322 **Alcoholism: Employee**
Registration #0516-322 **Assistance Programs and Community Resources**
The course analyzes symptoms and diagnosis of the alcohol abuser and current methods of rehabilitation. Explores structure, function and use of community resources including the increasing role played by Employee Assistance Programs (EAPs). (GSWS-302, GSHH-547, GSSP-210,440, GSSS-210,526,527, SBIG-211,212)

Class 3, Credit 2 or 4 (every other year)

GSWS-330 **Rural Social Services**
Registration #0516-330
The course will identify the historical development, cultural makeup, family lifestyles and work habits of the nation's migrant population and the rural poor. The course will examine and critically analyze the differences between migrants and the rural poor and compare them to the characteristics of the urban poor found in contemporary American cities. The course considers governmental rural policies and service-delivery systems directed to the rural areas which reflect the economic, political and social conditions during the time they were developed. The skills of generalist social work as applied in the rural setting are compared to application in urban settings.

Class 3, Credit 4 (offered on sufficient demand)

GSWS-340 **Deafness: Fundamental Aspects**
Registration #0516-340
This course is designed to provide the student with a basic understanding of deafness. The overview includes how we hear, techniques for diagnosis, the etiology of deafness, as well as an historical perspective on how education for the deaf has developed with its various philosophies. Language acquisition and modes of communication are explored, as well as the social, psychological and vocational development of deaf persons.

This is the first course in a sequence that will provide a knowledge base for the development of generalist social work practice skills. (GSWS-302, GSHH-547, GSSP-210,440, GSSS-210,526,527, SBIG-211, 212)

Class 3, Credit 4 (W)

GSWS-341 **Psychosocial Implications**
Registration #0516-341 **of Deafness**
The purpose of this course is to provide the student with an in-depth examination of the psychosocial implications of deafness for the individual. The various systems with which the deaf individual interacts will be examined for its relevance to the development and functioning of the individual. The course also examines how the individual and these systems impact and influence each other. These systems will include family, school, service-delivery systems and society. (GSWS-340)

Class 3, Credit 4 (offered on sufficient demand)

GSWS-342 **Deafness: Intervention Strategies**
Registration #0516-342
The purpose of this course is to build skills in applying the knowledge base developed in the prerequisite course to case situations. Students demonstrate collection and recognition of pertinent information, and development and implementation of appropriate intervention plans. Legal and political issues, as well as methods of assessing local resource networks, are considered. Professional roles and intervention goals are discussed as they relate to interfacing systems, including individual, family, school, medical, mental health, rehabilitation and employment (GSWS-340)

Class 3, Credit 4 (every other year)

GSWS-357 **Mental Health and Mental Illness**
Registration #0516-357 **from a Social Work Perspective**
This course is designed to give social work students a basic understanding of mental health, mental illness and mental retardation from a social work perspective. The role of the social worker in working with individuals and their families will be included. Students will be given a general understanding of our current mental health systems. The medical model and alternative systems of diagnosis are considered. (GSWS-302, GSHH-547, GSSP-210,440, GSSS-210, 526, 527, SBIG-211, 212)

Class 3, Credit 4 (S)

GSWS-360 **Social Work with the Disabled**
Registration #0516-360
This course provides an examination of the psychosocial aspects of disabilities. The course emphasizes the effects of disability on the individual's development and functioning and the accompanying stress on the family and society in attempts to respond to her/his needs. Interventive strategies and critical times for intervention by the social worker are examined. (GSWS-302, GSHH-547, GSSP-210, 440, GSSS-210, 526, 527, SBIG-211, 212)

Class 3, Credit 4 (S, every other year)

GSWS-370 **Child Protective Services**
Registration #0516-370
This course examines the concepts and knowledge base of child abuse and neglect. Topics will include: definition of abuse and neglect; an historical perspective; possible causes and effects of abuse; intervention strategies; statutes and legislation; preventive approaches; child abuse services in New York State, provision of service, role of the social worker, and future concerns in this problem area. (GSWS-302, GSHH-547, GSSP-210, 440, GSSS-210, 526, 527, SBIG-211, 212)

Class 3, Credit 4 (offered on sufficient demand)

GSWS-380 **Social Work and the Law**
Registration #0516-380
This course provides the student with the opportunity to develop a workable vocabulary and understanding of some of the basic legislative processes and laws that effect the practice of social work. Focus centers around significant issues and points of law that have affected the delivery of services. (GSWS-302, GSHH-547, GSSP-210,440, GSSS-210, 526, 527, SBIG 211, 212)

Class 3, Credit 4 (offered on sufficient demand)

GSWS-455 **Contemporary Issues in Social Work**
Registration #0516-455
This course is designed to offer students an opportunity to examine and discuss contemporary issues in the field of social work. Course content will vary from quarter to quarter depending on current issues and student interest. Areas related to expressed student interest, faculty expertise and developments in the field will be examined. (GSWS-302, GSHH-547, GSSP-210, 440, GSSS-210, 526, 527, SBIG-211, 212)

Class 3, Credit 3 (offered every year) (214-F,W,S; 215-W,S)

GSWS-506 Services for Children
Registration #0516-509 and Their Families
This course is designed to give social work students a beginning knowledge of social work services to children and their families. Specific services included are preventive services, homemakers, day care, protective services, foster care, adoption, unmarried parents, institutional care and mental health services. The development of each type of service will be discussed, as well as the reasons why each service is needed and for what type of situation. The social worker's role in each area will also be considered. (GSWS-302, GSHH-547, GSSP-210,440, GSSS-210,526,527, SBIG-211,212)

Class 3, Credit 4 (offered on sufficient demand)

GSWS-512 Advanced Intervention
Registration #0516-512 with Individuals
This course builds upon the knowledge base of generalist social work practice and develops students' understanding of the specific ways in which these concepts and theories are applied in social intervention with individuals. Use will be made of case studies and role playing to further develop the students' skills in this area. (GSWS-550, 551, 560)

Class 3, Credit 4 (offered on sufficient demand)

GSWS-513 Advanced Intervention
Registration #0516-513 with Families
This course is for students who have completed the practice sequence and field instruction, and have learned the theories and concepts of generalist social work intervention. This course builds on that knowledge base and develops the students' understanding of the specific ways in which these concepts and theories are applied in intervention with families. (GSWS-550, 551, 560)

Class 3, Credit 4 (offered annually)

GSWS-522 Advanced Intervention
Registration #0516-522 in Communities
This course examines community intervention as a social work method. The roles and functions of the community intervention practitioner and alternate methods of practice are analyzed, such as locality development, social planning and social action. The course will investigate specific applications of community intervention theory to political influence processes, coalition, neighborhood associations and regionalization. (GSWS-550, 551, 560)

Class 3, Credit 4 (offered on sufficient demand)

GSWS-525 Advanced Intervention
Registration #0516-523 with Groups
This course examines social treatment as one form of group work practice. There are different service procedures and approaches which may be applied to client groups, and each may have utility in pursuing distinct service objectives. The course will investigate the scope, techniques and functions of generalist social work practice in such diverse settings as social service agencies, business, correctional institutions and communities. (GSWS-550, 551, 560)

Class 3, Credit 4 (offered on sufficient demand)

GSWS-525 Grant Writing
Registration #0516-525
The course is designed to provide the student with a series of readings and experiential exercises necessary for writing a grant proposal. Focus will be on funding sources which provide money for social welfare programs and for research into social work. (GSWS-535)

Class 3, Credit 4 (offered on sufficient demand)

GSWS-536 Aging and Society
Registration #0516-536
This course considers concepts, issues and research techniques in the behavioral and biological aspects of aging. It examines the interaction of group processes in the family and community which influence society's attitudes toward the aging process. It further examines the cultural, environmental and institutional changes as they relate to an increasing population of older people. (GSWS-302, GSHH-547, GSSP-210, 440, GSSS-210, 526, 527, SBIG-211, 212) (May also be taken for liberal arts elective credit. See GSSS-508)

Class 3, Credit 4 (SR, F)

GSWS-537 Social Policy and the Aging
Registration #0516-537
This course will be organized around culture and values as the context for policy formulation. Special attention will be given to the process of policy analysis and implementation. Several specific policy areas will be examined: social security and income maintenance; health and long-term care; work and retirement; social services and the aging network; housing and living arrangements for the elderly; and the role of the family and the elderly. (GSWS-302, GSHH-547, GSSP-210,440, GSSS-210,526,527, SBIG-211, 212) (May also be taken for liberal arts elective credit. See GSSS-515)

Class 3, Credit 4 (W)

GSWS-538 , Family Violence
Registration #0516-538
This course is designed to acquaint social work students and practitioners with the problem of family violence. The causes and dynamics of various forms of violence in the family will be addressed. These include: child abuse, incest, spouse abuse, sibling violence, marital rape, abuse of parents by adolescents, and the abuse of the elderly by their adult children. Factors affecting intervention in families where these occur and techniques for intervention will be included. (GSWS-302, GSHH-547, GSSP-210, 440, GSSS-210, 526, 527, SBIG-211, 212)
Class 3, Credit 4 (SR, every other year)

GSWS-539 Services for the Aging
Registration #0516-539
This course deals with the variety of existing community-based services available for the elderly. The course also examines the tactics, assessment, coordination and evaluation of various direct and indirect services for the elderly. Particular attention will be given to such service groups as nursing homes, home health care, mental health and other formal and informal support systems. (GSWS-302, GSHH-547, GSSP-210,440, GSSS-210,526, 527, SBIG-211,212)

Class 3, Credit 4 (S)

GSWS-599 Independent Study
Registration #0516-599
A combined student/faculty effort on a chosen topic beyond the normal course selections. It provides the self-motivated student with a creative orientation, the opportunity to develop an autonomous and personal sense of academic growth and achievement. Independent Study may include independent work in an agency setting or other field work away from the Rochester area.

Credit variable (F, W, S, SR)

Graduate Courses

The State University of New York at Buffalo School of Social Work offers seven graduate social work courses on the RIT Campus

1. Social Welfare Policies and Programs
2. History and Philosophy of Social Welfare
3. Behavioral Sciences I: Individual Development
4. Behavioral Sciences II: Organizational Development
5. Introduction to Statistical Research
6. Social Work Research
7. Small Group Dynamics

These courses comprise most of the first year of study toward the MSW degree. For information, contact Dr. Marshall L. Smith, 475-2018.

Liberal Arts Courses

Language, Literature and Communication

GLLC-220 English Composition
Registration #0502-220
This course develops the language skills needed to write effectively. It should be taken in the freshman year.

Class 3, Credit 4 (offered quarterly)

GLLC-440 Human Communication
Registration #0502-440
Human Communication is an overview of the field of communication, including the contexts of interpersonal, group, mass, and public communication. This course is part of the Language concentration and may also be taken as an elective. (GLLC-220 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-441 Small Group Communication
Registration #0502-441
Practice in analysis of a variety of small group discussion techniques focusing on phenomena such as processes of interaction, decision making, norms structure and development, membership, and theory of group development. This course is part of the Language concentration and may also be taken as an elective. (GLLC-220 or equivalent)

Class 4, Credit 4 (offered annually)

GLLC-442 Persuasion
Registration #0502-442
A study in depth of the theories, practices, effects and ethics of persuasion. Persuasion is defined as human communication designed to influence one's beliefs, values, attitudes, and actions. This course is part of the Language concentration and may also be taken as an elective. (GLLC-220 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-443 Writing and Thinking
Registration #0502-443
This course develops the reasoning and advanced language skills needed to carry out applied logic and applied problem-solving writing processes. This course is part of the Language concentration and may also be taken as an elective. (GLLC-220 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-444 Technical Writing
Registration #0502-444
This course develops in students those skills necessary for completing technical writing tasks, such as instructional memos; letters of inquiry; reports (trip, progress/status, accident, research, feasibility); problem analyses; specifications; flow charts; technical manuals. Students enrolling in Technical Writing should have command of clear and logical standard written English prose. This course is part of the Language concentration and may also be taken as an elective. (GLLC-220 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-445 History of the English Language
Registration #0502-445
What makes the English language so difficult? Where do our words come from? Why is it a challenge for native speakers to master English grammar? This course surveys the development of the English language from its beginning to the present to answer such questions as these about the nature and flexibility of the English language. This course is designed for anyone who is curious about the English language. This course is part of the Language concentration and also may be taken as an elective. (GLLC-220 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-490 Persuasion and Social Change
Registration #0502-490
Readings and analysis of selected public speeches and essays advocating or opposing major issues of social change in the United States from the 18th century through contemporary advocacy. This course is part of the Peace Studies Concentration and also may be taken as a Liberal Arts elective or a professional elective in the Professional and Technical degree program.

Class 3, Credit 4 (offered occasionally)

GLLC-501 Effective Speaking
Registration #0502-501
The development of the techniques of formal public speaking as an aid to self-confidence in modern social and business situations. Weekly practice talks with emphasis on organization, clarity, vocal expression, poise.

Class 3, Credit 4 (offered annually)

GLLC-502 Group Communication and
Registration #0502-502 Problem Solving
This course will acquaint students with the general body of theory and research concerning small group communication; enable them to prepare informational and problem-solving group discussions; aid them in developing skills in conference participation and leadership and improve their ability to observe, analyze and evaluate the group process. A major emphasis in the course will be on systematic methods of group problem-solving and decision making.

Class 3, Credit 4 (offered annually)

GLLC-504 Theories of Communication
Registration #0502-504
This course is an introduction to human communication theory, including a history of the major stages in the development of modern theories of communication. Theories based both in the humanities and in the social sciences will be covered. This is a required professional course for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective. (GLLC-440 and either GLLC-442 or GLLC-502 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-507 **Professional Writing**
Registration #0502-507
This course develops in the student those professional writing skills necessary to the composition of in-house journals or newsletters; press releases; trade journals/books; speeches; general interest writing; and ghostwriting. Students enrolling in Professional Writing should have command of clear and logical standard written English prose. This is a required professional course for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective. (GLLC-220 or equivalent)
Class 3, Credit 4 (offered annually)

GLLC-508 **Organizational**
Registration #0502-508 **Communication**
This course examines both interpersonal and small group communication in organizational settings. Topics to be covered include information flow and networks, organizational theory, managerial decision making, interviewing, organizational development, and conflict resolution. This is a required professional course for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective. (GLLC-440 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-510 **Visual Communication**
Registration #0502-510
Visual Communication examines communication processes and principles that use the visual mode. Through a survey of the several areas represented in the literature of visual communication, this course examines theories, analysis, and sender and receiver orientations to images. Emphasis is on communicative understanding rather than aesthetic, technical, or skills approach. Discussion will primarily depend on, but will not be limited to, the photographic image. Visual Communication is a Liberal Arts elective, without prerequisite, required for Professional and Technical Communication majors.

Class 3, Credit 4 (offered annually)

GLLC-513 **Interviewing**
Registration #0502-513
Interviewing examines dyadic communication as it occurs in the organizational, professional interviewing context **Emphasis** is placed on the major types of interviews: informational, selection, and persuasive. Students are provided with theory, as well as opportunities for skills development This is a professional elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective.

Class 3, Credit 4 (offered annually)

GLLC-514 **Mass Communication**
Registration #0502-514
An introduction to the study of the mass media. The focus of the course is on the history, development, and law and regulation of the mass media in the United States. This is a required professional course for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective.

Class 3, Credit 4 (offered annually)

GLLC-515 **Uses and Effects**
Registration #0502-515 **of the Mass Media**
An analysis of the "effects" and the "uses and gratifications" of mass communication research with focus on building mass communication theory. NOTE: Students may find GLLC-514 a useful introduction to this course. This is a professional elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective.

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GLLC-516 **Creative Writing/Poetry**
Registration #0502-516
An exploration of techniques of writing poetry in both open and closed forms. This is a writing elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective. (GLLC-220 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-517 **Newswriting**
Registration #0502-517
Practicum in basic techniques of news writing and gathering for the daily press. Emphasis will be primarily on writing for the print media. Emphasis on frequent writing against a deadline. This is a writing elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective.

Class 3, Credit 4 (offered occasionally)

GLLC-518 **Creative Writing/Prose Fiction**
Registration #0502-518
An exploration of some of the most important contemporary techniques of prose fiction in the short story form. This is a writing elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective. (GLLC-220 or equivalent)

Class 3, Credit 4 (offered annually)

GLLC-519 **Advanced Creative Writing**
Registration #0502-519
Students who have completed Creative Writing or who have satisfied the instructor, normally by presentation of a writing sample, of their readiness to undertake the course will be given an opportunity to explore in depth a literary genre, subject or theme chosen by the individual student in conference with the instructor. The acceptability of the student's project will be determined on the basis of its intrinsic literary merit and its potential value to the student's development as a writer. This is a writing elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective. (GLLC-220 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLC-520 **College Vocabulary Skills**
Registration #0502-520
Application to the process of vocabulary building of the various disciplines of language study will be provided. Included among these will be applications of dictionary study, etymology, semantics, and structural linguistics. In addition, literary works, periodicals, and newspapers will be examined to strengthen the student's awareness of the contextual variation in the meaning of words. Ineffective and faulty devices of language usage will also be discussed. (0502-220 & 0504-332)

Class 3, Credit 4 (offered annually)

GLLC-521 **Intercultural Communication**
Registration #0502-521
This course is an examination of the role of culture in face-to-face interaction. There are no prerequisites, but students may find a basic background in communication, anthropology, or psychology useful. This is a professional elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective.

Class 3, Credit 4 (offered annually)

GLLC-524 **Communication and**
Registration #0502-524 **Documentary Film**
An examination of the documentary film and video as case studies in communication media. The course focuses on film techniques used as argument, persuasion, propaganda and reconstruction of reality. Such elements as director, subject shooting style, and editing techniques will be analyzed in terms of message, purpose and audience. This is a professional elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective.

Class 4, Credit 4 (offered every year) (W, S)

GLLC-525 Special Topics in Communication
Registration #0502-525
A focused, in-depth study and analysis of a selected advanced topic in communication and associated issues. Specific course topic will vary according to faculty assigned and will be published when the course is offered. Topics include: semiotics, public relations, communication technologies, gender differences in communication, legal communication, and censorship and propaganda. (For junior and senior PTC students; non-PTC students must receive permission of the instructor.)

Class 3, Credit 4 (offered annually)

GLLC-526 Advanced Public Speaking
Registration #0502-526
This course blends classical and modern public address theory in an attempt to produce the speaker who is both wise and eloquent. The course focuses on ideas—how to invent, arrange, stylize, and deliver them. Attention is given to the creative use of language, special occasion speeches, speaking in front of a camera, and the ethics of public speaking. **This** is a professional elective for the Professional and Technical Communications degree program and also may be taken as a Liberal Arts elective. (GLLC-501 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLC-530,482,483 Beginning German I, n, m
Registration #0502-530, 482,483
This sequence of courses is designed to give students with no prior exposure to the language a sound basic knowledge of German as it is spoken and written today. A strong emphasis is placed on speaking and reading skills. Besides language, students will also study contemporary life and culture in the German-speaking countries. Courses II and III are part of the Foreign Language/ Culture Study concentration and may also be taken as electives.

Class 4, Credit 4 (offered annually)

GLLC-533,486,487 Beginning Spanish I, II, m
Registration #0502-533,486,487
This sequence of courses is designed to give students with no prior exposure to the language a sound basic knowledge of Spanish as it is spoken and written today. A strong emphasis is placed on speaking and reading skills. Besides language, students will also study contemporary life and culture in the Spanish-speaking countries. Courses II and III are part of the Foreign Language/ Culture Study concentration and may also be taken as electives.

Class 4, Credit 4 (offered annually)

GLLC-536 American Sign Language I
Registration #0502-536
This course presents a study of the origins, nature, and development of American Sign Language (ASL), and its variants, as used by the deaf population of North America. Integral to the course is the linguistic structure of ASL and the nature of signing as a linguistic modality.

Class 3, Credit 4 (offered annually)

GLLC-537,484,485 Beginning Japanese I, II, IH
Registration #0502-537, 484,485
This sequence of courses is offered in a modified, self-instructional format developed by the National Association of Self-Instructional Language Programs (NASILP). The College of Liberal Arts is certified by NASILP and uses course material and examiners accredited by NASILP.

These courses will introduce students with no prior exposure to the language to elementary spoken Japanese. The Japanese writing system will be introduced in Japanese III. (Permission of the foreign language coordinator)

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GLLC-540, 480, 481 Beginning Chinese I, II, m
Registration #0502-540,480,481
This sequence of courses is offered in a modified self-instructional format developed by the National Association of Self-Instructional Language Programs (NASILP). The College of Liberal Arts is certified by NASILP and uses course material and examiners accredited by NASILP.

These courses will introduce students with no prior exposure to the language to elementary spoken Mandarin. The Chinese writing system will be introduced in Chinese III. Courses II and III are part of the Foreign Language/Culture Study concentration and may also be taken as electives. (Permission of the foreign language coordinator)

Class 2, Credit 4 (offered annually)

GLLC-543, 544, 545 Beginning Arabic I, II, ED
Registration #0502-543, 544, 545
This sequence of courses is offered in a modified self-instructional format developed by the National Association of Self-Instructional Language Programs (NASILP). The College of Liberal Arts is certified by NASILP and uses course material and examiners accredited by NASILP.

These courses will introduce students with no prior exposure to the language to modern standard Arabic. Arabic I will introduce the phonology and script. Throughout, the emphasis will be put on acquiring oral skills. (Permission of the foreign language coordinator)

Class 2, Credit 4 (offered annually)

GLLC-548,549, 550 Beginning Japanese IV, V, VI
Registration #0502-548, 549, 550
This sequence of courses is offered in a modified, self-instructional format developed by the National Association of Self-Instructional Language Programs (NASILP). The College of Liberal Arts is certified by NASILP and uses course material and examiners accredited by NASILP.

These courses will enable students with some prior knowledge of Japanese to communicate more fluently in modern Japanese. Although the students will learn reading and writing skills, the primary emphasis will be the acquisition of oral fluency. (GLLC-485 or permission of the foreign language coordinator)

Class 2, Credit 4 (offered annually)

GLLC-551, 552, 556 Beginning Chinese IV, V, VI
Registration #0502-551, 552, 556
This sequence of courses is offered in a modified self-instructional format developed by the National Association of Self-Instructional Language Programs (NASILP). The College of Liberal Arts is certified by NASILP and uses course material and examiners accredited by NASILP.

These courses will enable students with some prior knowledge of Mandarin to communicate more fluently in modern Mandarin. Although the students will learn reading and writing skills, the primary emphasis will be the acquisition of oral fluency. (GLLC-481 or permission of the foreign language coordinator)

Class 2, Credit 4 (offered annually)

GLLC-553 Creative Interpretation in Sign
Registration #0502-553
Creative approaches to the interpretation of selected literary classics (prose, poetry, fiction, drama) through the visual medium of sign (sign language and sign-mime). (Prerequisite: sign language)

Class 3, Credit 4 (offered occasionally)

GLLL-332 Literature
Registration #0504-332
The students study some of the great literary works of our culture to enrich their lives and reinforce their analytical abilities. The students read representative poems, dramas, and narratives drawn from the Ancient, Medieval-Renaissance, and Modern Periods.

Class 3, Credit 4 (offered quarterly)

GLLL-337 **Literature: Poetry and Drama**
Registration #0504-337
The students study some of the great literary works of our culture to enrich their lives and reinforce their analytical abilities. The students read representative poems and dramas, drawn from the Ancient, Medieval-Renaissance, and Modern Periods. This two credit course and the companion two credit course GLLL-338 are the only required literature courses in the student's career.

Class 2, Credit 2 (offered on sufficient demand)

GLLL-338 **Literature: Prose Fiction**
Registration #0504-338
The students study some of the great literary works of our culture to enrich their lives and reinforce their analytical abilities. The students read representative prose fiction drawn from the Ancient, Medieval-Renaissance, and Modern Periods. This two credit course and the companion two credit course GLLL-337 are the only required literature courses in the student's career.

Class 2, Credit 2 (offered on sufficient demand)

GLLL-440 **Drama/Theatre**
Registration #0504-440
The Drama/Theatre course studies drama as a genre and theatre as a performing art. Intensive study of at least one major playwright or period complements a general survey of Drama) Theatre from Ancient Greece to Modern Broadway. This course is part of the Literature concentration and may also be taken as an elective. (GLLL-332 or equivalent)

Class 3, Credit 4 (offered annually)

GLLL-441 **The Art of Poetry**
Registration #0504-441
This course emphasizes the enjoyment and study of poetry with primary attention to major poetry in English. This course is part of the Literature concentration and may also be taken as an elective. (GLLL-332 or equivalent)

Class 3, Credit 4 (offered annually)

GLLL-442 **Short Fiction**
Registration #0504-442
The course is a study of a collection of short stories with critical commentary in order to provide source materials on the nature and development of this genre. This course is part of the Literature concentration and may also be taken as an elective. (GLLL-332 or equivalent)

Class 3, Credit 4 (offered annually)

GLLL-443 **The Novel**
Registration #0504-443
The Novel course provides a close reading and analysis of several novels selected to show the range of narrative techniques, methods of characterization and plot construction, and styles representative of the genre. This course is part of the Literature concentration and may also be taken as an elective. (GLLL-332 or equivalent)

Class 3, Credit 4 (offered annually)

GLLL-444 **Film as Literature**
Registration #0504-444
This course examines the nature of narrative in both film and literature, the various aspects of adaption of literature into film, and the relationship between social reality and storytelling in documentary film. This course is a non-technical, non-chronological study of film with a balance of roughly 50% literature and 50% film. This course is part of the Literature concentration and may also be taken as an elective. (GLLL-332 or equivalent)

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GLLL-445 **Great Authors**
Registration #0504-445
This course provides extended study of the works of specific great authors (to be listed in the subtitles). Students can take any section of this course as part of the Literature concentration or as an elective. Additional sections also can be taken for the Literature concentration or elective credit Detailed descriptions, objectives and content/methods appear under each subtitle. (0504-332 or equivalent)

Class 3, Credit 4 (offered annually)

GLLL-445 **Great Authors: Mark Twain**
Registration #0504-445 **and the American Dream**
The course will consist of readings from the bitter-comic writings of the last part of Twain's career, focusing on his philosophy of total determinism, his disenchantment with the "damned human race" and its institutions of government, his trust in and later disillusionment with industrialism, and his romantic nostalgic desire to return to an idyllic pre-Civil War existence. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-445 **Great Authors: Ibsen-**
Registration #0504-445 **Drama and Film**
Reading and/or viewing ten plays of Henrik Ibsen, the father of modern drama, enables attentive examination of values and structures of modern society that form and formulate the lives of women and men. Ibsen argues that the possibility of individual freedom and creativity can only be won by seeing beyond and acting in spite of formidable forces. The texts and films are analyzed for visual, as well as verbal information. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-445 **Great Authors: Chaucer and**
Registration #0504-445 **His Times**
A close reading of the major poetry of Geoffrey Chaucer and The Pearl Poet in modern English translation, and a brief introduction to the history of the English language. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-445 **Great Authors: Jonathan Swift**
Registration #0504-445 **and the Age of Satire**
Vicious satirical writings of Jonathan Swift and other early 18th century authors will be read and analyzed focusing on the intrigue and scandals marking the political and religious environment of the age. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-445 **Great Authors: Hawthorne**
Registration #0504-145
This course provides an extended study of the works of Hawthorne that includes short stories, sketches, and novels. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-445 **Great Authors: James Joyce**
Registration #0504-445
Careful study of three of James Joyce's major works: ***Dubliners, A Portrait of the Artist as a Young Man,*** and ***Ulysses.*** This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 4, Credit 4 (offered every year) (W, S)

GLLL-445 **Great Authors: Shakespeare—**
Registration #0504-445 **Tragedy and Romance**
A generous sample of Shakespeare's tragedy and romance plays is investigated to reveal their literary excellence and their theatrical power. Reference is made to his poems; to the sources of his plays; to the world of Shakespeare's time, its intellectual preconceptions, political stresses, and religious rivalries; and to the theatre and its traditions. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-445 **Great Authors: Shakespeare—**
Registration #0504-445 **Comedy and History**
Several of Shakespeare's comedy and history plays are read and analyzed to reveal their literary excellence and their theatrical power. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-446 **Modern Literature**
Registration #0504-446
The course provides extended study of works written in the 20th century (the particular genres or topics will be listed in the subtitles). Students can take any section of this course as part of the Literature concentration or as an elective. Additional sections also may be taken for concentration or elective credit. Detailed descriptions, objectives, and content/methods appear under each subtitle. (0504-332 or equivalent)

Class 3, Credit 4 (offered annually)

GLLL-446 **Modern Literature:**
Registration #0504-446 **Modern World Drama**
Reading modern plays from Europe, America, and the Third World reveals both style and content that function to depict, from a variety of perspectives, the condition of the individual in the modern world. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-446 **Modern Literature:**
Registration #0504-446 **20th Century World Fiction**
Reading 20th century short stories and novels from the East, West, and Third World reveals, in addition to stylistic innovation and excellence, a variety of perspectives, values, and problems that contribute to the delineation of contemporary global civilization. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-446 **Modern Literature:**
Registration #0504-446 **Modern Poetry**
A close examination of the poems of important English and American poets of the 19th and 20th centuries, including several living poets. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-446 **Modern Literature: Modern Latin**
Registration #0504-446 **American Literature**
Reading short stories, novels, and poetry of modern Mexico, Central and South America reveals a literature and culture wherein the mythic functions as an integral part of the modern world view and the poetic functions as a political power. The impressive vitality of modern Latin American literature can be attributed to its indigenous roots and to its branches that, stemming from a common language and a shared continent, overarch national boundaries and political regimes to form an international literary community. This course is part of the Literature concentration and the Foreign Language Culture concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-446 **Modern Literature: World**
Registration #0504-446 **Literature in English**
The course will cover short stories and novels written in English by Australian, African, Asian, and West Indian authors. The selections will be discussed against the background of the social, political, and cultural milieu in which the authors worked. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-446 **Modern Literature: Short Story**
Registration #0504-446
A study of American writers of the 20th century with particular attention to the beginnings of realism, naturalism, and symbolism. A survey of the literature of two decades: the '20s and the '30s, and the study and interpretation of the themes of myth, escape and protest The work of Fitzgerald, Hemingway, Steinbeck, and others will be read. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 **Literature Topic**
Registration #0504-447
The course provides extended study of special topics in literature (the particular topics will be listed in the subtitles). Students can take any section of this course as part of the Literature concentration or as an elective. Additional sections also can be taken for concentration or elective credit. Detailed descriptions, objectives, and content/methods appear under each subtitle. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 **Literature Topic: Technology**
Registration #0504-447 **in American Literature**
A study of 19th and 20th century American literature (short stories, essays, poems, and novels) commenting on the impact of technology on society. The works selected reflect mostly the skeptical response of American writers to the technological Utopia. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 **Literature Topic: The Nightmare**
Registration #0504-447 **of Technology—Studies in 19th Century British Writings**
A study of 19th century British prose and poetry. Attention will be devoted to the effects of industrialism on a changing English society. The course will study, in general, the various social problems confronting 19th century England and how various writers responded to these problems in their works. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 **Literature Topics:**
Registration #0504-447 **The Romantic Vision**
A study of 19th century European prose and poetry (primarily British) with particular attention paid to the collapse of the Romantic vision, and its gradual absorption into the Aesthetic and Decadent literary traditions of late 19th century European literature. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 **Literature Topic:**
Registration #0504-447 **Literature of the Bible**
A close and rapid reading of selected Old and New Testament books to show the range and variety of literary genres and styles in the ***Bible.*** This course is part of the Literature concentration and Perspectives on Religion concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 Literature Topic:
Registration #0504-447 Myth, Legend, Folklore
Scholarly investigation into the rationale, origins and sources of myths, legends, and folklore of the western world and the effect these primary forms have had on our literature. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 Literature Topic: The Epic
Registration #0504-447
Advanced study of great representative works in the epic mode. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 Literature Topic:
Registration #0504-447 Viking Myth and Saga
Reading the myths, sagas, and folktales of the Viking world reveals the values of a people that created the world's oldest extant democratic society. Both women and men fiercely defend their honor and freedom, willing to risk death rather than to bow in submission. The sagas are analyzed as compelling narrative structures and as documents of a culture that continues significantly to shape Western civilization. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 Literature Topic:
Registration #0504-447 Rites of Passage
A survey of literary works providing a variety of insights into growing up, especially from adolescence into adulthood, which take the reader from the humorously reminiscent to the devastatingly brutal and which provide the reader with a better understanding of and appreciation for this phase of life. This course is part of die Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 Literature Topic:
Registration #0504-447 Black Literature
This course traces the literary contributions of selected black writers in the various genres from its roots in the African heritage through slavery to the present day. This course is part of the Literature concentration and the Minority Relations concentration. It also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 Literature Topic: The American
Registration #0504-447 Spirit in Literature
This is a survey of the development of American philosophy through the study of selected works from the colonial period through the mid-19th century. Particular attention is given to the ideas of the writers under consideration and their effect on modern American thought. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-447 Literature Topic:
Registration #0504-447 Literature of Suspense
An introduction to stories of mystery and suspense whose literary mode has aesthetic merit; whose plots, characters, and/or settings are uniquely entertaining, and whose authors have evolved rare styles of storytelling. This course is part of the Literature concentration and also may be taken as an elective. (0504-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-480 Women in Literature
Registration #0504-480
This course concentrates on literature by women about women primarily from the early 19th century to the present. The course considers the aspirations, frustrations, and achievements of women as documented by themselves, as well as the perceptions and representations of women in literature by male writers. Works are examined for their literary value as well as their documentation of broader feminist issues. This course is part of the Women's Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GLLL-481 Literature of War and Peace
Registration #0504-481
This course gives students an awareness of the different views on war and peace in world literature and cinematic works. This course is part of the Peace Studies Concentration, but also may be taken as an elective. (GLLL-332 or equivalent)

Class 3, Credit 4 (offered occasionally)

GLLL-483 Hinduism and Buddhism
Registration #0504-483
This course presents the religious experience from the viewpoints of two major Eastern Religions: Hinduism and Buddhism. Drawing upon these traditions, the course examines the psychological and philosophical dimensions of the religious experience. This course is part of the Perspectives on Religion concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GLLL-484 Literature and Religion
Registration #0504-484
A literature course which explores the complexity of religious experience, both personal and cultural, as it is portrayed by writers from biblical times to our own day. The literature will be supplemented by readings from such disciplines as psychology, philosophy, history and theology. This course is part of the Perspectives on Religion concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GLLL-501 Speculative Fiction
Registration #0504-501
Speculative fiction is a survey course in contemporary literature presenting conjectural views of man, his world, his society and his belief. Attention is given to the historical development of the genre as well as those works which have become classics of science fiction and fantasy.

