An abstract graphic design featuring a grid pattern that curves and distorts across the page. The grid lines are most visible in the lower right quadrant, where they form a dense, circular pattern. The overall composition is framed by a thin white border, with a thick white horizontal bar at the top and another at the bottom. The text 'RIT' is positioned in the upper left, and 'GRADUATE STUDY / '85' is at the bottom.

**RIT**

**GRADUATE STUDY / '85**



# Rochester Institute of Technology Calendar 1985-86

	Graduate Registration	No Classes	Non-Matriculated Student Registration	Classes Begin Day Colleges	Exam Week	Last Day of Quarter
Fall Quarter	Sept. 5, 6	Nov. 24-Dec. 1	Sept. 9	Sept. 9	Nov. 18-21	Nov. 21
Winter Quarter	Dec. 2	Dec. 21-Jan. 5 Feb. 4 (day) Mar. 2-9	Dec. 3	Dec. 3	Feb. 26-Mar. 1	Mar. 1
Spring Quarter	March 10	May 25-June 1	March 11	March 11	May 20-23	May 23



## Acknowledgements

**Dean,** Dr. Paul Bernstein

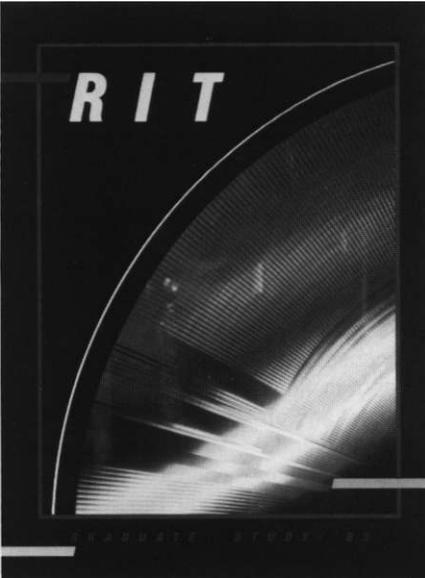
**Art Director,** John Massey

**Coordinator,** Karen Beadling

**Photography,** Jim Castelein, Rod Reilly, Sue Weisler

**Typography,** Rochester Mono/Headliners

**Printed by** Cohber Press Inc.



#### About this bulletin—

This Graduate Bulletin does not constitute a contract between the Institute and its students on either a collective or individual basis. It represents RIT's best academic, social, and financial planning at the time the Graduate Bulletin was published. Course and curriculum changes, modifications of tuition, fee, dormitory, meal and other charges, plus unforeseen changes in other aspects of RIT life sometimes occur after the Graduate Bulletin has been printed but before the changes can be incorporated in a later edition of the same publication. Because of this, Rochester Institute of Technology does not assume a contractual obligation with its students for the contents of this Graduate Bulletin.

RIT admits and hires men and women, veterans and disabled individuals of any race, color, national or ethnic origin, or marital status, in compliance with all appropriate legislation, including the Age Discrimination Act. The compliance officer is James Papero.

Graduate Study 1985-86  
Produced by RIT  
Communications and the  
Graduate Council

Write or phone:  
Rochester Institute of Technology  
Admissions Office  
P.O. Box 9887  
Rochester, NY 14623  
(716)475-6631

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## RIT

Vol. 1 No. 3

July 29, 1985

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# About RIT

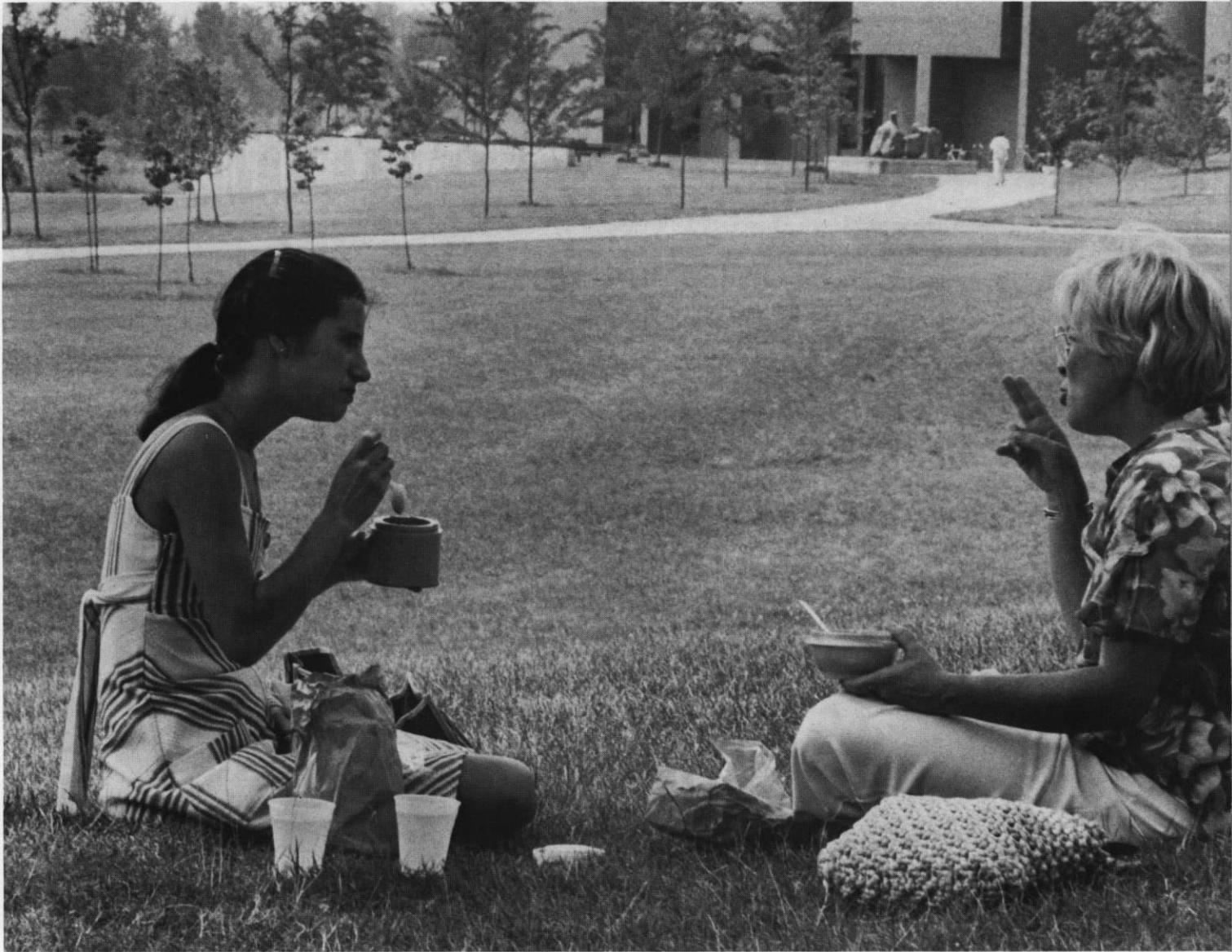
Founded in 1829, Rochester Institute of Technology has been a pioneer in career-oriented and cooperative work-study higher education. RIT includes a modern 1,300-acre campus and the RIT City Center in downtown Rochester. The nonsectarian, coeducational, independent Institute prepares students for technical and professional careers in a changing world.

RIT consists of 9 colleges: Applied Science and Technology, Business, Continuing Education, Engineering, Fine and Applied Arts, Graphic Arts and Photography, Liberal Arts, Science, and the federally-funded National Technical Institute for the Deaf.

## Graduate Education at RIT

About 26 years ago, Rochester Institute of Technology expanded its educational responsibilities to include graduate curricula, the first being in the area of fine arts. Encouragement from a variety of professional sources plus student demand caused the Institute to initiate programs in the arts and crafts leading to the master of fine arts degree. Shortly thereafter, RIT appointed a Graduate Council and petitioned for a charter to give the Institute authority to grant the master of science degree. The function of the Council on Graduate Studies was "to define the essential character of a graduate study at the Institute, to establish policies and procedures for the administration of graduate study, and to provide for a continuous coordination in review of graduate programs."





By 1963 student interest and industrial and business requirements caused the College of Science to develop a master's program in chemistry. This program was designed to provide opportunities for significant research, additional acquisition of knowledge in appropriate areas of chemistry, and study in allied areas such as physics and mathematics.

Within a year, the Institute received requests from the armed forces and many industrial employers for a graduate program in photographic science. The new curriculum, in contrast to offerings at European universities, was concerned principally with the application of photography to problems of science and engineering.

By 1965 national and local surveys suggested another area of responsibility for RIT. Considerable need was indicated for sophisticated statisticians,

particularly individuals who could undertake the complex task of collecting, analyzing, and interpreting data necessary for industrial planning. Accordingly, the College of Continuing Education created a Department of Statistics and began to offer work leading to a master of science degree in applied and mathematical statistics.

Soon thereafter the College of Engineering entered the field of graduate education through new programs in electrical and mechanical engineering. These curricula were designed to meet the needs of academically capable engineers in industry who wished to continue studies in a graduate degree program. The graduate curricula in engineering provided students with meaningful opportunities to associate with those who were engaged in the daily application of scientific engineering and management

knowledge in business and industry.

By 1968 important unmet demands for graduate training in business administration were apparent in the Rochester area and beyond. In view of this considerable need, the College of Business developed a master of business administration program which encompassed all of the management and business areas common to middle and upper-middle management. The new curriculum was also designed to provide a balance between the behavioral and



quantitative aspects of business management.

Later in 1968, in addition to the two-year MFA program, the College of Fine and Applied Arts developed a program in art education leading to the master of science in teaching degree. The program was specifically designed for secondary school teachers of fine and applied arts who wished to improve their understanding and skills and earn certification.

The need for additional people with technological training in the graphic arts became apparent from the numerous requests RIT received for a graduate program in printing. As a result, the School of Printing introduced a graduate program, operational in January, 1969, leading to the MS degree.

Recent additions to the list of graduate degree programs now available include the MFA in photography and the graduate internship leading to a master of engineering degree.

The Department of Instructional Technology has developed an MS degree program in instructional technologies for those engaged in teaching or directing multi-media communications. This combines and builds upon the several communication/graphics/visual disciplines long associated with RIT. In addition, the College of Applied Science and Technology now offers an MS in computer science through its School of Computer Science and Technology. The Department of Packaging Science also started its master of science degree program in the spring of 1983 in response to demand from industry for people with graduate education in packaging. RIT is one of only four schools in the country to offer an MS degree in packaging.

RIT has also initiated a new MS interdisciplinary program involving science and engineering in the area of materials science. In addition, our College of Fine and Applied Arts began an MFA offering in medical illustration in 1981-82 and

inaugurated its MFA program in computer graphics design in the fall of 1984. Beyond this, the new manufacturing engineering option within the ME was approved for the fall of 1985.

Through these programs, the Institute has exhibited a continuous concern for the emerging needs of the business, industrial and scholarly communities. It will consider additional graduate programs as these requirements become evident.

#### **Accreditation**

The Institute is chartered by the legislature of the State of New York and accredited by the Middle States Association of Colleges and Secondary Schools. In addition to institutional accreditation, curricula in some of the colleges are accredited by appropriate professional accreditation bodies. Specific mention of these is included in the college descriptions, where applicable.

# Graduate Programs of Study

	Graduate Degrees Offered	Programs Available in	HEGIS* Code	For More information See Page
<b>College of Applied Science and Technology</b>	Master of Science	Career and Human Resource Development Computer Science Instructional Technology Packaging Science	0826 0701 0699 4999	<b>18</b>
<b>College of Business</b>	Master of Business Administration	Business Options Listed on page 36	0506	<b>35</b>
<b>College of Continuing Education</b>	Master of Science	Applied and Mathematical Statistics Cooperative Program Summer Program	1702	<b>45</b>
<b>College of Engineering</b>	Master of Science  Master of Engineering	Electrical Engineering Mechanical Engineering Materials Science and Engineering"  Engineering (EC, EE, ME, IE)	0909 0910  0915  0901	<b>50</b>
<b>College of Fine and Applied Arts</b>	Master of Fine Arts or Master of Science for Teachers  Master of Fine Arts  Master of Science for Teachers	Ceramics and Ceramic Sculpture Graphic Design Industrial & Interior Design Glass Metalcrafts and Jewelry Painting Printmaking Weaving and Textile Design Woodworking and Furniture Design  Medical Illustration Computer Graphics Design  Art Education	1009 1009 1009 1009 1009 1002 1002  1009 1009  1299 1009  0831	<b>66</b>
<b>College of Graphic Arts and Photography</b>	Master of Science  Master of Science  Master of Fine Arts	Printing Technology  Imaging and Photographic Science  Photography	0699  1011  1011	<b>76</b>
<b>College of Science</b>	Master of Science	Chemistry Clinical Chemistry Materials Science and Engineering**	1905 1223  0915	<b>92</b>
<b>National Technical Institute for the Deaf</b>	None	Educational Specialists for the Deaf		<b>104</b>

Enrollment in other than registered or otherwise approved programs may jeopardize a student's eligibility for certain student aid awards. All the above programs are registered according to the indicated HEGIS\* code.

# Philosophy of Graduate Education at RIT

Graduate education has been part of the mission of the Rochester Institute of Technology since the first graduate program in Fine and Applied Arts was begun in 1958. During the ensuing years, student demand has led to the emergence of more than 35 graduate programs in such diverse areas as fine arts, business, engineering and career education. These offerings have drawn on the total resources of the Institute and have received wide acceptance.

From its beginnings as the Mechanics Institute, RIT has stressed both "earning a living and living a life." Its offerings have also emphasized the amalgam of formal education and experience, and have included a definitive commitment to career training in a context of social responsibility. In particular, RIT's graduate thrust has been oriented in the direction of technology and business, as well as the aesthetic content of the fine arts, photography, and printing.

RIT's graduate programs stress the applications of specialized knowledge that enable students to use their professional knowledge and skills to attain personal and career goals. Further, their graduate accomplishments at the Institute are basic to continuing lifelong learning, career development and personal satisfaction. In certain areas, the MS or MFA is the terminal degree in the field, while in others it provides the base for work at a higher level.

Another fundamental objective of graduate education at RIT is that it be characterized both by effective teaching and quality scholarship. Out of these concerns have risen selective research projects that aid the education of students and provide continuing opportunities for professional growth. At RIT many of our research projects—including projects in energy, graphic arts, information and communication—are under the umbrella of the RIT Research Corporation. These projects

bring industry experts to campus to interact with faculty and graduate students, give graduate students the opportunity to assist with research projects and keep faculty members up to date on current industry practices. In addition, through the Research Corporation, graduate students utilize special libraries and research facilities as they study in their fields.

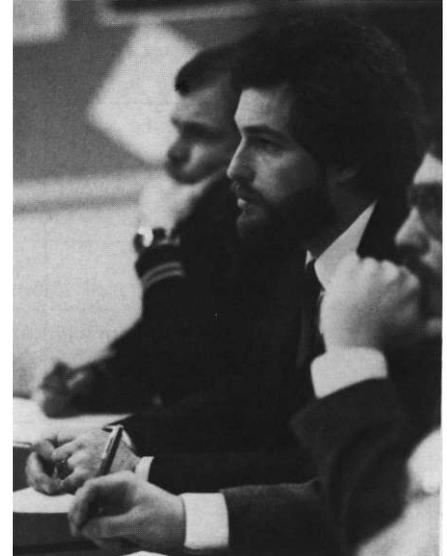
Graduate programs at RIT help students understand the conceptual structure and organization of knowledge of their chosen programs. Such an understanding is a necessity if our graduates are to cope with the accumulation of knowledge and technological change in the professions. These programs provide the educational base for additional learning, and offer access into and mobility within one or more professional areas. Through their education, RIT's graduate learners become equipped with the knowledge, skills, and attitudes to stay abreast in their professional fields.

Graduate study should help students to mature as perceptive problem-solvers who will emerge as professional and community leaders. It should provide a strong base for independent study and experimental learning. Above all, graduate education should help students become skillful and incisive professionals who perceive the human purposes that underscore all learning.

## Admission

Decisions on graduate selection rest within the college offering the program. Correspondence between the student and the Institute will be conducted through the Admissions Office, according to the following procedures:

1. Inquiries about, and applications for, graduate study are directed to the Director of Admissions, Rochester Institute of Technology, One Lomb Memorial Drive, P.O. Box 9887, Rochester, New York, 14623-0887.
2. The Admissions Office will acknowl-



edge the inquiry or application, instructing the student as to the information required by the school or department to which he or she is applying before the admission can be made.

3. Once a student has made formal application, the Admissions Office will prepare an applicant folder for him or her. All correspondence and admission data will be collected by the Admissions Office, and placed in the applicant's folder. The applicant's file folder will include an RIT application, previous college or secondary school records, applicable test scores, recommendations (if required) and other documents that may support admission of the candidate.
4. When all relevant admission data has been received, the applicant's folder will be sent to the appropriate school or department for action.
5. When the school or department has made a decision on the application, this decision and the applicant's folder will be returned to the Admissions Office.
6. The Admissions Office will notify the student of the admission decision.
7. Academic departments may infor-

mally advise non-matriculated students, but no formal program of study can be approved prior to matriculation.

8. The formal program will be laid out by the dean's designee (department head, coordinator or program director, etc.) and is the one that must be followed by all students applying for admission or readmission.

### Readmission

1. If a student has become inactive (has not completed a course in four quarters) or has withdrawn from RIT, Institute policy requires the student to reapply for admission. Readmission applications are handled according to the following policy:

A. Students who left the program with a GPA of 3.0 or better (in good standing) and will return to the program within two years of the time their last course was completed, will be readmitted to the program upon reapplication.

B. Students who left the program with a GPA of 3.0 or better and return to the program more than two years after the last course was completed, must meet current admission standards upon reapplication. The program of study shall be subject to review and will be rewritten. Previous waiver and/or transfer credit may be lost and program deficiencies may need to be made up.

C. Students who leave a program with a GPA below 3.0 must meet current admission standards upon reapplication. Readmission will be based on all information, including previous graduate level work. Program requirements in effect at the time of reapplication will apply. Previous waiver and/or transfer credit may be lost and program deficiencies may need to be made up.

D. In addition, each college will have the responsibility, upon readmission, of determining which previous courses, if any, will be applicable toward the degree.

#### E. *The Seven Year Rule*

In all cases, students must complete the program within seven years of the date of the oldest course counted toward their program. This does not apply to prerequisites, Bridge Program

courses in computer science, Foundation courses or similar requirements in other departments.

F. This policy took effect on September 1, 1984.

RIT admits and hires men and women, veterans and disabled individuals of any race, color, national or ethnic origin, or marital status, in compliance with all appropriate legislation, including the Age Discrimination Act. The compliance officer is James Papero.

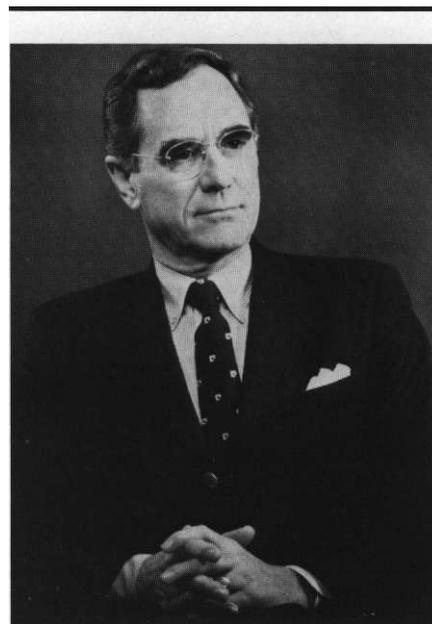
The basic entry requirements for master's degree candidates include the completion of a baccalaureate degree and whatever other evidence of the applicant's potential to successfully complete graduate studies may be required by the particular college. Rare exception to the baccalaureate requirement can be made in the case of candidates who have demonstrated unusual competence in their field of specialization. For these exceptions the recommendation of the department chairperson or director and the approval of the appropriate dean is required.

In certain cases graduate students may be admitted prior to, but conditional on completion of, the baccalaureate degree. Applicants should not be considered for admission prior to the start of their final year of undergraduate study. The student must present a final transcript within one quarter after first registering for a graduate program.

Graduate applicants who do not fully satisfy all admission criteria as to grades, test scores or other credentials, but do show sufficient promise to qualify for a trial period of graduate study may be admitted on probation to the Institute. Such students must achieve a 3.0 ("B") program cumulative grade point average by the end of their first 12 quarter credit hours of graduate study. Those students who do not meet this criterion will be suspended. Responsibility for specific requirements and maintenance of the student's appropriate status rests with the department in consultation with the Admissions Office and the Registrar.

Evaluation of transfer credit (see p. 12) is made by the academic school or department in question and the College of Liberal Arts. For students applying to the College of Continuing Education, transfer credit will be evaluated within that college.

## Graduate programs specialized and diverse



*RIT President M. Richard Rose*

### RIT proud of link with Rochester

"RIT means access to employment and significant contributions to the community for thousands of young people and adults," says President M. Richard Rose. "For those of us who work and study here, RIT is a dynamic and progressive university that always has been willing to take those extra steps necessary to maintain relevant career and professional programs.

"RIT continues to provide opportunities for its alumni to improve themselves and their families educationally, professionally, financially and socially.

"In many ways, RIT also symbolizes much of what we find so desirable about our community, particularly through its attractive blend of tradition, culture, innovation, business and education.

"In the final analysis each student's future is our first priority. We hope they share our pride in an institution that provides access to the future with graduate programs that are both satisfying and rewarding."



Dr. Paul Bernstein

"RIT is a highly specialized institution, and our graduate program is a reflection of that," says Dr. Paul Bernstein.

"The hallmark of our overall graduate program is the diversity of the individual programs," he says.

Bernstein is dean of Graduate Studies. He received his bachelor's and master's degrees in education from Temple University, and his Ph.D. in history from the University of Pennsylvania. He has been at RIT since 1966.

"Each of our graduate programs is built as a freestanding unit," he says. "As such, they are designed to fill a specific need in a given field of study.

"As a need developed in a specialized field and RIT felt it could satisfy that need, a program was developed," he says.

"Good examples of that are the materials science and MBA programs. We perceived a real need for people in this area from our discussions with business and industrial leaders, and then proceeded to develop these interdisciplinary offerings with their encouragement."

## Costs

On the date of publication, the tuition for graduate students pursuing a master's degree is:

Full-time (12-18 credit hours)—  
\$2485/quarter

Part-time (11 credit hours or less)—  
\$211/credit hour

Master of Science (CCE)—  
\$211/credit hour

Internship\*—\$78/credit hour

In addition, any graduate student carrying over 18 credit hours of study will be charged the full-time tuition rate plus \$211/credit hour for each hour of study exceeding 18.

All full-time graduate students are required to pay a Student Activities Fee of \$15 per quarter.

Tuition and fee payments are due on the following dates:

Fall Quarter, August 14, 1985;

Winter Quarter, November 12, 1985;

Spring Quarter, February 18, 1986;

Summer Quarter, May 13, 1986.

These due dates are rigid. If payment is not received by the date stated, the student must appear at the registration day for the quarter desired. (See calendar on inside front cover.) A late payment fee will be charged to all student accounts that become past due.

**The Institute reserves the right to change its prices without prior notice. Nonmatriculated students are charged graduate rates for graduate courses.**

\*Applied only to the internship portion of the master of engineering degree in the College of Engineering, the industrial research option of the MS degree in the Department of Chemistry and the External Research Option in the MS in Clinical Chemistry in the Department of Clinical Sciences. It also applies to the MS degree in career and human resource development in the College of Applied Science and Technology.

Note: Matriculated graduate students enrolled in CCE or Day College undergraduate courses will be charged the Day College graduate tuition rate.

## 12-Month Payment Plan

For the 1985-86 academic year RIT offers a 12-month payment plan, which combines the elements of a prepayment/deferred payment plan. For further information about the plan, contact the Bursar's Office at (716) 475-6059.

## Refund Policies

Advance deposits are non-refundable. The acceptable reasons for the withdrawal with refund during the quarter are:

### For a full refund

1. Active military service: A student called to active military service during the first eight weeks of the term may receive a full tuition refund. If called after the eighth week, he may elect to complete the course by making special arrangements with both his instructor and department, or to withdraw and receive a full tuition refund. If he withdraws, he will have to repeat the course at a later date.

2. Academic reasons: Students sometimes register before grades for the previous quarter are available. If such a student later finds that he or she is subject to academic suspension, or has failed prerequisites, the student will be given a full refund upon withdrawal. It remains the student's responsibility to contact his or her department to assure that the withdrawal form and refund are properly processed.

3. If students drop a course(s) during the Official Drop Period (first six days of classes during that specific quarter), they may contact the Bursar's Office for a 100% refund for the courses dropped. Courses dropped after the Official Drop Period will not result in any tuition refund.

### For a partial tuition refund

A student must officially withdraw or take a leave of absence FROM THE INSTITUTE in order to be eligible for a partial tuition refund.

A partial refund will be made during a quarter if withdrawal/leave of absence is necessitated for one of the following reasons:

1. Illness, certified by the attending physician, causing excessive absence from classes
2. Withdrawal for academic reasons at the request of the Institute during a quarter
3. Transfer by employer, making class attendance impossible
4. Withdrawal for academic or personal reasons at the request of the student,

approved by the student's advisor or department representative, the Institute Coordinator for Academic Advising and the Bursar

Students withdrawing from the Institute must complete a withdrawal form to initiate the refund process. Refunds will be made according to the following schedule.