Class 3, Credit 4 (offered occasionally)

GLLL-516 Literature and Society
Registration #0504-516
Selected works by writers such as Sophocles, Dante, Dickens, Camus and Vonnegut as important works of art that reflect the human condition and implicitly prophesy against particular evils in attitudes or institutions of their times.

Class 3, Credit 4 (offered occasionally)

GLLL-524 Contemporary Film
Registration #0504-524
A study of contemporary world films, to be drawn from those presently showing in the Rochester area (theaters, television, film festivals). Emphasis will be on both technical and aesthetic aspects of the films.

Class 3, Credit 4 (offered annually)

GLLL-545 The Deaf in Fiction
Registration #0504-545
A study of the literature of deafness, with special emphasis on literary works which identify and illuminate "the deaf experience."

Class 3, Credit 4 (offered occasionally)

Science and Humanities

GSHF-213 **Fine Arts: Visual Arts**
Registration #0505-313
The course will develop ability in perceiving worth in objects of art through consideration of fundamental concepts in painting, sculpture and architecture, involving analysis, interpretation and principles of aesthetics.

Class 3, Credit 4 (offered quarterly)

GSHF-214 **Fine Arts: Musical Arts**
Registration #0505-214
An introduction to music as a fine art. The course is designed to develop skills in listening, evaluation, and analysis through an examination of music's forms, constituent elements, and stylistic and historical development

Class 3, Credit 4 (offered quarterly)

GSHF-215 **Fine Arts: Film Arts**
Registration #0505-215
This course will develop ability to view analytically and evaluate the film arts, both still and moving (motion) pictures, through consideration of their technologies, histories, aesthetics and critical writings.

Class 3, Credit 4 (offered annually)

GSHF-441 **American Architecture**
Registration #0505-441
A survey of American Architecture from the seventeenth century to the present. Stress will be placed on a visual as well as a historical and social analysis. This course is part of the American Artistic Experience concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHF-442 **Music in the United States**
Registration #0505-442
A survey of music in the United States from the time of European colonization to the present. Particular emphasis will be placed upon the question of what makes music distinctively "American." This course is part of the American Artistic Experience concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHF-443 **Images of American Life**
Registration #0505-443
This course examines images of American life in the 19th and 20th century in the visual arts, particularly photography, to analyze and evaluate the influences of American political, social and cultural events on imagery and perception. This course is part of the American Artistic Experience concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHF-444 **American Painting**
Registration #0505-444
A survey of the style and meaning in American paintings from the colonial limners to contemporary artists. It will center on what distinguishes painting of the colonies and of the United States from its European counterpart. This course is part of the American Artistic Experience concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHF-445 **Issues in American Art**
Registration #0505-445
The purpose of this course is to offer the student a comprehensive overview of American attitudes and philosophies as they have shaped and been embodied in our artistic heritage. Emphasis will be placed on American art from 1850 to the present. This course is part of the American Artistic Experience concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHF-446 **American Film**
Registration #0505-446
This course will develop an understanding of theories, styles and trends in American film through a historical and sociological study of the medium. This course is part of the American Artistic Experience concentration and also may be taken as an elective.

Class 3, Credit **4** (offered annually)

GSHF-447 **The American Musical Theatre**
Registration #0505-447
This course will survey the development of American opera and the American musical theatre, highlighting representative works, composers, librettists and performers of both the "cultivated and vernacular traditions." This course is part of the American Artistic Experience concentration and also may be taken as an elective.

Class 3, Credit **4** (offered annually)

GSHF-480 **Women and the Visual Arts**
Registration #0505-480
This course examines the image of women in the visual arts and the role of women as image makers. Major topics to be covered include: the variety of images of women, the evolution and change of these images over time, media images (as differentiated from fine art images) of women, images of women by women and by men, women's images and the issues of their relationship to the images made by men, the nude and pornography, history of women artists, selected women artists and their work, relation of their work to the art of the period, current issues and status of women artists. This course is part of the Women's Studies concentration and also may be taken as an elective.

Class 3, Credit **4** (offered annually)

GSHF-481 **Oriental Art**
Registration #0505-481
A survey outlining the development of art in India, China, Japan and examining the philosophical circumstances that distinguish Eastern artistic traditions. There will be opportunity for each student to pursue special interests in depth. This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit **4** (offered occasionally)

GSHF-482 **Beethoven**
Registration #0505-482
This course introduces the music of Beethoven in the psychological, political and philosophical contexts that gave it shape and force. Using the classical style of Haydn and Mozart as background, it focuses on the development of the "Dionysian" personality in Beethoven's compositions and the creation of the sublime in music. This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit **4** (offered occasionally)

GSHF-483 **Bach and the Baroque**
Registration #0505-483
This course is devoted to a study of Johann Sebastian Bach, his life and times, and his music in the context of Baroque styles and aesthetics. Compositions from each of the major periods of his creative life will be examined and discussed, particularly as they serve the social and religious purposes for which they were written, and as they reveal the psychology of so-called "Rhineland mysticism." This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit **4** (offered occasionally)

GSHF-501 **Craftsmanship in Gothic Art**
Registration #0505-501
A survey of religious and secular art in Europe from about 1100 to 1500 A.D. and its antecedents. Media to be studied include manuscript illumination, sumptuous objects, and church architecture (including associated sculpture, mosaics, paintings and stained glass).

Class 4, Credit **4** (offered every year) (S, SR)

GSHF-509 Impressionism to Analytical Cubism
Registration #0505-509
This course deals with the historical and stylistic aspects of the avant-garde painters of the second half of the 19th century and the first decade of the 20th century. It traces the struggles of these artists to break away from the traditional forms of expression and to attain a new vision of reality.

Class 3, Credit 4 (offered occasionally)

GSHF-512 Master Drawings Since the Renaissance
Registration #0505-512
A study of drawings from the 15th to the 20th centuries, including the work by Leonardo da Vinci, Michelangelo, Durer, Rembrandt and Picasso.

Class 3, Credit 4 (offered occasionally)

GSHF-514 Cubism to the Present
Registration #0505-514
An investigation into modern man's struggle to preserve his identity in our fast developing technological world as reflected in the vitality and diversity of today's visual arts. Differences and similarities with art forms of earlier eras and other cultures also will be discussed.

Class 3, Credit 4 (offered occasionally)

GSHF-519 Rembrandt Van Rijn: His Art and Times
Registration #0505-519
A study of the life, art and times of the Baroque master. Emphasis will be placed on his stylistic evolution, his relation to his society and to the Baroque style, and on his humanistic world view.

Class 3, Credit 4 (offered occasionally)

GSHF-520 Picasso
Registration #0505-520
The life and work of one of the most influential artists of our century.

Class 3, Credit 4 (offered occasionally)

GSHF-524 Music Theory I
Registration #0505-524
This course is designed for the student who has basic musical literacy (ability to read music notation). In addition to the writing of melody, two-part counterpoint and four-part harmony, some attention will be given to the analysis of form and style.

Class 3, Credit 4 (offered occasionally)

GSHF-526 20th Century Music
Registration #0505-526
A survey of major 20th century composers and their works. Emphasis will be placed on the development of music in the classical tradition, experimental music and jazz.

Class 3, Credit 4 (offered occasionally)

GSHF-528 Romanticism in Music
Registration #0505-528
A survey of music written during the Romantic Period (19th century), including later trends-Impressionism (Debussy, Ravel) and Neo-classicism (Satie, Stravinsky). Genres include orchestral music, chamber music, piano, song, ballet, and opera. Representative composers are Chopin, Brahms, Wagner, and Tchaikovsky.

Class 3, Credit 4 (offered occasionally)

GSHF-530 Art and Human Values
Registration #0505-530
This course investigates the nature and value of the arts and their relation to other areas of human activity such as religion, economics, science and technology and personal freedom.

Class 4, Credit 4 (offered every year) (W, S)

GSHF-532 African Tribal Art
Registration #0505-532
After an investigation of the world of "primitive" man and the function of art in a tribal environment, this course will focus on preliterate societies of sub-Saharan Africa.

Class 3, Credit 4 (offered occasionally)

GSHF-534 Renaissance and Baroque Art
Registration #0505-534
This course examines the stylistic development of painting in Europe from 1420 to 1650. The Renaissance style will be analyzed and studied through the works of painters, with emphasis placed on stylistic evolution through the 15th century and the classical synthesis created in the high Renaissance. Mannerist and Early Baroque paintings will be discussed from the point of view of the Renaissance style to investigate concepts of stylistic continuity, evolution, and change. Paintings also will be discussed within their cultural and political contexts.

Class 3, Credit 4 (offered occasionally)

GSHF-536 Music and the Stage
Registration #0505-536
This course will survey the development of opera and the American musical theatre, highlighting representative works, composers, librettists, and performers.

Class 3, Credit 4 (offered occasionally)

GSHF-539 Music Performance
Registration #0505-539
This course involves the historical and theoretical study of musical forms and styles in the context of active participation in the RIT Singers or the RIT Philharmonia. As an experiential outcome of such study, the group will prepare significant musical compositions for public performance. Credit: one hour per quarter. A total of four such credits may count as a Liberal Arts elective.

Class 1, Credit 1 (offered quarterly)

GSHH-301 History: Modern America
Registration #0507-301
This course examines the political, social, cultural, and economic development of the American people in the modern, period. Studies the Unites States in its foreign relations.

Class 3, Credit 4 (offered quarterly)

GSHH-302 History: Modern European
Registration #0507-302
An examination of social, economic, political and intellectual movements of Europe from the Modern Period to the Twentieth Century, which played major roles in shaping our contemporary world.

Class 3, Credit 4 (offered quarterly)

GSHH-440 United States: Its People and Its Institution
Registration #0507-440
This course will examine the American people, their society and their culture, in relation to the nation's institutions: government, courts, business, labor and political and private associations. The interplay between the American people and the institutions which structure their lives sheds light on the dynamic forces which shape American history and help to explain the present. Instead of detailing day-to-day chronology, this study will highlight the sweep of major trends and movements over longer periods of the American experience. This course is part of the History concentration and also may be taken as an elective. (GSHH-301 or GSHH-302 or equivalent)

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GSHH-441 20th Century American
Registration #0507-441 Diplomatic History
An examination of the major events and forces which shaped American diplomacy from the opening years of the 20th century to the immediate post World War II era. This course is part of the History concentration and also the Global Studies concentration, and also may be taken as an elective. (GSHH-301 or GSHH-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSHH-442 The Contemporary
Registration #0507-442 Middle East
This course analyzes the making of the contemporary Middle East from the rise of Islam to the present with special emphasis on the patterns of political development in the 20th century. This course is part of the History concentration and also the International Relations concentration and also may be taken as an elective. (GSHH-301 or GSHH-302 or equivalent for the History concentration; GSSM-211 or GSSM-215 or equivalent for the International Relations concentration)

Class 3, Credit 4 (offered annually)

GSHH-443 European Social Intellectual
Registration #0507-443 History Since 1600
An analysis of social events and intellectual movements in Europe since 1600. This course is part of the History concentration and also may be taken as an elective. (GSHH-301 or GSHH-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSHH-444 European Diplomatic History,
Registration #0507-444 1871-1945
This course seeks to investigate the origins of the First and Second World Wars with special emphasis on the diplomacy of the European Great Powers. This course is part of the History concentration and also may be taken as an elective. (GSHH-301 or GSHH-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSHH-445 Modern Latin America
Registration #0507-445
This course surveys the historical development of the Hispanic and Portuguese areas of the Americas from independence to the mid-twentieth century. The movement towards independence, the problems that emerged during the nineteenth century of forming unified nations, and the problems of modernization in the twentieth century are all covered. The histories of selected countries are used to illustrate these issues. This course is part of the History concentration and also the Foreign Language/Culture Study concentration, and also may be taken as an elective. (GSHH-301 or GSHH-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSHH-480 History of American Women
Registration #0507-480
A history of women in North America from the colonial period to the present. Concentrates on the social, political, cultural, diplomatic and economic history of women in the United States and Canada. This course is part of the Women's Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHH-483 Christianity in the West
Registration #0507-483
This course traces the development of Christian thought in the broad historical context of Western Civilization. It concentrates on major movements and outstanding personalities. This history of Christian thought is examined against the background of economic, political, social and intellectual currents. The study sheds light on both the conflicts within and the criticisms from outside and Christian tradition. This course is part of the Perspectives on Religion concentration and also may be taken as an elective.

Class 4, Credit 4 (offered every year) (W, S)

GSHH-484 Europe Since 1945
Registration #0507-484
An analysis of the political, economic, social and cultural events that have shaped the new system of Europe since 1945. This course is part of the Global Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHH-485 Foundations of Asian
Registration #0507-485 Civilizations
This course is primarily a study of the Confucian/Buddhist world in East Asia with the focus on China and Japan, their origins and their cultural characteristics. This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit 4 (offered occasionally)

GSHH-486 China and Japan
Registration #0507-486 in the 20th Century
An examination of social, political, economic, and intellectual developments of China and Japan in the 20th Century with an analysis of how these two Asian powers have reached their respective significant status in the contemporary world. This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHH-487 History of Chinese
Registration #0507-487 Communism
An analysis of the main characteristics of Chinese Communism, its native roots, Marxist/Leninist elements, and Maoist innovations. The course also will examine the causes for the rise of Communism in modern China, the context and process of its development, as well as contributions and problems Communism brought forth to the Chinese people. In addition, China and the world will be examined. This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit 4 (offered occasionally)

GSHH-488 Modern Germany
Registration #0507-488
A study of Germany in the 19th and 20th centuries. This course will begin with the unification of Germany in 1871 and trace the political evolution of the nation to the present Special emphasis will be placed on the rise of Nazism. Pertinent social and cultural factors will be considered as well. This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHH-489 Japan in the Modern World
Registration #0507-489
An examination of social, economic, political and intellectual developments of Japan in the nineteenth and twentieth centuries with an analysis of how Japan has reached such a significant status in the contemporary world. This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit 4 (offered occasionally)

GSHH-490 History of Mexico
Registration #0507-490
The historical development of Mexico including the colonial period, independence movement, the liberal-conservative class, and the revolution of 1910. This course is part of the Foreign Language/Culture Study concentration and also may be taken as an elective.

Class 3, Credit 4 (offered alternate years)

GSHH-491 Black Experience in America
Registration #0507-491
Examines the history of blacks in America, treating the subject primarily from a social and cultural perspective. Studies the impact of whites on black Americans and describes the contribution of blacks to the development of the United States. This course is part of the Minority Relations concentration and also may be used as an elective.

Class 3, Credit 4 (offered annually)

GSHH-492 Selected Problems in Black History
Registration #0507-492
A seminar approach to the thought of key black leaders (Washington, Garvey, King) and the study of civil rights and black power movements. This course is part of the Minority Relations concentration and also may be taken as an elective.

Class 3, Credit 4 (offered occasionally)

GSHH-493 History of Social Discrimination
Registration #0507-493
A study of the discriminatory practices, present and historical, found in the United States. To include the cultural values and problems of acculturation for the American Indian, Black, Puerto Rican, Chicano, Asian, women, and religious groups, with emphasis on its implications to social work. This course is part of the Minority Relations concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHH-494 The Immigrant in American History
Registration #0507-494
This course explores the personal and collective experience of immigrants arriving in North America from colonial times to the present. Categories of special interest include immigrant expectations and adaptation; the tension between ethnic exclusiveness and assimilation; the role of the immigrant in the urban communities of the United States and Canada; native-born reactions to immigrants; the ethnic revival of the 1960s and 1970s; and the condition of ethnicity and the new immigration in contemporary America. This course is part of the Minority Relations concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHH-501 United States Community
Registration #0507-501 History
Students will study the lives of Americans in various communities (such as families, working, ethnic and political communities) from 1850 to present.

Class 3, Credit 4 (offered occasionally)

GSHH-502 Europe of the Dictators:
Registration #0507-502 Stalin, Mussolini, Hitler
A study of the European states and peoples in the inter-war period, the diplomatic and military history of World War II, the reconstruction of Europe, the Cold War, Detente, and contemporary Europe.

Class 3, Credit 4 (offered occasionally)

GSHH-503 The History of Russia
Registration #0507-503
A study of the historical context and development of Russian society and the factors leading to the emergence of the Soviet regime.

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GSHH-507 World at War 1914-45
Registration #0507-507
This course aims to give continuity (interpretation of cause and effect relationships) to the major developments of the period 1914-45. The course notes the impact of classical liberal economic theories in a period of rapid mechanization and industrialization. Rising social expectations in the period of exploding democratic and later social liberalism are observed in their relationship to revolution and reaction. This course considers the causes of World War I and examines the military operations in some detail.

Class 3, Credit 4 (offered occasionally)

GSHH-514 Race and Society
Registration #0507-514
A social, historical, political, religious and anthropological appraisal of the factors which have produced the differences between social appearances and social attainments of the world's population. Primary emphasis will be placed upon the fact that such differences are not sufficient reason for believing that there are underlying disparities or innate capacities among races.

Class 3, Credit 4 (offered occasionally)

GSHH-519 United States-Latin America
Registration #0507-519 Diplomatic Relations
The emphasis in this course will be on analyzing the United States' relations with Latin America from independence to the present

Class 3, Credit 4 (offered occasionally)

GSHH-520 Crime, Violence, and Urban
Registration #0507-520 Crisis
The course will analyze the causes of the outbreak and rapid increase of violent and criminal trends in the world as the most serious realities of the 20th century. The course will be a comparative study on America's and the world's problems of violence, crime, and urban crisis.

Class 3, Credit 4 (offered occasionally)

GSHH-524 The Italian American
Registration #0507-524 Experience
Examines the history and culture of the Italian Americans from the colonial period to the present Stresses their role in the arts, business, politics, the Church, and the labor movement. Italian history is studied as it relates to the Italians in America.

Class 3, Credit 4 (offered occasionally)

GSHH-526 The United States and
Registration #0507-526 The Third World Revolutions in the 20th Century
One of the dominant features of the 20th century has been the revolution of rising expectations in the countries of the Third World. This course will study the underlying causes of these revolutions and the reaction of the United States government to this revolutionary ferment in Latin America, Asia and Africa.

Class 3, Credit 4 (offered occasionally)

GSHH-528 This History of Popular
Registration #0507-528 Culture in America
American myths, icons, heroes, and institutions as represented in American popular culture from the late nineteenth century to the present Examines the history of popular entertainment and the mass media in the United States.

Class 3, Credit 4 (offered occasionally)

GSHH-530 19th Century American
Registration #0507-530 Diplomatic History
An examination of American diplomacy from the early years of American independence to the emergence of the United States as a world power. The War of 1812, Monroe Doctrine, and Manifest Destiny are among the topics considered.

Class 3, Credit 4 (offered annually)

GSHH-532 **Civil Liberties in American History**
Registration #0507-532
The course will teach the history of civil liberties in America. Emphasis will be placed on the current state of civil liberties. Students will make philosophical as well as historical analyses of cases.

Class 3, Credit 4 (offered annually)

GSHH-538 **Social Justice and the Constitution In American History**
Registration #0507-538
This course will analyze how well the Constitution has met the social and political expectations of citizens. Emphasis will be placed on analyzing Supreme Court cases that explain the current state of social justice. This is a companion course to GSHH-532, Civil Liberties in American History.

Class 3, Credit 4 (offered annually)

GSHH-545 **Revolutionary Leaders in Latin America**
Registration #0507-545
In this course three movements will be studied: the rise of Juan Peron in Argentina in the 1940's, Fidel Castro's revolution in Cuba; and Salvador Allende's electoral victory in Chile in 1970. By studying these three "revolutionary" movements, it is hoped that the student will come to an understanding of the historical perspective and nature of the social discontent in Latin America.

Class 3, Credit 4 (offered annually)

GSHH-550 **The Ascent of Man**
Registration #0507-550
The course is a multi-disciplinary study in societal, historical, intellectual, technological and scientific perspectives of man's development from prehistoric times to the present. The course is partially based on the television series The Ascent of Man created and narrated by J. Bronowski.

Class 3, Credit 4 (offered occasionally)

GSHH-552 **War and Crises, 1945-Present**
Registration #0507-552
World backdrop for American foreign policy and relations from 1945 to the present, dealing with the Greek Civil War, the Chinese Civil War, the Korean War, the American assumption of Western leadership in the Cold War, economic warfare, the Cuban crisis, war in Southeast Asia, the roles of Presidents Truman to Reagan, detente, multinational business, the press, and crises in the Middle East. Background is developed for decisions of the 1980s.

Class 3, Credit 4 (offered occasionally)

GSHH-553 **The United States Since World War II: Patterns in Recent American History 1945 to the Present**
Registration #0507-553
An analysis of the major themes characterizing post World War II United States history. The course aims to investigate the specific characteristics of America as a modern state. Selected themes will have an intellectual, cultural and political history focus.

Class 3, Credit 4 (offered occasionally)

GSHH-555 **The History of the Soviet Union**
Registration #0507-555
A study in depth of the Bolshevik revolution, the rise of Stalin, industrialization and collectivization, the terror and purges, the process of de-Stalinization under Krushchev and his successors, and current developments in the Soviet Union.

Class 3, Credit 4 (offered annually)

GSHH-556 **The Renaissance World**
Registration #0507-556
The thematic study of the Renaissance in Europe from 1300 to 1600. The course explores the art, literature, philosophy, society and institutions of the Renaissance which have contributed to the revival of the western culture and heritage.

Class 3, Credit 4 (offered occasionally)

GSHH-557 **Communism, Fascism and Democracy In Their Theoretical Foundations**
Registration #0507-557
A political and historical appraisal of these philosophies. Emphasis is placed upon the claims they make with regard to the individual and the state, and the changes they demand for the future.

Class 3, Credit 4 (offered occasionally)

GSHN-211 **Science, Technology and Values**
Registration #0508-211
This course explores the concepts and effects of science and technology in society, analyzes the relationship between science and technology, examines how each has come to play a major role today, and looks at how science and technology have been affected by our values. Science and technology are often assumed to be value free, yet people, guided by individual and societal values, develop the science and technology. In turn, the choices people make among the opportunities provided by science and technology are guided by their individual values.

Class 3, Credit **4** (offered quarterly)

GSHN-440 **History of Science**
Registration #0508-440
This course presents a study of the origins, nature, and development of Western science, and its social, economic, and cultural context. This course is part of the Social Impacts of Science and Technology concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHN-441 **Science and Technology Policy**
Registration #0508-441
This course will examine how local, state, Federal, and international policies are developed to influence innovation, the transfer of technology, and industrial productivity in the United States and other selected nations. This course is part of the Social Impacts of Science and Technology concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHN-442 **History of American Technology**
Registration #0508-442
This course presents an examination of the cultural context of American technology and its influence on American social, economic, political, and cultural institutions. This course is part of the Social Impacts of Science and Technology concentration and also may be taken as an elective.

Class 3, Credit **4** (offered annually)

GSHN-443 **Face of the Land**
Registration #0508-443
This course is a case study in the relationship of technology and society, focusing on the interaction of land, people and technology. By considering the natural landforms of the United States and other countries as appropriate, students will see how the nature of land determines its value. As technological innovations are made and introduced, old relationships with the land are altered, sometimes irreversibly. Through this study students have a concrete example of the positive and negative effects of technology on the social structure. This course is part of the Social Impacts of Science and Technology concentration and also may be taken as an elective.

Class 3, Credit **4** (offered annually)

GSHN-444 Social Consequences of Technology
Registration #0508-444
Modern society is increasingly based on technology. With each advance due to technology, unanticipated problems are also introduced. Society must define and solve these problems or the advances may be diluted or lost. In this course we will study several interactions between technology and the world in which we live. We will investigate how various technologies developed and compare the expected effects of the new technologies with the actual results. This course is part of the Social Impacts of Science and Technology concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHN-445 Biomedical Issues in Science and Society
Registration #0508-445
A study of the impact of science and technology on life, our view of life, and of the value issues that arise from this impact. This course is part of the Social Impacts of Science and Technology concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHN-481 Introduction to Environmental Studies
Registration #0508-481
This course seeks to make students aware of the environmental consequences of modern technology by investigating to what degree various technological systems conflict with the basic ecological principles. This course is part of the Environmental Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHN-482 Energy and the Environment
Registration #0508-482
In this course we will look at the current situation, its environmental implications, and try to determine how we got here, why we got here, and where we may be able to go in the next 20 to 50 years. We will look at the nature, uses, and relative importance of our sources of energy; high technology and low or appropriate technology, hard energy paths and soft energy paths. We will look especially at the role of government policy in the energy area. This course is part of the Environmental Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHN-483 Environmental Values
Registration #0508-483
We seek to identify, interpret, and trace the values associated with concern for the environment, and the factors that induced change in these values. Concern with the environment is not a new concept; its history reaches to ancient times, but the values related to this concern have drastically changed. Understanding environmental values helps one become a better prepared participant in the environmental decision making. This course is part of the Environmental Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHN-484 Environmental Policy
Registration #0508-484
Public compliance with environmental regulations has become increasingly complicated as a result of many laws and regulations instituted since the mid-1960s. The purpose of this course is to study the consequences of mzyor environmental legislation and regulations and to examine the actions of both citizens and the corporate sector as they comply with these laws. The course also will focus on the value, economic, and social implications of environmental regulation, enforcement, and will identify current developments in the area. This is a concentration course in the Environmental Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHN-486 Modern Warfare Technology and Arms Control Problems
Registration #0508-486
In this course we will study the importance of science and technology to defense matters. We investigate how modern weapons, both nuclear and conventional, their delivery systems, and reconnaissance and surveillance methods have seriously affected the character of armed conflict and of preventing wars. However, we shall also see how scientists, by providing their expertise, have been able to influence national security and attempts to control arms. This course is part of the Peace Studies concentration and also may be used as an elective.

Class 3, Credit 4 (offered annually)

GSHN-503 Technology and the Individual
Registration #0508-503
A study of the effects on the life of the individual due to the acceleration of the technological change.

Class 3, Credit 4 (offered occasionally)

GSHN-506 Space, Time and Reality
Registration #0508-506
In this course we learn the conceptual development of the 20th century theories of time and space with major emphasis on their applications in the present decade. These views, which grew out of the rigorous, mathematical logic of relativity theory and quantum theory, represent one of the most profound revisions of intellectual thought in human history. We learn how any vestige of an absolute frame of reference in space and time, and how cause and effect and strict determinism were demolished and how probability was introduced by means of these theories.

Class 3, Credit 4 (offered occasionally)

GSHN-507 Community Energy Planning
Registration #0508-507
This course is designed to allow the student to understand the concepts underlying community energy self-reliance, how to analyze a community's energy supply and consumption, and how to evaluate possible energy futures for a community based as much as possible on conservation and alternative energy strategies.

Class 3, Credit 4 (offered occasionally)

GSHN-508 Special Topics in Environmental Studies
Registration #0508-508
This course will be offered periodically as an elective. The topic and specific content and methods will vary from year to year or term to term. The course will allow an in depth examination of a problem or area that is relevant to the other environmental studies courses.

Class 3, Credit 4 (offered occasionally)

GSHN-509 Special Topics in the Social Impacts of Science and Technology
Registration #0508-509
This course will be offered periodically as an elective in the area of the social impact of science and technology. The topic and specific content and methods will vary from year to year or term to term. The course will allow examination of a special problem or area that is relevant to the other courses in this area of study.