During official add/drop period (first 6 days of classes)—100% tuition reduction

From the end of the official add/drop period through the end of the second week of classes—70% tuition reduction

During the third week of classes—60% tuition reduction

During the fourth week of classes—50% tuition reduction

Fifth and subsequent weeks—No tuition reduction

**Note:** Non-attendance does not constitute an official withdrawal.

A student is not "officially withdrawn" until he or she receives the student's copy of the withdrawal form. The date on which a withdrawal form is properly completed shall be the date of "official withdrawal" used to determine the refundable amount. If a student drops his or her course load from full-time (12 or more credits) to part-time (less than 12 credits) status during the Official Drop Period, he or she may contact the Bursar for a refund based on the differential between the full-time tuition payments and the total per-credit-charge for the part-time load.

No refund will be made for classes dropped after the Official Drop Period unless the student is officially withdrawing from the Institute.

### Fees

Fees are not refundable.

### Appeals process

An official appeals process exists for those who feel that individual circumstances warrant exceptions from published policy. The initial inquiry in this process should be made to Richard B. Schonblom, bursar. Unresolved matters will be referred for further action to William J. Welch, controller.

### Room and board

To complete a withdrawal from RIT, a resident student or a non-resident student on a meal plan must check out with Housing and/or Food Service. Refunds, when granted, are from the date of official check-out.

Partial refund schedule:

1. Room
  - a. During the first week of classes  
90% of unused room charge
  - b. During the second week of classes  
75% of unused room charge
  - c. During the third week of classes  
60% of unused room charge
  - d. During the fourth week of classes  
50% of unused room charge
  - e. Fifth and subsequent weeks—  
No refund
2. Board
  - a. During the first four weeks, 75% of  
unused board charge
  - b. After the first four weeks, 50% of  
the unused board charge

### Financial aid

Fellowships and graduate assistantships are often available. Please write to the appropriate department chairperson or dean, or contact the Financial Aid Office (475-2186).

In addition, RIT Graduate Scholarships will be offered in 1985-86 in the colleges of Fine and Applied Arts, Continuing Education (applied statistics), Graphic Arts and Photography, Science, Applied Science and Technology, Engineering and Business. Additional funds are available for minority applicants. For information, write to the Dean of Graduate Studies, or call (716) 475-6523.

### Tuition Assistance Program

New York State residents who show ability to pursue a full-time program may receive awards from \$100 to \$600 as a graduate student.

### Other

Fees for all proficiency examinations in the MS degree programs offered by the Center for Community/Junior College Relations and the College of Business are charged at the rate of \$20 per quarter credit hour covered by the examination. Arrangements for such proficiency examinations are made through the director of the Center for Community/Junior College Relations.

### Graduate degree programs

A master's degree at RIT may be obtained in programs ranging from business administration to photography, from computer science and technology to environmental design. (Please refer to p. 7 for a complete listing of graduate programs of study.)

Upon completion of the stipulated requirements, a student's academic

department certifies him or her for a degree. A statement of requirement completion will be listed on the transcript in the appropriate term. After commencement, a statement verifying that a degree has been awarded will be posted to the transcript. Degrees for fall graduates are mailed in winter quarter; for winter graduates, in spring; and for spring and summer graduates in the summer.

## The steps toward earning your degree

### Graduate registration

Matriculated graduate students are those who have applied and been formally accepted into a graduate program through the Office of Admissions. Such students may register for graduate level courses (700-800) that fit their home department approved programs. When registering for graduate courses outside the home department, not in the normally approved program, the approval of the department offering the course is also necessary.

Non-matriculated (undergraduate or graduate) students will be allowed to take graduate courses on a space-available basis with the department's approval and with the knowledge that the course work completed while a non-matriculated student will not apply to any given baccalaureate or master's program.

Matriculated and non-matriculated graduate students may register for undergraduate level courses with the understanding that these courses may not always apply to an RIT master's program. In certain cases, where educationally sound programs will result, appropriate undergraduate courses as approved by the faculty advisor and by the department may be included in a master's program. However, no more than nine undergraduate quarter credit hours (600 level or below) may be applied toward the 45 quarter credit minimum (12 undergraduate hours for those programs requiring 48 or more quarter credit hours). Where undergraduate work is allowed, it must be well planned and closely controlled. In the vast majority of cases, most, if not all, course work will be at the graduate (700-800) level.

### Credit requirements

The minimum credit requirement for a master's degree is 45 quarter (or 30 semester) credit hours. Students should refer to the section covering the college in which they will enroll to earn the credit hour requirements. At least 36 of these quarter credit hours must be earned at the graduate level in residence at the Institute.

External master's degree programs allow for varying amounts of acceptable graduate transfer credits. Thus, the residency requirement may be decreased, if approved by the Graduate Council and vice president for academic affairs. Other exceptions pertaining to a group of students must be approved by the Graduate Council.

### Transfer credit

A maximum of nine quarter credit hours in a 45 credit hour program or 12 quarter credit hours in a 48 credit hour program or more may be awarded as transfer credit from other institutions (except for the external degree offered through the Center for Community/Junior College Relations). A request for transfer credit must be made at the time of application for graduate student status. Only a grade of B (3.0) or better may be transferred.

Transfer credits are not calculated in the student's Grade Point Average (GPA) but will count toward overall credit requirements for the degree. Transfer credits do not count in the satisfaction of residency requirements.

A graduate student who wishes to take work at another institution and transfer it to his or her degree work at the Institute must obtain prior permission.

### Thesis requirements

Included as part of the total credit hour requirement may be a research and thesis requirement as specified by each department. Some departments have requirements in place of a thesis. The amount of credit the student is to receive for Research and Thesis Guidance in any given quarter must be determined by the time of registration for that quarter, recorded on the student's card and verified on the course list.

For the purpose of verifying credit, an end-of-quarter grade of R should be submitted for each registration of Research and Thesis Guidance by the

student's faculty advisor. Before the degree can be awarded, the acceptance of the thesis must be recorded on the student's permanent record.

### Candidacy for an advanced degree

A graduate student must be a candidate for an advanced degree for at least one quarter prior to receipt of the degree.

The position of the Graduate Council is that a student is a candidate for the master's degree when he or she has been formally admitted to the Institute as a graduate student.

A student not formally admitted as a graduate student of the Institute (regardless of the number of graduate credits earned) is a non-matriculated student and not a candidate for an advanced degree. Such a student cannot be a candidate until formally admitted to the Institute as a graduate student. There is no guarantee that any credits in graduate courses earned as a non-matriculated student will apply toward an advanced degree.

### Summary experience

The Graduate Council regards some form of integrative experience as necessary for candidates of advanced degrees. Such requirements as the comprehensive examination, the oral examination of the thesis and a summary conference are appropriate examples, provided they are designed to help the student integrate the separate parts of his or her total experience. The nature of the experience will be determined by the individual college or department.

### Overlapping credit for second degree

At the discretion of the Graduate Committee in the specific degree area, 9-12 previous master's quarter credit hours can normally be applied toward satisfying requirements for a second master's degree. The use of a given course in two different programs can be allowed only if the course that applied for credit toward the first degree is a required course for the second degree. The course must be used in both programs within five years; i.e., no more than five years between time used for first degree and applied again toward second degree.

In no case shall less than the minimum 36 quarter credit hours of residency be accepted for the second degree. If duplication of courses causes

a student to go below the 36-hour limit in the second degree program, he or she would be exempted from these courses but required to replace the credit hours with departmental<sup>^</sup> approved courses. An RIT student will not be admitted through the Admissions Office to the second degree program until the first program has been completed.

### Financial standing

Tuition and fees paid to the Institute cover approximately 60-70 percent of the actual expense of a student's education. The rest of the cost is borne by the Institute through income on its endowment and from the gifts of alumni and other friends.

Students, former students, and graduates are in good financial standing when their account is paid in full in the Bursar's Office. Any student whose account is not paid in full will not receive transcripts, degrees or recommendations from the Institute.

The Institute reserves the right to change its prices without prior notice.

### Summary of requirements for master's degree

1. Successfully complete all required courses of the Institute and the college. These requirements should be met within **seven years** of the date of the oldest course counted toward the student's program. Extensions of this rule may be granted through petition to the Graduate Council.
2. Complete a minimum of 45 quarter credit hours for the master's degree. At least 36 quarter credit hours of graduate level course work and research (courses numbered 700-800) must be earned in residence at the Institute.
3. Achieve a program cumulative grade point average of 3.0 (B) or better. (See p. 13 for further details.)
4. Complete a thesis or other appropriate research or comparable professional achievement, at the discretion of the degree granting program.
5. Pay in full, or satisfactorily adjust, all financial obligations to the Institute.

**Note:** The dean and departmental faculty can be petitioned, in extraordinary circumstances, to review and judge the cases of individual students who believe the spirit of the above requirements have been met yet fall short of the particular requirement. If

the petition is accepted and approved by the faculty, dean and vice president for academic affairs, a signed copy will be sent to the registrar for inclusion in the student's permanent record.

### Definition of grades

Grades representing the students' progress in each of the courses for which they are registered are given on a grade report form at the end of each quarter of attendance. The letter grades are as follows:

A Excellent

B Good

C Satisfactory

D and F grades do not count toward the fulfillment of program requirements for a master's degree.

**The grades of all courses attempted by graduate students will count in the calculation of the program cumulative grade point average.** This program cumulative grade point average shall average 3.0 ("B") as a graduate requirement. The dean of the college or his designee must approve all applications for graduate courses a student wishes to repeat.

### Quality points

Each course has a credit hour value based on the number of hours per week in class, laboratory or studio and the amount of outside work expected of each student. Each letter grade yields quality points per credit hour as follows:

A 4 quality points

B 3 quality points

C 2 quality points

D 1 quality point

E and F count as 0 in computing the grade point average (GPA). The GPA is computed by the following formula:

$$r = \frac{\text{total quality points earned}}{\text{total quality hours}}$$

There are other evaluations of course work that do not affect GPA calculations. Only I, W and R (as described below) can be assigned by individual faculty members at the end of a quarter.

**Registered (R)**—a permanent grade indicating that a student has registered for a given course but has yet to meet the total requirements of the course or has continuing requirements to be met. The grade is given in graduate thesis work.

Completion of this work will be noted by having the approved/accepted thesis title, as received by the registrar from the department, posted to the student's permanent record. Full tuition is charged for these courses. "R" graded courses are allowed in the calculation of

the residency requirement for graduate programs.

**Incomplete (I)**—this grade is given when the professor observes conditions beyond the control of the student such that the student is not able to complete course requirements in the given quarter. This is a temporary grade that reverts to an F if the registrar has not received a "change of grade" form from the professor by the end of the second succeeding quarter. Full tuition is charged.

**Withdrawn (W)**—will be assigned in courses from which a student withdraws after the second week and before the ninth week of classes or if a student withdraws from all courses in a given quarter.

**Audit (Z)**—indicates a student has audited the course. The student need not take exams and full tuition will be charged. A student can change from credit to audit or from audit to credit status for a course only during the first 6 days of classes. Audited courses do not count toward the residency requirement.

**Transfer Credit (T)**—assigned through the admission process and, possibly, through later review (see p. 12 for details).

**Credit by examination (X)**—assigned for the successful completion of various external or Institute examinations provided such examinations cover or parallel the objectives and content of the indicated course. Credit must be assigned in advance of any credit received through registration for the indicated course. X graded courses do not count toward the residency requirement. A maximum of 12 quarter credit hours is allowed for graduate courses.

**Exceptions** to the maximum transfer credit or credit-by-exam for graduate programs can be granted by the dean of Graduate Studies in unusual circumstances upon appeal from the dean of the college involved.

**Waived**—Waived courses are those courses eliminated from the list of requirements that a student must take to graduate. For graduate students, required courses may be waived because of previously completed academic work, but in no case shall the resulting graduate program requirements be reduced below 45 quarter credit hours. In addition, waiver credit for graduate courses can be applied only towards required, not elective, courses. The process of waiving courses and thereby reducing graduate

program requirements is not to be confused with the process of exempting certain requirements that are then replaced by an equal number of credit hours, thus retaining the total number of credit hours in the specified program.

**Changing grades**—once a grade has been reported by a faculty member it is not within the right of any person to change this unless an actual error has been made in computing or recording it. If an error has been made, the faculty member must complete the appropriate form, and the completed form must be approved by the head of the department in which the faculty member teaches and the head of the department enrolling the student. When approved by both of these individuals, the form is to be forwarded to the registrar. There is, however, an appeal procedure for disputed grades through the Academic Grievance Committee of the college in which the course was offered, with final appeal to the Institute Hearing and Appeals Board.

### Academic probation and suspension

Any matriculated graduate student whose program cumulative GPA falls below a 3.0 after 12 quarter credit hours will be placed on probation and counseled by the departmental advisor concerning continuation in the graduate program.

Those students placed on probation must raise their program cumulative GPA to the 3.0 level within 12 quarter credit hours or be suspended from the graduate program.

Should it be necessary to suspend a graduate student for academic reasons, the student may apply for readmission to the dean of the college or his designee upon demonstration of adequate reason for readmission.