Class 3, Credit 4 (offered occasionally)

GSHN-512 Science as a Humanity
Registration #0508-512
A telecourse designed to present the way of the humanist and reveal it as commanding more of the hidden potential of the individual, and to present science as an expression of the human spirit that commands more of the hidden potential of nature. Science is presented as one life style—a human one based on the need for understanding, and not for the sake of progress, survival, or upgrading one's position in the world.

Class 3, Credit 3 (offered every year) (214-F,W,S; 215-W,S)

GSHN-513 Makers of Modern Science
Registration #0508-513
This course is designed to help the student understand the life of modern science through the lives of modern scientists. Modern science is understood to be science from Scientific Revolution of the sixteenth and seventeenth centuries to the present Much recent scholarship has been devoted to analyzing science in context, i.e., the way it actually develops in particular social and political environments as well as through the lives of individuals.

Class 3, Credit 4 (offered annually)

GSHP-210 Philosophy: Selected Issues
Registration #0509-210
An introduction to some of the major problems, methods and insights of philosophy with readings from both classical and contemporary sources.

Class 3, Credit 4 (offered quarterly)

GSHP-211 Philosophy: Ethics
Registration #0509-211
An introduction to moral philosophy through an analysis, comparison and evaluation pf some main theories that have been offered as systematic ways of making moral decisions, and through discussions of contemporary moral problems.

Class 3, Credit 4 (offered quarterly)

GSHP-213 Philosophy: Critical Thinking
Registration #0509-213
An introduction to philosophical analysis, especially as it may be applied in contexts other than professional philosophy.

Class 3, Credit 4 (offered quarterly)

GSHP-440 Philosophy of Religion
Registration #0509-440
A critical examination of a number of important issues connected with religion. These include the nature of religion itself, the existence of God, the problem of evil, and questions about the language we use when we talk and write about religion. This course is part of the Philosophy concentration and the Perspectives of Religion concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHP-441 Logic
Registration #0509-441
An introduction to the basic principles of logic. The main emphasis will be on symbolic, or formal logic, but some attention may be paid to informal logic as well. This course is part of the Philosophy concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHP-442 Aesthetics
Registration #0509-442
This course will introduce students to thinking philosophically about the nature of art and its relation to other human experiences. Among the topics considered will be: the aesthetic experience, the relation between morality and art, ugliness in art, and truth in art. This course is part of the Philosophy concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHP-443 Philosophy of Science
Registration #0509-443
An examination of the nature of the scientific enterprises; possible discussion topics include the presuppositions of science, its logic, its claims to reliability, and its relationships to society and to problems of human values. This course is part of the Philosophy concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHP-444 The Great Thinkers
Registration #0509-444
This course will introduce the student to the thought of some of those philosophers who have been most influential in the history of ideas. An attempt will be made to cover in some depth the works of one or more of those "great thinkers." It is hoped that the student will begin to recognize the enduring nature of some of our most pressing problems, as well as the intellectual foundation of proposed solutions. This course is part of the Philosophy concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHP-445 Social and Political Philosophy
Registration #0509-445
An examination of some of the main problems of social and political philosophy through an analysis, comparison and critical examination of various views concerning the natures of individuality and society, the relations between them and the dependence of one on the other. This course is part of the Philosophy concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHP-446 Philosophy of Law
Registration #0509-446
This course is an introduction to philosophical analysis centering on the nature, extent and justification of law, the nature of legal thought, and the problems and theories of justice. This course is part of the Philosophy concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHP-447 Contemporary Moral Problems
Registration #0509-447
This course will present moral issues which arise in the professions and other areas of technical expertise. These problems in applied ethics will be studied through contemporary literature by moral philosophers (Donegan, Frankena, Gadamer, Habermas, Jonas, Singer, and Wellmer), as well as key classical texts (Plato, Locke, Reid, Kant, and Dewey).

Each section of the course will apply moral theory to one of a number of professional areas, such as business, communications, medicine and bioethics, public policy, and technology. This course is part of the Philosophy concentration and also may be taken as an elective. (GSHP-211)

Class 3, Credit 4 (offered annually)

GSHP-480 Philosophy and Peace
Registration #0509-480
An introduction to some of the philosophical dimensions of the search for world peace including the elements that would constitute a just and lasting peace, nations as moral entities, justice and national self-interest, force and violence, the morality of the use of force, peace-making and peace-keeping groups. This course is part of the Peace Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSHP-483 The Biblical Tradition
Registration #0509-483
An examination of Judaism and Christianity as they are presented in the Old and New Testaments. This course is part of the Perspectives on Religion concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

Social Science

GSSA-210 Cultural Anthropology
Registration #0510-210
This course is a study of the nature, method, and scope of human culture—the patterns of thought and behavior with which mankind makes decisions, criticisms, choices, and judgments in order to satisty the needs of life and experience.

Class 3, Credit 4 (offered quarterly)

GSSA-440 **Culture in Crisis**
Registration #0510-440
The Chinese proverb "may you be cursed to live in interesting times" sets the tone for this course. Change in all subsystems of human culture is the hallmark of the 20th century. The stress and strain that accompany change challenge every traditional way of life in the world today. From peasant revolutions and millenarian movements, to the feminist activism of the past generation, causes and consequences are explored in historical and cross-cultural perspective. This course is part of the Social Change in a Technological Society concentration and also may be taken as an elective. (GSSA-210 or GSSS-210)

Class 3, Credit 4 (offered annually)

GSSA-483 **The Anthropology of Religion**
Registration #0510-483
This course is designed to provide students with a basic understanding of how religion operates as an integral part of any society. In order to demonstrate this, the institution of religion will be studied from a cross-cultural, anthropological perspective. Emphasis will be on primitive and peasant societies. This course is part of the Perspectives of Religion concentration and also may be taken as an elective.

Class 3, Credit 4 (offered occasionally)

GSSA-501 **Anthropological Research**
Registration #0510-501 **Methods: Explorations In Subcultural Diversity**
This course is designed to expose students from a variety of backgrounds to an alternative means of understanding human behavior through the methods of the cultural anthropologist and to demonstrate that variations in cultural patterning exist in our presumably homogeneous society. The primary emphasis in the course will be involvement of students in the actual observation of human behavior and collection of data in a subculture of their own selection in the Rochester area.

Class 3, Credit 4 (offered occasionally)

GSSA-502 **American Culture: The**
Registration #0510-502 **Archaeology of Us**
American history and contemporary American society are examined through the only unexpurgated record of our behavior, the material remains. This course illustrates how the techniques of archaeology can throw new light on the lives of our Pilgrim forbearers, the founding fathers, on slaves and free blacks, on the American industrial revolution, and even on the contemporary middle-class of a city like Tucson, Arizona.

Class 3, Credit 4 (offered occasionally)

GSSA-504 American Culture: The
Registration #0510-504 Anthropology **of** Us
Call them Nacirema, American backward. This course takes an anthropologist's eye view of the "Nacirema" way of life now, what they say and think about themselves, and how they actually act, their myth, ritual, music, humor, religion, class structure, regional subcultures, and ethnic groups. (GSSA-210 or permission of instructor)

Class 3, Credit 4 (offered occasionally)

GSSE-210 **Introduction to Economics**
Registration #0511-210
This course is designed to introduce the student to basic economic concepts and methods of analysis. Application of these concepts and methods of analysis to the contemporary economic issues of the U. S. and other countries will be emphasized. Topics of primary interest will include: economic methodology, the economizing problem, economic foundations of American capitalism, the marginal principle and efficient choice, supply and demand, national income accounting, models of income determination, the role of government in the economy, money and the banking system, unemployment, and inflation.

Class 3, Credit 4 (offered quarterly)

GSSE-440 **Urban Economics**
Registration #0511-440 **and Public Policy**
Urban economics is the application of economic analysis to spatial relationships in densely populated (urban) areas. The first part of the course develops economic models which explain the location behavior of consumers and businesses in cities. The second part of the course is issue-oriented, applying the insights gained in the first part to a number of urban problems. This course is part of the Economic concentration and also may be taken as an elective. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSSE-441 **Economics of Human**
Registration #0511-441 **Resources**
The microeconomic study of human resources encompasses aspects of human involvement in the production and distribution of goods and services. Potential topics are labor force participation, economics of employment discrimination, primary and secondary education, higher education, distribution of income and wealth, poverty and income maintenance, manpower planning, and microeconomic analysis of the work/leisure decision. This course is part of the Economics concentration and also may be taken as an elective. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSSE-442 **Contemporary International**
Registration #0511-442 **Economic Problems**
This course aims to prepare the student to deal with foreign exchange market, international trade decisions, the macroeconomics effects of trade on domestic economics, and the effects of domestic business fluctuations on international trade and finance of each country. Though the course is basically a theory course in economics, the applied aspects of international trade and finance are emphasized. This course is part of the Economics concentration and also may be taken as an elective. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSSE-443 **Current American**
Registration #0511-443 **Macroeconomic Problems**
This course is an in-depth analysis of selected macroeconomic problems such as economic growth, inflation, and business cycles. The primary focus is consideration of current macroeconomic theory and policy application in the context of the U. S. economic problems, e.g., tax-based incomes policies, wage-price controls. This course is part of the Economics concentration and also may be taken as an elective. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSSE-444 **Public Finance**
Registration #0511-444
This course is a study of the economics of the public sector. Topics include but are not limited to: taxation and public expenditures and their effect on the allocation of resources, distribution of income, and employment; market failure; public goods; the economics of public choice; and the application of public finance principles and normative questions to public economic issues. This course is part of the Economics concentration and also may be taken as an elective. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit **4** (offered annually)

GSSE-445 **Survey of Economic Thought**
Registration #0511-445
This course is a survey of the various schools of thought which have developed in economics from the late eighteenth century up to the present Representative economists from each of the major schools (Classical, Marxian, Neo-Classical, Keynesian, Monetarist, etc.) are studied. This course is part of the Economics concentration and also may be taken as an elective. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit **4** (offered occasionally)

GSSE-446 Economics, Public Policy
Registration #05011-446 and Competition
This course is a study of society's responses to imperfections in an otherwise competitive marketplace. Economic analysis, along with some legal analysis, is used to examine not only the problems but also some solutions to such problems as monopolies, externalities, and other forms of market failure. Responses examined include: regulation, antitrust, public enterprise, and other forms of government action. This course is part of the Economics concentration and also may be taken as an elective. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSSE-448 Economics of Less
Registration #0511-448 Developed Countries
This course introduces students to the economic problems of less developed countries (LDC). Students study the historical causes of underdevelopment gap between developed and underdeveloped countries, and the theories and the policies aimed at accelerating the rate of growth in LDC. In addition, the role of international organizations in the economic development of LDC is discussed. This course is part of the Global Studies concentration and the Economics concentration and also may be taken as an elective. (GSSE-210 or GSSE-301)

Class 3, Credit 4 (offered annually)

GSSE-449 Comparative Economic Systems
Registration #0511-449
This course provides a comparative analysis of different economic systems. The three major economic systems to be studied are the Capitalist Mode of Production, the Planned Economy, and the Mixed Economy. The student will study the economic decision-making process in each system including the economic structure, operation, and relative efficiency in achieving its macroeconomic goals. Upon completion of this course, the student will be able to critically evaluate each economic system, recognize the advantages and disadvantages of each, and propose general policy recommendations to improve each system's relative efficiency. This course is part of the Global Studies concentration and the Economic concentration and also may be taken as an elective. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit 4 (offered annually)

GSSE-480 The Economic Role of Women
Registration #0511-480
This course is intended to analyze the economic role of women in today's society. This analysis includes the economic role of women in the labor force, as owners of other factors of production, and in business decision making process. The impact of the changing role of women on GNP, labor market, and other economic variables is elaborated. Through the analysis of some economic models and their application to real world situations, it is shown that the social, political, and individual equality of women depends, to a great extent, on their economic role in family and society.

Class 3, Credit 4 (offered on sufficient demand)

GSSE-481 Environmental Economics
Registration #0511-481
The course will examine the relationship and apparent conflict between economic growth and environmental quality, the economics of environmental issues and policy, the environment as a resource and a public good, and the ability and lack of ability of free markets and the government to deal adequately with pollution and other environmental problems. This course is part of the Environmental Studies concentration and also may be taken as an elective.

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GSSE-520 Intermediate Price Theory
Registration #0511-520
Intermediate Price Theory develops the tools of analysis utilized in contemporary economics to study the process of price formation in a capitalist society. Topics covered in the course include the theories of consumer behavior, cost and production, alternative market structures, and the pricing of factors of production. (GSSE-302 or equivalent)

Class 3, Credit 4 (offered occasionally)

GSSE-521 Intermediate Macroeconomic
Registration #0511-521 Theory
The central question of macroeconomics is the determination of output, employment and prices. This course develops models which incorporate behavioral assumptions concerning consumption, investment, and the role of money and their relationship to macroeconomic variables. (GSSE-301 or equivalent)

Class 3, Credit 4 (offered occasionally)

GSSE-522 International Trade
Registration #0511-522 and Finance
This course introduces the students to the theory and the practical issues of the export/import markets, the international flow of capital, and international investment decisions. In addition, the students study the foreign-exchange and the Eurodollar markets and the investment opportunities in them. The role of multinational corporations in international trade and finance is also discussed. (GSSE-210 or GSSE-301 and GSSE-302 or equivalent)

Class 3, Credit 4 (offered occasionally)

GSSE-523 Monetary Analysis and Policy
Registration #0511-523
This course is the study of monetary behavior and the role of monetary institutions in the modern economy. The course includes consideration of monetary theory, the development and current characteristics of monetary institutions in the American economy, and the use of the tools of monetary analysis to evaluate alternative monetary policies. The course will conclude with an evaluation of the neo-Keynesian and Monetarist positions. (GSSE-210 or GSSE-301 or equivalent)

Class 3, Credit **4** (offered occasionally)

GSSE-524 Industrial Organization
Registration #0511-524
This course is the study of the structure, conduct, and performance of contemporary American industry. The course involves the application of the tools of microeconomic analysis and empirical evidence to aid in understanding the behavior of modern industry. In addition the course considers the historical determinants of contemporary market structure and the public policy measures designed to preserve a competitive market structure. (GSSE-302 or equivalent)

Class 3, Credit 4 (offered occasionally)

GSSE-526 Research Methods
Registration #0511-526 for Economics
This course develops the skills used by the applied economist in computer-based research. Exercises and research projects for the course will be chosen to illustrate the kind of problems actually dealt with by the contemporary applied economist. (GSSE-302, ICSA-210)

Class 3, Credit 4 (offered occasionally)

GSSE-528 Applied Econometrics
Registration #0511-528
This course is designed to provide students in the economics program with an opportunity to develop their skills in applied regression analysis. This course will cover the various regression models, estimation techniques, data preparation and transformation, and the interpretation of regression results. Particular emphasis will be placed on the dangers of misuse of regression techniques.

Class 4, Credit 4 (offered every year) (W, S)

GSSE-529 Business Cycle Analysis and Economic Forecasting
Registration #0511-529
This course introduces students to one of the major functions contemporary economists perform—economic forecasting. Students will be exposed to alternative theories of economic fluctuations in a capitalist society, the quantitative data and techniques contemporary economists utilize to analyze business cycles, and the manner in which economists in both the private and public sector use these frameworks of analysis, data, and quantitative methods to generate economic forecasts. (GSSE-521 and BBUQ-330)

Class 3, Credit 4 (offered occasionally)

GSSM-211 American Politics
Registration #0513-211
This course is a study of the American national political system, its theoretical foundations and institutions, and the contemporary issues which confront it

Class 3, Credit 4 (offered quarterly)

GSSM-215 Ideology and the Political Process
Registration #0513-215
This course examines major ideological concepts and how these are operationalized through the political processes of various governmental structures.

Class 3, Credit 4 (offered quarterly)

GSSM-440 International Relations
Registration #0513-440
This course critically analyzes the structure and principles of the international system with emphasis on the tensions between the imperatives of power politics and the requirements of law and justice. This course is part of the International Relations concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 3, Credit 4 (offered annually)

GSSM-441 Politics in China
Registration #0513-441
This course is designed to provide the students with the political dynamics of the People's Republic of China. Major emphasis will be given to the historical background, major aspects of the political systems, and the foreign relations of China. This course is part of the International Relations concentration and also may be taken as an elective. This course is part of the International Relations concentration and also the Foreign Language/Culture Study concentration and also may be taken as an elective. (GSSM-211 or GSSM-215)

Class 3, Credit 4 (offered annually)

GSSM-442 Government and Politics of the USSR
Registration #0513-442
This course examines various aspects of the Soviet political system with particular emphasis on the communist party apparatus, governmental institutions, political leadership and contemporary issues in the USSR. This course is part of the International Relations concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 3, Credit 4 (offered annually)

GSSM-443 Foreign Policy of the Soviet Union
Registration #0513-443
This course critically examines fundamental elements of Soviet foreign policy since its inception. Special emphasis will be given to geopolitical and ideological aspects of Soviet national interests as well as analyses of the mechanics of foreign policy formulation and its implementation with respect to the United States, Western and Eastern Europe, China, the Third World and the Middle East This course is part of the International Relations concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 4, Credit 4 (offered every year) (W, S)

GSSM-444 The Cold War
Registration #0513-444
This course is an examination of the origins and evolution of the Cold War with the major emphasis upon the Soviet-American rivalry in the post World War II era. This course is part of the International Relations concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)
Class 3, Credit 4 (offered annually)

GSSM-445 Comparative Politics
Registration #0513-445
This course provides a mode of analysis for the study of political systems. Basic concepts of political science are utilized to present a descriptive and analytical examination of various political systems that can be classified as western democracies, communist, or third world. Particular attention is paid to the governmental structure, current leadership, and major issues of public policy of those selected political systems under review. This course is part of the International Relations concentration and the Global Studies concentration, and also may be used as an elective.

Class 3, Credit 4 (offered annually)

GSSM-450 State and Local Politics
Registration #0513-450
This course is a study of politics and government on the state and local levels, and the relationships between these levels and the federal government It will illustrate differences in state governments by comparing other states to New York, and will use the Rochester area for comparisons with local governments found elsewhere. This course is part of the American Politics concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 3, Credit 4 (offered annually)

GSSM-451 The Legislative Process
Registration #0513-451
This course examines the role of the legislature in the U. S. political process. The primary emphasis will be the study of the U. S. Congress, but some attention also will be directed to state legislatures. Topics to be studied include elections, party organization, committees, interest group activities, and executive-legislative relations. This course is part of the American Politics concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 3, Credit **4** (offered annually)

GSSM-452 The American Presidency
Registration #0513-452
This course is a study of the role of the presidency in the American Political System. Among the topics to be considered are: the nomination and election process, evolution, expansion and limitation of presidential powers, factors in decision making, and the various leadership functions performed by the American Presidency. This course is part of the American Politics concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 3, Credit 4 (offered annually)

GSSM-453 American Foreign Policy
Registration #0513-453
A study of the formulation and execution of American foreign policy, including the examination of the instruments, procedures and philosophies shaping the development and implementation of foreign policy. This course is part of the American Politics concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GSSM-454 Political Parties and Voting
Registration #0513-454
Political parties are a crucial part of the democratic process. Parties serve as a critical link between citizens and their Government, as parties promote policies favored by their voters. This course studies parties; their history, their future and their role in the democratic process. Its overall emphasis is on the degree to which parties perform or fail to perform as links between citizens and Government. This course is part of the American Politics concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 3, Credit 4 (offered annually)

GSSM-455 Politics and Public Policy
Registration #0513-455
This is a course in the politics of the policy process. The basic questions of the course are: How do public problems get to the agenda of government? How does government formulate policy alternatives? How does government legitimate public policy? How does government implement public policy? How does government evaluate public policy? This course is part of the American Politics concentration and also may be taken as an elective. (GSSM-211 or GSSM-215 or equivalent)

Class 3, Credit 4 (offered annually)

GSSM-456 The Judicial Process
Registration #0513-456
This course examines the structure and function of the state and federal courts in the American political system. This course is part of the American Politics concentration and also may be taken as an elective. (GSSM-211 or GSSM-215)

Class 3, Credit 4 (offered annually)

GSSM-502 Politics of Developing
Registration #0513-502 Countries
Since World War II more than 100 new countries have joined the global political system and they are searching for appropriate political means to serve their societies' ends. In addition, many older and established countries have been struggling to adjust their political arrangements to cope more effectively with modern problems. Several elements are involved in this complex process: social mobilization, economic development, and political modernization. This course will focus on the political problems of the developing countries which occupy roughly the southern half of the earth's land mass.

Class 3, Credit 4 (offered occasionally)

GSSM-504 20th Century America
Registration #0513-504
An examination of the major political, social and economic developments affecting the United States in the 20th century. Emphasis will be placed upon the reactions of the various presidential administrations to conditions in both the domestic and foreign fields.

Class 3, Credit 4 (offered occasionally)

GSSM-514 Theories of Political Systems
Registration #0513-514
An examination of the basic questions in political theory, a survey of the major political philosophers, and an inquiry into the major political ideologies.

Class 3, Credit 4 (offered occasionally)

GSSP-210 Introduction to Psychology
Registration #0514-210
This course is designed to introduce the student to the scope and methodology of psychology. Topics will include: aims and methods, sensation and perception, learning and memory, emotion and motivation, normal and abnormal personality, and social psychology.

Class 3, Credit 4 (offered quarterly)

GSSP-440 Childhood and Adolescence
Registration #0514-440
This course explores human development from conception through adolescence. The developmental approach provides the opportunity to integrate many areas of psychological research such as cognition, personality, perception, social interaction and moral development as they apply to human development This course is part of the Psychology concentration and also may be taken as an elective. (GSSP-210 or equivalent)

Class 3, Credit **4** (offered annually)

GSSP-441 Growth Psychology
Registration #0514-441
This course examines the major assumptions, theories and implications of "growth" or humanistic psychology. In the course, students will study human beings as dynamic, complex creatures who shape themselves and their world through the choices they make each day and whose best hope for realizing their individual and collective potential is an accurate understanding of what human persons need to grow psychologically and what societal conditions seem to foster such growth. This course is part of the Psychology concentration and also may be taken as an elective. (GSSP-210 or equivalent)

Class 3, Credit **4** (offered annually)

GSSP-442 Adulthood and Aging
Registration #0514-442
This course encompasses the psychology of the span of life from young adulthood through the middle years. The developmental approach, presented in an interdisciplinary framework, provides a systematic orientation to the study of the individual during early adulthood. This course is part of the Psychology concentration and also may be taken as an elective. (GSSP-210 or equivalent)

Class 3, Credit **4** (offered annually)

GSSP-443 Learning and Memory
Registration #0514-443
This course focuses on the environmental forces that are responsible for the outcome of human development It studies how learning shapes and changes individuals almost from the moment they are born and how it continues to be all pervasive throughout their lives. It examines the complexity of memory process, which is an essential element of learning and learning theories and their applications in real-life situations. This course is part of the Psychology concentration and also may be taken as an elective. (GSSP-210 or equivalent)

Class 3, Credit **4** (offered annually)

GSSP-444 Social Psychology
Registration #0514-444
The course will attempt to give a general overview of those areas of social psychology currently under the most intensive investigation, and likely to be of most interest to the student, including nonverbal communication, attraction, aggression and group effects. This course is part of the Psychology concentration and also may be taken as an elective. (GSSP-210 or equivalent)

Class 3, Credit **4** (offered annually)

GSSP-445 Psychology of Perception
Registration #0514-445
The course covers topics of all sense modalities with emphasis on visual perception. It traces what happens to the physical stimulus as our sensory systems analyze it to produce complicated perceptions of the world around us. Many complex perceptual phenomena draw upon explanations at the physiological, psychological and cognitive levels. This course is part of the Psychology concentration and also may be taken as an elective. (GSSP-210 or equivalent)

Class 3, Credit **4** (offered annually)

GSSP-446 Psychology of Personality
Registration #0514-446 .
This course examines the strengths and weaknesses of the major psychological theories of personality. Methods of assessing personality, research, and applications of theory to real-life situations are included in the evaluation of each theory. This course is part of the Psychology concentration and also may be used as an elective. (GSSP-210 or equivalent)

Class 3, Credit 4 (offered annually)

GSSP-447 Abnormal Personality
Registration #0514-447
This course examines the major categories of mental disorder not only from the descriptive point of view, but also in terms of the major theoretical explanations of the causes of disorder. The major treatment modalities also are covered. This course is part of the Psychology concentration and also may be used as an elective. (GSSP-210 or equivalent)

Class 3, Credit 4 (offered annually)

GSSP-480 Psychology of Women
Registration #0514-480
This course examines the relevance and applicability of present psychological theory and research to the understanding of the development and behavior of women. Major topics covered include: psychological and biological sex differences, psychological theories of women's development, the relationship between female personality development and various sociocultural factors, women's place in society, women and their bodies, and women and mental health. This course is part of the Women's Studies concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSSP-483 Social Psychology of Religion
Registration #0514-483
This course examines religions as cultures which, like other "ways of life," face the task of attracting or creating new members, maintaining their loyalty, providing them with a coherent world view and satisfying their basic needs. It will examine the way religions use education, ritual, rewards, punishment, symbols and other mechanisms of social control and cohesion formation to build and nurture their flocks. In addition it will examine the ways in which religious organizations and their individual members reconcile conflicts between religious and secular norms, world views, loyalties and problem solving strategies. Finally it will suggest how psychological processes such as identity information, attribution, self actualization, brainwashing, conflict, denial, projection, and repression may be applied and misapplied in efforts to understand religious belief and behavior. This course is part of the Perspectives on Religion concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSSP-501 Industrial Psychology
Registration #0514-501
Consideration of principles, application and current research in industrial psychology, with particular reference to personnel selection, training, motivation, morale, performance appraisal, leadership and communication. (GSSP-210 or equivalent)

Class 3, Credit 4 (offered annually)

GSSP-504 Attitude Formation and
Registration #0514-504 Persuasion Techniques
The course will focus on current theories of attitude formation, and seek to apply them to contemporary events to achieve an understanding of how those who wish to shape or change attitudes do so. (GSSP-210 or equivalent)

Class 4, Credit 4 (offered every year) (W, S)

GSSP-513 Psychology of Motivation
Registration #0514-513
The course surveys basic motivational concepts and provides a fair representation of many different areas of motivational research, relating these to each other where possible. (GSSP-210 or equivalent)

Class **3,** Credit **4** (offered occasionally)

GSSP-514 Behavior Modification
Registration #0514-514
This course will teach you the skills of changing your behavior by controlling your environment and the consequences of your behavior. (GSSP-210 or equivalent)

Class **3,** Credit **4** (offered occasionally)

GSSP-515 Psychology of Human
Registration #0514-515 Adjustment
This course will teach you the skills of coping with a variety of everyday experiences. Particular attention will be given to the areas of self validation, interpersonal tactics, and interpersonal relations. (GSSP-210 or equivalent)

Class **3,** Credit 4 (offered occasionally)

GSSP-517 Death and Dying
Registration #0514-517
This course will view death from a social-psychological perspective. After dealing with topics such as the leading causes of death, attitudes toward death, suicide, and American funeral practices, it will focus on such questions as how people can better cope with their own mortality and that of loved ones, and how people can help others face death, and help themselves and others during periods of bereavement. (GSSP-210 or equivalent)

Class **3,** Credit 4 (offered annually)

GSSP-519 Psychology of Altered States
Registration #0514-519 of Consciousness
This course will cover such topic areas as the specialized consciousness in the two halves of the brain, dreaming, hypothesis, meditation, systematic relaxation, and parapsychology. The course format will be discussion/demonstration. (GSSP-210 or equivalent)

Class **3,** Credit 4 (offered annually)

GSSP-520 Psychology of Creativity
Registration #0514-520
A psychological investigation of the creative process and creative individuals with a focus on techniques which stimulate creativity. (GSSP-210 or equivalent)

Class **3,** Credit 4 (offered occasionally)

GSSP-521 Psychology and Politics
Registration #0514-521
This course examines how political attitudes are acquired and altered, how politicians and ordinary citizens satisfy psychological needs through participation in politics and how principles of learning can illuminate processes of political leadership, persuasion and control. (GSSP-210 or equivalent)

Class **3,** Credit 4 (offered occasionally)

GSSS-210 Foundations of Sociology
Registration #0515-210
This course introduces students to the way sociologists interpret social reality, the major elements of the field and the most important research findings. Included are such topics as cultural differences and ethnocentrism, socialization, social statuses and roles, group dynamics, social institutions, stratification, collective behavior.

Class 3, **Credit 3 (offered every y e a r) (214-F, W, S; 215-W, S)**

GSSS-441 The Changing American Family
Registration #0515-441
This sociology course examines contemporary patterns in the courtship, marital and family systems of the United States with special reference to gender role definitions, participation in the workplace and variations in social class. This course is part of the Social Change in a Technological Society concentration and also may be taken as an elective. (GSSS-210 or GSSA-210)

Class 3, Credit 4 (offered annually)

GSSS-443 Sociology of Work
Registration #0515-443
This sociology course analyzes the essential properties of work, its structure, the group processes involved in it, and its social meaning. The course treats work as emerging, like other social realities, out of social relationships between individuals and groups. It looks at ways in which people can develop a positive self-regard or a sense of alienation in their occupations and professions and various types of work organizations. It also considers leisure as a complement to work. This course is part of the Social Change in a Technological Society concentration and also may be taken as an elective. (GSSS-210 or GSSA-210 or instructor's permission)

Class 3, Credit 4 (offered annually)

GSSS-444 Social Change
Registration #0515-444
Few people need to be more prepared to deal with social change than professionals in technical fields. In this culture, technology is often at the center of change and technical people are expected not only to cope with change but to help guide it. The purpose of this course is to help RIT students understand and deal with change rather than to simply react to it This course is part of the Social Change in a Technological Society concentration and also may be taken as an elective. (GSSS-210 or GSSA-210 or equivalent)

Class 3, Credit 4 (offered annually)

GSSS-445 Television and Social Change
Registration #0515-445
This course will analyze how television and other modern media affect social and cultural change. It will emphasize historical development, structure, organization, function and effects of mass media in society. Issues to be discussed will include: ethnicity, race, age and sex-role stereotyping, the consequences of broadcasting violence; children and the media; the business of television; economic control; the entertainment industry; the production of culture; the global reach of television and its consequences. (GSSS-210 or GSSA-210) or equivalent)

Class 3, Credit 4 (offered occasionally)

GSSS-446 Sociology of Health
Registration #0515-446
This course is a survey of the sociological aspects of health and illness. Some areas of study will be the definition, causes (etiology) and cure of disease in various societies and social groups. Also included will be a discussion of the epidemiology of disease, access to, and delivery of health care in contemporary U. S. society, problems of patient care and the study of mental illness and death and/or dying. This course is part of the Social Change in a Technological Society concentration and also may be taken as an elective. (GSSS-210 or GSSA-210 or equivalent)

Class 3, Credit 4 (offered annually)

GSSS-447 Women in Contemporary
Registration #0515-447 U. S. Society
This sociology course will examine three major social institutions which shape the lives of women in contemporary U. S. society: the family, the workplace, and political structure. This course is part of the Social Change in a Technological Society concentration and the Women's Studies concentration, and also may be taken as an elective. (GSSS-210 or GSSA-210)

Class 4, Credit 4 (offered every year) (W, S)

GSSS-448 Minority Group Relations
Registration #0515-448
This course will deal with the principal concepts and research findings of those who have studied racial and ethnic minorities and their relations. Taking into account the growing body of theory and data on the dynamics of ethnic prejudice and discrimination, the course is concerned with the subcultures of minorities, the nature of prejudice and discrimination, the etiology, patterns and consequences of intergroup conflict, and the reactions of minorities to differential and discriminatory treatment. Concepts such as assimilation, amalgamation and desegregation will be analyzed as forms of conflict resolution. This course is part of the Social Change in a Technological Society concentration and the Minority Group Relations concentration, and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSSS-482 Hispanic American Culture
Registration #0515-482
This course offers the study of the social experiences and conditions of Hispanic Americans and the degree to which they have been assimilated into the mainstream dominant culture. Various Hispanic groups will be studied with the goal of defining and outlining their differences and similarities. The Puerto Ricans in the northeast and the Mexican-Americans in the southwest will be specifically selected for analysis. The course will help students to better understand the problems faced by Hispanic Americans by looking at specific socio-economic indicators such as: their access to health care, job opportunities, educational institutions, and the degree in which Hispanics have "progressed" in the U.S. This course is part of the Minority Relations concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSSS-483 Black Culture
Registration #0515-483
This course is designed to analyze past, present and future social policies, programs and practices from their actual and predictable effects on black people. These analyses and solutions will include particular emphasis on how the black community has been forced to develop mechanisms for coping with the debilitating effects of poverty, environmental deprivation, and institutional racism. The course is designed to present a systematic means of facilitating change in people's attitudes and behaviors. This course is part of the Minority Relations concentration and also may be taken as an elective.

Class 3, Credit 4 (offered annually)

GSSS-506 Social Inequality
Registration #0515-506
The study of social inequality is a survey course which will examine different dimensions of stratification in the U. S. and elsewhere. Explanations for the existence of inequality will be addressed at individual, group and institutional levels.

Class 3, Credit 4 (offered occasionally)

GSSS-507 Complex Organizations
Registration #0515-507
This course analyzes the structure and dynamics of a wide variety of social organizations (government bureaucracies, corporations, and voluntary groups). Topics discussed will include theories of organization, organizational processes, technological impact, and organizational change and development. An examination of the internal operation of large organizations will include sources of power and authority, modes of communication, division of labor as well as tension, stress and strain.

Class 3, Credit 4 (offered occasionally)

GSSS-508 Aging and Society
Registration #0515-508
This course considers concepts, issues, and research techniques in the behavioral and biological aspects of aging. It examines the interaction of group processes in the family and community which influence society's attitudes toward the aging process. It further examines the cultural, environmental and institutional changes as they relate to an increasing population of older people.

Class 3, Credit 4 (offered annually)

GSSS-509 Social Policy
Registration #0515-509
An examination of social policy formulation in a variety of contexts from local government to national government. Special attention will be given to the strategies, choices and priorities in the formulation of social policy. The course will deal with historical development of social policies including the issues of health, aging, poverty, family and children. The course also will examine the question of how social values and economy influence policy development

Class 3, Credit 4 (offered occasionally)

GSSS-510 Juvenile Justice
Registration #0515-510
The philosophical, historical and operational aspects of the juvenile justice system; evaluation of the social and personal factors related to juvenile delinquency; the role of police, the courts, corrections and community programs in delinquency prevention, control and treatment.

Class 3, Credit 4 (offered annually)

GSSS-511 Population and Society
Registration #0515-511
Study of demographic variables of mortality, fertility, and migration as they affect the rise and quality of population.

Class 3, Credit 4 (offered annually)

GSSS-513 Criminology
Registration #0515-513
A survey of the field of criminology with emphasis on major forms of contemporary crime, definition of crimes and criminality, theories of criminality, the extent of crime, criminal typologies, and fundamental aspects of the social control of crime.

Class 3, Credit 4 (offered annually)

GSSS-514 The Urban Experience
Registration #0515-514
This sociology course analyzes social and spatial characteristics of cities and considers reasons for urban development, ecological factors, types and networks of settlements, and urbanism as a way of life. It also examines the issues of neighborhoods, subareas, ghetto enclaves, metropolitan regions, urban social and political structures, problems, services, and planning. (GSSS-210 or GSSA-210)

Class 3, Credit 4 (offered annually)

GSSS-515 Social Policy and the Aging
Registration #0515-515
This course will be organized around culture and values as context for policy formulation. Special attention will be given to the process of policy analysis and implementation. Several specific policy areas will be examined: social security and income maintenance; health and long-term care; work and retirement; social services and the aging network; housing and living arrangements for the elderly; and the role of the family and the elderly.

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GSSS-524 Applied Sociology
Registration #0515-524
This course is an effort to provide the student with useful sociological knowledge applicable to solutions of practical problems. The inventory of problems is not fixed beforehand, and the specific course content reflects the problems either already encountered by students or very likely to represent a significant portion of their anticipated professional concern upon graduation. (Permission of instructor)

Class 3, Credit **4** (offered annually)

GSSS-569 Human Sexuality
Registration #0515-569
This course is designed to be sex positive in its approach to the study of human sexual behavior. It will focus upon basic physiology, sexual awareness, sexual development throughout the life cycle, sex roles, sexual myths, legal and social issues, pre-marital and marital sexual behavior, and alternative sexual choices. Frequently these issues raise questions of sexual attitude and value and these will be examined and clarified.

Class 3 + 2hr. weekly seminar, Credit **4** (offered biannually)

GLAI-501 Senior Seminar
Registration #0520-501
This course enables students to sharpen and demonstrate their ability to define a research task or problem, gather and evaluate scholarly evidence and present their findings in a paper or project. While the content and focus of the seminar will change from year to year, it will always direct student attention toward a broad issue or aspect of contemporary culture and equip them to understand that subject more fully, investigate one facet of it in depth, and provide an advanced experience of problem-solving and value clarification.

Class 1, Credit 2 (offered quarterly)

Independent Study

A student may register for an independent study project subject to the approval of the faculty sponsor, student's department, the academic committee of the College of Liberal Arts and the dean of the College of Liberal Arts and providing that she or he has a minimum GPA of 2.7 at time of application. An independent study project is not a substitute for a course. It enables the interested student and his or her faculty sponsor to coordinate their efforts on subjects and topics that range beyond the normal sequence of course selection.

Credit variable (offered annually)

Service Courses

Service courses are required courses offered by the College of Liberal Arts for specific professional departments. These courses may not be taken for Liberal Arts credit.

GLAA-201, 202, 203 History of Air Power
Registration #0519-201, 202, 203
This course is a study of the development of airpower from its origins to the present This course deals with the impact of airpower upon 20th century warfare. It also traces the evolution of airpower as a factor in military and nonmilitary operations in support of U.S. foreign and domestic policy.

Class 1 (201, Credit 1); (202, Credit 2); (203, Credit 1) (offered annually)

GSSM-401 National Security Forces in
Registration #0513-401 Contemporary American Society I
This course will examine the sociology aspects of officership, the military criminal justice system, and introduce National Security Policy. Topics of interest focus on the military as a profession, officership, Air Force doctrine, civilian control of the military, and a comparison of the military/civilian justice systems. (Approval of the Aerospace Studies Department)

Class 4, Credit 4 (offered every year) (W, S)

GSSM-402 National Security Forces in
Registration #0513-402 Contemporary American Society II
This course will examine the American National Security Policy by analysis of the evolution of the American defense strategy and policy. Topics include methods for managing conflict, international terrorism, alliances and regional security, an analysis of arms control and the threat of war, and the formulation of American defense policy and strategy. (Approval of the Aerospace Studies Department)

Class 3, Credit 4 (offered annually)

GLAI-201 Seminar: Academic Fields of
Registration #0520-201 Study (Tech. and Lib. Studies)
This seminar is designed to introduce students to the full array of degree programs offered by RIT. Although it is part of a student's exploration of career possibilities, the focus will be on fields of study necessary for particular careers rather than on the ultimate career activity itself. The presupposition is that interest in a field of study is necessary to career success, but also that any one field of study can lead to a variety of career choices.

Class 1, Credit 1 (offered annually)

GLLC-301, 302 College Writing I, H
Registration #0502-301, 302
This course sequence develops minimal college-level writing competencies. The credits earned, however, may not comprise part of the student's normal Liberal Arts curriculum. Furthermore, this sequence may not be substituted for English Composition.

Class 1, Credit 1 (offered quarterly)

GLLC-402 Conference Techniques
Registration #0502-402
Basic theories of conference techniques including leadership, participation, types, and functions of public and private conferences and their evaluation. Student participation in training, problem solving, and informational-developmental conferences.

Class 4, Credit 4 (offered annually)

GLLC-403 Effective Technical
Registration #0502-403 Communication
This course provides knowledge and practice of written and oral communication skills generally required in technical professions. Focus is on individual and group writing and speaking tasks. All written work must be prepared on word processor.

Class 3, Credit 4 (offered annually)

GLLC-404 Communication with the
Registration #0502-404 Handicapped
An examination of the communication difficulties with the handicapped: specifically the deaf, blind and others with physical handicaps. To include interpersonal, family, social and rehabilitation modes of communication. (GSSP-210)

Class 3, Credit 4 (offered occasionally)

GLLC-505, 506 Research Methods I and H
Registration #0502-505, 506
This course is an introduction to the methods and ethics of scholarly communication research. It covers methods of locating, analyzing, and critiquing communication research literature, as well as the techniques of conducting descriptive, experimental, critical, and historical research. The course will be offered in a sequence of two, two-credit courses to students in the third year of the Professional and Technical Communication Program.

Class 1, (505-Credit 2) (506-Credit 2) (offered annually)

GLLC-509 Senior Thesis in Communication
Registration #0502-509
This course is a guided research seminar culminating in a major project that brings communication studies and substantive work in the technical studies area together. The course focuses on designing, conducting and completing an independent research project. The progress of each project will be shared with the class for discussion and critique. (GLLC-505, 506, 504)

Class 3, Credit 4 (offered occasionally)

GSSE-301 Principles of Economics I
Registration #0511-301
This is the first course in a two quarter sequence designed to introduce the student to the basic principles of economics. This course will focus on basic economic concepts and macroeconomics. Topics of primary interest include economic methodology, the economizing problem, capitalist ideology, supply and demand, national income accounting, income determination, inflation, money, and the role of government in the economy. Other topics in basic economics will be selected by the instructor.

Class 3, Credit 4 (offered quarterly)

GSSE-302 Principles of Economics II
Registration #0511-302
This is the second course in a two quarter sequence designed to introduce the student to the basic principles of economics. This course will focus on microeconomics. Topics of primary interest include market structure, supply and demand analysis involving elasticity, the theory of cost in the short and long run, perfect competition, monopoly, monopolistic competition oligopoly, marginalist distribution theory, the labor market, and general equilibrium analysis. Other topics in microeconomics will be selected by the individual instructor.

Class 3, Credit 4 (offered quarterly)

GSSE-303 Principles of Economics III
Registration #0511-303
A further elaboration of the elementary principles of economic analysis introduced in Principles of Economics **I** and **II.** Particular emphasis will be placed on the application of these principles to the decision making process of the firm. (GSSE-302)

Class 3, Credit 4 (offered annually)

GSSE-527 Seminar in Applied
Registration #0511-527 Economics
A senior-level course emphasizing applications of economic analysis and quantitative methods to economic decision-making. Cases will be drawn from both the private and public sectors of the economy. (Limited to BS in economics degree seniors)

Class 3, Credit 4 (offered occasionally)

GLLZ-200 Basic Communications
Registration #0518-200
Students will gain an understanding of deafness, plus basic skills which will permit communication with a segment of the deaf population.

Class 3, Credit 4 (offered on sufficient demand)

GLLZ-201, 202, 203 Manual Communication I, II, m
Registration #0518-201, 202,203
A course designed to provide the student with the basic vocabulary of frequently used signs and the American manual alphabet.

Class 3, Credit 4 (offered on sufficient demand)

Graduate Courses

GLLL-702 Film and Society
Registration #0504-702
An inquiry concerning the relationship between motion pictures and society that will use historical, humanistic, and social science research to achieve an understanding of movies as a social force, industry, and art form.

Class 3, Credit 4 (offered occasionally)

GSHF-702 Film History and Criticism
Registration #0505-702
A critical examination of key aspects of film criticism and of the development of film as an art. The emphasis of the course will be historical, with the development of cinema being traced through major films by important directors. There will be an opportunity to pursue individual interests.

Class 3, Credit 4 (offered occasionally)

GSHF-703 American Architecture
Registration #0505-703
An examination of American architecture from the 17th century to the present designed for the graduate level of study. Emphasis will be placed on American building art in the late 19th and 20th centuries.

Class 3, Credit 4 (offered occasionally)

GSHF-705 Theories of Aesthetics and
Registration #0505-705 Art Criticism
A course of the art-oriented graduate student centering on the student's search for a supportable and reliable basis for making value judgments about works of art as well as introducing the student to major concepts in aesthetics.

Class 3, Credit 4 (offered occasionally)

GSHF-707 Cubism to the Present
Registration #0505-707
Cubism as a way of seeing and as an expression of 20th century thinking. Differences and similarities with art forms of earlier eras and other cultures will be discussed.

Class 3, Credit 4 (offered on sufficient demand)

GSHF-708 Oriental Art
Registration #0505-708
A seminar exploring the philosophical and cultural perspectives underlying traditional Far Eastern art as a prelude to examining selected topics in Indian, Chinese and Japanese art. Emphasis will be placed on the application of research techniques and critical methods of an individually selected area of interest which may serve as a foundation for continuing study.

Class 3, Credit 4 (offered occasionally)

GSHF-711 20th Century American Art
Registration #0505-711
An investigation of American art from the Civil War to the present. Emphasis will be placed on the visual arts but many references will be made to music and architecture.

Class 3, Credit 4 (offered occasionally)

GSHF-712 Arts and Crafts in Tribal
Registration #0505-712 Societies
A study of the function of primitive art and the techniques of its production, including the use of clay, stone, fibers, bark, wood, bronze, gold, etc. Hair styling, body painting and scarification also will be discussed.

Class 3, Credit 4 (offered occasionally)

GSHF-713 Contemporary Issues in Art
Registration #0505-713
This course offers the graduate art student the opportunity to investigate those aspects of 20th century art that question the very nature of art and the role of the artist in today's and tomorrow's society.

Class 3, Credit 4 (offered occasionally)

GSHF-714 Art Vision and Concept
Registration #0505-714
Though the course will develop chronologically from the Renaissance to the present, emphasis will be placed on a close analysis of (1) selected works of art, including paintings, sculpture and architecture, and (2) the development of the unique oeuvre of selected artists. Topics chosen for study will be limited in number but treated in depth. Topical choices will be based on richness and import of the formal and/or conceptual content embodied therein. Some background in the history of art is helpful but not necessary.

Class 4, Credit 4 (offered every year) (W, S)

GSHF-715 Picasso
Registration #0505-715
The impact of Picasso and his circle on 20th century art. Their affinities with modern scientific and philosophical attitudes also will be discussed.

Class 3, Credit 4 (offered occasionally)

GSHF-716 Rembrandt
Registration #0505-716
A detailed analysis of the art and times of the Baroque master. Emphasis will be placed on the development of his style and technique, on his and other artist's relationship to their society and to the character of the Baroque outlook.

Class 3, Credit 4 (offered occasionally)

GSHF-717 Topics in Music History
Registration #0505-717
This course is a study of various aspects of music in different historical environments with emphasis on analogies between music and the other fine arts.
Class 3, Credit 4 (offered occasionally)

GSHH-701 History of American Educational
Registration #0507-701 Thought and Practice
An historical analysis of change and continuity in American educational history from the colonial through the contemporary period. Special emphasis on the leading historiographical aspects of American educational history and enabling the student to acquire mastery of the relevant bibliography. Lectures and readings offer comprehensive coverage of the salient intellectual themes and a chronological structure to mark the significant educational developments in particular periods—e.g., the Progressive Era, the 1920s and 30s, and post World War II changes. Course structure: Lectures, seminars, final exam and paper.

Class 3, Credit 4 (offered occasionally)

GSHP-705 Seminar in Aesthetics
Registration #0509-705
This is a seminar, not a lecture course. At each meeting one or two students will give a presentation and then lead the discussion. Active participation in the discussions is required of all students at all seminar meetings. About half of the meetings will be devoted to critical examination of standard theories of art, including the theory that art is representation, that it is the expression of the artist's emotions, and that it is "significant form." We also will explore the history of the concept of fine art as it relates to such concepts as skill, craft, and design. Topics for the latter part of the course will be chosen by students. Recent seminar classes have discussed such things as conceptual art, minimalism, the status of computer art, feminist aesthetics, the commercialization of art in the 20th century, and kitsch.

Class 3, Credit 4 (offered occasionally)

GSHP-706 The Philosophy of Mind
Registration #0509-706
An investigation into concepts concerning mental experience. The basic questions is "What is consciousness?" The question hides some presuppositions and raises many further questions. Can we be conscious of consciousness? What does it mean to be conscious? Is there a mind-brain identity? Can we describe mental experiences in non-mentalistic terms? Can computers think? It will be the business of this course to explore these and other related questions and to see what progress has been made in attempting to answer them.

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GSSM-701 Country Risk Assessment
Registration #0513-701
An interdisciplinary introduction to the methods and procedures of country risk assessment Practice in developing a country risk assessment will be offered in order to familiarize the student with the role of international environment analysis (political stability analysis) in the operations of business and financial institutions planning investments or operations abroad.

Class 3, Credit 4 (offered occasionally)

GSSP-701 Developmental Psychology
Registration #0514-701
This course will cover the major theoretical approaches to the understanding of human development. Areas of study will include, but not be limited to, cognitive development language development development of personality, social development and moral development (See requirements for admission for prerequisites or receive permission of professor.)

Class 3, Credit 4 (offered occasionally)

GSSP-702 Educational Psychology
Registration #0514-702
This course is designed to furnish students with an understanding of the basic psychological processes underlying the educational process, and to apply them to concrete situations that may arise for persons who teach. (See requirements for admission for prerequisites or receive permission of professor.)

Class 3, Credit 5 (offered annually)

GSSP-720 Theories of Personality
Registration #0514-720
This course will cover the major theoretical approaches to understand human personality, including, but not limited to, psychodynamic, behavioral, cognitive and humanistic approaches. (See requirements for admission for prerequisites or receive permission of professor.)

Class 3, Credit 4 (offered annually)

GSSP-722 Psychology of Learning
Registration #0514-722
History and principles of psychological learning theories. Comparative study of behaviorism, cognitive approaches and social learning theory. Basic factors affecting learning, forgetting and transfer of various tasks relevant to learning and instruction. Discussion of theories of memory, neuro-physiological processes and computer models of human learning. (See requirements for admission for prerequisites or receive permission of professor.)

Class 3, Credit 4 (offered annually)

GSSP-723 Emotional Adjustment
Registration #0514-723
Normal and deviant adaptation in relationship to human growth and development with emphasis on children and youth. Models of deviant childhood behavior with attention to physical, learned and social bases of deviant behavior. Rehabilitation facilities and treatment are discussed. (GSSP-447)

Class 3, Credit 4

GSSP-724 Counseling Theory
Registration #0514-724
This course examines various approaches to counseling students in an educational setting. An understanding of development underlies the traditional, cognitive and behavioral models that are examined. Crisis intervention and short term strategies therapy are discussed. (GSSP-720)

Class 3, Credit 4

GSSP-725 Counseling Practicum
Registration #0514-725
This practicum provides the opportunity for students to learn interviewing techniques and offer appropriate services under supervision. (GSSP-724)

Class 4, Credit 4 (offered every year) (W, S)

GSSP-726 Tests and Measurements
Registration #0514-726
This introductory course, in a series of assessment courses, will study assessment types of tests and their uses, strengths and weaknesses, basic measurement, principles of reliability, validity, scales and norms. Students will acquire an understanding of quantitative and qualitative principles of measurement. There will be extensive laboratory experiences on a variety of instruments, the clinical method, and die uses of tests in schools and other settings.

Sample tests include Kaufman Test of Educational Achievement (K-TEA), Peabody Individual Achievement Test (PLAT), Woodcock Johnson Psychoeducational Battery—Part II, Berry Visual Motor Integration (VMI), Wide Range Achievement Test, the Detroit Test of Learning Aptitude, Bender Visual Motor Gestalt Test, and various standardized diagnostic tests in subject areas. (Matriculation in the School Psychology Program or receive permission of instructor)

Class **3,** Credit 4

GSSP-727 Cognitive Psychology
Registration #0514-727
This introduction to the theories, issues and related research in concept learning, problem-solving, information processing, perception, attention, cognitive development and creativity will be applicable to the practicing school psychologist in analysis of school learning behaviors. (See requirements for admission for prerequisites or receive permission of professor.)

Class **3,** Credit 4

GSSP-728 Research Methods
Registration #0514-728
The different research methods available to school psychologists will be critically examined and utilized in analyzing each method's advantages and disadvantages. The actual procedure of producing a completed research study will be presented, from grant acquisition to publication. Statistics will be reviewed and amplified in the course. (See requirements for admission for prerequisites or receive permission of instructor.)

Class **3,** Credit 4

GSSP-730 Seminar for the School
Registration #0514-730 Psychologist
Critical professional issues, theories and practices; role of the school psychologist as defined by competencies and responsibilities in the settings in which school psychology is practiced. Emphasis will be placed on legal and ethical issues which bear on the role of the psychologist in the school. (Matriculation in the School Psychology Program plus 16 quarter credit hours successfully completed in the program or permission of instructor)

Class **3,** Credit 4

GSSP-731 Intellectual Assessment
Registration #0514-731
This course concentrates on development of intellectual assessment skills. Students learn to select and administer individual intelligence tests, to interpret results, and to provide written and oral reports.

Laboratory experiences involve administration, scoring, and interpretation of tests including the Stanford-Binet-IV, Wechsler Intelligence Scale for Children (WISC-R), Wechsler Adult Intelligence Scale Revised (WAIS-R), Wechsler Pre-school and Primary Scale of Intelligence (WPPSI), Kaufman Assessment Battery for Children (K-ABC), McCarthy Scales of Children's Abilities, Raven's Progressive Matrices. (GSSP-726 and matriculation in the School Psychology Program or receive permission of instructor)

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

GSSP-732 Personality Assessment
Registration #0514-732
This course uses interview, behavioral observation, rating scales, and projective measures for assessment of child and adolescent personality and adaptive behavior. Students gain experience administering, interpreting, and reporting results of measures currently used in the practice of psychology in the schools. (Matriculation in the School Psychology Program plus GSSP-726 or permission of instructor)

Class 3, Credit 4

GSSP-733 Behavioral Management
Registration #0514-733 Techniques and Assessment
This course offers training in the behavioral assessment of students in educational settings. Various techniques for recording and analyzing behavior are implemented, and programs for behavior management are designed. (Matriculation in the School Psychology Program or permission of instructor)

Class 3, Credit 4

GSSP-734 Analysis of Exceptional Individuals
Registration #0514-734
An applied course in the diagnostic evaluation of exceptional individuals in order to-provide psychoeducational and psychoneurological information to multidisciplinary evaluation teams. Students select, administer and integrate test data, and report results and recommendations for treatment. An overview of relevant information on theory of exceptionality and current status of diagnosis and treatment of exceptional children and adolescents is provided. (Matriculation in the School Psychology Program plus GSSP-726, GSSP-731, GSSP-732 or permission of instructor)

Class 3, Credit 4

GSSP-735, 736 Practicum in School
Registration #0514-735, 736 Psychology I & II
The practicum serves as a bridge from theory and research to the professional practice of school psychology. Completion of at least 48 hours of sequential courses will serve as a basis for this course. A weekly classroom seminar will be provided in addition to a 15 hour/week placement in a school or agency setting. The practicum experience is a major part of preparation for the field placement internship. (Matriculation in the School Psychology Program plus 24 quarter credit hours successfully completed in the program or permission of instructor)

Class 3, Credit 4

GSSP-739 Social Psychology
Registration #0514-739
This course examines the way human behavior is affected by the social and physical environment It analyzes the situational variables which promote or inhibit various behaviors and suggests ways in which individuals can recognize and resist social influence or fashion an environment conducive to attainment of their goals. (See requirements for admission for prerequisites or receive permission of professor)

Class 3, Credit 4

GSSP-740 Psychology of Deafness
Registration #0514-740
This course is an introduction to the cognitive, linguistic and emotional processes of hearing-impaired persons. Emphasis is placed on understanding the functional integrity and the dynamics of hearing-impaired persons' psychological systems. (See requirements for admission for prerequisites or receive permission of professor)

Class 3, Credit 4 (offered on sufficient demand)

GSSP-742 Learning Disabilities:
Registration #0514-742 Identification and Intervention
This course provides the student with an overview of the issues and research on learning disabilities. Because the topic of learning disabilities is diverse, the course emphasizes criteria and content that have an established empirical base. Attention is directed to the issues of definition with a focus on identification (definition and diagnosis) and intervention (instruction and service delivery). Issues related to etiology and theoretical constructs of learning disabilities are presented in readings and by lecture contenL A neuropsychological approach is emphasized. (See requirements for admission for prerequisites or receive permission of professor)

Class 3, Credit **4**

GSSP-777, 778 Internship in School
Registration #0514-777, 778 Psychology I & II
Through direct, supervised experience the student will practice the various professional roles of a school psychologist in a real setting. Competency in carrying out these tasks in an ethical and professional manner will be developed as preparation for employment (Matriculation in the School Psychology Program plus completion of 60 hours in graduate program and qualifying examination)

Class 3, Credit **5**

GSSS-701 Educational Sociology
Registration #0515-701
This course is designed to furnish students with an understanding of the basic sociological processes underlying the educational process, and to help students apply it to concrete situations that may arise for teachers. (See requirements for admission for prerequisites or receive permission of professor)

Class 3, Credit **4** (offered annually)

Independent Study
A student may register for a graduate independent study project subject to the approval of the director of the student's graduate program, the faculty sponsor, the graduate committee and dean of the College of Liberal Arts. Because of the length of the approval process, students who desire to take independent study should make arrangements several weeks before the quarter begins. An independent study project enables the interested student and his or her faculty sponsor to coordinate their efforts on subjects and topics that range beyond the normal sequence of the graduate course selection.

Credit variable (offered annually)

College of Science

Biology

SBIB-201 **General Biology**
Registration #1001-201
Characteristics and origin of life; basic principles of modern cellular biology including cell organelle structure; chemical basis and functions of life including enzyme systems, cellular respiration and photosynthesis; nutrient procurement in plants and animals.

Class 3, Credit 3 (F)

SBIB-202 **General Biology**
Registration #1001-202
A study of the physiological processes of gas exchange, internal transport, osmoregulation^ excretion, and hormonal control in plants and animals; nervous system and behavior in animals.

Class 3, Credit 3 (W)

SBIB-203 **General Biology**
Registration #1001-203
A study of cellular and organismal reproduction, the principles of genetics and developmental biology, introduction to evolution and ecology.

Class 3, Credit 3 (S)

SBIB-205, 206,207 **General Biology Laboratory**
Registration #1001-205, 206, 207
Laboratory work to complement the lecture material of General Biology (SBIB-201, 202, 203). The experiments are designed to illustrate concepts, develop laboratory skills and techniques, and improve ability to make, record and interpret observations. (Co-requisite SBIB-201, 202, 203)

Lab 3, Credit 1 (205-F; 206-W; 207-S)

SBIB-230 **Introduction to Co-op**
Registration #1001-230 **Seminar**
Exploration of cooperative education opportunities in the biological sciences. Practice in writing letters of application, resume writing, and interviewing procedures.