**Any student who intentionally defrauds or attempts to defraud the Institute of tuition, fees or other charges, or who gives false information in order to obtain financial aid, is subject to legal liability, prosecution and Institute disciplinary action.**

# Student Services

## The Wallace Memorial Library

Wallace Memorial Library is a high technology, multimedia resource center with a collection of over 340,000 items. Included in the holdings are 2,700 journal subscriptions, 17,000 theses, 122,000 microforms, 1,700 cassettes, tapes and records, and over 200,000 books. Access to the collection is provided through an online computer catalog. Services include interlibrary loans, computerized literature searching of commercial data bases, class instruction, individual taped tours and access to the Archives and Special Collections Room.

The library also contains a special collection of materials on the deaf to serve the National Technical Institute for the Deaf. Supplementing the main library is the Graduate Chemistry Library in the College of Science.

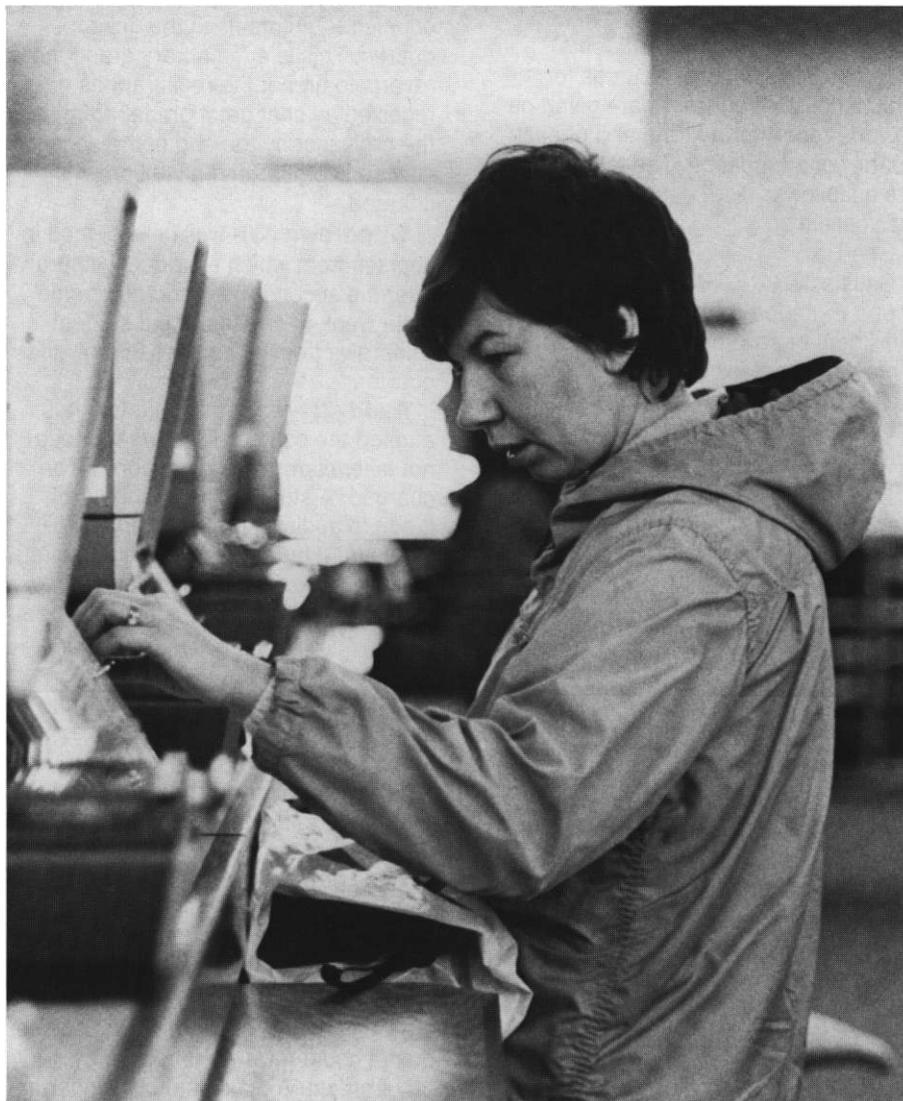
The Media Resource Center located just inside the library entrance on the main level contains a variety of audiovisual equipment and non-print media for individual use. In addition, the center contains more than 70,000 slides. Preview facilities and study carrels are also provided.

The Audiovisual Service Department houses a collection of nearly 400 films and provides materials, equipment, and assistance for classroom instruction. Approximately 3,500 films are shown in classrooms each year.

The library is open over 100 hours a week with extended hours before finals.

Reference librarians are available during the week and on weekends to provide individual assistance, and a special instruction librarian offers service for the hearing-impaired and disabled. The Center for the Visually-Impaired houses a Kurzweil Reading Machine and other aids.

For additional information call 475-2562.





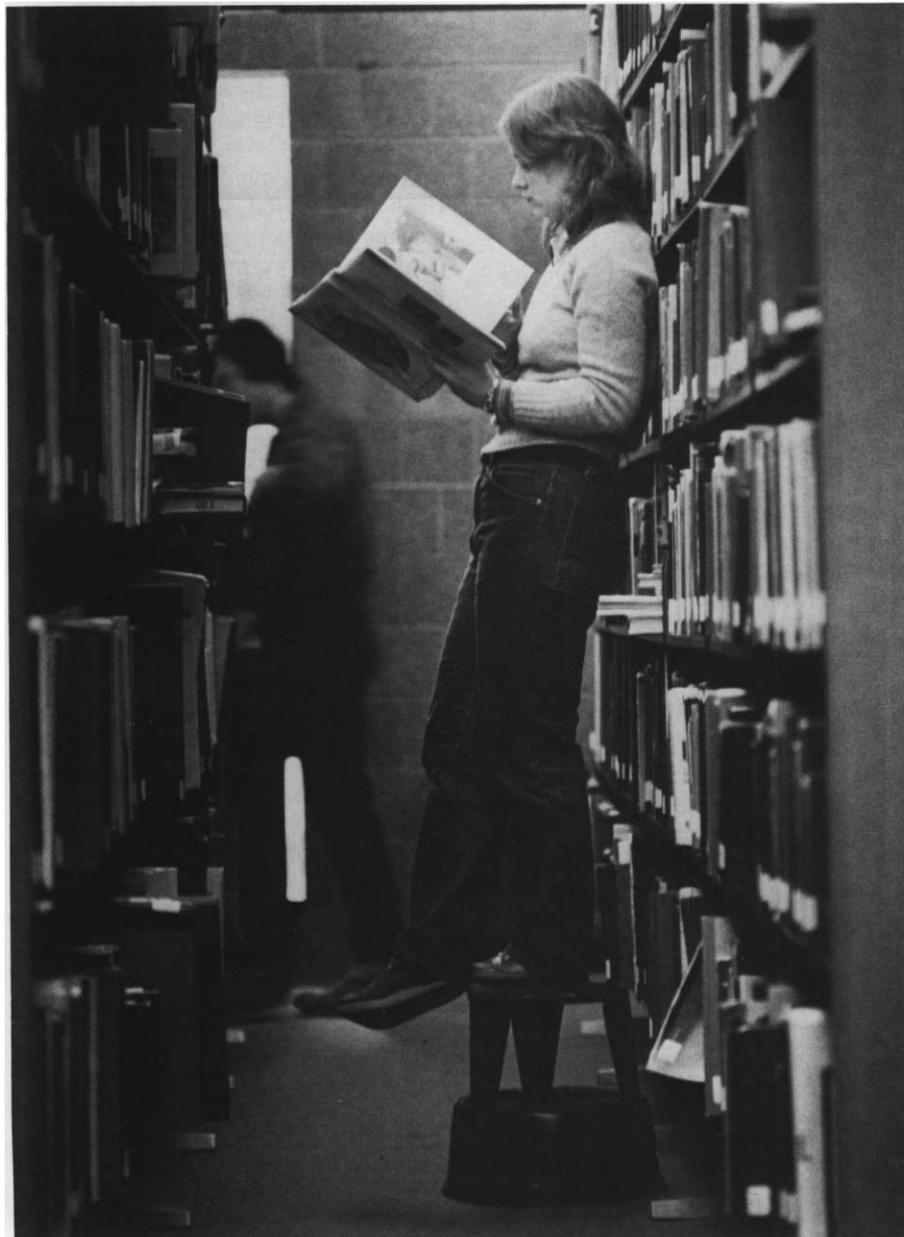
### **Counseling Center**

The Counseling Center, located in Grace Watson Hall, offers a variety of services to RIT graduate students.

These services include:

- Personal/Psychological Counseling
- Career Counseling
- Career Resource Center
- SIGI (System of Interactive Guidance and Information)
- Testing
- Developmental Programs and Groups
- Consultation
- PASS (Programs on Alcohol for Student Success)
- Victims Assistance Program
- Referral Services

Counseling Center hours are 8:30-4:30, Monday through Friday and 8:30-8:30, Wednesdays. For more information about Counseling Center services, call 475-2261.



### **Learning Development Center**

The Learning Development Center provides individual and group instruction in efficient reading, study procedures, mathematics and writing skills. These services are available at no additional charge during the day to all graduate students of the Institute and may be scheduled at the center, located on the second floor, north end, of the administration building.

### **Child care**

RIT's Horton Child Care Center offers preschool and kindergarten programs for the children of students, faculty, and staff. For complete information, call (716) 424-1244.

### **Housing**

RIT has four campus apartment complexes on the campus for both married and single students. You should apply through the Office of Off-Campus and Apartment Life, Rochester Institute of Technology, P.O. Box 9887, Rochester, N.Y. 14623. This should be done at your earliest convenience.

The residence halls are designed and programmed primarily for undergraduate students. Due to increased enrollment and the number of returning students living in the halls, they have been filled beyond capacity for the past several years. Entering students are frequently tripled.

There are several large apartment

complexes within a short distance of the campus. Please call the Residence Life Office at (716) 475-2572 for information.

### Identification cards

You'll need an RIT identification card to use any campus facility.

You apply for your identification card at the time of your first registration.

For further information, call the ID office at 475-2125.

### Automobile registration

Those students having automobiles on campus must register these vehicles with Campus Safety at the time they first register for classes, or upon bringing the automobile onto campus for the first time.

### Enrollment of veterans

Courses and programs at the Institute are approved for the education of veterans under the Veterans Readjustment Benefits Act, the Rehabilitation Acts, and War Orphans Act.

To receive benefits, an eligible veteran or dependent must submit an application for the VA "Certificate of Eligibility." This application must be sent to the VA Regional Office in Buffalo, N.Y., well in advance of the beginning of the starting quarter. These applications are available at your local VA Office or on campus from the Veterans Affairs Office.

Visit the Veterans Affairs Office and complete the necessary forms to ensure your benefits will arrive on time for the beginning of school.

Students who have been receiving benefit payments at other institutions or while participating in a different program and wish to transfer into one of RIT's many programs will be required to complete and submit a "Request for Change of Program or School" form.

To ensure a smooth transition and successful academic program completion at RIT, start your benefits paper work early. For benefits assistance or information, call the Veterans Affairs Office at 475-6641.

### Emergencies; Escort Service

In case of emergency (fire, injury) the

Institute's 24-hour emergency number 475-3333, should be called. For routine security services, 475-2853, which is staffed 24 hours a day, should be contacted.

### Center for Cooperative Education and Career Services

RIT's particular philosophy is called career education—and The Center for Cooperative Education and Career Services supports the Institute's commitment to preparing students for "the making of a living and the living of a life." We made a commitment to career education as early as the 1880s. Our friends called it a bright new idea; we called it common sense.

Since 1912 RIT has developed one of the country's largest and strongest co-op programs. Students and employers alike look to the program as a beginning experience with that potential employee in that particular company. Many co-op positions lead directly to permanent positions upon graduation. Other students find permanent positions through the outstanding on-campus recruitment program, bringing employers and students together in a professional environment for interviewing. We think the center helps the student have an edge over the competition when graduation arrives.

Graduates, co-op students and alumni find the services of The Center for Cooperative Education and Career Services a boon in the career development and career entry process. Individual career counseling, group skills sessions, reference/credential services, job listings, use of resource library, and on-campus interviewing provide a steady linkage from campus to the workplace. The center provides these services to students at no fee. All students approaching graduation are encouraged to attend one of the many orientation sessions to the use of the center and register for use of all services during the important job-search period. Graduate students often seek their counselors in the center early in the graduate program. Those students know that the employer seeking qualified graduates with an advanced degree contacts the center for job listings and interviews with graduate students. The Center for Cooperative Education and Career Services is committed to linking RIT students to career experiences and to career entry upon graduation.

### Student Health Service

Student Health Service provides primary level medical care on an outpatient basis. The staff includes physicians; medical nurse practitioners; registered nurses; and an interpreter for the deaf. Some specialties—psychiatry, gynecology—are available on campus by appointment. In addition, Student Health Service provides health education programs.

Student Health Service is located on the second floor of the George Eastman Memorial Building. Students are seen on a walk-in basis (Monday through Friday, 8:30 a.m. to 4:00 p.m.; to 4:30 p.m. for emergencies). Appointments for follow-up treatment are arranged when necessary. A registered nurse is on duty in Nathaniel Rochester Hall in the evening (4:30-11 p.m.). On Saturday and Sunday a medical provider is available from 10 a.m.-5:30 p.m. in Nathaniel Rochester Hall.

For emergency transportation, the RIT Ambulance is available. The unit can be reached through Campus Safety at 475-3333.

Payment of a quarterly Student Health Service fee is mandatory for all full-time undergraduate students. All other students may pay either the quarterly fee or on a fee-for-service basis. Some laboratory work ordered through Student Health Service is not covered by this fee; there is a nominal charge for this service. The health fee does not include prescription medications.

The Institute **requires** students to maintain health insurance coverage as long as they are enrolled at RIT. Students may obtain coverage either through RIT or their own insurer.

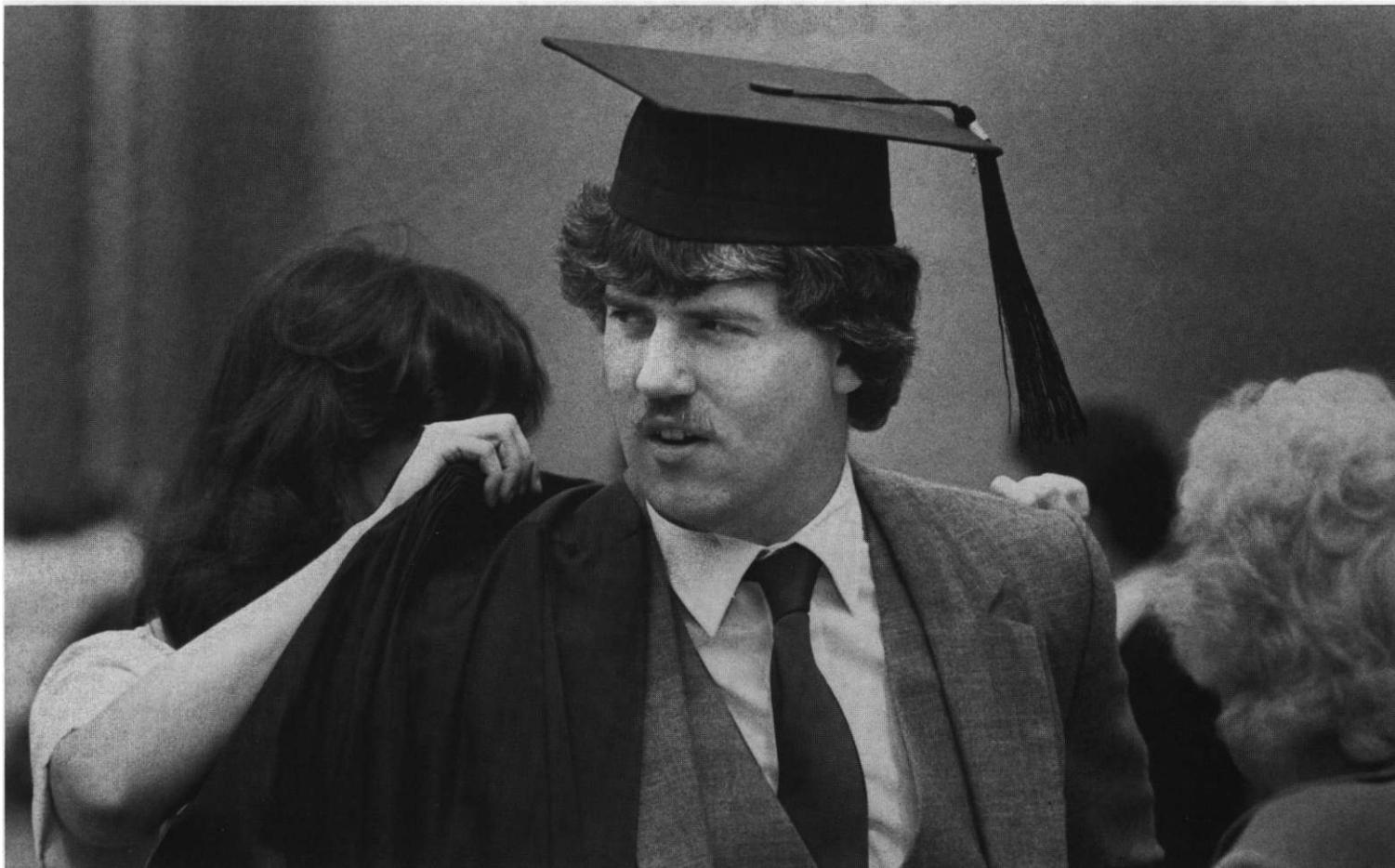
Questions about Student Health Service or health insurance should be directed to the office (475-2255).

**Health records:** Medical records are confidential. Information will not be released without the written consent of the student. Exceptions to this rule are made only when required by the public health laws of New York State.

### Institutional and civil authority

Students must recognize that they are members of the local, state and federal communities, and that they are obliged to live in accord with the law without special privilege because of their status as students or temporary residents.

# Course Numbering



The Institute reserves the right to alter any of its courses at any time.

In addition to its title, each course is identified by two numbers.

The alpha-numeric directly to the left of the course title is the official Institute course number. The number will appear on grade reports, transcripts, and other official correspondence. This is what the alpha-numeric means:

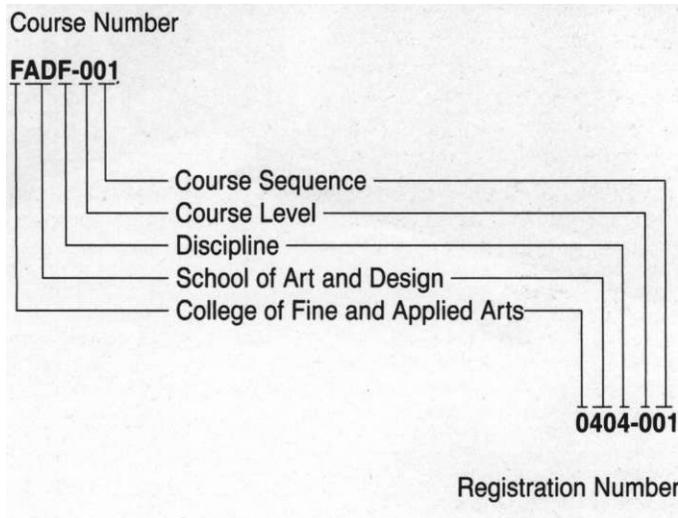
**First letter:** College offering the course

**Second and Third letters:** School or department of that college

**Fourth letter:** Discipline

**First number:** Course level: 0 = 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



Directly 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 cannot be read by the computer system. Course prerequisites are shown in parentheses after course descriptions.

# College of Applied Science and Technology

## Dennis C. Nystrom, Dean

Higher education in any of the technological disciplines requires commitment of both the student and the institution. The academic areas within the College of Applied Science and Technology represent RIT's commitment to curricular innovation, program flexibility and academic rigor. The College of Applied Science and Technology is composed of six units: School of Computer Science and Technology, Department of Instructional Technology, Department of Packaging Science, School of Engineering Technology, Department of Career and Human Resource Development, and School of Food, Hotel and Tourism Management.

Many College of Applied Science and Technology programs are academic leaders in the regional, state, or even national educational communities. Students entering computer science have three graduate programs from which to select; others will follow in succeeding years. The career and human resource development program provides a sound background for this emerging quantitative field. Programs in instructional technology answer the demand for skilled and professional systems oriented training and educational technologists. The master's program in packaging science was added in response to demand from industry for people with graduate education in packaging.

The following graduate programs are currently offered in the College of Applied Science and Technology.

### **Master of Science Degree in Computer Systems Management**

This curriculum, the first of its kind in the United States, is designed to prepare competent personnel for the management of computer installations. Graduate management courses and computer courses are combined in such a way that the student concentrates in areas where he or she has the least experience, and is strengthened in those areas of knowledge already acquired. Both full-time and part-time students are enrolled in this curriculum.

### **Master of Science Degree in Computer Science**

Graduates of computer science, science, engineering, or business programs who wish to pursue advanced



technical and theoretical studies in the field, for purposes of employment or further graduate study at the doctoral level, will find this curriculum offers the opportunity to tailor a program that will satisfy their goals. Both day and evening courses are available.

### **Master of Science Degree in Information Science**

The newest program offered by the School of Computer Science and Technology, Information Science, is designed to prepare the graduates for work in those areas of business, industry and education where information is managed by data systems. The students coming from other educational programs will be given sufficient computer studies to move into automated data information positions in their academic field.

### **Master of Science Degree in Instructional Technology**

The MS in Instructional Technology Program prepares graduates to develop courses and training materials for adult learners. The program is oriented primarily toward training and development in business, industry, and governmental organizations. For qualified individuals, the RIT Instructional Technology Program offers options in the areas of training and development, health sciences education, higher education, and hospitality management. While based strongly in theories of learning and instruction, the program is pragmatic and offers training in specific job-related skills. The program may be pursued on a full- or part-time basis. Most courses are offered in the evening hours to enable all those employed during the day to pursue degree work.

### **Master of Science Degree in Career and Human Resource Development**

The MS in Career and Human Resource Development prepares qualified individuals for career advising in the education sector or for human resource development in the private sector and large organizations. Graduates of the program receive a grounding in the theory of career counseling and human resource development and are afforded ample opportunity to put their skills in practice in classes as well as in the final project or internship. The program draws not only on the teaching resources of the Institute but brings in professionals and specialists in the HRD field to give the student insights into current practice and to afford the student a chance to build his/her own professional network.



The program may be pursued on a full- or part-time basis. Most courses are offered in the evening hours to allow those employed during the day to pursue degree work.

### **Master of Science Degree in Packaging Science**

This graduate program is a natural extension of the undergraduate curriculum, and is one of only a very few graduate curricula in the U.S. Students completing undergraduate studies may continue the study of packaging at a more intensive level, and those who are already working in industry can use the program to enhance career development or allow for concentrated study in an area of interest. There is enough flexibility in curriculum requirements to tailor programs to suit individual need. Courses are generally offered late in the day so that people presently employed full-time may pursue the degree.

## **School of Computer Science and Technology**

**Wiley R. McKinzie**, Director  
**Peter G. Anderson**, Chairman,  
Graduate Studies

The School of Computer Science and Technology offers a graduate program leading to the degree of master of science in Computer Science. Graduate courses are given at times of the day convenient to both part-time and full-time graduate students: late afternoon, evening, early morning, etc. Students may begin their coursework in any one of the four quarters at RIT. Depending on individual preparation, a full-time student can complete the coursework for the master's degree in as little as one calendar year and complete the thesis in one more quarter.

The master of science in Computer Science degree program prepares students for a wide variety of computer related careers in business, industry, and academia. Graduates are prepared to work in computer system software design, specification, applications, and education.

This program is particularly suited to individuals who have a strong undergraduate background in a quantitative

field in which computers are applied, such as engineering, science and business.

### Computer Facilities

RIT's main computing system is a network of five VAX-11/780 systems and an IBM/370 (the latter is used primarily for administrative data processing). These computers are accessed from two remote batch stations and over 500 time-sharing terminals distributed over the campus (300 of these are intelligent terminals that also support color graphics).

The School of Computer Science and Technology laboratories are extensive. The hardware associated with these facilities represents current distributed processing technology, including an Ethernet coupling:

- two VAX-11/780 systems,
- two PDP-11 systems (11/34 and 11/70),
- five Motorola 68000-based Masscomp microcomputers
- and four MC 68000-based microcomputers (the operating systems laboratory)

All these computers operate under the UNIX (UNIX is a trademark of Bell Labs) operating system. There are over 200 CRT terminals (half supporting color graphics) accessing these systems.

A laboratory devoted exclusively to graduate computer science students has a Pyramid Technologies 90X computer running UNIX with 48 ports and 6MB of main memory. Terminals and dial-in ports in the laboratory are available for graduate student classwork and research use.

The digital logic laboratory is equipped with single-board microcomputers supporting courses, individual student projects, and theses. Other laboratory facilities include graphics workstations and personal computer systems.

Computer Science graduate students have dial-up access to all systems and are encouraged to use home terminals and personal computers. (The RIT bookstore carries computer equipment and software and provides significant discounts for RIT students.)

### Entrance Requirements

Undergraduate degree: Applicants should have a baccalaureate or equivalent degree from an accredited institution and a minimum cumulative grade-point average of 3.0 (B).

Applicants from foreign universities should submit Graduate Record Exam (GRE) scores. (GRE scores can also be considered for applicants whose undergraduate grade-point average is lower than 3.0.) Applicants whose native language is other than English should take the TOEFL examination; a score of at least 535 is required. Applicants with a lower TOEFL may be admitted conditionally and will take a prescribed program in English along with a reduced program course load.