Class 1, Credit 1 (W, S)

SBIB-250 **Introduction to**
Registration #1001-250 **Biotechnology**
An introduction to the nature and scope of the science of biotechnology, the employment environment and opportunities, and the literature of the field. (One quarter of general biology)

Class 1, Credit 1 (W)

SBIB-301 **Invertebrate Zoology**
Registration #1001-301
Biology in invertebrate animals with reference to classification, structure, function, and ecology. (One year of general biology or permission of instructor)

Class 2, Lab 6, Credit 4 (F)

SBIB-302 **Vertebrate Zoology**
Registration #1001-302
Morphology, physiology, behavior, classification, and ecology of chordates. (One year of general biology)

Class 3, Lab 3, Credit 4 (offered upon sufficient request)

SBIB-303 **Comparative Vertebrate**
Registration #1001-303 **Anatomy**
A comparative study of the organ systems of representative members of the vertebrates with emphasis on structural changes which occur during evolution. (One year of general biology)

Class 3, Lab 3, Credit 4 (offered upon sufficient request)

SBIB-304 **Botany**
Registration #1001-304
Distribution of the major groups of plants and their adaptations to their particular environment. (One year of general biology or permission of instructor)

Class 3, Lab 3, Credit 4 (F)

SBIB-305 **Physiology and Anatomy**
Registration #1001-305
An integrated approach to the structure and function of the nervous, endocrine, integumentary, muscular and skeletal systems. Laboratory exercises include histological examination, anatomical dissections and physiology experiments with human subjects. (One year of general biology, SCHG-217, or permission of instructor for non-science majors)

Class 4, Lab 3, Credit 5 (W)

SBIB-306 **Physiology and Anatomy**
Registration #1001-306
An integrated approach to the structure and function of the gastrointestinal, cardiovascular, immunological, respiratory, excretory and reproductive systems with an emphasis on the maintenance of homeostasis. Laboratory exercises include histological examinations, anatomical dissections and physiological experiments using human subjects. (SBIB-305 or permission of instructor)

Class 4, Lab 3, Credit 5 (S)

SBIB-310 **Plant Physiology**
Registration #1001-310
Physiological phenomena in the growth and development of higher plants. Water relationships, photosynthesis, translocation, mineral nutrition, growth, hormonal control and reproduction. (One year of general biology and one year of organic chemistry)

Class 3, Lab 3, Credit 4 (F, W)

SBIB-320 **Histology**
Registration #1001-320
Detailed microscopic studies on the structure and function of normal human tissues. (One year of general biology)

Class 3, Lab 3, Credit 4 (F)

SBIB-330 **Small Animal Laboratory**
Registration #1001-330 **Techniques**
A course designed to prepare the student for small animal handling, biological administrations and preparations, minor surgery and autopsies. (Third-, fourth-, fifth-year status and permission of instructor)

Class 1, Lab 3, Credit 3 (not offered during 1988-89)

SBIB-340 **General Ecology**
Registration #1001-340
Introduction to ecosystem ecology stressing the dynamic interrelationships of plant and animal communities with their environments. A study to include such ecological concepts as energy flow and trophic levels in natural communities, plant responses and animal behavior, population dynamics, bio-geography and representative ecosystems. (One year of general biology)

Class 3, Lab 3, Credit 4 (F)

SBIB-350 **Molecular Biology**
Registration #1001-350
The study of structure, function, and organization of proteins, nucleic acids and other biological macromolecules. (One year of general biology)

Class 3, Lab 3, Credit 4 (W, S)

SBIB-360 **Horticulture**
Registration #1001-360
A basic introduction to horticulture with a study of the interconnections of plants, gardens and their environment and discussion relating to applications of principles to indoor and outdoor gardening. (Corequisite SBIB-361)

Class 3, Credit 3 (offered upon sufficient request)

SBIB-361 **Horticulture Laboratory**
Registration #1001-361
Experiments relating to the basic principles of horticulture. (Corequisite SBIB-360)

Lab 3, Credit 1 (offered upon sufficient request)

SBIB-370 **Biological Writing**
Registration #1001-370 -
Written technical communication in the biological sciences with emphasis on components of report writing: analysis, definition, description, instruction, data presentation, literature research, abstracting and editing. (Third-, fourth-, fifth-year status)

Class 1, Rec. 1, Credit 2 (F, W)

SBIB-380 **Human Gross Anatomy**
Registration #1001-380
This course is designed to expose students to details of human anatomy through cadaver dissection. Lecture material stresses functional and clinical correlates corresponding to laboratory exercises. (SBIB-306 and permission of instructor)

Class 2, Lab 6, Credit 4 (W)

SBIB-402 **Immunology**
Registration #1001-402
Investigation of the basic concepts of immunology (antigens, antibodies, immunologic specificity, antibody synthesis, and cell-mediated immunity) and the applications of immunology to infectious diseases, allergic reactions, transplantations, tumors, autoimmune diseases, immunosuppression and tolerance. (One year of general biology, one quarter of organic chemistry)

Class 3, Credit 3 (F, W)

SBIB-403 **Cell Physiology**
Registration #1001-403
Functional eucaryotic cytology, nuclear and cytoplasmic regulation of macromolecular synthesis, exchange of materials across cell membranes, regulation of cellular metabolism and control of cell growth. (SBIB-350)

Class 3, Lab 3, Credit 4 (W, S)

SBIB-404 **Introductory Microbiology**
Registration #1001-404
Principles of anatomy, biochemistry, genetics, taxonomy, ecology of viruses, bacteria, molds, algae and protozoa. Useful and harmful activities. Basic laboratory techniques, microscopy, staining, counting, identifying. (One year of general biology, one year of organic chemistry)

Class 3, Lab 4, Credit 5 (F, W)

SBIB-407 **Microbial and Viral Genetics**
Registration #1001-407
The study of the molecular genetics of bacteria, bacteriophages, fungi, and eucaryotic viruses. (SBIB-350, 421; SCHO-334)

Class 3, Lab 3, Credit 4 (F, S)

SBIB-417 **Industrial Microbiology**
Registration #1001-417
Use of yeasts, molds, and bacteria for fermentations of economic importance. Industrial aspects of strain selection, cultivation, assay, production and recovery of fermentation products. Microbiology, biochemistry, chemistry and engineering aspects. (SBIB-404, SCHO-334)
Class 3, Lab 3, Credit 4 (W, S)

SBIB-420 **Plant Ecology**
Registration #1001-420
A consideration of the nature and variation of plant communities with a discussion of factors which limit, maintain, and modify communities both locally and regionally. Field studies of various plant communities will be conducted. (SBIB-340)

Class 3, Lab 3, Credit 4 (offered upon sufficient request)

SBIB-421 **Genetics**
Registration #1001-421
Introduction to the principles of inheritance; the study of genes and chromosomes at molecular, cellular, organismal, and population levels. (SBIB-350)

Class 3, Lab 3, Credit 4 (F, W)

SBIB-424 **Descriptive Embryology**
Registration #1001-424
Study of the developmental processes leading to the mature vertebrate form, with emphasis on early human development and its clinical variations. Course requires extensive use of independent study materials. (One year of introductory biology or permission of instructor)

Class 2, Credit 4 (W)

SBIB-430 **Radiation Biology**
Registration #1001-430
Effects of radiation upon living tissue, both harmful and beneficial. Morphological changes, genetic effects, and pathological changes in both plant and animal tissues. Use of radioisotopes in plant and animal research. (Minimum of 20 credits in biological science)

Class 3, Lab 3, Credit 4 (F)

SBIB-431 **Histological Techniques**
Registration #1001-431
Preparation of plant and animal tissues of slide mounts. Techniques in paraffin and frozen sectioning. Sectioning on the rotary and sliding microtomes and multiple staining techniques. (One year of general biology)

Class 1, Lab 4, Credit 3 (offered upon sufficient request)

SBIB-442 **Hybridoma Techniques**
Registration #1001-442
Designed to acquaint each student with the basic methods employed in the production of hybridoma cell lines and monoclonal antibodies. To include preparation of viable cell suspensions, cell culture fusion techniques, cloning, and monoclonal antibody production and characterization. (Corequisite SBIB-402) (SBIB-445)

Lab 3, Credit 2 (W, S)

SBIB-445 **Tissue Culture**
Registration #1001-445
Study of the techniques and applications of culturing cells, tissues, and organs in vitro. Emphasis on mammalian systems. (One year of general biology)

Class 2, Lab 3, Credit 4 (F, W)

SBIB-446 **Plant Tissue and Cell Culture**
Registration #1001-446
Study of the techniques and applications of plant organ, tissues, and cell culture in vitro, with emphasis on plant regeneration. (One year of general biology)

Class 2, Lab 3, Credit 4 (W, S)

SBIB-450 **Genetic Engineering**
Registration #1001-450
Introduction to the theoretical basis, laboratory techniques, and applications of gene manipulation. (SBIB-350, 404)

Class 3, Lab 6, Credit 5 (W, S)

SBIB-471 **Freshwater Ecology**
Registration #1001-471
A study of the physics, chemistry and biology of inland waters. The course will emphasize the physical and chemical properties of water and how these properties affect the associated biological communities. Planktonic, benthic and littoral communities will be considered. Field trips to streams and lakes will be conducted to gather physical, chemical and biological data. (SBIB-340 or permission of instructor)

Class 3, Lab 3, Credit 4 (offered upon sufficient request)

SBIB-472 **Introduction to**
Registration #1001-472 **Oceanography**
An introduction to the study of the world ocean, with emphasis on fundamental principles, concepts and processes of biological, geological, chemical and physical oceanography. (SBIB-340 or permission of instructor)

Class 3, Lab 3, Credit 4 (offered upon sufficient request)

SBIB-473 **Marine Biology**
Registration #1001-473
The biology of marine life, with emphasis on the roles that marine plants and animals assume in their environmental situations, and the structural and physiological adaptations necessary to fulfill those roles. (Minimum of 20 credits in biological science)

Class 3, Lab 3, Credit 4 (offered upon sufficient request)

SBIB-490 **Transmission Electron**
Registration #1001-490 **Microscopy**
A lecture/laboratory course covering operation, maintenance and calibration of transmission electron microscopes; preparation of biological, chemical and physical specimens for the transmission electron microscope; black-and-white photographic darkroom techniques. (Fourth- or fifth-year status and permission of instructor)

Class 1, Lab 6, Credit 4 (F)

SBIB-491 **Scanning Electron**
Registration #1001-491 **Microscopy**
A lecture/laboratory course covering operation, maintenance and calibration of scanning electron microscopes; preparation of biological, chemical and physical specimens for the scanning electron microscope; black-and-white photographic darkroom techniques. (Third-, fourth- or fifth-year status)

Class 1, Lab 6, Credit 4 (offered upon sufficient request)

SBIB-541, 542, 543 **Biology Research**
Registration #1001-541, 542, 543
Faculty directed projects of research usually involving original field or laboratory work encompassing a period of at least two quarters. Final results are presented in written and oral formats. (Third-year status with a GPA of 2.5 in science and mathematics courses, and consent of faculty)

Class variable, Credit variable (F, W, S, SR)

SBIB-550 **Biology Seminar**
Registration #1001-550
Written and oral reports and their discussion by class members covering topics of current interest in the biological sciences. (40 quarter credits in biology and successful completion of the departmental writing requirement)

Class 2, Credit 2 (W, S)

SBIB-559 **Special Topics: Biology**
Registration #1001-559
Advanced courses which are of current interest and/or logical continuations of the courses already being offered. These courses are structured as ordinary courses and have specified prerequisites, contact hours and examination procedures.

Class 4, Credit 4 (offered everyy e a r) (F, W, S, SR)

SBIB-561 **Biotechnology Senior Project**
Registration #1001-561
Completion of a laboratory project in biotechnology; preparation of laboratory notebook and research report. (Fourth- or fifth-year biotechnology major status)

Lab 6, Credit 2 (F, W, S)

SBIB-579 **Topics in Biotechnology**
Registration #1001-579
An in-depth study of one or more aspects of the field of biotechnology, with emphasis on current areas of research. (Fourth- or fifth-year biotechnology major status)

Class 3, Credit 3 (F, S)

SBIB-599 **Independent Study: Biology**
Registration #1001-599
Faculty directed study of appropriate topics on a tutorial basis. This course will generally be used to enable an individual to pursue studies of existing knowledge available in the literature. (One year of general biology)

Class variable, Credit variable (F, W, S, SR)

SBIB-720 **Introduction to Pharmacology**
Registration #1001-720
A survey of the pharmacodynamic properties and physiological effects of drugs used clinically to treat disease. Emphasis will be placed on anti-cancer drugs, antibiotics, and drugs which will affect the central and peripheral nervous system. (SBIB-305, 306 or equivalent; SBIB-403; SCHO-233)

Class 3, Credit 3 (offered upon sufficient request)

SBIB-721 **Introduction to Pharmacology**
Registration #1001-721 **Laboratory**
Laboratory work to accompany the lectures in Introduction to Pharmacology. (Corequisite SBIB-720)

Lab 3, Credit 1 (offered upon sufficient request)

SBIB-740 **General Toxicology**
Registration #1001-740
The study of the science of poisons (the harmful actions of chemicals on biologic tissue) through the examination of biological and chemical mechanisms, their implications for biological systems, and detection. (SBIB-741 a corequisite for biology majors) (Physiology, anatomy, organic chemistry or permission of the instructor. Genetics recommended.)

Class 3, Credit 3 (offered upon sufficient request)

SBIB-741 **General Toxicology**
Registration #1001-741 **Laboratory**
Laboratory work to accompany the lectures in General Toxicology. (Corequisite SBIB-740)

Lab 3, Credit 1 (offered upon sufficient request)

NOTE: The following courses may not be taken for biology credit by biology or biotechnology majors.

SBIG-210 **Microbiology in Health and**
Registration #1004-210 **Disease**
An introduction to microorganisms; their relationship to the environment and human health; the causes, prevention and treatment of infectious diseases; and the role of microorganisms in the preparation and spoilage of foods. (One year of high school biology or equivalent)

Class 4, Credit 4 (F, S)

SBIG-211 **Human Biology I**
Registration #1004-211
A general study of human anatomy and physiology. This course includes discussions of cellular biology, skeletal, muscular, nervous, and endocrine systems. (Corequisite SBIG-231)

Class 4, Credit 4 (offered every year) (S, SR)

SBIG-212 **Human Biology II**
Registration #1004-212
A general study of human anatomy and physiology with emphasis on mechanisms by which the nervous and endocrine systems coordinate and integrate body functions. This second course includes discussions of nutrition, metabolism and respiratory, circulatory, lymphatic, urinary and reproductive systems. (Corequisite SBIG-232)

Class 3, Credit 3 (S)

SBIG-231 **Human Biology I Laboratory**
Registration #1004-231
Laboratory to complement the lecture material of SBIG-211. Experiments are designed to illustrate the dynamic characteristics of cells, tissues and organ systems.

Lab 3, Credit 1 (W)

SBIG-232 **Human Biology II Laboratory**
Registration #1004-232
Laboratory for dietetic and medical illustration students complements the lecture material of SBIG212. Experiments are designed to illustrate the dynamic anatomy and physiology of major organ systems.

Lab 3, Credit 1 (S)

SBIG-289 **Contemporary**
Registration #1004-289 **Science: Biology**
A study in various biological topics relevant to contemporary problems of society. Topics may include population biology, pollution, disease control, human heredity, contagious diseases, marine biology, bioethics.

Class 4, Credit 4 (F, W, S)

SBIG-315 **Medical Genetics**
Registration #1004-315
A survey of selected human variations and diseases of medical importance, with emphasis on the underlying genetic principles. (SBIB-203 or equivalent)

Class 2, Credit 2 (S)

Chemistry

NOTE: SCHG courses, except SCHG-309, may not be taken by chemistry or polymer chemistry majors.

SCHA-261 **Introduction to Chemical**
Registration #1008-261 **Analysis I**
An introduction to quantitative analysis; solubility of ionic compounds and the equilibria involved; activity concepts; statistical treatment of data. Laboratory experiments include gravimetric and precipitation methods. (Corequisite SCHC-251)

Class 2, Lab 5, Credit 3 (offered every year) (F)

SCHA-262 **Introduction to Chemical**
Registration #1008-262 **Analysis II**
Systematic treatment of acid-base equilibria, titrations, analytical oxidation-reduction processes; complexometric methods. (Corequisite SCHC-252) (SCHA-261)

Class 2, Lab 5, Credit 3 (offered every year) (W)

SCHA-263 **Introduction to Chemical**
Registration #1008-263 **Analysis III**
Introduction to electrochemical and spectroscopic methods, potentiometric and spectrometric titrations. Electrodeposition and pH measurements included in lab. (Corequisite SCHC-253) (SCHA-262)

Class 4, Lab 3, Credit 5 (offered every year) (S)

SCHA-311 **Analytical Chemistry:**
Registration #1008-311 **Instrumental Analysis**
Elementary treatment of instrumental theory and techniques; properties of light, ultraviolet, visible, and infrared spectrophotometry; atomic and molecular fluorescence, emission spectroscopy; flame photometry. (Corequisite SCHA-318) (SCHC-253)

Class 3, Credit 3 (offered every year) (F, W)

SCHA-312 **Analytical Chemistry:**
Registration #1008-312 **Separations**
Inorganic and organic separations; Raoult's and Henry's Laws; phase rules; distillation; extraction; adsorption and surface effects; chromatography including gas, liquid, column, paper, thin layer, and ion exchange. (Corequisite SCHA-319) (SCHC-253)

Class 3, Credit 3 (offered every year) (S, SR)

SCHA-318 **Instrumental Analysis Lab**
Registration #1008-318
Lab accompanying SCHA-311. Quantitative and qualitative experiments in ultraviolet, visible, and infrared spectrophotometry, molecular fluorescence and flame atomic absorption spectrophotometry. Laboratory report writing is emphasized. (Corequisite SCHA-311) (SCHC-253)

Lab 4, Credit 1 (offered every year) (F, W)

SCHA-319 **Separations Lab**
Registration #1008-319
Lab accompanying SCHA-312. Experiments with chemical separation techniques including distillations, extractions and a variety of chromatographic methods (HPLC, thin layer, paper, ion exchange, gas, gel filtration). Laboratory report writing is emphasized. (Corequisite SCHA-312) (SCHC-253)

Lab 4, Credit 1 (offered every year) (S, SR)

SCHA-620 **Building Scientific Apparatus**
Registration #1008-620
Basic skills associated with the construction of scientific laboratory apparatus, some of which is not commercially available, will be covered: machine shop skills, working with glass, vacuum technology, optics, and electronics. Special emphasis will be placed on function-structure relationship between an instrument and its intended use. Several references on construction techniques will be provided and information about current manufacturers and suppliers of necessary components will be given. (Corequisite SSEG-621) (SCHP-441, SPSP-212, 213 or 312, 313)

Class 3, Credit 3 (offered upon sufficient request)

SCHB-334 **Biochemistry**
Registration #1009-334
Introduction to biological chemistry. An in-depth survey of the molecular organization, physiological functions and bio-energetics principles of the molecular components of cells; amino acids, proteins, enzymes, carbohydrates, lipids, and nucleic acids. Emphasis is on the structure-function relationships, solution behavior, and metabolism of biomolecules. (SCHO-233)

Class 4, Credit 4 (offered every year) (F)

SCHC-200 **Chemical Safety**
Registration #1010-200
A basic course in safe chemical laboratory practices. Topics include protective equipment, toxicity, safe reaction procedures, storage and disposal methods, and handling all chemicals including flammable materials, compressed gases, cryogens, radioactive materials and other special chemicals.

Class 1, Credit 1 (offered every year) (F)

SCHC-230 **Introduction to Co-op**
Registration #1010-230 **Seminar**
Exploration of cooperative education opportunities; practice in writing letters of application, resume writing, and interviewing procedures.

Class 4, Credit 4 (offered every year) (F, W, S)

SCHC-251 General Chemistry I
Registration #1010-251
A detailed study of fundamental tools of chemistry, atomic theory; stoichiometry (elements, compounds, reactions); properties of gases and thermochemistry (First Law). (Corequisite SCHA-261)

Class 3, Credit 3 (offered every year) (F)

SCHC-252 General Chemistry II
Registration #1010-252
Structure and properties of the atom; periodic relationships; basic concepts of chemical bonding, kinetics, and equilibrium; thermodynamics (Free energy, Second and Third Laws). (Corequisite SCHA-262) (SCHC-251)

Class 3, Credit 3 (offered every year) (W)

SCHC-253 General Chemistry III
Registration #1010-253
Oxidation-reduction and electrochemistry; descriptive chemistry of selected elements; chemical bonding theories; transition elements and coordination chemistry; introduction to organic chemistry, biochemistry and polymers; nuclear chemistry. (Corequisite SCHA-263) (SCHC-252)

Class 3, Credit 3 (offered every year) (S)

SCHC-301 Elements of Chemical Research
Registration #1010-301
The nature of chemical research will be presented in terms of the concepts, approaches, and procedures. Special attention will be given to methods of keeping research records and notebooks. Opportunities and projects available for undergraduate and graduate research will be described by Department of Chemistry faculty. (Corequisite SCHP-340) (SCHO-431)

Class 1, Credit 1 (offered every year) (F, W)

SCHC-401 Chemical Literature
Registration #1010-401
Instruction will be given on the use of chemical literature resources such as Chemical Abstracts, Science Citation Index, Beilstein, Current Contents, and computerized information retrieval. Students will prepare a library-based research paper on a chemical topic of their choice as a culmination of instruction on planning a research paper, outlining, using correct scientific English and formats for documentation (footnotes, endnotes, bibliographies), and preparing visuals, abstracts, and letters of transmittal.

Class 2, Credit 2 (offered every year) (F, W)

SCHC-541, 542, 543 Chemistry Research
Registration #1010-541, 542,543
Faculty directed student projects or research usually involving laboratory work and/or calculations that would be considered original. (SCHC-401 or permission of research advisor)

Class variable, Credit variable (offered every year) (F, W, S, SR)

SCHC-559 Special Topics:
Registration #1010-559 Undergraduate Chemistry
Courses in which topics of special interest to a sufficiently large group of students, and not covered in other courses, may be offered upon request.

Class variable, Credit variable (offered upon sufficient request)

SCHC-599 Independent
Registration #1010-599 Study: Chemistry
Faculty directed study of appropriate topics on a tutorial basis. This course will generally be used to enable an individual to pursue studies of existing knowledge available in the literature. (Permission of independent study advisor)

Class variable, Credit variable (offered every year) (F, W, S, SR)

NOTE: SCHG courses, except SCHG-309, may not be taken by chemistry or polymer chemistry majors.

SCHG-201 Survey of General Chemistry
Registration #1011-201
One quarter survey of general chemistry for non-science majors with no previous background in chemistry. Fundamentals of matter and energy, the atomic theory, chemical structure and bonding, ionic species and solutions, and acid-base chemistry are covered. (Corequisite SCHG-221)

Class 3, Credit 3 (offered every year) (F)

SCHG-202 Survey of Organic Chemistry
Registration #1011-202
One quarter survey of the fundamentals of organic chemistry that are essential for an understanding of biological molecules, biochemistry, and the basics of polymer chemistry. Topics covered include alkanes, alkenes, alkynes, aromatics, alcohols, ethers, aldehydes, ketones, carboxylic acids and derivatives, amines, and addition and condensation polymers. (Corequisite SCHG222) (SCHG-201 or equivalent)

Class 3, Credit 3 (offered every year) (W)

SCHG-203 Biochemistry I
Registration #1011-203
Structure and reactions of the major classes of biomolecules are studied. Topics include amino acids and proteins, lipids, carbohydrates and nucleic acids. (SCHG-202 or equivalent)

Class **4,** Credit **4** (offered every year) (S)

SCHG-204 Biochemistry II
Registration #1011-204
The fundamentals of the metabolism of major classes of biomolecules are covered. Topics include biochemical energetics; the metabolism of carbohydrates, lipids and proteins; and the functions of nucleic acids. (SCHG203 or equivalent)

Class **4,** Credit **4** (offered every year) (F)

SCHG-205 Chemical Principles I
Registration #1011-205 Laboratory
A laboratory course for photoscience, microelectronics, and science majors and others who are taking SCHG-211. Laboratory experiments are designed to complement the lecture material and may cover the following topics: analytical balance, volumetric measurements, titrations, syntheses, and analyses. (Corequisite SCHG-211)

Lab **3,** Credit 1 (offered every year) (F, SR)

SCHG-206 Chemical Principles II
Registration #1011-206 Laboratory
A laboratory course for photoscience, microelectronics, and science majors and others who are taking SCHG-212. Laboratory experiments are designed to complement lecture topics and may include the following titrations, thermochemistry, kinetics, spectrophotometry (visible), and redox reactions. (Corequisite SCHG-212) (SCHG-205)

Lab **3,** Credit 1 (offered every year) (W, S, SR)

SCHG-207 Introduction to Organic
Registration #1011-207 Chemistry Laboratory
An introduction to organic laboratory techniques. Methods of separating, purifying, and characterizing organic compounds are covered. (Corequisite SCHG-213) (SCHG-206)

Lab 3, Credit 1 (offered every year) (S, SR)

SCHG-208 College Chemistry I
Registration #1011-208
Primarily for, but not limited to, engineering students. Topics include an introduction to some basic concepts in chemistry, stoichiometry, First Law of Thermodynamics, thermochemistry, electronic theory of composition and structure, chemical bonding.

Class 4, Credit 4 (offered every year) (F, W)

SCHG-209 **College Chemistry II**
Registration #1011-209
A continuation of SCHG-208. Topics include chemical equilibrium, properties of acids and bases, aqueous equilibria, free energy, entropy and equilibrium, electrochemistry, nuclear chemistry and the chemistry of metals. (SCHG-208)

Class 4, Credit 4 (offered every year) (S)

SCHG-211 **Chemical Principles I**
Registration #1011-211
For science, microelectronics, and photoscience majors and others who desire an in-depth study of general chemistry. Atomic structure and chemical bonding, chemical equations and chemical analysis; gases; acids and bases. (Corequisite SCHG205)

Class 3, Credit 3 (offered every year) (F, W, SR)

SCHG-212 **Chemical Principles II**
Registration #1011-212
Problem solving applications of chemical principles. Topics include thermodynamics and equilibrium, oxidadon-reduction, and chemical kinetics. (Corequisite SCHG-206) (SCHG211)

Class 3, Credit 3 (offered every year) (W, S, SR)

SCHG-213 **Introduction to Organic**
Registration #1011-213 **Chemistry**
Introduction to the structure and reactivities of organic molecules for physical science majors. An overview of the structure, nomenclature, bonding, and reactivities of major functional groups. Special topics will include spectroscopy, organometallics, polymers, and biomolecules. (Corequisite SCHG-207) (SCHG **212)**

Class 3, Credit 3 (offered every year) (S, SR)

SCHG-215 **General & Analytical**
Registration #1011-215 **Chemistry I**
General chemistry for students in biology, medical technology, and the life sciences. Introduction to chemical symbols, formulas, equations, stoichiometry, atomic structure, chemical periodicity and bonding. Emphasis on an early introduction to solutions, concentrations, acid-base and precipitation reactions; analytical chemistry problem-solving applications are stressed. (Corequisite SCHG-225)

Class 3, Credit 3 (offered every year) (F)

SCHG-216 **General & Analytical**
Registration #1011-216 **Chemistry II**
Introduction to quantitative gravimetric analysis, oxidation-reduction, nomenclature, chemical equilibrium and equilibria in aqueous solutions. Particular emphasis on solution equilibria including weak acids, bases, buffers, hydrolysis, pH titrations and heterogenous equilibria. (Corequisite SCHG-226) (SCHG-215)

Class 3, Credit 3 (offered every year) (W)

SCHG-217 **General & Analytical**
Registration #1011-217 **Chemistry in**
The concepts of polyprotic equilibria, spectrophotometry instrumentation and analyses, electrochemistry, nuclear chemistry and chemical kinetics are presented with an emphasis on the analytical applications of these principles to the life sciences. (Corequisite SCHG227) (SCHG-216)

Class 3, Credit 3 (offered every year) (S)

SCHG-2 21 **Survey of General Chemistry**
Registration #1011-221 **Laboratory**
Laboratory courses to accompany SCHG-201. Emphasis on introduction to methods of chemical analysis, qualitative and quantitative techniques. (Corequisite SCHG-201)

Lab 3, Credit 1 (offered every year) (F)

SCHG-222 **Survey of Organic Chemistry**
Registration #1011-222 **Laboratory**
Laboratory course to accompany SCHG-202. Emphasis is on representative examples of typical organic techniques and synthesis. (Corequisite SCHG-202) (SCHG-221 or equivalent)

Lab 3, Credit 1 (offered every year) (W)

SCHG-225 **General & Analytical**
Registration #1011-225 **Chemistry Laboratory**
Introduction to analytical chemistry laboratory techniques and methods of qualitative and quantitative analysis. Topics include use of the Sartorius balance, volumetric calibration, density and chemical formula analysis, and an introduction to volumetric titration and spectrophotometric analysis. Emphasis is placed on laboratory methods, notebook documentation, report writing, and quantitative evaluation of laboratory data. Experiments are designed to complement lecture material in SCHG-215. (Corequisite SCHG-215)

Lab 3, Credit 1 (offered every year) (F)

SCHG-226 **General & Analytical**
Registration #1011-226 **Chemistry Laboratory**
Continuation of SCHG-225 laboratory. Topics include gravimetric analysis; atomic absorption analysis; redox titration; visible spectrophotometric titrations; and thin layer, gas and gel filtration chromatographies. Emphasis is placed on analytical methods of analysis, report writing and quantitative unknown reports. Experiments are designed to complement lecture material in SCHG-216. (Corequisite SCHG-216) (SCHG-225)

Lab 3, Credit 1 (offered every year) (W)

SCHG-227 **General & Analytical**
Registration #1011-227 **Chemistry Laboratory**
Continuation of SCHG-226 laboratory. Topics include pH measurement, buffers and pH indicators, polyprotic acid multi-endpoint titrations, spectrophotometric analysis of equilibrium constants, a redox titration contest, enzyme catalysis, and an independent laboratory practical on the quantitative analysis of an unknown solution by various analytical methods. Experiments are designed to complement lecture material in SCHG-217. Emphasis is on independent laboratory analysis, experimental design, and data analysis. (Corequisite SCHG-217) (SCHG-226)

Lab 6, Credit 2 (offered every year) (S)

SCHG-240 **Fundamentals of Chemistry**
Registration #1011-240
Basic training in general chemistry assuming no prior experience, concentrating on those aspects important to the fields of engineering technology. Emphasis will be placed on atomic structure, periodicity, bonding, structure of compounds, physical and chemical properties, acids and bases, oxidation-reduction, and kinetics. (SCHG-275 may be taken concurrently.)

Class **4,** Credit **4** (offered every year) (F, W, S, SR)

SCHG-271 **Basic Chemistry**
Registration #1011-271
Basic training in general chemistry assuming no prior experience, concentrating on those aspects important to the field of water conservation. (SCHG-275 should be taken concurrently.)

Class 3, Credit 3 (offered every year) (W)

SCHG-272 **Chemistry of Water and**
Registration #1011-272 **Waste Water**
Chemistry of water analyses, including solids, pH, alkalinity, acidity, chloride, phosphate, BOD, COD, nitrogen, metals, radioactivity, residual chlorine and chlorine demand. Polymers will also be covered. (Corequisite SCHG-276) (SCHG-271 or equivalent)

Class 3, Credit 3 (offered every year) (F)

SCHG-275 **Basic Chemistry Lab**
Registration #1011-275
Laboratory to be taken concurrently with SCHG-240 or SCHG-271. General chemistry and volumetric techniques will be covered.

Lab 3, Credit 1 (offered every year) (F, W)

SCHG-276 **Chemistry of Water and**
Registration #1011-276 **Waste Water Lab**
Laboratory to be taken concurrently with SCHG-272. Techniques used in water and waste water analysis will be covered. (SCHG-271 or equivalent)

Lab 3, Credit 1 (offered every year) (F)

SCHG-281 **Chemical Foundations I**
Registration #1011-281
Basic concepts of general chemistry including measurement, atomic theory, chemical bonding, stoichiometry, the liquid and solid states, properties of water. (SMAM-204)

Class 3, Recitation 1, Credit 4 (offered every year) (W)

SCHG-282 **Chemical Foundations II**
Registration #1011-282
Basic concepts of general chemistry including solutions, colligative properties, acid-base theory, pH, titrations, oxidation-reduction, organic functional groups, addition and condensation polymers. (SCHG-281)

Class 3, Recitation 1, Credit 4 (offered every year) (S)

SCHG-289 **Contemporary Science:**
Registration #1011-289 **Chemistry**
This course examines a broad range of contemporary scientific topics with a chemical basis. These may include nuclear power, sources of energy, air and water pollution, medicines and drugs in addition to the chemical laws and structure of the atom.

Class 4, Credit 4 (F, W, S)

SCHG-309 **Glassblowing Techniques**
Registration #1011-309
This course is designed to introduce and train each student in small-scale scientific glassblowing techniques. Proficiency will be developed in rod manipulation, ring seals, construction of apparatus, annealing, use of a simple lathe and hand-torch work. (May be taken by chemistry, polymer chemistry, and other majors.)