In addition, there is a certain minimal background required of all students wishing to enter the master's program. If an applicant is lacking in some way, Bridge Program courses are provided to allow students to meet these prerequisites and to achieve the required knowledge and skills. Generally, formal acceptance into the master's program is deferred until the applicant has made significant progress through these necessary courses.

The areas that constitute the required minimal background are:

#### Mathematics

Differential and integral calculus  
Statistics

Discrete Mathematics

#### Computing

Experience with a modern high-level language (e.g., Pascal, Ada, Modula, Algol)

Data structures programming  
Assembly language programming  
Basic software design methodology  
Elementary computer architecture and digital logic  
Elementary systems programming

### The Bridge Program

Students whose undergraduate preparation or industrial experience does not satisfy the above content or grade-point requirements may make up these deficiencies through up to a year of study, taking one or more of the following RIT courses, as prescribed by a graduate department advisor:

#### Mathematics

Calculus SMAM-251, 252, and 253  
Statistics EIEI-715 or BBUQ-781  
Discrete Math ICSS-705 or SMAM-265

### Computing

Introductory Programming ICSS-700  
Data Structures ICSS-703  
Assembly Language ICSS-704  
Advanced Programming ICSS-707  
Computer Organization ICSS-708

#### Alternative intensive courses

Programming IICSS-701  
(combined ICSS-700 and 703)  
Programming IIICSS-702  
(combined ICSS-704 and 707)

If a student matriculates before finishing the Bridge Program, all remaining Bridge Program courses must be completed with a grade of at least B; courses with lower grades must be repeated. The Bridge Program courses are not part of the 48 credits required for the master's degree, and their grades are not included in a student's graduate grade-point average.

A Bridge Program can be designed in ways different from that described above. Often, other courses can be substituted, and courses at other colleges can be applied. (See the Computer Science *Graduate Studies Handbook* for more details.)

### The Curriculum

The graduate program of study consists of 48 credits comprising the computer science graduate core, electives, concentration, and a thesis.

The Computer Science Core consists of four courses:

ICSS-706 Foundations of Computing Theory  
ICSS-709 Programming Language Theory  
ICSS-720 Computer Architecture  
ICSS-809 Operating Systems I

The elective section consists of four courses to provide breadth of experience in computer science and applications areas. Students may include graduate courses from departments outside Computer Science as electives (e.g. Science, Engineering, or Business). The following courses are typical computer science electives:

ICSS-610EDP Auditing  
ICSS-721 Microcomputers & Microprocessors  
ICSS-730 Simulation & Modeling  
ICSS-744 Data Communications and Networks I  
EECC-655 Real-Time Computation  
ICSS-770 Computer Graphics  
ICSS-810 Operating Systems II  
ICSS-846 Information Storage & Retrieval  
ICSS-852 Coding Theory

The concentration section consists of an integrated sequence of at least three courses; the thesis is generally in the same area. Four possible concentration areas are:

**Applications of Computer Science**

Data bases; simulation and modeling; computer graphics, data communications; artificial intelligence; information storage and retrieval

**Computing Systems**

Computer, multiprocessor, and microprocessor architectures; real-time computing; operating systems and programming environments; languages and their implementation

**Mathematics of Computer Science**

Coding theory; complexity; computability; theory of parsing; numerical analysis; graph theory

**Software Engineering**

On-Line system design; software engineering and modern programming practices

Students' programs of study must be designed cooperatively with a graduate advisor.

**The Master's Thesis**

A thesis is the capstone of each graduate program. Before registering for ICSS-895 (thesis) a student must submit an acceptable thesis proposal to a three-member faculty committee.

**Financial Aid**

Some graduate assistantships are available in the School of Computer Science and Technology. Information may be obtained from:

Graduate Studies Chairman  
School of Computer Science and  
Technology  
Rochester Institute of Technology  
One Lomb Memorial Drive,  
P.O. Box 9887  
Rochester, New York 14623

## Department of Instructional Technology

**Clint Wallington, Director**

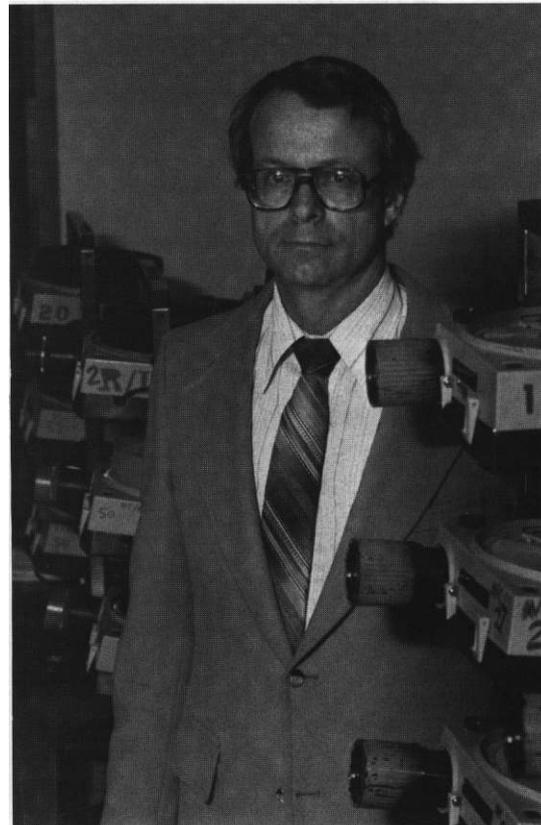
Instructional Technology . . . a name still not completely understood by many who use it. Instructional Technology . . . a name with different meanings in different circles. Instructional Technology . . . only an idea 20 years ago, but a reality now.

At RIT, Instructional Technology is synonymous with developing training courses for business and industry. Although some graduates choose to enter higher education or health training, the majority hold jobs in business, industry, or in larger organizations in the public sector. While their training responsibilities vary from place to place, most start by designing courses—some lengthy, some only a lesson or two to fit into a day-long seminar.

At RIT, Instructional Technology means an orientation toward training where the bulk of the instructional load is carried by a highly structured set of lessons based on materials. While the Instructional Technology Program does have courses in computer-assisted instruction and interactive training, the kind of learning drives the selection of media, not vice-versa.

At RIT, Instructional Technology also means "people skills." Good instructional developers must have good interpersonal communications skills, and the Instructional Technology Program has required courses in interpersonal communications and group dynamics—not theory-only courses, but process courses.

At RIT, there are also certain things that Instructional Technology is *not*. The RIT Instructional Technology Program is not a traditional teacher education or curriculum methods program. The reason is simple. While certain learning principles are constant in any setting, their application in business and industry training is often quite different from their use in elementary and



secondary education. Because trainers in the private sector are not frequently called on to actually produce audio-visual shows, the RIT program is not a media production or a library-media program. Moreover, the program is not oriented toward instructional technology research and theory. It is designed to train trainers and course developers, not theorists.

In short, the program prepares people to develop courses to train adult learners in technical, professional, and managerial skills. While the program is rooted in the theories of adult learning and instructional development, it still has a strong practical component that makes the graduate a contributing member of a training and development team the first day on the job.

## The Program

The Instructional Technology Program is a 48 (quarter) hour program. About half of the courses are required core courses. The student may also elect to take one of four options—or not to take an option. The four options currently available are Training and Development, Higher Education, Health Science, and Tourism/Hospitality Management and Training.

The Training and Development Option is for the graduate planning to enter the training field either in the private sector (business and industry) or larger organizations (social or governmental agencies) in the public sector. The Training and Development Option requires that the student's elective courses be in areas that strengthen the skills sought by future employers. Currently, there is a widespread and expanding need for training specialists, especially instructional developers, in the private sector, and RIT has internship agreements (for qualified students) with three major corporations.

The Higher Education Option is for the graduate seeking employment in an institution of higher education. While the call for instructional developers in higher education is less pronounced than in the private sector, some students elect to seek instructional development positions within this area. The electives in this option relate to the operations and norms of educational institutions.

The Health Science Option is only for practitioners in the health field or for those with an extensive health sciences background. Health education—from patient instruction to technician training—is currently changing. In addition to professional continuing education, some regulatory agencies and advisory groups are recommending additional training . . . and the burden often falls to supervisory personnel. The health sciences option is designed to help these practitioners meet the training demands.

The Tourism/Hospitality Management and Training Option is a new concentration designed for those who already

have a degree or several years of experience in the tourism and hospitality industry. Specially designed in conjunction with RIT's nationally known School of Food, Hotel, and Tourism Management, the Tourism/Hospitality Management and Training Option offers the hospitality industry professional a powerful alternative to more traditional MBA programs. In addition to its instructional technology core curriculum, the Tourism/Hospitality Management and Training Option has its own set of graduate tourism/hospitality courses developed by the School of Food, Hotel, and Tourism Management. The classroom activities are coupled with required tourism/hospitality laboratory internships in which the student develops and field tests instructional units in current tourism/hospitality areas—including RIT's own American Airlines Sabre reservations system. Admission to the program is limited, and individuals applying for this option are screened by a joint committee of the School of Food, Hotel, and Tourism Management and Instructional Technology academic programs.

## Admission Requirements

Admission decisions for the Instructional Technology Program are based on a review of the baccalaureate degree and any other coursework, including grades; scores from the Graduate Record Examination; letters of reference from academic advisors or major professors and from supervisors or managers; and a personal statement of work goals and how the degree can contribute to those goals.

Nonmatriculated students with a baccalaureate degree may, with special permission, take 2 courses or 8 hours of coursework (whichever comes first). Successful completion of any coursework does not change the requirements for admission nor are those courses necessarily counted toward the degree.

If a prospective student has any questions about the program, job prospects, or the relation of the degree to any personal goals, the student should contact the department director for an individual interview. Application forms are available from the RIT Admissions Office or the Instructional Technology Department.

## Financial Assistance

In addition to the assistance available through the RIT Financial Aid Office (716/475-2186) or the Dean of Graduate Studies (716/475-6523), the Instructional Technology Department often has departmental assistantships. The number and kind vary from year to year. For more information and assistantship applications, contact the department (716/475-2892).

## Degree Requirements

The degree requires the completion of a minimum of 48 quarter hours at the graduate level. Of the 48 hours, 24 are in 8 core courses required of all students. In addition, all students are required to complete an instructional development project that can serve as part of a portfolio for prospective employers. The degree may be completed in four consecutive quarters if the student starts in the fall quarter. However, the majority of students attend part time and take from two to four years to complete the degree work. A student *must* complete the degree within five years of matriculation. Almost all courses are offered in the evenings so that students may work in the daytime as they take courses.

Of the 24 hours of electives, students are relatively free to choose what they feel best meets their needs. The only restrictions are:

- all courses must be graduate level courses;
- a maximum of 9 quarter hours (not counted toward another degree) may be transferred from another college or university;
- a maximum of 12 hours may be taken outside the Instructional Technology Department;
- a maximum of 8 hours may be taken in projects or internship courses (ICIT-722, -840, and -850);
- a student may take a maximum of 14 hours of any combination of the above.

Each student has an academic advisor to help develop a plan of study. While the student has some liberty to choose course sequence, careful attention should be given to course prerequisites. A good rule of thumb is to take ICIT-700, -735, -755, -756, -770 within the first 20 hours of coursework. For specific questions, the student should see his/her academic advisor.

	<b>Credit Hours</b>
<b>Required Courses</b>	
Introduction to Instructional Technology I—ICIT-700	2
Psychology of Learning and Teaching—ICIT-735	4
Instructional Development I— ICIT-750	4
Instructional Development II— ICIT-751	4
Criterion Referenced Instruction and Technical Training I—ICIT-755	3
Group Dynamics for Career Development—IJCC-753	4
Interpersonal Communications— ICIT-770	2
Selected Topics in Instructional Technology—ICIT-780	2
<b>Training and Development Option</b>	
Core Courses (minimum 10 hours of courses below are required)	
Applications of Behavioral Psychology to Training and Adult Learning—ICIT-736	3
Criterion Referenced Instruction II ICIT-756	3
Techniques of Work Analysis— ICIT-757	3
Developing Instructional Modules—ICIT-758	3
<b>Higher Education Option</b>	
Core Courses (minimum of 8 hours required)	
Criterion Referenced Instruction II ICIT-756	3
Evaluation of Training and Instruction—ICIT-721	4
Management and Budgeting in Instructional Technology— ICIT-762	4
Individual Learning Styles— ICIT-765	4
Education/Business/Industry Interrelationships—IJCC-743	2
<b>Health Science Option</b>	
Core Courses (minimum of 8 hours required)	
Evaluation of Training and Instruction—ICIT-721	4
Applications of Behavioral Psychology to Training and Adult Learning—ICIT-736	3
Criterion Referenced Instruction and Technical Training II—ICIT-756	3

## Department of Career and Human Resource Development

**Clint Wallington**, Director

Career and Human Resource Development (CHRD) is the newest department in the College of Applied Science and Technology. It came into being to meet an expressed need on the part of graduates, students, and employers. That original program encompassed what is now the program's career education concentration.

Shortly after its inception, career education graduates found that the private sector was beginning to appreciate the benefits of career development programs for its employees. At the same time that graduates discovered the human resource development (HRD) movement in business and industry, corporations and large organizations discovered the graduates. Both requested that RIT add elements to its Career and Human Resource Development Program that would better prepare program graduates for entry into the business world. RIT responded, and the HRD concentration, drawing upon the strengths of RIT's respected MBA program, was born.

The shift in the average age of employees, the impact of high technology, the demand for increased productivity, and the change from smokestack industry to knowledge and service industries are all causing organizations—private and public, large and small—to re-evaluate their stance toward employees. Enlightened employers are treating their employees not as simple tools in the process but as a resource pool like money, facilities, and capital equipment. The Human Resource Development Concentration offers students interested in this area an alternative to the more quantitative MBA programs.

### The Program

The Career and Human Resource Development Program is a 52 (quarter) hour program with a 30-hour core required of all students. In addition, the student must choose one of two elective concentrations, Human Resource Development or Career Education. The core guarantees a common base of career counseling, career development,

and manpower development skills. The concentrations assist the student in preparing for a specific market sector.

The Career Education Concentration is for the graduate planning to enter the world of education. Career Education graduates are most often found in higher education or secondary education, helping students make career choices or developing career opportunities for students through placement and cooperative education units within a school or college. In this concentration, the emphasis is more on the individual student and his or her future career options than meeting the specific manpower needs of an organization.

The Human Resource Development (HRD) Option is for the graduate planning to enter an organization in the private or public sector to help the organization project its manpower needs and to find ways of meeting those needs. While there is some focus on the individual, the HRD option looks at the individual as part of a particular work force. The concentration's required courses are MBA courses that introduce the student to the processes of management and decision making, especially as they relate to HRD and personnel matters.

### Admission Requirements

Admission decisions for the Career and Human Resource Development Program are based on a review of the baccalaureate degrees and any other coursework, including grades; coursework in basic statistics, sociology, psychology, and business or economics; experience in the areas of counseling, advising, and supervision; scores from the Graduate Record Exam (GRE) or the Graduate Management Admission Test (GMAT); and a statement of personal and career goals. In general, applicants should have at least three years of work experience, preferably in counseling or supervision. Students who do not have the necessary undergraduate courses in statistics, sociology, psychology, and business/economics may demonstrate competency in these areas through work experience or approved non-credit courses. A personal interview is strongly recommended to clarify the applicant's own goals and the relationship of the program to the achievement of those goals.

**The Degree**

Nonmatriculated students with an appropriate baccalaureate degree may, with special permission, take two courses or eight hours (whichever comes first) but *not* any courses offered by the College of Business. Successful completion of any coursework does not change the requirements for admission nor are those courses necessarily counted toward the degree program. Any prospective student with questions about the program should contact the CHRD department director for more information. Application forms are available from the RIT Admissions Office or the department.

**Financial Assistance**

In addition to the assistance available through the RIT Financial Aid Office (716/475-2186) or the Dean of Graduate Studies (716/475-6523), the Career and Human Resource Development Program has occasional departmental assistantships. The number and kind vary from year to year. For more information and assistantship applications, contact the CHRD Department (716/475-6677).

**Degree Requirements**

The degree requires the completion of a minimum of 52 quarter hours at the graduate level. Of the 48 hours, 30 are in nine core courses required of all students. In addition, all students are required to complete a CHRD project or internship as part of a portfolio for prospective employers. The degree can usually be completed in five consecutive quarters if the student starts in the fall quarter. However, the majority of students attend part time and take from two to four years to complete the degree work. The student must maintain a B average. A student *must* complete the degree within five years of matriculation. Almost all courses are offered in the evenings so that students may work in the daytime as they take courses.

Of the 22 hours of electives, students are relatively free to choose what they feel best meets their needs. The only restrictions are:

- all courses must be graduate level courses;
- a maximum of 12 quarter hours (not counted toward another degree) may be transferred from another college or university;

- a maximum of 12 hours may be taken outside the Career and Human Resource Development Department or the College of Business;
- a maximum of 6 hours may be taken in seminars, independent studies, and internships (UCC-750, -751, -754, -777, -840, and -850).

Each student has an academic advisor to help develop a plan of study. While the student has some liberty to choose course sequence, careful attention should be given to course prerequisites. For specific questions about courses and plan of study, the advisor or the department director should be consulted.

<b>Required Core</b>	<b>Credits</b>
0615-703 Management of Learning	2
0615-742 Career Decision Making Concepts	4
0615-745 Career Concepts: Production or Commerce or Services (one course required)	3
0615-748 Information Retrieval Systems in Career Planning	4
0615-749 Manpower Forecasting Fundamentals	4
0615-760 Career Counseling Skills	4
0615-777 Career Development Project	2
0102-740 Organizational Behavior	4
0240-712 Fundamentals of Statistics II	_3
<b>Total</b>	<b>30</b>

**Concentrations**

Students choose one concentration and follow the requirements indicated below.

<b>Career Education Concentration</b>	<b>Credits</b>
0615-743 Education/Business/Industry Interrelationships	2
0615-745 Career Concepts: 0615-746 (one course in addition to the one taken as part of the required core)	3
0615-753 Group Dynamics for Career Development	4
Electives	14
<b>Concentration Total</b>	<b>23</b>
Credits from Required Core	30
<b>Total</b>	<b>53</b>

**Human Resource Development Concentration**

0102-741 Organization and Management	4
0102-748 Employee and Labor Relations	4
0102-750 Personnel Systems	4
Electives	10
<b>Concentration Total</b>	<b>22</b>
Credits from Required Core	30
<b>Total</b>	<b>52</b>

**Suggested Electives**

0615-751 Occupational/Industrial Environments	3
0615-752 Career Education in Colleges and Special Settings	3
0615-754 Human Resource Topics	1-3
0615-762 Career Education Seminar	3
0613-757 Techniques of Work Analysis	3
0613-770 Interpersonal Communications	2
0102-746 Management and Career Development	4
0102-755 Compensation and Reward Systems	4

Additional courses, especially those from the College of Business or the Department of Instructional Technology, College of Applied Science and Technology, may be used as electives with the approval of the program director.

**Department of Packaging Science**

David L. Olsson, Director

The master of science degree program in packaging science is designed to accommodate a wide range of needs of people in differing circumstances. It is flexible enough to meet the needs of professionals who have been working in the field for a number of years, and it is suitable for those students who wish to pursue a graduate program immediately upon receiving the BS degree.

In addition, although an undergraduate curriculum in packaging science is preferred as preparation for the MS program, graduates from certain other disciplines can successfully pursue this program if certain basic packaging science courses are coupled with appropriate work experience.

## Requirements

Students entering the program will have a graduate academic advisor appointed and will develop their programs of study in consultation with their advisor. They may utilize the model curriculum to complete their degree requirements, or may propose alternative course work. All programs must be consistent with the general outline of the model curriculum, and have advisory approval. In instances where the student has insufficient academic or practical preparation to study packaging at the graduate level, he or she will work out an appropriate program to correct such deficiency, by selecting one or more from the following list of undergraduate courses: Packaging Principles, Materials I, Materials II, Container Systems I, II, Production Systems, Packaging for Distribution, Packaging for Marketing, and/or Shock and Vibration. These courses may not be used for credit toward the MS degree.

Further, a basic competence in statistics and basic computer literacy will be assumed. Applicants for graduate study may satisfy these requirements by having completed the equivalent of CTAM-712, and having completed a course in a programming language. Lacking this background, applicants will be required to take CTAM-711 and CTAM-712, and/or ICSP-205, or equivalent course work to remedy a background deficiency.

Application for admission for graduate study in packaging will be made through the RIT Office of Admissions. Final acceptance of the candidate for graduate study will be determined by the Department of Packaging Science. All applicants must (1) have earned a B (3.0) average grade in their final two years of undergraduate degree work, (2) submit transcripts of undergraduate work to the RIT Office of Admissions, and (3) submit two letters of recommendation to the Department of Packaging Science. Normally, completion of the last two years of the undergraduate degree program with a B average will serve to satisfy entrance requirements. In those cases where there may be some question of the capability of the applicant to complete this program of graduate study, he or she may be required to submit his or her scores on the Graduate Record Examination to support the candidacy.

## The curriculum

The curriculum is comprised of three components identified as (1) packaging core courses, (2) research, and (3) elective credit. The MS degree program requires completion of 48 credits of graduate-level course work, as follows:

### **Packaging core course work**

Completion of a minimum of 20 credits in graduate-level packaging courses, including IPKG-701, Research Methods, and any four of the following: IPKG-721 Packaging Administration IPKG-731 Advanced Packaging

#### Economics

IPKG-742 Distribution Systems  
IPKG-750 Graduate Seminar  
IPKG-752 The Legal Environment  
IPKG-763 Packaging for End-Use  
IPKG-770 Computer Applications  
IPKG-783 Packaging Dynamics  
IPKG-799 Advanced Packaging Design

### **Research**

Students in the master's program will be required to prepare and defend a 12-credit thesis which has been completed under the supervision of their advisor. They may also elect to take up to 8 credits of independent study credit, but this may NOT be used as credit towards the 20 credits of packaging core course work.

IPKG-798 Independent Study

1-4 credits, maximum of 8 credits;  
does not count as "core"

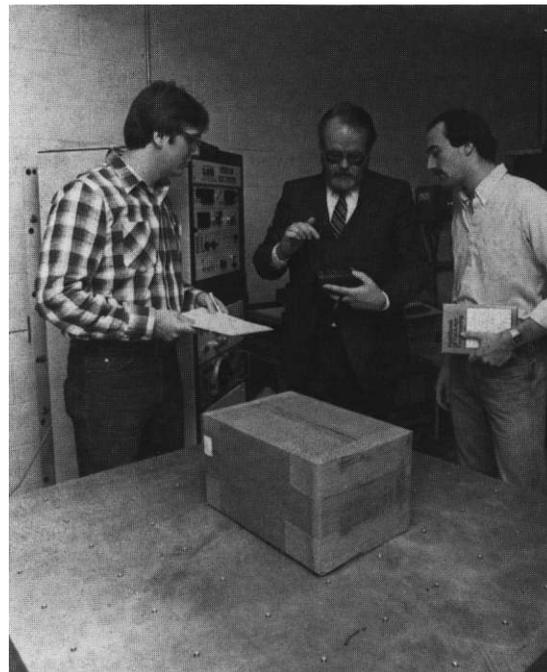
IPKG-890 Graduate Thesis

12 credits; required. The type of research done and the area of study will be agreed upon by the student and the advisor before enrolling for graduate thesis credits.

### **Elective credit**

In addition to packaging core (20 credits, including Research Methods) and thesis (12 credits), each student will complete a minimum of 16 elective credits selected in consultation with the advisor, to complete the degree requirement.

In general, graduate-level course work will be selected to meet degree requirements, but, in limited circumstances, where individual need indicates that it would be appropriate, a limited number of 500-level undergraduate courses (not to exceed 12 credits, in total) may be used to fulfill elective credit.



# School of Computer Science and Technology

## Graduate Courses

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.

## Computer Science

### ICSS-700 Computer Programming and Problem Solving

#### Registration #0603-700

An introductory Course in the use of computers, interactive environments, file systems, editor. Programming in a modern structured programming language such as Pascal or Ada, covering: control structures, procedures and functions, recursion, arrays, pointers, file I/O, records. Application areas cover: numerical methods, sorting and searching, graphics, text processing. Programming projects will be required. (Pre-calculus)

Credit 4

### ICSS-701 Programming I

#### Registration #0603-701

Fundamentals of computer programming and problem-solving using 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 co-requisite)

Credit 8

### ICSS-702 Programming II

#### Registration #0603-702

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 that supports these programming practices—ADA, for example. Programming projects will be required. (ICSS-701 or equivalent)

Credit 8

### ICSS-703 Algorithms and Data Structures

#### Registration #0603-703

Topics include 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

### ICSS-704 Assembly Language Programming

#### Registration #0603-704

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. (ICSS-700, 701 or a programming proficiency in some high-level language.)