Class 4, Credit 2 (offered upon sufficient request)

SCHO-231, 232 **Organic Chemistry**
Registration #1013-231, 232
Survey of the structure, nomenclature, reactions, and synthesis of the major functional groups. Mechanisms of main classes of reactions are discussed. (Corequisites SCHO-235, 236) (SCHG-216, or 212, or 209)

Class 3, Credit 3 (offered every year) (231-F; 232-W)

SCHO-233 **Organic Chemistry**
Registration #1013-233
Structure, nomenclature, reactions, and properties of the important classes of bio-organic molecules (carbohydrates, lipids, amino acids, proteins, and nucleic acids) are covered in depth. Emphasis is on structure and reactivity in relation to biochemical processes. (Corequisite SCHO-237) (SCHO-232)

Class 3, Credit 3 (offered every year) (S)

SCHO-235,236, 237 **Organic Chemistry Lab**
Registration #1013-235, 236, 237
Laboratory work emphasizes techniques, preparations, and analyses. SCHO-237 emphasizes reactions and properties of biomonomers and polymers. (Corequisites SCHO-231, 232, 233)

Lab 3, Credit 1 (offered every year) (235-F; 236-W; 237-S)

SCHO-431 **Organic Chemistry I**
Registration #1013-431
A rigorous survey of the reactions of major organic functional groups, emphasizing alkanes, alkenes, alkyl halides, and alkynes. Stereochemistry is also included. (Corequisite SCHO-435) (SCHC-253)

Class 3, Credit 3 (offered every year) (S, SR)

SCHO-432 **Organic Chemistry II**
Registration #1013-432
A continued survey of reactions of major organic functional groups, including aromatic compounds, alcohols, ethers, aldedydes, and ketones. Organometallics and spectral analysis (IR, UV, NMR) are also included. (Corequisite SCHO-436) (SCHO-431)

Class 3, Credit 3 (offered every year) (F, W)

SCHO-433 **Organic Chemistry m**
Registration #1013-433
A continued survey of reactions of major organic functional groups, including carboxylic acids, carboxylic acid derivatives, amines, and enolate anions. Structure, nomenclature, reactions, and properties of important classes of bio-organic molecules are also included. (Corequisite SCHO-437) (SCHO-432)

Class 3, Credit 3 (offered every year) (S, SR)

SCHO-435, 436 **Preparative Organic**
Registration #1013-435,436 **Chemistry**
Synthesis of organic compounds utilizing a variety of laboratory techniques. Purification techniques and spectral characterization will be routinely used. (SCHO-431 should be taken concurrently with SCHO-435; SCHO-432 with SCHO-436.) (SCHC-253 or equivalent)

Lab 6, Credit 2 (offered every year) (435-S, SR; 436-F, W)

SCHO-437 **Systematic Identification of**
Registration #1013-437 **Organic Compounds**
A laboratory course utilizing synthesis, and chemical and spectral (IR, NMR, and GC/MS) techniques to identify and characterize organic compounds. (Should be taken concurrently with SCHO-433.) (SCHO-432, 436)

Lab 6, Credit 2 (offered every year) (S, SR)

SCHO-6OI **Organic Chemistry of Polymers**
Registration #1013-601
The chemistry of high molecular weight organic polymers and their properties are introduced and discussed in depth. Mechanisms of step-growth and chain-growth polymerization reactions, polymer reactions and degradations are studied. (SCHO-433)

Class 4, Credit 4 (F, W)

SCHP-301 **Introduction to**
Registration #1014-301 **Polymer Technology**
Introduction to the history of polymer chemistry, the terminology of polymers, the structures and properties of commercially significant polymers, and the major polymer processing techniques. (SCHO-432 or equivalent)

Class 2, Credit 2 (offered every year) (F, W)

SCHP-340 **Introduction to Physical**
Registration #1014-340 **Chemistry**
Properties of gases, kinetic theory of gases, energy and the First Law; thermochemistry; entropy and the Second and Third Laws; introduction to Helmholtz and Gibbs free energy, gas equilibrium. (SCHC-253, SMAM-252, SPSP-311)

Class 3, Credit 3 (offered every year) (F, W)

SCHP-441 **Physical Chemistry I**
Registration #1014-441
Review of the thermodynamic laws; criteria for equilibrium and spontaneity; chemical equilibrium; phase rule; equilibrium in ideal and non-ideal solutions; electrochemistry. (Should be taken concurrently with SCHP-445.) (SCHP-340)

Class 3, Credit 3 (offered every year) (S, SR)

SCHP-442 Physical Chemistry n
Registration #1014-442
Introduction to quantum mechanics and spectroscopy, radioactivity; Planck's law; photoelectric effect; the Bohr atom; de-Broglie, Schrodinger, and Heisenberg theories; eigenvalue/eigenfunction equations; variation and perturbation theory; quantum statics; Heitler-London theory of covalent bonds; selection rules and spectroscopy. (Should be taken concurrently with SCHP-446.) (SMAM-306, SCHP-441)

Class 3, Credit 3 (offered every year) (F, W)

SCHP-443 Physical Chemistry III
Registration #1014-443
Kinetic molecular theory; transport properties of gases; chemical kinetics; surface chemistry; photochemical kinetics; irreversible processes in solution. (Should be taken concurrently with SCHP-447.) (SCHP-441)

Class 3, Credit 3 (offered every year) (S, SR)

SCHP-445 Physical Chemistry
Registration #1014-445 Laboratory I
Introduction to physical chemistry laboratory; chemical thermodynamics and equilibrium. (Should be taken concurrently with SCHP-441.)

Lab 3, Credit 1 (offered every year) (S, SR)

SCHP-446 Physical Chemistry
Registration #1014-446 Laboratory II
Experiments in the application of quantum chemistry, atomic and molecular spectroscopy, and radioactivity. (Should be taken concurrently with SCHP-442.)

Lab 3, Credit 1 (offered every year) (F, W)

SCHP-447 Physical Chemistry
Registration #1014-447 Laboratory III
Laboratory experiments in chemical dynamics. (Should be taken concurrently with SCHP-443.)

Lab 3, Credit 1 (offered every year) (S, SR)

SCHP-602 Physical Chemistry of Polymers
Registration #1014-602
Study of the theoretical and experimental aspects of polymer characterization. In addition, theoretical considerations of the configuration of polymer chains and statistical thermodynamics of polymer solutions will be related to experimental results. (SCHP-443)

Class 4, Credit 4 (offered every year) (S, SR)

SCHP-603 Structure-Property
Registration #1014-603 Relationships in Polymers
An introduction to amorphous and semicrystalline polymeric systems; thermomechanical, tensile and impact properties of polymers; rubber elasticity, viscosity, viscoelasticity. (SCHO-6OI or SCHP-602)

Class 4, Credit 4 (F, W)

SCHP-604 Characterization of High
Registration #1014-604 Polymers
Experiments on dilute solution viscosity, gel permeation chromatography, vapor phase osmometry, differential scanning calorimetry, thermogravimetric analysis, tensile testing, infrared spectroscopy, NMR spectroscopy and other aspects of polymer characterization. (SCHO-6OI or SCHP-602)

Lab 6, Credit 2 (F, W)

SCHP-605 Synthesis of High Polymers
Registration #1014-605
Experiments on condensation, free radical, ring opening, and ionic polymerizations and polymer modification. (SCHO-437)

Lab 6, Credit 2 (F, W)

SCHP-630 Magnetic Resonance Imaging
Registration #1014-630
This course introduces the principles of magnetic resonance imaging (MRI) at a level understandable by both the scientist and non-scientist. The course begins with the basics of nuclear magnetic resonance, the foundation of MRI. Magnetic resonance imaging techniques and instrumentation will be explained. Emphasis will be placed on understanding the imaging process. A discussion of information available for water proton content images of body parts and tissue types will be presented. Future directions of MRI will be presented.

Class 4, Credit 4 (W)

Graduate Courses

SCHA-711 Instrumental Analysis
Registration #1008-711
Theory, applications, and limitations of selected instrumental methods in qualitative, quantitative, and structural analysis. Topics covered include mass spectroscopy, nuclear magnetic resonance, electrochemistry, surface methods and new analytical methods. (SCHA-312)

Class 3, Credit 3 (offered every year) (F, W)

SCHA-720 Instrumental Analysis Lab
Registration #1008-720
Lab accompanying SCHA-711. Experiments include AA, fluorimetry, coulometry, "C and 'H NMR, polarography. Assignments depend on student background. (Corequisite SCHA-711)

Lab 6, Credit 2 (offered every year) (F, W)

SCHB-702 Biochemistry: Biomolecular
Registration #1009-702 Conformation & Dynamics
Introduction to biological chemistry. Chemical structures, reactions, molecular organization and physiological functions of the molecular components of cells; amino acids, proteins, enzymes, enzyme kinetics, co-enzymes, biochemical thermodynamics, carbohydrates and lipids, membrane structure, and active transport. Emphasis is on the structure-function relationships of biomolecules, their solution behavior and dynamics. (SCHO-433 and SCHP-340 or SCHP-742)

Class 3, Credit 3 (offered every year) (F, W)

SCHB-703 Biochemistry: Metabolism
Registration #1009-703
Bioenergetics principles; catabolism of carbohydrates, fatty acids and amino acids; photosynthesis, biosynthesis of carbohydrates, lipids, and nitrogenous compounds; metabolic diseases. (SCHB-702)

Class 3, Credit 3 (offered every year) (F, W)

SCHB-704 Biochemistry: Nucleic Acids
Registration #1009-704 and Molecular Genetics
The biochemistry of inheritance, expression of genetic information, protein biosynthesis, differentiation, viral and bacterial infection and the "origin of life." (SCHB-702)

Class 3, Credit 3 (offered every year) (S, SR)

SCHC-772 Special Topics
Registration #1010-772
Advanced courses which are of current interest and/or logical continuations of the course already being offered. These courses are structured as ordinary courses and will have specified prerequisites, contact hours and examination procedures. Recent courses taught as Special Topics include Nuclear Chemistry, Polymer Morphology, Advanced Chromatographic Methods, and Applications of Computer Interfacing.

Class variable, Credit variable (offered every year)

SCHC-870 Chemistry Seminar
Registration #1010-870

Credit 1 (offered every year)

SCHC-877 **External Research**
Registration #1010-877
Industrial internship research.

Credit 1-16 (offered every year)

SCHC-879 **Research and Thesis**
Registration #1010-879 **Guidance**
Hours and credits to be arranged. Chemical research in a field chosen by the candidate, subject to approval of the department head and advisor.

Credit variable (offered every year)

SCHC-899 **Independent Study:**
Registration #1010-899 **Chemistry**

Credit variable (offered every year)

SCHI-762 **Inorganic Chemistry I:**
Registration #1012-762 **Periodicity and Reactivity**
For the common elements, mastery will be required of chemical reactions which describe: (1) their isolation, (2) their characteristic chemical reactivities, and (3) large volume industrial processes. Relationships between the reactivities of neighboring elements will be elucidated and justified according to current theories. (SCHO-433, SCHP-442)

Class 3, Credit 3 (offered every year) (S, SR)

SCHI-763 **Inorganic Chemistry II:**
Registration #1012-763 **Isomerism, Symmetry, and Bonding**
This course provides an in-depth view of how bonding theories endeavor to account for and predict the physical properties (e.g., color, magnetism, stability, chemical potential, electrical conductivity, and others) of a wide variety of inorganic compounds. (SCHO-433, SCHP-442)

Class 3, Credit 3 (offered every year) (F, W)

SCHI-764 **Inorganic Chemistry ID: Physical**
Registration #1012-764 **Methods and Recent Advances**
This course introduces the student to the more sophisticated tools with which an inorganic chemist investigates inorganic materials. These physical methods, with the bonding theories from SCHI-763, are applied to inorganic reactions that exemplify the similarities and anomalous behavior of the elements in each family of the periodic table. Application of this knowledge to contemporary research areas of inorganic chemistry is conducted. (SCHI-763)

Class 3, Credit 3 (offered every year) (S, SR)

SCHI-765 **Preparative Inorganic**
Registration #1012-765 **Chemistry**
The complexity of many inorganic "building blocks" requires a detailed understanding of inorganic theory, special handling precautions, and special methods to investigate inorganic products. Different areas of the periodic table, new synthetic methods, and new characterization techniques are examined. (Corequisite SCHI-763) (SCHI-762 or permission of instructor)

Class 1, Lab 6, Credit 3 (offered every year) (W, S)

SCHO-730 **Chemical Toxicology**
Registration #1013-730
Xenobiotic mechanism, chemical carcinogenesis, drug-induced toxicology, environmental and genetic toxicology, teratology and bioassay/biometrics. (SCHO-433)

Class 3, Credit 3 (offered upon sufficient request)

SCHO-736 **Spectrometric Identification**
Registration #1013-736 **of Organic Compounds**
Theory and application of proton and carbon nuclear magnetic resonance, infrared, mass spectrometry, and ultraviolet spectra as applied to organic structure determination. (SCHO-433)

Class 4, Credit 4 (offered every year)

SCHO-737 **Advanced Organic Chemistry**
Registration #1013-737
Several of the following advanced topics in organic chemistry are covered: polyfunctional compounds, modern synthetic methods, stereochemistry, conformational analysis, free radical reactions, natural products, new synthetic reagents. (SCHO-433)

Class 4, Credit 4 (offered every year)

SCHO-739 **Advanced Organic Chemistry**
Registration #1013-739
Selected topics in physical organic chemistry including: techniques for elucidation of mechanism (kinetic, linear free, energy relationships, isotope effects), molecular orbital theory, electrocyclic reactions. (SCHO-433, SCHP-443)

Class 4, Credit 4 (offered every year)

SCHO-832 **Stereochemistry**
Registration #1013-832
Advanced treatment of steric relationships and stereoisomerism in organic compounds. (SCHO-433, SCHP-443)

Class 4, Credit 4 (offered upon sufficient request)

SCHO-833 **Heterocyclic Chemistry**
Registration #1013-833
This course will contain a comprehensive treatment of heterocyclic chemistry. Based on the concept of x-excessive and T-deficient ring systems, the student will be introduced to categorical similarities and differences among various heterocyclic systems. In addition, the course will explain the logical consistency of the numerous syntheses and relative reactivities of heterocyclic compounds as demonstrated by their chemical reactions and spectroscopic properties. These results of reactivities and synthetic studies are then applied to a number of commercially important heterocyclic compounds. (SCHO-433)

Class 4, Credit 4 (offered upon sufficient request)

SCHP-741 **Chemical Thermodynamics**
Registration #1014-741
A study of the basic fundamentals of thermodynamics and their use in deriving the interrelationships of thermodynamic functions. Thermodynamic properties of gases will be calculated based on spectroscopic data. (SCHP-443, SMAM-306)

Class 4, Credit 4 (offered alternate years)

SCHP-742 **Survey of Physical Chemistry**
Registration #1014-742
A study of the fundamental principles of physical chemistry for clinical chemistry and biotechnology students. Kinetic-molecular theory, quantum mechanics, spectroscopy, thermodynamics and kinetics are presented with applications to the life sciences. Not acceptable for BS in chemistry.

Class 3, Credit 3 (offered alternate years) (W)

SCHP-743 **Chemical Kinetics**
Registration #1014-743
Methods of investigating the kinetics of chemical reactions and the theories used to interpret their results. Focus on homogeneous reactions in gas and liquid phases. Discussions of references from recent chemical literature. (SCHP-443)

Class 4, Credit 4 (offered alternate years)

SCHP-744 **Quantum Mechanics**
Registration #1014-744
Matrix formulation of quantum mechanics; variation and perturbation methods, group theory molecular orbital energies of complex molecules, calculation of vibrational frequencies and selection rules for complex molecules. Emphasis on use of spectroscopy and quantum chemistry to obtain chemical information. (SCHP-442)

Class 4, Credit 4 (offered every year) (S, SR)

SCHP-747 **Principles of Magnetic Resonance**
Registration #1014-747
This course will consist of a series of lectures designed to introduce the principles of both nuclear magnetic resonance (NMR) and electron spin resonance spectroscopies, two of the" more popular of magnetic resonance spectroscopies. Modern applications, classical and quantum mechanical theory and instrumentation, both pulsed and continuous wave, of magnetic resonance spectroscopies are the general subject areas to be covered. A few of the specific topics to be covered are Fourier transform spectroscopy, magnetic resonance imaging, solid state NMR, spin relaxation, two dimensional NMR, resonance line shapes, laser magnetic resonance, magic angle spinning, and spectrometer design. (SCHP-443)

Class 4, Credit 4 (offered upon sufficient request)

Mathematics

SMAM-200 **Algebra**
Registration #1016-200
An algebra course including such topics as operations involving polynomials, algebraic fractions, factoring, exponents and radicals, solution of linear and quadratic equations, and graphing linear equations.

Class 4, Credit 4 (F, W)

SMAM-204 **College Algebra and Trigonometry**
Registration #1016-204
Topics include a review of the fundamentals of algebra; solution of linear, fractional and quadratic equations; functions and their graphs; polynomial, exponential, logarithmic and trigonometric functions; systems of linear equations. (2 years of high school algebra)

Class 4, Credit 4 (offered every year) (F, W, S)

SMAM-205, 206,207 **Introduction to Mathematics for Computing I, II, m**
Registration #1016-205, 206, 207
Topics in discrete mathematics, including logic, sets, relations, functions, combinatorics, graphs and trees, probability and queueing theory, with applications to computer technology.

Class 4, Credit 4 (205-F, S; 206-F, W; 207-S)

SMAM-210, 211 **Freshman Seminar**
Registration #1016-210, 211
210: Orientation program for entering applied statistics, applied mathematics and computational mathematics majors. Several 2-3 week modules introducing students to various non-traditional areas of mathematics; brief orientation to co-op.
211: A continuation of 210 including a four-week introduction to co-op with cover letter and resume writing. Additional mathematical and statistical topics will be discussed. A technical report is required.

Class 1, Credit 1 (offered every year) (210-F, 211-W)

SMAM-214, 215 **Introduction to Calculus I, II**
Registration #1016-214, 215
214: A non-rigorous introduction to the study of differential calculus. The following topics will be covered: functions and graphs, limits, continuity, the derivative and its significance, the algebra of derivatives, chain rule, related rates, maxima and minima. (SMAM-204 or equivalent)
215: A continuation of SMAM-214, dealing with an introduction to integral calculus. The following topics will be covered: definite integral, area, work and distance problems, volumes, fundamental theorem of calculus, approximation techniques, exponential and logarithmic functions, applications, introduction to differential equations. (SMAM-214)

Class 3, Credit 3 (offered every year) (214-F, W, S; 215-W, S)

SMAM-216, 217 **Mathematics of Business and Finance I, II**
Registration #1016-216, 217
A non-rigorous introduction to selected topics in matrix algebra, finite mathematics, and calculus used extensively in business and finance applications.
216: Demand, revenue and cost functions, breakeven analysis, matrix and vector operations and applications, solutions of systems of linear equations and inequalities, the simplex method of solving linear programming problems (with and without a computer). (SMAM-204 or equivalent)
217: Compound interest, annuities, depreciation, differentiation techniques, marginal cost and marginal revenue, elasticity of demand, applied max-min problems. (SMAM-216)

Class 3, Credit 3 (offered every year) (216-W, S; 217-S)

SMAM-220 **Fundamentals of Trigonometry**
Registration #1016-220
A study of the fundamental concepts in trigonometry including terminology, radian measures, trigonometric ratios, graphs of trigonometry, applications, and vectors.

Class 1, Credit 1 (offered every year) (S)

SMAM-225 **Algebra for Management Sciences**
Registration #1016-225
Introduction to functions including linear, quadratic, polynomial, exponential, logarithmic, and rational functions with applications to supply and demand, cost, revenue, and profit functions. Additional topics include matrices, linear programming, and mathematics of finance. (3 years of high school mathematics)

Class 4, Credit 4 (offered every year) (F, W, S)

SMAM-226 **Calculus for Management Science**
Registration #1016-226
A course stressing applications of calculus concepts to solving problems in business and economics. Topics include the limit concept; differentiation and integration of algebraic, logarithmic, exponential, and multivariate functions. (SMAM-225)

Class 4, Credit 4 (offered every year) (F, W, S)

SMAM-228 **Analytic Geometry**
Registration #1016-228
A course covering topics in analytical geometry such as slopes, lines, and conic sections. Also additional topics in polar coordinates, determinants, parametric equations, trigonometry, and two- and three-dimensional vectors. (SMAM-204)

Class 4, Credit 4 (W)

SMAM-251,252,253 **Calculus I, II, m**
Registration #1016-251, 252, 253
A standard first course in calculus intended for students majoring in mathematics, science or engineering with the major emphasis on understanding the concepts and using them to solve a variety of physical problems. The subject matter is divided as follows:
251: Two-dimensional analytic geometry, functions, limits, continuity, the derivative and its formulas, and applications of the derivative. (3 years of high school mathematics)
252: Anti-derivatives by various methods, the definite integral with applications to calculation of area, arc length, volumes of revolution, etc., transcendental functions, numerical integration. (SMAM-251)
253: Improper integrals, formal limits of sequences, infinite series, Taylor series, polar coordinates, conic sections. (SMAM-252)

Class 4, Credit 4 (offered every year) (F, W, S, SR)

SMAM-265 **Discrete Mathematics I**
Registration #1016-265
An introduction to discrete mathematics with applications in computer science and mathematics with an emphasis on proof techniques. It covers the basics of combinatorics, sets, functions, the natural numbers, and the integers modulo n. (Sophomore standing)

Class 4, Credit 4 (offered every year) (W, S)

SMAM-266 Discrete Mathematics II
Registration #1016-266
A continuation of discrete mathematics with applications in computer science and operations research. It covers finite state machines, relations, graphs, trees, optimization and matching. **NOTE: The course may not be taken for credit if credit is to be earned in SMAM-467.** (SMAM-265)

Class 4, Credit 4 (S)

SMAM-289 Contemporary
Registration #1016-289 Science: Mathematics
A basic survey of mathematical structures as well as an introduction to problem solving. Topics will be chosen from foundations of mathematics, algebra, topology, number theory, graph theory, probability and statistics. These structures will be examined as they occur naturally in modern settings. **NOTE: Not acceptable for science credit for College of Science majors.**

Class 4, Credit 4 (offered every year) (F, W, S)

SMAM-305 Calculus IV
Registration #1016-305
A continuation of SMAM-253 treating 3-dimensional analytic geometry and vector algebra, partial derivatives, multiple integrals and applications. (SMAM-253, or may be taken concurrendy)

Class 4, Credit 4 (offered every year) (F, W, S, SR)

SMAM-306 Differential Equations I
Registration #1016-306
This course provides an introduction to the study of ordinary differential equations and their application. Common first order equations and linear second order equations are solved. Method of undetermined coefficients, variation of parameters, linear independence and the Wronskian, numerical solution techniques of Runge Kutta, vibrating systems, LaPlace transforms. (SMAM-305)

Class 4, Credit 4 (offered every year) (F, W, S, SR)

SMAM-307 Differential Equations II
Registration #1016-307
Second quarter course in ordinary differential equations which includes power series solution to ordinary differential equations about ordinary and regular singular points; Legendre's equations; Bessel's equations; hypergeometric equation; Picard's theorem; solution of systems of linear differential equations; phase plane analysis and stability. (SMAM-306)

Class 4, Credit 4 (offered every year) (S)

SMAM-309 Elementary Statistics
Registration #1016-309
An introduction to elementary techniques of statistical description and inference. Topics include descriptive statistics, probability, estimation of parameters, hypothesis testing, and simple linear regression. The statistical software package MINITAB will be used to introduce students to the use of computers in statistical analysis. **NOTE: This course may not be taken for credit if credit is to be earned in SMAM-314 or 319.** (SMAM-204)

Class 4, Credit 4 (offered every year) (W, S, SR)

SMAM-314 Statistics
Registration #1016-314
Basic statistical concepts for engineers and scientists covering descriptive statistics, probability, and inference. Calculus will be used where appropriate and the software package MINITAB will be incorporated. **NOTE: This course may not be taken for credit if credit is to be earned in SMAM-309 or 319.** (SMAM-253)

Class 3, Credit 4 (offered on sufficient demand)

SMAM-318 Matrices and Boundary
Registration #1016-318 Value Problems
This course provides an introduction to matrix algebra and boundary value problems. Topics will include: matrix operations with applications to the solution of linear systems of algebraic equations, Fourier series, separation of variables, the heat equation, and the wave equation. **NOTE: This course may not be taken for credit if credit is to be earned in SMAM-338.** (SMAM-306)

Class 4, Credit 4 (offered every year) (S)

SMAM-319 Data Analysis
Registration #1016-319
This course will study the statistical principles of presenting and interpreting data. Topics covered will include: descriptive statistics and displays, random sampling, the normal distribution, confidence intervals, and hypothesis testing. The statistical software package MINITAB will be used to introduce students to the use of computers in statistical analysis. **NOTE: This course may not be taken for credit if credit is to be earned in SMAM-309 or 314.** (SMAM-204)

Class 4, Credit 4 (offered every year) (F, W)

SMAM-328 Engineering Mathematics
Registration #1016-328
This course provides an introduction to matrix algebra and vector calculus. Topics include: matrix operations with applications to the solution of linear systems of algebraic equations; gradient, divergence and curl; line and surface integrals; independence of path and the divergence theorem and Stoke's theorem with discussion of engineering applications. **NOTE: This course may not be taken for credit if credit is to be earned in SMAM-431.** (SMAM-306)

Class 4, Credit 4 (offered every year) (S, SR)

SMAM-338 Series Solutions for Differential
Registration #1016-338 Equations
The course includes: power series solutions of ordinary differential equations at ordinary and regular singular points; Fourier series and an introduction to their use in the solution of heat and wave equations.

Class 4, Credit 4 (offered every year) (S)

SMAM-351 Probability
Registration #1016-351
Discrete and continuous probability models; random variables; probability density and distribution functions; mathematical expectation; measures of central tendency and dispersion; central limit theorem. (Corequisite SMAM-305) (SMAM-253)

Class 4, Credit 4 (offered every year) (F, W, S, SR)

SMAM-352 Applied Statistics I
Registration #1016-352
Basic statistical concepts, sampling theory, hypothesis testing, confidence intervals and nonparametric methods. (SMAM-351)

Class 4, Credit 4 (offered every year) (W, S, SR)

SMAM-353 Applied Statistics II
Registration #1016-353
Topics in simple linear regression, an introduction to analysis of variance and the use of statistical software packages. (SMAM-352)

Class 4, Credit 4 (offered every year) (W, S, SR)

SMAM-354 **Introduction to Regression**
Registration #1016-354 **Analysis**
A study of regression techniques with applications to the type of problems encountered in real-world situations. Includes extensive use of statistical software. Topics include review of simple linear regression; residual analysis; multiple regression; matrix approach to regression; model selection procedures; various other models as time permits. (SMAM-353 and 431 or permission of instructor).

Class 4, Credit 4 (offered every year) (F, W)

SMAM-355 **Design of Experiments**
Registration #1016-355
A study of the design and analysis of experiments. Includes extensive use of statistical software. Topics include: single-factor analysis of variance; multiple comparisons and model validation; multifactor factorial designs; fixed, random, and mixed models; expected meansquare calculations; confounding, randomized block designs; Latin square designs; other designs and topics as time permits. (SMAM-353)

Class 4, Credit 4 (offered every year) (S, SR)

SMAM-365 **Combinatorial Mathematics**
Registration #1016-365
An introduction to the mathematical theory of combination, arrangement and enumeration of discrete structures. Topics include: enumeration; recursion; inclusion-exclusion; block design; general functions. (SMAM-265 or permission of instructor)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-399 **Co-op Seminar**
Registration #1016-399
Exploration of cooperative education opportunities; practice in writing letters of application; resume writing, and interviewing procedures.

Class 1, Credit 0 (offered every year) (W)

SMAM-411,412 **Real Variables**
Registration #1016-411, 412
411: An investigation and extension of the theoretical aspects of elementary calculus. Topics include: mathematical induction, real numbers, functions, limits, continuity, differentiation, l'Hopital's Rule, Taylor's theorem. (SMAM-305 and either SMAM-265 or permission of the instructor)
412: A continuation of SMAM411 which concentrates on integration; definition of integral-its existence and its properties, improper integrals, infinite series, sequences and power series. (SMAM-411)

Class 4, Credit 4 (offered every year) (411-F, W; 412-S, SR)

SMAM-420 **Complex Variables**
Registration #1016-420
A brief discussion of preliminaries leading to the concept of analyticity. Complex integration. Cauchy's integral theorem and integral formulas. Taylor and Laurent series. Residues. Real integrals by complex methods. (SMAM-305)

Class 4, Credit 4 (offered every year) (F, W)

SMAM-431 **Matrix Algebra**
Registration #1016-431
An introduction to the basic concepts of linear algebra, with an emphasis on matrix manipulation. Topics will include Gaussian elimination, matrix arithmetic, determinants, Cramer's rule, vector spaces, linear independence, basis, null and column space of a matrix, eigenvalues, and numerical linear algebra. Various applications will be interspersed throughout the course. (SMAM-306)

Class 4, Credit 4 (offered every year) (F, W, S, SR)

SMAM-432 **Linear Algebra**
Registration #1016-432
A further development of the basic concepts of linear algebra, including orthogonality. Topics will include similarity, linear transformations, diagonalization, inner products, Gram-Schmidt, quadratic forms, and various numerical techniques. Several applications of these ideas will also be presented. (SMAM-431)

Class 4, Credit 4 (offered every year) (F, W, SR)

SMAM-437 **Computer Methods in Applied**
Registration #1016-437 **Mathematics**
Emphasizes the formulation of problems to allow solutions by standardized techniques and library routines. A study of numerical techniques such as direct and iterative methods for solving linear and nonlinear equations and optimizing functions, discrete methods for boundary value problems, and other techniques for solving problems. Computer based homework. (SMAM-306, 431)

Class 4, Credit 4 (offered every year) (F, W, S)

SMAM-451,452 **Mathematical Statistics I, II**
Registration #1016-451,452
451: Brief review of basic probability concepts and distribution theory; mathematical properties of distributions needed for statistical inference; classical and Bayesian methods in estimation theory and mathematical justification of standard test procedures. (SMAM-352)
452: Chi-square test; Neyman-Pearson theory of hypothesis testing, nonparametric methods; sufficient statistics and further topics in statistical inference. (SMAM-451)

Class 4, Credit 4 (offered every year) (451-F, W; 452-S, SR)

SMAM-454 **Nonparametric Statistics**
Registration #1016-454
This course provides an in-depth study of inferential procedures that are valid under a wide range of shapes for the population distribution. Topics include: tests based on the binomial distribution, contingency tables, statistical inferences based on ranks, runs tests, and randomization methods. (SMAM-353)

Class 4, Credit 4 (offered every year) (F, W)

SMAM-457 **Research Sampling**
Registration #1016-457 **Techniques**
This course provides a basis for understanding the selection of the appropriate tools and techniques for analyzing survey data. Topics include: design of sample surveys, methods of data collection, a study of standard sampling methods, and a discussion of specific industrial sampling methods. (SMAM-353, 355)
Class 4, Credit 4 (offered upon sufficient request)

SMAM-458 **Statistical Quality Control**
Registration #1016-458
A review of probability models associated with control charts, control charts for continuous and discrete data, interpretation of control charts, acceptance sampling, O.C. curves, multiple and sequential sampling plans and some standard sampling plans. (SMAM-353)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-461 **Mathematical Modeling**
Registration #1016-461
The course will explore problem solving, formulation of the mathematical model from physical considerations, solution of the mathematical problem, testing the model and interpretation of results. Problems will be selected from the physical sciences, engineering and economics. (SMAM-306, 352, 431)

Class 4, Credit 4 (offered every year) (S, SR)

SMAM-465 **Linear Programming**
Registration #1016-465
A presentation of the general linear programming problem. A review of pertinent matrix theory, convex sets and systems of linear inequalities; the simplex method of solution; artificial bases; duality; parametric programming; and applications. (SMAM-432)

Class 4, Credit 4 (offered every year) (F, W)

SMAM-466 **Advanced Mathematical Programming**
Registration #1016-466
The optimization of functions of integers; theory and practice of branch and bound; implicit enumeration; cutting plane duality and related solution techniques; heuristics, and applications. (SMAM-465)

Class 4, Credit 4 (offered every year) (S)

SMAM-467 **Theory of Graphs and Networks**
Registration #1016-467
The basic theory of graphs and networks, including the concepts of circuits, trees, edge and vertex separability, planarity and vertex coloring and partitioning. There is a strong emphasis on applications to physical problems and on graph algorithms such as those for spanning trees, shortest paths, non-separable blocks and network flows. (SMAM-265)

Class 4, Credit 4 (offered every year) (F, W)

SMAM-469 **Mathematical Simulation**
Registration #1016-469
An introduction to computer simulation, simulation languages, model building and computer implementation, and mathematical analyses of simulation models and their results using techniques from probability and statistics. (SMAM-353,361; ICSP-241,242)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-501, 502 **Advanced Differential Equations**
Registration #1016-501, 502
A study of first order, linear higher order and systems of differential equations including such topics as existence, uniqueness, properties of solutions, Green's functions, Sturm-Liouville systems and boundary value problems. (SMAM-338)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-511, 512 **Numerical Analysis**
Registration #1016-511, 512
511: Numerical techniques for the solution of non-linear equations, interpolation, differentiation, integration, initial value problems. (SMAM-306, ICSA-220)
512: Continuation of 511 which treats systems of equations, eigenvalue problems, boundary value problems, splines, additional topics at the discretion of the instructor. (SMAM-511)

Class 4, Credit 4 (offered every year) (511-F, W; 512-S, SR)

SMAM-521,522 **Probability Theory**
Registration #1016-521, 522
Selected topics in applied probability and statistics to meet the needs and interest of the students. (SMAM-305, 352 or permission of instructor)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-524 **An Introduction to Time Series**
Registration #1016-524
A study of time series, auto-covariance functions and spectrum, integral representation of time series, linear filtering, estimation of spectrum, and multivariate time series prediction. (SMAM-353)

Class 3, Credit 3 (offered everyy e a r)(214-F,W,S;215-W,S)

SMAM-531, 532 **Abstract Algebra**
Registration #1016-531,532
531: A review of pertinent basic set theory and number theory. Groups, subgroups, cyclic and permutation groups, Lagrange's theorem, quotient groups, isomorphism theorems, applications to scientific problems. (SMAM-265, 432)
532: The basic theory of rings, integral domains, ideals and fields GF (pn), applications to coding theory or abstract vector spaces, function spaces, direct sums, applications to differential equations, and to scientific problems. (SMAM-531)

Class 4, Credit 4 (offered every year) (531-F, W; 532-S, SR)

SMAM-551 **Topics in Algebra**
Registration #1016-551
Topics in abstract algebra to be chosen by the instructor either to give the student an introduction to topics not taught in SMAM-531, 532 or to explore further the theory of groups, rings or fields. (Permission of instructor)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-552 **Topics in Analysis**
Registration #1016-552
Topics in analysis to be chosen by the instructor, either to introduce the student to topics not covered in SMAM-411, 412 or to explore further the topics covered there. (SMAM-265,412)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-555, 556 **Statistics Seminar I, II**
Registration #1016-555, 556
This course introduces the student to statistical situations not encountered in the previous course of study. Topics include: open-ended analysis of data, motivating use of statistical tools beyond the scope of previous courses, introduction to the statistical literature, development of statistical communication skills, and the pros and cons of statistical software packages. (SMAM-354, 355)

555: Class 4, Credit 4 (offered every year) (F, W)
556: Class 2, Credit 2 (offered every year) (S, SR)

SMAM-558 **Multivariate Analysis**
Registration #1016-558
A study of the multivariate normal distribution, statistical inference on multivariate data, multivariate analysis of covariance, canonical correlation, principal component analysis, and factor analysis. (SMAM-353, 431)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-559 **Special Topics: Mathematics**
Registration #1016-559
Course in which topics of special interest to a sufficiendy large group of students, and not covered in other courses, may be offered upon request.

Class variable, Credit variable (offered upon sufficient request)

SMAM-561,562 **Complex Analysis I, II**
Registration #1016-561, 562
Introduction to the theory of functions of one complex variable. Limits, continuity, differentiability; analytic functions; complex integration; Cauchy integral theorem and formula; sequences and series; Taylor and Laurent series; singularities; residues; analytic continuation; conformal mapping. A more in-depth study of analytic function theory than SMAM-420. (SMAM-411)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-565 **Game Theory**
Registration #1016-565
Introduction to the theory of games with solution techniques and applications. Topics include: game trees; matrix games; linear inequalities and programming; convex sets; the minimax theorem; n-person games; and Pareto optimality. (SMAM-431 or permission of instructor)

Class 4, Credit 4 (offered every year) (W, S)

SMAM-56S **Non-Linear Optimization Theory**
Registration #1016-566
The theory of optimization of non-linear functions of several real variables. Topics include: unconstrained optimization (Newton-Raphson, steepest ascent and gradient methods); constrained optimization (LaGrange multipliers, Kuhn-Tucker theorem, penalty concept, dynamic programming); and computational aspects (rates of convergence, computational complexity). (SMAM-305, 432)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-571,572 **Topology**
Registration #1016-571, 572
Metric spaces, topological spaces, separation axioms, compactness, connectedness, product spaces. (SMAM-412 or permission of instructor)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-581 **Introduction to Linear Models**
Registration #1016-581
Introduction to the theory of linear models. Least squares estimators and their properties, matrix formulation of linear regression theory, random vectors and random matrices, the normal distribution model and the Gauss-Markov theorem, variability and sums of squares, distribution theory, the general linear hypothesis test, confidence intervals and confidence regions. Special topics including geometric aspects of linear regression, orthogonal polynomials, weighted least squares, ANOVA models, etc., as time permits. (SMAM-431, 454)

Class 4, Credit 4 (offered upon sufficient request)

SMAM-599 **Independent Study: Math**
Registration #1016-599
Faculty directed study of appropriate topics on a tutorial basis. This course will generally be used to enable an individual to pursue studies of existing knowledge available in the literature and not taught in regularly offered courses.

Class variable, Credit variable (offered every year)

SMAM-620 **The Fourier Transform**
Registration #1016-620
This course provides an introduction to an important mathematical tool for the analysis of linear systems. Topics covered are: a Fourier integral theorem; the Fourier transform and its inverse; an introduction to generalized functions; the Dirac delta functions; evaluating transforms; convolution, serial products; the sampling theorem; Rayleigh, power convolution, and autocorrelation theorems; the discrete Fourier transform; the fast Fourier transform. (SMAM-420)

Class 4, Credit 4 (offered every year) (S)

SMAT-420 **Calculus for Technologists I**
Registration #1019-420
The first course in a calculus sequence covering essential concepts and manipulations. Topics include: limits, derivative, indefinite and definite integrals, and numerical approximation. Applications to physical problems are stressed. (SMAM-204)

Class 4, Credit 4 (offered every year) (F, W, SR)

SMAT-421 **Calculus for Technologists II**
Registration #1019-421
A continuation of SMAT-420. Topics covered in this course are applications of the integral calculus; differential and integral calculus of the transcendental functions; and basic techniques of integration with emphasis on applications to engineering technology problems. (SMAT-420 or equivalent)

Class 4, Credit 4 (offered every year) (F, W, S, SR)

SMAT-422 **Solutions of Engineering Problems**
Registration #1019-422
A continuation of SMAT-421. Course covers selected applied mathematics topics including: differential equations through second order linear, LaPlace transforms, Taylor series, and other appropriate topics. Emphasis is on the application of these topics to engineering technology problems. (SMAT-421 or equivalent)

Class 4, Credit 4 (offered every year) (F, W, S, SR)

Physics

SPSP-200 **Physics Orientation**
Registration #1017-200
An introduction to the nature and scope of physics for freshmen interested in physics as a profession. Topics include: (a) what is physics? (b) professional opportunities in physics; (c) the physics profession; (d) the literature of physics; (e) communicating in physics. Laboratory includes safety instruction; measurement and recording techniques; graphical analysis; error analysis and report writing. Each student will present a formal written or oral report on some topic of interest at the end of the course.

Class 1, Lab 2, Credit 2 (offered every year) (F)

SPSP-201, 202 **Physics in the Arts**
Registration #1017-201, 202
A study of topics from the world of art in which the underlying physical laws have influenced the art form and its development. A weekly laboratory will allow study of the relation of an art form to basic optical, mechanical, and electrical physics and in addition will provide time for the development of student projects. **NOTE: Not acceptable for science credit for College of Science majors.**

Class 2, Lab 2, Credit 3 (offered upon sufficient request) (W, S)

SPSP-211 **College Physics I**
Registration #1017-211
An elementary course in college physics. Mechanics: Newton's laws of motion, momentum, rotational motion, energy. (Competency in algebra, geometry, and trigonometry) (See SPSP-271 for lab)

Class 3, Credit 3 (offered every year) (F, W)

SPSP-212 **College Physics II**
Registration #1017-212
Heat and thermodynamics, fluids, wave motion, sound. (SPSP-211) (See SPSP-272 for lab)

Class 3, Credit 3 (offered every year) (W, S)

SPSP-213 **College Physics m**
Registration #1017-213
Geometrical and wave optics, electricity and circuits, magnetism, some elements of modern physics. (SPSP-211) (See SPSP-273 for lab)

Class 3, Credit 3 (offered every year) (F, S)

SPSP-271 **College Physics Lab I**
Registration #1017-271
This laboratory course includes experiments related to the principles and theories discussed in the corresponding lecture. (Credit or coregistration in SPSP-211)

Lab 2, Credit 1 (offered every year) (F, W)

SPSP-272 **College Physics Lab II**
Registration #1017-272
This laboratory course includes experiments related to the principles and theories discussed in corresopnding lectures. (Credit or coregistration in SPSP-212)

Lab 2, Credit 1 (offered every year) (W, S)

SPSP-273 College Physics Lab III
Registration #1017-273
This laboratory course includes experiments related to the principles and theories discussed in corresponding lectures. (Credit or coregistration in SPSP-213)

Lab 2, Credit 1 (offered every year) (F, S)

SPSP-289 Contemporary Science:
Registration #1017-289 Physics
Introductory science for non-science students. One or more topics such as astronomy, space exploration, relativity, nuclear energy, and lasers are discussed and explained simply, to give an appreciation of the significance of physics in our contemporary technological society. A minimum of mathematics is used. A laboratory or discussion option may be offered for small group meetings once a week, which reinforce the material given in demonstration lectures and audiovisual presentations. **NOTE: Not available for science credit for College of Science majors.**

Class 4, Credit 4 (F, W, S)

SPSP-300 Introduction to Semiconductor
Registration #1017-300 Device Physics
An introductory survey, using some calculus, of the physics underlying operation and manufacture of modern semiconductor devices used in integrated circuits and microcomputers. Review of classical physics, classical free-electron gas, atomic physics, molecular bonds and band theory, theory of metals, structure and properties of semiconductors and semiconductor devices. (SPSP-212, 213, 273; SMAT-422)

Class 4, Credit 4 (W, SR)

SPSP-311 University Physics I
Registration #1017-311
An intensive course in general physics, using calculus, for majors in the sciences and engineering. Mechanics; kinematics and dynamics of a particle and of a rigid body, work and energy, momentum and impulse, rotational motion, oscillatory motion, gravitation. (Credit or coregistration in SMAM-252) (See SPSP-371 for three-hour lab, SPSP-375 for two-hour lab)

Class 4, Credit 4 (offered every year) (F, W, S)

SPSP-312 University Physics H
Registration #1017-312
Fluids and elastic properties, heat and thermodynamics, wave motion, sound, geometrical and physical optics. (Credit or coregistration in SMAM-253) (SPSP-311) (See SPSP-372 for three-hour lab, SPSP-376 for two-hour lab)

Class 4, Credit 4 (offered every year) (F, W, S)

SPSP-313 University Physics m
Registration #1017-313
Electrostatics, Gauss's law, electric field and potential, dielectrics, dc circuits, magnetic fields, Ampere's law, Faraday's law, inductance and capacitance, magnetism in matter, ac series circuits. (Coregistration or credit in SMAM-253) (SPSP-311) (See SPSP-373 for three-hour lab, SPSP-377 for two-hour lab)

Class 4, Credit 4 (offered every year) (F, W, S)

SPSP-314 Introduction to Modern
Registration #1017-314 Physics
An introductory survey of modern physics at the sophomore level. Fundamentals of relativity, photons, interaction of radiation with matter, deBroglie waves, Bohr model, introduction to quantum mechanics, nuclear systematics, radioactivity, alpha, beta, and gamma decays, Q-values, nuclear fission, nuclear fusion. (SMAM-305; SPSP-312, 313)

Class 4, Credit 4 (offered every year) (F, W, S)

SPSP-315 Introduction to
Registration #1017-315 Semiconductor Physics
Kinedc theory of gases and transport phenomena; Drude's theory of metals; quantum mechanics of a particle in a box; atomic orbitals; band theory of metals, insulators, and impurity semiconductors; Fermi-Dirac distribution; equilibrium charge-carrier densities in metals, insulators, and semi-conductors; operation principles of diodes, bipolar junction transistors, and MOSFET's. (SMAM-306, SPSP-314)

Class 4, Credit 4 (offered every year) (W, S)

SPSP-319 Electrical Processes in Solids
Registration #1017-319
Introducdon to statistical mechanics; Planck's formula; transport equation; electronic properties of conductors and semiconductors; characteristics of metal-metal, metal-semiconductor, and pn junctions; operating principles of solid state devices; theory and application. (SPSP-315 and permission of instructor)

Class 4, Credit 4 (offered upon sufficient request) (S)

SPSP-321 Introduction to Laboratory
Registration #1017-321 Techniques
An introduction to equipment and procedures common to the physics research laboratory. The oscilloscope and ac circuit analysis, statistics, vacuum systems including vacuum pumps and gauges, the laboratory notebook, and writing for publication. (SPSP-312,313, 372, 373)

Class 3, Lab 3, Credit 4 (offered every year) (F, transfer students only; W)

SPSP-331 Introduction to Electricity and
Registration #1017-331 Electronics
Fundamentals of electricity, construction and measurements of electrical and electronic circuits encountered in a scientific laboratory. (Two quarters of college-level physics)

Class 3, Lab 3, Credit 4 (offered upon sufficient request) (S)

SPSP-341 Foundations of Scientific
Registration #1017-341 Thinking
Definition of science; historical perspective; ingredients of the scientific quest; the scientific method; scientific explanation, laws, theories, and hypotheses; the role of mathematics; probability and induction; science and other disciplines. (At least a year of basic sciences at the college level)

Class 2, Credit 2 (offered upon sufficient request) (F, W)

SPSP-351 Radiation Physics I
Registration #1017-351
Introductory modern physics emphasizing radiation phenomena. Atomic physics, nuclear physics, radioactivity, production of radionuclides, interaction of charged particles and neutrons with matter. (SPSP-213; competency in algebra, geometry, and trigonometry; SMAM-309 recommended)

Class 4, Lab 3, Credit 5 (offered every year) (F)

PSP-352 Radiation Physics II
Registration #1017-352
Interaction of x-rays and gamma-rays with matter. Radiation detectors; scintillation detectors, solid state detectors. Radionuclide imaging instrumentation. (SPSP-351)

Class 4, Lab 3, Credit 5 (offered every year) (W)

SPSP-353 Radiation Physics m
Registration #1017-353
Principles of radiation protection. Radiation protection instrumentation. Internal and external dose calculations. Practical radiation health physics. Introduction to electronics, including laboratory. (SPSP-352)

Class 4, Lab 3, Credit 5 (offered every year) (S)

SPSP-355 Radiation Protection
Registration #1017-355
Principles and practical aspects of radiation protection; calculation of external and internal radiation dose measurements. (Permission of instructor and one year of college-level "physics)

Class 3, Credit 3 (offered every year) (S)

SPSP-361 Ultrasonic Physics
Registration #1017-361
A course in the basic physics of ultrasound, covering ultrasonic wave generation and propagation, transducers, Doppler effect, reflection and refraction, biological effects, and applications of ultrasonic physics in medicine. (Permission of instructor and one year of college-level physics)

Class 4, Lab 3, Credit 5 (offered every year) (F)

SPSP-371 University Physics Lab I
Registration #1017-371
This laboratory course includes experiments related to the principles and theories discussed in the corresponding lectures. (Credit or coregistration in SPSP-311) (See SPSP-375 for a 2-hour lab)

Lab 3, Credit 1 (offered every year) (F, W, S)

SPSP-372 University Physics Lab II
Registration #1017-372
This laboratory course includes experiments related to the principles and theories discussed in the corresponding lectures. (Credit or coregistration in SPSP-312) (See SPSP-376 for a 2-hr lab)

Lab 3, Credit 1 (offered every year) (F, W, S)

SPSP-373 University Physics Lab m
Registration #1017-373
This laboratory course includes experiments related to the principles and theories discussed in the corresponding lectures. (Credit or coregistration in SPSP-313) (See SPSP-377 for a 2-hr lab)

Lab 3, Credit 1 (offered every year) (F, W, S)

SPSP-374 Modern Physics Laboratory
Registration #1017-374
Basic experiments representative of the experimental foundations of modern quantum physics, such as: photoelectric effect; Franck-Hertz experiment; X-ray diffraction; optical diffraction and interference; atomic spectroscopy; electron microscopy; nuclear spectroscopy; radioactive half-life; Millikan oil drop; blackbody radiation. Students enrolled in SPSP-315 may include experiments in semiconductor solid state physics. (SPSP-314)

Lab 3, Credit 1 (offered every year) (S)

SPSP-375 University Physics Lab I
Registration #1017-375
This laboratory course includes experiments related to the principles and theories discussed in the corresponding lectures. (Credit or coregistration in SPSP-311) (This course recommended for all students in the University Physics lectures who are not required to take a 3-hr lab)

Lab 2, Credit 1 (offered every year) (F, W, S)

SPSP-376 University Physics Lab II
Registration #1017-376
This laboratory course includes experiments related to the principles and theories discussed in the corresponding lectures. (Credit or coregistration in SPSP-312) (This course recommended for all students in the University lectures who are not required to take a 3-hr lab)

Lab 2, Credit 1 (offered every year) (F, W, S)

SPSP-377 University Physics Lab HI
Registration #1017-377
This laboratory course includes experiments related to the principles and theories discussed in the corresponding lectures. (Credit or coregistration in SPSP-313) (This course recommended for all students in the University Physics lectures who are not required to take a 3-hr lab)

Lab 2, Credit 1 (offered every year) (F, W, S)

SPSP-401,402 Intermediate Mechanics
Registration #1017-401, 402
Particle dynamics, systems of particles, motion of a rigid body, gravitational fields and potential, moving coordinate systems, generalized coordinates, Lagrange's equations, mechanics of continuous media. (SMAM-307, SPSP-312, 313)

Class 4, Credit 4 (offered every year) (401-F, 402-S)

SPSP-411,412 Electricity and Magnetism
Registration #1017-411, 412
Electric and magnetic fields using vector methods, Gauss's law, theory of dielectrics, Ampere's law and Faraday's law, vector potential, displacement current, Maxwell's equations, wave propagation in dielectrics and conductors; production and propagation of radiation. (SMAM-307; SPSP-312, 313)

Class 4, Credit 4 (offered every year) (411-F, 412-S)

SPSP-415 Thermal Physics
Registration #1017-415
Introduction to the principles of classical thermodynamics and kinetic theory. Equations of state, the First and Second Laws of Thermodynamics, entropy, thermodynamic potentials, applications of thermodynamics, and kinetic theory of gases. (SMAM-307; SPSP-312, 313)

Class 4, Credit 4 (offered every year) (F)

SPSP-421,422 Experimental Physics
Registration #1017-421,422
The elements of advanced laboratory work, including the importance of detailed experiment planning, are presented. The requirement of effective communication of results is also an integral part of the course. Experiments are chosen from any area of physics compatible with department facilities: optics, thin films, cryogenics, semiconductors, acoustics, nuclear, etc. (SPSP-314, 321, 431 plus coregistration or credit in any one of these: SPSP-401, 411, 415, 455)

Class 1, Lab 5, Credit 3 (offered every year) (421-F, 422-S)

SPSP-431 Electronic Measurements
Registration #1017-431
Laboratory course in electronic measurements and instrumentation, with theory and applications of discrete and integrated circuits in analog and digital electronics. (SPSP-313, 321)

Class 3, Lab 3, Credit 4 (offered every year) (S)

SPSP-432 Computer Interfacing to Laboratory
Registration #1017-432 Instrumentation
An introduction to microcomputer interfacing with associated laboratory exercises. Emphasis on the interface circuits and TTL logic design using an 8088 based microprocessor. Covers elementary logic circuits, computer architecture, assembly language programming, serial and parallel interfaces, A/D and D/A conversion, RS-232C, IEEE488, and other industry standards. (SPSP-331 or 431 or equivalent)

Class 3, Lab 3, Credit 4 (offered upon sufficient request) (F)

SPSP-455 Optical Physics
Registration #1017-455
Physical optics including interference, diffraction, and polarization. Brief introduction to modern optics. (SMAM-305; SPSP-312, 313)

Class 4, Credit 4 (offered every year) (F)

SPSP-480 **Theoretical Physics I**
Registration #1017-480
An introduction to mathematical topics necessary for a quantitative study of physical phenomena. Topics include: vector analysis including vector differentiation and integration, curvilinear coordinate systems and transformations from one orthogonal coordinate system to another, Fourier series and an introduction to Fourier integrals. Applications of these concepts to physics are presented. (SMAM-307, SPSP-312, 313)

Class 4, Credit 4 (offered every year) (S)

SPSP-501 **Theoretical Physics II**
Registration #1017-501
Application of advanced mathematical methods to physics. (SMAM-307, SPSP-480, plus coregistration or credit in SPSP-401 and 411)

Class 4, Credit 4 (offered every year) (F)

SPSP-521 **Advanced Experimental**
Registration #1017-521 **Physics**
Advanced laboratory experiments and projects in atomic physics, nuclear physics, or solid state physics. Special emphasis on experimental research techniques. (SMAM-307, SPSP-421)

Lab 6, Credit 2 (offered every year) (F)

SPSP-522 **Introduction to Quantum**
Registration #1017-522 **Mechanics**
A study of the concepts and mathematical structure of nonrelativistic quantum mechanics. Exact and approximate techniques for solving the Schroedinger equation are presented for various systems. (SPSP-315, 402, 455,480)

Class 4, Credit 4 (offered every year) (S)

SPSP-531 **Solid State Physics**
Registration #1017-531
The structure of solids and their thermal, mechanical, electrical and magnetic properties. (SPSP-315, 415, 480 and 522) (SPSP-501 is recommended)

Class 4, Credit 4 (offered every year) (F)

SPSP-541, 542,543 **Physics Research**
Registration #1017-541, 542, 543
Faculty-directed student projects or research usually involving laboratory work or theoretical calculations that could be considered as of an original nature. (Permission of instructor)

Class variable, Credit variable (offered every year)

SPSP-550, 551 **Physics Seminar**
Registration #1017-550, 551
Preparation and presentation of papers based on physics literature search. May include reports on student research projects. Special emphasis on the techniques of physics literature search and on the mechanics of preparation, organization, and presentation of technical papers. (Senior physics major or permission of instructor)

Class 1, Credit 1 (offered every year) (F, S)

SPSP-553 **Nuclear Physics**
Registration #1017-553
A study of the structure of the atomic nucleus as determined by experiments and theory. Description and quantum mechanical analysis of nuclear properties, radioactivity, and nuclear reactions. (SPSP-522)

Class 4, Credit 4 (offered on sufficient request) (F)

SPSP-559 **Special Topics: Physics**
Registration #1017-559
Advanced courses which are of current interest and/or logical continuations of the courses already being offered. These courses are structured as ordinary courses and have specified prerequisites, contact hours and examination procedures. Topics could include: introductory statistical mechanics; plasma physics; general relativity; linear integrated circuits; cryogenics; radio astronomy, history of physics; astrophysics; astronomy.

Class variable, Credit variable (offered upon sufficient request)

SPSP-599 **Independent Study: Physics**
Registration #1017-599
Faculty-directed study of appropriate topics on a tutorial basis. This course will generally be used to enable an individual to pursue studies of existing knowledge available in the literature.

Class variable, Credit variable (offered every year)

General Science

SSEG-621 **Building Scientific Apparatus**
Registration #1018-621 **Laboratory**
Basic skills associated with the construction of scientific laboratory apparatus, some of which is not commercially available, will be covered: machine shop skills, working with glass, vacuum line technology, optical spectrometer design, and instrument electronics. (Corequisite SCHA-620) (SCHP-441; SPSP-212, 213 or 312, 313; or permission of instructor)

Lab 4, Credit 1 (offered upon sufficient request)

Clinical Sciences

SCLG-205 **Introduction to Diagnostic Medical**
Registration #1026-205 **Imaging**
An entry-level exploration of the historical, professional and occupational development of medical imaging. Current uses and future trends will be discussed in the areas of radiography, computed tomography, magnetic resonance, nuclear medicine, and ultrasound imaging.

Class 2, Credit 2 (F, S)

SCLG-289 **Contemporary Science:**
Registration #1026-289 **Health Sciences**
This course will examine areas within the health field, including evolutionary structural development and future projections, with emphasis on methods of diagnostic testing, selected disease conditions and the utilization of computers.

Class 4, Credit 4 (W)

SCLG-301 **Medical Terminology**
Registration #1026-301
Emphasizes etymology, definition, pronunciation and correct utilization of medical terms which enables students to develop a vocabulary essential to the understanding of and communication with the various health areas in which allied health professionals will serve.

Class 3, Credit 3 (offered every year) (F, S)

SCLG-415 **Pathophysiology**
Registration #1026-415
This course combines knowledge of human physiology with disease processes, the etiology, pathological mechanisms, characteristic symptoms, clinical manifestations, diagnostic and therapeutic procedures of common diseases will be covered. Topics include cellular and tissue response to pathogenic agents, neoplasia, developmental disorders, disorders of body systems, and diseases of major organs. (SBIB-306)

Credit 4 (S)

SCLG-559 **Special Topics: Clinical**
Registration #1026-559 **Sciences**
Advanced courses which are of current interest and/or logical continuations of the courses already being offered. These courses are structured as ordinary courses and have specified prerequisites, contact hours and examination procedures.

Class variable, Credit variable (F, W, S)

SCLG-599 **Independent Study: Clinical**
Registration #1026-599 **Sciences**
Faculty directed study of appropriate topics on a tutorial basis. This course will be used to enable an individual to pursue studies of existing knowledge available in the literature.

Class variable, Credit variable (F, W, S)

SCLB-201 **Introduction to Biomedical**
Registration #1027-201 **Computing**
An introduction to the applications of computers in health care. Information concerning career opportunities and cooperative education will be provided.

Class 1, Credit 1 (offered every year)

SCLM-210 **Medical Technology Seminar**
Registration #1024-210
This course is designed to introduce the student to the profession of Medical Technology through a series of lectures which provide an overview of the major departments within the modern clinical laboratory. Historical perspectives, developmental aspects, and regulating standards of the Medical Technology profession will be discussed. Insights into the dynamics of the profession will be facilitated by informal discussions with interning students, practicing Medical Technologists, area sales representatives and members of the clinical sciences department.

Class 1, Credit 1 (F)

SCLM-350 **Special Topics in Medical**
Registration #1024-350 **Technology**
Topics related to the practice of medical technology are presented in a series of seminars. Each series is devoted to a specific aspect of the field and includes a discussion of contemporary issues affecting the practice of medical technology. (Third-year standing in MT program)

Class 1, Credit 1 (F, W, S)

SCLM-401 **Hematology/**
Registration #1024-401 **Immunohematology**
A study of the blood (erythrocytes, leukocytes, platelets, coagulation factors and blood group antigens). Descriptions of the cellular components of the blood in health and in disease. Cellular and immunological functions and' their inter-relationships. Hemostasis and coagulation mechanisms. Structures of antigens and antibodies and mechanisms of antigen-antibody reactions. Lab procedures demonstrate cell counting techniques, coagulation studies, antigen-antibody reactions and compatability testing of various blood groups. (SBIB-306 or permission of instructor)

Class 3, Lab 3, Credit 4 (S)

SCLM-405 **Diagnostic Bacteriology and**
Registration #1024-405 **Mycology**
Study of bacteria and fungi that cause human disease. Lecture and laboratory subjects include microorganism growth, isolation, identification, antibiotic sensitivity, and related human immunological and serological responses. (SBIB-404)

Class 3, Lab 3, Credit 4 (W)

SCLM-406 **Virology**
Registration #1024-406
Molecular biology, chemistry, epidemiology and clinical aspects of viruses; morphology, genetics, immunology, environmental effects; methods of isolation, cultivation, identification; assays. Human virus diseases. (One year of general biology)

Class 4, Credit 4 (offered upon sufficient request)

SCLM-412 **Parasitology**
Registration #1024-412
Ecology, structure, life cycle metabolism, pathology and control of human parasites. Insects, protozoa, nematodes, flukes and tapeworms of medical importance. Chemotherapy and immunology of human parasites. Emphasis on recognizing human parasites.

Class 3, Lab 3, Credit 4 (offered upon sufficient request)

SCLM-432 **Biology Laboratory**
Registration #1024-432 **Techniques I**
Principles of clinical laboratory instruments in the analysis of body fluids. This quarter stresses the principles of instrumental methods of analysis including visible and ultraviolet spectrophotometry, nephelometry, fluorometry, flame photometry, atomic absorption spectrophotometry, chromatography, electrophoresis, osmometry, radiation counters, and automated chemical analyzers. (SCHG-217 or equivalent, SBIB-306)

Class 2, Lab 6, Credit 4 (F, W)

SCLM-433 **Biology Laboratory**
Registration #1024-433 **Techniques II**
Principles of clinical chemistry in the analysis of the chemical component of body fluids. This quarter stresses the basic chemistries underlying the classical methodologies and relates them to the disease state. Topics include; liver function tests, renal function tests, carbohydrates, electrolytes, acid base balance, enzymes, lipids, endocrine function tests, drug analysis, and statistical quality control. (SCHG-217 or equivalent, SBIB-306)

Class 2, Lab 6, Credit 4 (S)

SCLN-401 **Introduction to Clinical**
Registration #1025-401 **Nuclear Medicine**
A combination lecture/laboratory course introducing clinical aspects of Nuclear Medicine. Hospital organization is presented as well as the relationship of nuclear medicine services to other hospital services. Laboratories in affiliated hospitals are correlated with lectures on nuclear medicine technology, patient care and emergency procedures. (Fourth-year standing in NMT program)

Credit 4 (F)

SCLN-402 **Nuclear Medicine**
Registration #1025-402 **Procedures-Central Nervous System**
A combination lecture/practicum course. Lectures are given on specific imaging procedures involving structures in the central nervous system. Physiology and anatomy, medical indications, fundamental principles, technique and scan interpretation are covered. Students observe and perform these procedures in the clinical setting. (Fourth-year standing in NMT program)

Credit 1 (F)

SCLN-502 **Nuclear Medicine**
Registration #1025-502 **Procedures-Skeletal System**
A combination lecture/practicum course. Lectures are given on specific imaging procedures involving structures in the skeletal system. Physiology and anatomy, medical indications, fundamental principles, technique and scan interpretation are covered. Students observe and perform these procedures in the clinical setting. (Fourth-year standing in NMT program)

Credit 1 (F)

SCLN-503 **Nuclear Medicine Procedures-**
Registration #1025-503 **Respiratory System**
A combination lecture/practicum course. Lectures are given on specific imaging procedures involving structures in the respiratory system. Physiology and anatomy, medical indications, fundamental principles, technique and scan interpretation are covered. Students observe and perform these procedures in the clinical setting. (Fourth-year standing in NMT program)

Credit 1 (F)

SCLN-510 Nuclear Medicine Procedures-
Registration #1025-510 Urinary System
A combination lecture/practicum course. Lectures are given on specific imaging procedures involving structures in the urinary system. Physiology and anatomy, medical indications, fundamental principles, technique and scan interpretation are covered. Students observe and perform these procedures in the clinical setting. (Fourth-year standing in NMT program)

Credit 1 (F)

SCLN-511 Nuclear Medicine Procedures-
Registration #1025-511 Endocrine System
A combination lecture/practicum course. Lectures are given on specific imaging procedures involving structures in the endocrine system. Physiology and anatomy, medical indications, fundamental principles, technique and scan interpretation are covered. Students observe and perform these procedures in the clinical setting. (Fourth-year standing in NMT program)

Credit 2 (W)

SCLN-512 Nuclear Medicine Procedures-
Registration #1025-512 Cardiovascular System
A combination lecture/practicum course. Lectures are given on specific imaging procedures involving structures in the cardiovascular system. Physiology and anatomy, medical indications, fundamental principles, technique and scan interpretation are covered. Students observe and perform these procedures in the clinical setting. (Fourth-year standing in NMT program)

Credit 2 (W)

SCLN-513 Nuclear Medicine Procedures-
Registration #1025-513 Digestive System
A combination lecture/practicum course. Lectures are given on specific imaging procedures involving structures in the digestive system. Physiology and anatomy, medical indications, fundamental principles, technique and scan interpretation are covered. Students observe and perform these procedures in the clinical setting. (Fourth-year standing in NMT program)

Credit 2 (S)

SCLN-514 Nuclear Medicine
Registration #1025-514 Procedures-Special Studies
A combination lecture/practicum course. Lectures are given on specific imaging procedures involving special studies. Physiology and anatomy, medical indications, fundamental principles, technique and scan interpretation are covered. Students observe and perform these procedures in the clinical setting. (Fourth-year standing in NMT program)

Credit 1 (S)

SCLN-515 Nuclear Medicine
Registration #1025-515 Procedures-Hematological and In Vitro Studies
This course covers the basic procedures utilized in nuclear medicine for the evaluation of patients with hematologic disorders. Medical indications, fundamental principles, technique, data calculations and test interpretation are covered for each procedure discussed. (Fourth-year standing in NMT program)

Credit 1 (S)

SCLN-516 Instrumentation and
Registration #1025-516 Computers in Nuclear Medicine
A combination lecture/practicum course covering the various nuclear instrumentation found in the clinical setting. The lectures provide knowledge of the function and characteristics of the basic components of any scintillation detection system necessary to understand its applications in nuclear medicine. Lectures are reinforced through clinical practicums in which the student operates the equipment. Collimation, quality control, computer systems and data processing are covered. (Fourth-year standing in NMT program)

Credit 2 (W)

SCLN-517 Radiochemistry and
Registration #1025-517 Radiopharmacology
A combination lecture/lab course covering the production and use of radioisotopes in medicine. Radiopharmaceutical compounding, quality control procedures, dose calibration, and licensing regulations regarding the handling and use of radiopharmaceuticals are covered. (Fourth-year standing in NMT program)

Credit **2** (W)

SCLN-518 Radionuclide Therapy
Registration #1025-518
A study of the application of radionuclides in the treatment of disease and the study of the biologic changes which occur following irradiation. (Fourth-year standing in NMT program)

Credit 1 (W)

SCLN-519 Radiation Health Safety
Registration #1025-519
A course designed to familiarize the student with the daily routine for safe handling of radioactive materials. Radiation protection, licensing regulations, decontamination procedures, waste disposal and area surveys are covered. (Fourth-year standing in NMT program)

Credit 2 (S)

SCLN-520 Radioassay
Registration #1025-520
A combination lecture/practicum course in RIA. Topics include theory and basic principles, instrumentation, types of assays performed, and quality control. Commonly encountered pitfalls, current RIA developments and the diagnostic meaning of several tests are covered. (Fourth-year standing in NMT program)

Credit **4** (S)

SCLN-521 Review in Nuclear Medicine
Registration #1025-521
Discussion of all aspects of nuclear medicine covered during the clinical internship including preparation for the national certification exams in nuclear medicine technology. (Fourth-year standing in NMT program)

Credit **2** (S)

SCLN-522 Clinical Nuclear Medicine I
Registration #1025-522
A clinical practicum which gives the student the opportunity to learn and master nuclear medicine procedures through technical and practical experience. Each student is assigned a particular combination of three hospitals and trains approximately four months in each. Students work with patients under the supervision of physicians and technologists on the hospital staff. Student progress and performance is monitored by the RIT nuclear medicine technology clinical coordinator who makes periodic visits to the hospital department. (Fourth-year standing in NMT program)

Credit 7 (F)

SCLN-523 Clinical Nuclear Medicine II
Registration #1025-523
Continuation of Clinical Nuclear Medicine I. (Fourth-year standing in NMT program)

Credit 7 (W)

SCLN-524 Clinical Nuclear Medicine III
Registration #1025-524
Continuation of Clinical Nuclear Medicine II. (Fourth-year standing in NMT program)

Credit 7 (S)

SCLS-412 Ultrasonic Cross-Sectional Anatomy
Registration #1030-412
Basic cross-sectional anatomy of the head, neck, abdomen, and pelvis. Emphasis is placed on sonographic correlation of anatomical structures. Course is self-paced within each assigned section. Students draw and label cross-sections using the cadaver slices as guides. (SBIB-305, 306 or permission of instructor)

Class 4, Credit 4 (W)

SCLS-413 Ultrasound Instrumentation
Registration #1030-413
Principles and fundamentals of diagnostic ultrasound instrumentation. Application of ultrasonic physics to ultrasound scanning techniques will also be discussed. Laboratory will stress the development of scanning techniques and use of instrument controls.

Class 4, Credit 4 (S)

SCLS-551 Introduction to Clinical Ultrasound
Registration #1030-551
A combined lecture/laboratory course introducing clinical concepts of diagnostic medical sonography. Topics include both clinical and didactic applications of ultrasound. (Fourth-year standing in the ultrasound program)

Credit 5 (F)

SCLS-552 Introduction to Obstetrical Ultrasound
Registration #1030-552
This course will equip the student with the practical skills and clinical knowledge necessary to perform basic diagnostic obstetrical ultrasound scans. Image production, recognition, and acceptability are stressed. This course provides classroom, simulation laboratory, and clinical instruction in basic obstetrical ultrasound. Examination protocols will be outlined. Review of teaching files and discussion of scanning techniques will be addressed. This is an internship course. Completion of a clinical practicum is required. (SCLS-551, fourth-year standing in the ultrasound program)

Credit 5 (F, W, S)

SCLS-553 Introduction to Gynecologic Ultrasound
Registration #1030-553
This course will equip the student with the practical skills and clinical knowledge necessary to perform basic gynecologic ultrasound scans. Image production, recognition, and acceptability are stressed. Examination protocols will be outlined. This course provides classroom, simulation laboratory, and clinical instruction in techniques for competency in gynecologic ultrasound. Instruction includes review of teaching files. Completion of a clinical practicum is required. (SCLS-551, fourth-year standing in the ultrasound program)

Credit 5 (F,W,S)

SCLS-554 Advanced Obstetrical Ultrasound
Registration #1030-554
This course is a continuation of SCLS-552 and will equip the student with the practical skills and clinical knowledge necessary to perform advanced diagnostic obstetrical ultrasound scans. Image production, recognition, and acceptability are stressed. This course provides classroom, simulation laboratory, and clinical instruction in advanced obstetrical ultrasound. Examination protocols will be outlined. Review of teaching files and discussion of scanning techniques will be addressed. This is an internship course. Completion of a clinical scanning practicum is required. (SCLS-552, fourth-year standing in the ultrasound program)

Credit 5 (F, W, S)

SCLS-555 Advanced Gynecologic Ultrasound
Registration #1030-555
This course is a continuation of SCLS-553 and will equip the student with the practical skills and clinical knowledge necessary to perform advanced gynecological ultrasound scans. Image production, recognition, and acceptability are stressed. Examination protocols will be outlined. This course provides classroom, simulation laboratory, and clinical instruction in advanced gynecologic ultrasound. Instruction includes the review of teaching files. This is an internship course. Completion of a clinical practicum is required. (SCLS-553, fourth-year standing in the ultrasound program)

Credit 5 (F, W, S)

SCLS-556 Introduction to Abdominal Ultrasound I
Registration #1030-556
This course will equip the student with the practical skills and clinical knowledge necessary to perform basic abdominal ultrasound scans. Image production, recognition, and acceptability are stressed. This course provides classroom, simulation laboratory, and clinical instruction in basic abdominal ultrasound procedures. Examination protocols will be outlined. Review of teaching files and discussion of scanning techniques will be addressed. This is an internship course. Completion of a clinical practicum is required. (SCLS-551, fourth-year standing in the ultrasound program)

Credit 6 (F,W,S)

SCLS-557 Introduction to Abdominal Ultrasound II
Registration #1030-557
This course will equip the student with the practical skills and clinical knowledge necessary to perform basic abdominal ultrasound scans. Image production, recognition, and acceptability are stressed. The course provides classroom, simulation laboratory, and clinical instruction in basic abdominal ultrasound procedures. Examination protocols will be outlined. Review of teaching files and discussion of scanning techniques will be addressed. This is an internship course. Completion of a clinical practicum is required. (SCLS-556, fourth-year standing in the ultrasound program)

Credit 7 (F, W, S)

SCLS-558 Advanced Abdominal Ultrasound
Registration #1030-558
This course will equip the student with the practical skills and clinical knowledge necessary to perform basic abdominal and small parts ultrasound scans. Image production, recognition, and acceptability are stressed. This course provides classroom, simulation laboratory, and clinical instruction in basic abdominal ultrasound procedures. Examination protocols will be outlined. Review of teaching files and discussion of scanning techniques will be addressed. This is an internship course. Completion of a clinical practicum is required. (SCLS-557, fourth-year standing in the ultrasound program)

Credit 7 (F, W, S)

SCLS-560 Seminar in Ultrasound I
Registration #1030-560
Development of synthesis and presentation skills related to diagnostic imaging through case study presentations. Emphasis placed on correlation of patient history, physical findings, pathology, and sonographic examination. This is an internship course. (Permission of instructor)

Class 1, Credit variable (W, S)

SCLS-561 Seminar in Ultrasound II
Registration #1030-561
Continued development of synthesis and presentation skills. Emphasis will be on written and oral skills required to convey diagnostic information related to imaging procedures. This is an internship course. (Permission of instructor)

Class 2, Credit 2 (S)

Graduate Courses

Clinical Chemistry

SCLC-705 Mechanisms of Disease
Registration #1023-705
Following a brief review of normal physiology, emphasis will be on aspects of the development and reversal of functional abnormalities in disease states. Cellular damage will be integrated with organ failure and multi-organ systemic disease and healing.

Class 4, Credit 4 (offered every other year)

SCLC-712 Statistics and Quality Control
Registration #1023-712
The principles of statistics as applied to biomedical research as well as clinical laboratory analysis will be studied. Using a problem-oriented approach, probability, normal values, analysis of variance and quality control as well as the relationship of these procedures to patient care will be studied.

Class 3, Credit 3 (S)

SCLC-722 Clinical Laboratory Computer
Registration #1023-722 Applications
The basic concepts of data processing, as well as the design, evaluation and utilization of computer systems in both hospitals and clinical laboratories, will be studied. The legal aspects of biomedical data processing as well as instrument interfacing will also be studied.

Class 3, Credit 3 (offered every other year)

SCLC-820 Advanced Clinical
Registration #1023-820 Chemistry I
Toxicology, therapeutic drug monitoring, electrolytes, acid-base, vitamins, oncology, hepatitis, coagulation, and various standard methods. (Permission of instructor)

Class 4, Credit 4 (F)

SCLC-821 Advanced Clinical
Registration #1023-821 Chemistry II
Proteins, enzymes, hemoglobins, iron, renal functions, lipids, quality control, automation, and method selection. (Permission of instructor)

Class 4, Credit 4 (S)

SCLC-822 Advanced Clinical
Registration #1023-822 Chemistry m
Radioimmunoassay, hormones, fetal-placement unit, integration of laboratory data. (Permission of instructor)

Class 4, Credit 4 (offered every other year)

SCLC-870 Clinical Chemistry Seminar
Registration #1023-870

Credit 1

SCLC-872 Special Topics in Clinical
Registration #1023-872 Chemistry
In response to student and/or faculty interest, special courses which are of current interest and/or logical continuations of regular courses will be presented. These courses will be structured as ordinary courses with specified prerequisites, contact hours and examinations.

Class variable, Credit variable (offered upon sufficient request)

SCLC-877 External Clinical Chemistry
Registration #1023-877 Research
Research carried out in a laboratory outside of the College of Science. Prior to the initiation of external research, a proposal from the student as well as a commitment of support and direction from the laboratory are evaluated for determination of credit to be awarded.

Credit variable

SCLC-879 Clinical Chemistry Research
Registration #1023-879
Research carried out in College of Science laboratories under the direction of RIT faculty members. The amount of credit awarded for such projects is determined after evaluation of a research proposal.

Credit variable 1-16

SCLC-899 Independent Study
Registration #1023-899
Individual projects or studies carried out under the direction of a faculty member. Study objectives and design are developed through faculty-student interaction with evaluation and credit to be awarded determined after review of a study proposal.

Credit variable

Materials Science and Engineering

SESM-701 Introduction to Materials
Registration #1028-701 Science
The course provides an understanding of the relationship between structure and properties for development of new materials. Topics include: atomic and crystal structure, crystalline defects, diffusion theories, strengthening mechanisms, ferrous alloys, cast irons. Structure of ceramic and polymeric materials and corrosion principles. (Graduate standing or permission of instructor)

Class 4, Credit 4 (offered every year)

SESM-702 Introduction to Polymer
Registration #1028-702 Science
A study of the chemical nature of plastics detailing the relationships between polymerization conditions, structure and properties in both the solid and fluid states. (SESM-701 or equivalent)

Class 4, Credit 4 (offered every year)

SESM-703 Solid State Science
Registration #1028-703
This course will survey topics in the physics of solids. Included in these will be crystal symmetry, structure, and binding; mechanical, thermal, and electrical properties of insulators, semiconductors, and conductors including band theory. (SESM-704 or equivalent)

Class 4, Credit 4 (offered every year)

SESM-704 Introductory Theoretical
Registration #1028-704 Methods
Treatment of waves and fields; selected topics of interest in electrodynamics and fluid mechanics; statistical mechanics; Maxwell-Boltzmann, Bose Einstein, and Fermi-Dirac distributions and their applications. (SESM-701 or equivalent)

Class 4, Credit 4 (offered every year)

SESM-705 Introductory Experimental
Registration #1028-705 Techniques
The course introduces the student to laboratory equipment for hardness testing, impact testing, tensile testing, x-ray diffraction, and thermal treatment of metallic materials. Experiments illustrating the characterization of high molecular weight organic polymers will be conducted. (SESM-702 or equivalent)

Class variable, Lab variable, Credit 4 (offered every year)

SESM-706 Experimental Techniques
Registration #1028-706
Production of thin films of metals and dielectrics by physical vapor deposition. Lectures cover vacuum systems, evaporation sputtering, nucleation and growth of thin films, analysis and characterization of thin films, and application of thin films. Laboratories cover use of vacuum systems in evaporation and sputtering and some methods of characterizing the thin films thus produced. (SESM-701 or equivalent)

Class variable, Lab variable, Credit 4

SESM-707 **Experimental Techniques**
Registration #1028-707
The course includes a detailed study of scanning electron microscopy and modern applications in microelectronic engineering. (SESM-701 or equivalent)

Class variable, Lab variable, Credit 4

SESM-708 **Experimental Techniques**
Registration #1028-708
The course is designed to provide an in-depth integrated approach to the analysis, investigation and development of materials, concentrating on specific types or classes. (SESM-701 or equivalent)

Class variable, Lab variable, Credit 4

SESM-710 **Material Properties and**
Registration #1028-710 **Selection I**
A study of the principles of material behavior as applied to design. Application of materials according to these principles is stressed. Ferrous, nonferrous and nonmetallic materials are considered.

Class 4, Credit 4

SESM-711 **Material Properties and**
Registration #1028-711 **Selection H**
Mechanical properties of metallic polymeric materials; application and selection of such materials based on strength, fatigue, impact, creep, processing, and economy. (SESM-710)

Class 4, Credit 4

SESM-714 **Ceramics and Glass**
Registration #1028-714
Topics covered will include the structure and properties of glass, applied areas such as glass melting and processing, and various technological applications of glass. (SESM-701 or equivalent)

Class 4, Credit 4

SESM-717 **Materials Degradation**
Registration #1028-717 **Corrosion**
This course introduces the student to the basic electrochemical nature of corrosion and considers the various factors which influence the rate of corrosion in a variety of environments. Various means of controlling corrosion are considered. (SESM-701 or equivalent)
Class 4, Credit 4

SESM-720 **Organic Polymers**
Registration #1028-720
This course is designed to meet the needs of students in the area of organic chemistry related to synthesis, polymerization mechanism, structures, stereochemistry and reactions of organic polymers and their industrial usage. (SESM-702 or equivalent)

Class 4, Credit 4

SESM-721 **Physical Chemistry of**
Registration #1028-721 **Polymers**
A study of the theoretical and experimental methods available for designing plastics products and selecting appropriate materials, with special emphasis on the interrelationships between materials, product design, tooling construction and manufacturing producibility. (SESM-702 or equivalent)

Class 4, Credit 4

SESM-722 **Polymer Processing**
Registration #1028-722
A study of the basic principles and methods involved in the technology of processing polymeric materials, including treatment of heat transfer, mass transfer, mixing and shaping or molding of these materials.

Class 2, Credit 2 (S)

SESM-730 **Optical Properties**
Registration #1028-730 **Materials**
Fundamentals of geometrical and physical optics; interaction of radiation with matter, dielectrics and thin films; introduction to electro-optic and acousto-optic effects. (SESM-701 or equivalent)

Class 4, Credit 4

SESM-733 **Electrical and Magnetic**
Registration #1028-733 **Properties of Materials**
Band structures of pure and doped solids and solid compounds, transport phenomena, semiconduction, optical properties, galvanomagnetic and magneto-optic effects. (SESM-701 or equivalent)

Class 4, Credit 4

SESM-734 **Advanced Optics**
Registration #1028-734
Lasers: theory, types and construction; optics of metals; multilayer dielectrics; electro- and acousto-optic modulators and deflectors; optical detectors. (SESM-730 or equivalent)

Class 4, Credit 4

SESM-736 **Amorphous and**
Registration #1028-736 **Semicrystalline Materials**
Electrical, thermal, and optical properties of amorphous materials; models of conduction. (SESM-703 or equivalent)

Class 4, Credit 4

SESM-740 **Nuclear Science and**
Registration #1028-740 **Engineering**
Systemics of the atomic nuclei, radioactivity, nuclear reactions, fission, nuclear reactor principles, designs, materials and safety. (Permission of instructor)

Class 4, Credit 4

SESM-760 **Plasma Science**
Registration #1028-760
An introduction to plasma science; a study of the basic phenomena and application of plasma to etching, deposition, polymerization, plasma production of materials, analytical emission spectroscopy and atmospheric science. (SESM-701 or equivalent)

Class 4, Credit 4

SESM-770 **Physics and Chemistry**
Registration #1028-770 **of I. C. Processing**
Study of the various processing steps used in integrated circuit fabrication technology with special emphasis on diffusion, thermal oxidation, ion implantation and plasma assisted deposition and etching processes. Process modelling by using SUPREM. (Permission of instructor)

Class 4, Credit 4

SESM-800 **Special Topics**
Registration #1028-800
In addition to in-depth study of any of the courses listed under Elective Courses, special topics may be selected from such areas as elastomers, organometallics, radiation damage, processing of materials, superconductivity, etc. (Permission of instructor)

Class variable, Credit 4

SESM-879 **Research and Thesis**
Registration #1028-879 **Guidance**
A project involving research on a topic in materials science and engineering carried out either on campus or off campus under the industrial internship option. An oral examination and written thesis are required.

Credit 5 (F, W, S)

SESM-890 **Seminar**
Registration #1028-890
This course is required for completion of the program and will involve a one-hour presentation on some topic in materials science and engineering.

Class variable, Credit 1 (offered every year)

SESM-899 **Independent Study**
Registration #1028-899
This course number should be used by students wishing to study a topic on an independent study basis. (Permission of instructor)

Credit variable

National Technical Institute for the Deaf

Department of Support Service Education

Interpreting

NITP-200 **Sign Vocabulary Development**
Registration #0850-200
This course affords students the opportunity to develop, expand and refine sign vocabulary skills that prepare them for future courses in interpreting. Vocabulary introduced will include at least 300 signs.

Class 1, Lab 1, Credit 1

NITP-203 **American Sign Language I**
Registration #0850-203
Students will be able to generate and accurately produce ASL classifiers and ASL idioms, recognize and accurately produce non-manual grammatical markers, use appropriate body/facial expressions, apply grammatical features of ASL, and manipulate sign utilization to vary meaning. (CHGD-0234-211, 212)

Class 2, Lab 2, Credit 3 (offered annually)

NITP-204 **American Sign Language**
Registration #0850-204 **Interpreting I**
Students apply the skills and principles learned in Principles of American Sign Language. The student will practice interpreting from English to American Sign Language (ASL). Practice will include interpreting both live talent and audiotapes. The speed of the spoken message will be between 80-111 words per minute. (NITP-203)

Class 3, Lab 2, Credit 3 (offered annually)

NITP-205 **American Sign Language**
Registration #0850-205 **Interpreting II**
The course is built around a series of advanced vocabularies necessary for interpreting in the community and in educational environments. Materials are structured so that students progressively increase transmission skills from 80 to 120 words per minute. Students' skills in American Sign Language (ASL) will be enhanced with ongoing critiques. (NITP-204)

Class 3, Credit 3 (Elective)

NTTP-206 **American Sign Language II**
Registration #0850-206
This course develops conversational fluency in American Sign Language. Students incorporate appropriate use of ASL classifiers, non-manual grammatical markers, and grammatical features of ASL in a conversational setting. This is a required course. (NITP-203)

Class 2, Lab 2, Credit 3 (offered annually)

NITP-210 **Fingerspelling and Number**
Registration #0850-210 **Comprehension**
Students improve their ability to comprehend fingerspelled words and manually signed numbers within messages signed at a conversational rate of speed. Instructional activities include games, drills, and voice interpreting in a lecture/lab format.

Lab 6, Credit 3 (F, W, S)

NITP-211 **Voice Interpreting I**
Registration #0850-211
This course will increase the student's ability to receive the spoken and signed messages of hearing-impaired people. It also refines students' ability to use vocal modulation to prepare for the voice interpreting task. This is a self-paced lab course. Students learn by viewing videotapes and completing a series of exercises. The videotapes contain hearing-impaired people communicating orally, in Signed English or in ASL. (NITP-210)

Class 2, Lab 2, Credit 3 (W)

NITP-212 **Voice Interpreting II**
Registration #0850-212
This course develops the student's ability to generate a spoken English equivalent while viewing/listening to a hearing-impaired person's signed/spoken message. This is a self-paced lab course. (NITP-211,331)

Class 1, Lab 4, Credit 3 (F)

NITP-213 **Voice Interpreting HI**
Registration #0850-213
This course continues development of the voicing task. More complex videotaped samples of signed/spoken messages of hearing-impaired persons are delivered at a faster rate than those in Voice I and II. This is a self-paced lab course. (NITP-212)

Class 3, Credit 3 (F,W)

NITP-251, 252 **Aspects and Issues of**
Registration #0850-251, 252 **Deafness I, II**
The student learns the communication and psycho-social/cultural aspects of deafness through panels, discussions, readings, and field trips. (NITP-251, no prerequisite; NITP-252, prerequisite, NITP-251)

Class 3, Credit 3 (offered annually)

NITP-261 **Theory and Practice of**
Registration #0850-261 **Interpreting I**
This course addresses the current theory and practice of the profession of interpreting. Topic areas include: (1) general communication principles of their application to the interpreting task; (2) the history of the profession of interpreting, (3) different types of interpreting and related terminology; (4) general skills required in interpreting and current applications by professional interpreters; (5) overview of the professional code of ethics and its rationale; (6) populations served by interpreters, e.g., hearing-impaired speechreaders, deaf/blind individuals, multiple handicapped individuals, etc; (7) resources available to students related to interpreting and mainstreaming, (8) current issues facing the profession, i.e., multiple roles, mainstreaming specialists.

Class 3, Credit 3 (offered annually)

NITP-262 **Theory and Practice of**
Registration #0850-262 **Interpreting II**
Students use a communication process model to acquire a theoretical base for the interpreting task. Addressed are the linguistic principles associated with sign language and the interpreting task, and skills in positioning and lighting. These courses include lectures and student participation in small and large group activities. (NITP-261)

Class 3, Credit 3 (offered annually)

NITP-271, 372 **The Professional Interpreter I, II**
Registration #0850-271, 372
Students develop a broad understanding of interpreting as a profession, national standards for certification, and the concepts contained in the RID Code of Ethics. Other areas of concentration are interpersonal skills, self-critique, professional development, and resume writing. Course work includes panels, role plays, discussions, reading, and lectures. (NITP-271, no prerequisite; NITP-372, prerequisite, NITP-262 and 271)

Class 3, Credit 3 (offered annually)

NITP-281, 382 Interpreting Practicum I, H
Registration #0850-281, 382
These field experiences provide an opportunity to practice and integrate skills acquired in the classroom and laboratories. They include instructional and non-instructional activities on the RIT campus and in the Rochester community, under the supervision of the interpreter manager on site and the instructor responsible for the course. (For 281: NITP-211, 251, 262, 271, 331; for NITP-382: 212, 252, 332, 372, 395)

Class 10, Credit 5 (available any quarter)

NITP-283,384 Interpreting Seminar I, H
Registration #0850-283, 384
Designed as part of the field experience, students share their experiences and concerns as practicing interpreters. Panels of interpreters and consumers of interpreting services are used. (Corequisite NITP-281, 382)

Class 1, Credit 1 (available any quarter)

NITP-331, 332 Expressive IVansliteration I, H
Registration #0850-331, 332
These two courses concentrate on expressive transliteration as it relates to conceptually accurate English. Students develop the skills required to present a spoken message that is in a signed English mode. Emphasis is placed on conceptual accuracy, accuracy of fingerspelling, vocabulary development, facial expression and body movement, and self critiquing skills. (NITP-202)

Class 2, Lab 2, Credit 3 (S, F)

NITP-342 Deaf-Blind Interpreting
Registration #0850-342
Students are prepared to interpret for deaf-blind consumers. These topics concerning deaf-blindness include: causes and effects, aspects and issues of deaf-blindness, information and resources, interpreting modes, and methods of communication. Practice with deaf-blind consumers is included where possible. (NITP-211, 271, 331)

Class 3, Credit 3 (Elective)

NITP-343 Expressive Oral
Registration #0850-343 Interpreting/Transliteration
This course concentrates on the skill of expressive oral transliteration. Students develop the skill of receiving an auditory message and reproducing it in a highly visual modality by applying the principles of clear speech production and support techniques. Emphasis will be placed on speech production principles, natural gestures, body language, facial expression, and speed of transmission. (NITP-252, 211)

Class 2, Lab 2, Credit 3 (F)

NITP-391 Principles of
Registration #0850-391 Thtoring/Notetaking
This course prepares personnel to provide tutoring and notetaking support services for hearing-impaired people in mainstreamed educational settings. The methodology is appropriate for elementary, secondary, and postsecondary educational levels. (NITP-251)

Class 3, Credit 3 (offered annually)

NITP-392 Tutoring/Notetaking
Registration #0850-392 Practicum
Students provide tutoring and notetaking services to hearing-impaired students. A minimum of 10 hours per week is committed to taking notes in class and tutoring outside of class. Practicum sites include the Rochester City School District, the Monroe County Board of Cooperative Educational Services (BOCES) program, colleges of RIT, and other Rochester area universities and colleges. Supervision is provided. (NITP-391)

NTTP-395 Mainstreaming: Educational
Registration #0850-395 Programs and Alternatives
This course explores the goals and processes of education of the hearing-impaired and covers current demographic, legal, economic and social trends affecting education of the hearing-impaired; identifies criteria and processes for the establishment of quality support services for deaf students. (NITP-251)

Class 3, Credit 3 (offered annually)

NITP-396 The Support Service
Registration #0850-396 Professional
This course addresses the knowledge and skills necessary for functioning in a variety of educational and/or non-educational settings where the support service provider will have more than one major responsibility. Case studies and practical experience in the field will be used to enhance student's awareness of what it means to be a support service professional. (NITP-281, 382, 391, or permission of instructor)

Class 3, Credit 3 (S)

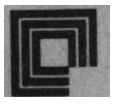
NITP-397 Contemporary Studies in
Registration #0850-397 Support Services
This course addresses the dynamic nature of support services and special education. As changes and growth happen in the field, this course will address "state-of-the-art" issues. Some examples are: court decisions; state or federal legislation; research findings; developments of new techniques or technology; in-service training programs for faculty and/or service providers; management of support services. The course will be offered as new topics arise, or if a lecturer with specific expertise is available to conduct the course. (NITP-281)

Class 1-3, Credit variable 1-3 (S) (Elective)

NITP-399 Independent Study
Registration #0850-399
This course provides the student with the opportunity for supervised exploration of special topics related to interpreting, deafness, tutoring, notetaking, and/or mainstreaming. (NITP-205,252, 262, 331, 391)

Credit variable 1-3 (W, S, SR)

Class 4, Credit 4 (offered every year) (F, W, S, SR) Class 4, Credit 4 (offered every y e a r) (S, SR)



Rochester Institute of Technology

Office of Admissions
One Lomb Memorial Drive
P.O. Box 9887
Rochester, N.Y. 14623

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