Credit 4

### ICSS-705 Discrete Computational Structures

#### Registration #0603-705

The fundamental concepts of discrete mathematics which are necessary for understanding further mathematics foundations of Computer Science. Topics include: structures defined on finite sets, elementary symbolic logic, patterns of mathematical proof, vectors and matrices, graphs, combinatorics, formal languages, abstract mathematical systems. The relevance of the chosen topics to Computer Science and the applications of computers to these topics will be stressed. (College algebra, computer literacy)

Credit 4

### ICSS-706 Foundations of Computing Theory

#### Registration #0603-706

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. (ICSS-705, ICSS-703)

Credit 4

### ICSS-707 Advanced Programming

#### Registration #0603-707

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. These, along with the study of a programming language that supports them—ADA, for example. Programming projects will be required. (ICSS-703)

Credit 4

### ICSS-708 Computer Organization and Programming

#### Registration #0603-708

An introduction to the basic concepts and terminology of hardware and software systems. Basic hardware is elementary circuit designates, 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. (ICSS-704, ICSS-703, ICSS-707)

Credit 4

### ICSS-709 Programming Language Concepts

#### Registration #0603-709

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. (ICSS-702 or equivalent)

Credit 4

### ICSS-711 Advanced Topics in Programming Language Theory

#### Registration #0603-711

An introduction to non-traditional programming paradigms and language translation techniques. Topics will include language translators, parsing, syntax directed translation and storage management for retentive and nonretentive languages. Languages studied will include examples of functional, logic, object oriented and data-flow languages. Programming projects will be required. (ICSS-706 and ICSS-709)

Credit 4

### ICSS-720 Computer Architecture

#### Registration #0603-720

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. (ICSS-708)

Credit 4



**ICSS-811** **Operating Systems III****Registration #0603-811**

This is a "topics" course in which the instructor chooses an advanced topic of interest and explores it with the class. The topic may vary from the implementation of an Operating System feature through the study of topics not covered in Operating Systems I to queuing theory of other theoretical topics. Programming projects will be required. (ICSS-809)  
Credit 4

**ICSS-846** **Information Storage and Retrieval****Registration #0603-846**

A study of contemporary approaches to the storage and retrieval of unformatted text with emphasis on document databases. Students use the experimental SMART information storage and retrieval system, and an AT&T Videotex system for project assignments. 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. (Completion of the bridge program)  
Credit 4

**ICSS-850** **Computability****Registration #0603-850**

Computability is the heart of theoretical computer science, for it is the theory which attempts to formalize the notion of computation. Topics include computation by white-programs, Turing machines, recursive function theory, Symbol-Manipulation Systems, program methodology, the limitation of the concept of effective computability. (ICSS-706)  
Credit 4

**ICSS-851** **Computational Complexity****Registration #0603-851**

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. (ICSS-706)  
Credit 4

**ICSS-852** **Coding Theory****Registration #0603-852**

A study of error-correcting codes and their applications 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. (ICSS-706)  
Credit 4

**ICSS-856** **Theory of Parsing****Registration #0603-856**

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. (ICSS-706)  
Credit 4

**ICSS-860** **Compiler Construction****Registration #0603-860**

The structure of language translators, lexical and syntactic analysis, storage allocation and management, code generation, optimization, error recovery. Programming projects will be required. (ICSS-706, ICSS-709 and ICSS-711)  
Credit 4

**ICSS-890** **Seminar****Registration #0603-890**

Current advances in computer science. (Permission of the instructor)  
Credit 2-4

**ICSS-895** **MS Thesis****Registration #0603-895**

Capstone of the Masters Degree program. Student must submit an acceptable thesis proposal in order to enroll. (Permission of the graduate studies committee)  
Credit 4

**ICSS-899** **Independent Study****Registration #0603-899**

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

## Department of Instructional Technology

### Graduate Courses

#### Instructional Technology

**ICIT-700** **Introduction to Instructional Technology I****Registration #0613-700**

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. Completion of modules and seminars on topics above are required (2 cr.) Additional modules cover specialized areas of instructional technology such as health sciences and community college applications, television and instruction, training and development. Course credit varies with the number of modules completed. Course required for graduation.  
Credit 2

**ICIT-705** **Sources of information in Instructional Technology****Registration #0613-705**

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 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 variable (3-4)

**ICIT-710** **Programed Instruction****Registration #0613-710**

Students review principles and techniques of preparing programed instruction; then design, produce and validate their own programed instruction materials; includes research and development related to programed instruction and sources of programed materials.  
Credit 4

**ICIT-712** **Computer Assisted Instruction (CAI-1)****Registration #0613-712**

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, programmed 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

**ICIT-713** **Advanced Computer Assisted Instruction (CAI-2)****Registration #0613-713**

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 Instructional Systems (CAI-3)****Registration #0613-714**

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 prepare 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, ICIT-713, ICIT-750, ICIT-755, ICIT-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, standalone 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 Technology****Registration #0613-720**

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 and Instruction****Registration #0613-721**

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)

Credit variable (1-3)

**ICIT-735 Psychology of Learning and Teaching****Registration #0613-735**

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. Course required for graduation.

Credit 4

**Applications of Behavioral Psychology to Training and Adult Learning****ICIT-736****Registration #0613-736**

The course distinguishes between counseling, coaching, and training, stressing task-related interpersonal and cognitive skills such as working with a subject matter expert of job counseling. Includes methods of interaction to maintain communications and to shape behavior. (ICIT-735, 770)

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

**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 18 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 III****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

**ICIT-755 Criterion Referenced Instruction and Technical Training I****Registration #0613-755**

Required for graduation.

Credit 3

**ICIT-756 Criterion Referenced Instruction and Technical Training II****Registration #0613-756**

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.

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 inter-related purposes. Students must complete a total of three additional job analyses.

Credit 3

**ICIT-758 Developing Instructional Modules****Registration #0613-758**

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-762 Management & Budgeting In Instructional Technology****Registration #0613-762**

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 Style Analysis****Registration #0613-765**

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 Communications****Registration #0613-770**

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 Organizational Change****Registration #0613-772**

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. Offered on demand. (ICIT-750, ICIT-751, ICIT-757, ICIT-770, IJCC-753, and permission of department.)

Credit 3

**ICIT-780 Selected Topics in Instructional Technology****Registration #0613-780**

This seminar provides a forum for a small group of students to examine various areas of interest to them. Students select topics, examine them thoroughly, and present the findings for group consideration. Required for graduation. (30 hours course work)

Credit 2

**ICIT-811 Tourism Planning and Development****Registration #0613-811**

Tourism planning defines the frames of reference used in making choices concerning the development of tourism facilities and optimum use of available space. Tourism development provides the structures by which present and future tourism programs are promoted and evaluated. This course focuses on planning and development as it relates to the external environmental components that impinge on tourism-related activities. (Permission of department required)

Credit 3

**ICIT-812 Tourism Resource Economics****Registration #0613-812**

Tourism resource economics encompasses the monetary transfer process of the tourism economy in relation to regional incomes and expenditures. Pricing policies, taxing authorities, ownership patterns, financing and leakage potentials of various tourism infrastructures are analyzed. (Permission of department required)

Credit 3

**ICIT-813 Tourism Policy Analysis****Registration #0613-813**

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 the tourism resource base. Specific policies for tourist regions are compared for effectiveness and overall cost benefits. Local, state, national and international examples are included. (Permission of department required)

Credit 3

**ICIT-814 Tourism Marketing Systems****Registration #0613-814**

Tourism 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. (Permission of department required)

Credit 3

**ICIT-815 Problem Analysis and Decision Making in Tourism****Registration #0613-815**

Specific 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. (Permission of Department required)

Credit 3

**ICIT-818 Practicum in Tourism/Travel Training and Management****Registration #0613-818**

An opportunity for the student to apply skills learned in previous courses in a work or laboratory setting. A proposal must be approved *prior to* enrolling in the course. (Required for graduation; 32 hours of coursework including ICIT-750, 751, 755, 770; permission of department required)

Credit variable 1-3

**Independent Study in Tourism/Travel Training and Management****ICIT-819****Registration #0613-819**

An opportunity for the student to apply skills learned in previous courses in a work, a laboratory or a research and development setting. The independent study must seek to answer questions outside the scope of regular coursework. A proposal must be approved *prior to* enrolling in the course. (32 hours of coursework including ICIT-735, 750, 751, 755; permission of department required)

Credit variable 1-3

**ICIT-821 Organizational Strategies of Hospitality Firms****Registration #0613-821**

An analysis of the organizational structure, operational procedures, corporate policies, financial growth and related factors in specific hospitality firms. Traces the evolution of selected companies to reveal individual growth strategies. (Permission of department required)

Credit 3

**ICIT-822 Employee Relations and Training in the Hospitality Industry****Registration #0613-822**

An overview and examination of various personnel functions with emphasis on their applications in the hospitality industry. Topics include: job and task analysis; employee recruitment and interviews; performance appraisals and advancement; motivation, incentives, and compensation; employee service programs; employee relations; and training. (Permission of department required)

Credit 3

**Research Methods and Applications in the Hospitality Industry****ICIT-823****Registration #0613-823**

A survey of research methods that are especially applicable to the various elements of the hospitality and tourism industry. Emphasis on utilization of primary data collection and its application to specific modelling and forecasting techniques used within the industry. (Permission of department required)

Credit 3

**ICIT-828 Practicum in Hotel/Hospitality Training and Management****Registration #0613-828**

An opportunity for the student to apply skills learned in previous courses in a work or laboratory setting. A proposal must be approved *prior to* enrolling in the course. (Required for graduation; 32 hours of coursework including ICIT-750, 751, 755, 770; permission of department required)

Credit variable 1-3

**Independent Study In Hotel/Hospitality Training and Management****ICIT-829****Registration # 0613-829**

An opportunity for the student to apply skills learned in previous courses in a work, a laboratory or a research and development setting. The independent study must seek to answer questions outside the scope of regular coursework. A proposal must be approved *prior to* enrolling in the course. (32 hours of coursework including ICIT-735, 750, 751, 755; permission of department required)

Credit variable 1-3

**ICIT-831 Food Marketing and Distribution Systems****Registration #0613-831**

A study of the delivery systems of the food industry. Includes an analysis of the supply, transportation requirements, packaging and warehousing that reveals the marketing systems of raw and finished food products. Specific food commodities are traced from production through their finished states of consumption. (Permission of department required)

Credit 3

**ICIT-832 Product Development and Problem Solving in Food Service****Registration #0613-832**

The application of sensory evaluation to the creation of new food products. Includes the application of the scientific method to the problems and decision making involving new food products, ingredients and preparation methods in food service. (Permission of department required)

Credit 3

**ICIT-833 Computer Based Accounting and Inventory Systems****Registration #0613-833**

A survey of the various commercially available computer-based accounting and data systems used within the hospitality and tourism industry. Emphasis is on the planning and control of inventory systems associated with restaurant and banquet catering services, hotel auditing systems, and travel agency and traveler-generated corporate reports. (Permission of department required)

Credit 3

**ICIT-835 Seminar: Contemporary Issues In the Food Industry****Registration #0613-835**

A small group study of contemporary issues and topics selected by the student or faculty member. Research, oral presentations and class discussion of all issues chosen for the seminar. (Permission of department required)

Credit 3

**ICIT-838 Practicum In Food Production Training and Management****Registration #0613-838**

An opportunity for the student to apply skills learned in previous courses in a work or laboratory setting. A proposal must be approved *prior to* enrolling in the course. (Required for graduation; 32 hours of coursework including ICIT-750, 751, 755, 770; permission of department required)

Credit variable 1-3

**ICIT-839 Independent Study in Food Production Training and Management****Registration #0613-839**

An opportunity for the student to apply skills learned in previous courses in a work, a laboratory or a research and development setting. The independent study must seek to answer questions outside the scope of regular coursework. A proposal must be approved *prior to* enrolling in the course. (32 hours of coursework including ICIT-735, 750, 751, 755; permission of department required)

Credit variable 1-3

**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 submitted prior to registering for this course. (ICIT-750, ICIT-751 plus 20 hours of course work)

Credit variable (1-3)

**ICIT-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 submitted prior to registering for this course. (ICIT-750, ICIT-751 plus 20 hours of course work)

Credit variable (1-3)

## Department of Career and Human Resource Development

All courses are offered on demand with sufficient enrollment. Note: Graduate courses applicable to the program are also listed under the College of Business.

**IJCC-703 Management of Learning****Registration #0615-703**

Systems of curriculum planning and cognitive styles, goals, objectives, evaluation, measurement, and productivity are studied as they relate to the accountability of faculty, students, and administration.

Credit 2

**IJCC-704 Instructional Techniques****Registration #0615-704**

To develop professional competence in direct applications and uses of various learning styles, including television, special audiovisuals, prepared lectures, seminars, computer assisted instruction, and programmed learning.

Credit variable (1-4 credits)

**IJCC-742 Career Decision Making Concepts****Registration #0615-742**

Based upon prior knowledge of basic sociological and psychological constructs, this course concentrates on the processes and influences involved in choices regarding careers. The relative and collective impacts of peers, teachers, and relatives, immediate family, and professional advisors are analyzed. Additional course goals include applications of processes such as socialization, acculturation, assimilation; status and role playing; and perception to related activities such as career education-orientation-advising. Current psychological research relating personality/self concepts/motivation to career decision making will be studied. A special topic involves the problems of communicating information on emerging careers to individuals to effect real and valid perceptions.

Credit 4

**IJCC-743 Education/Business/Industry Interrelationships****Registration #0615-743**

A study of the interrelationship of the world of formal education to the business, industrial, and labor communities. Constraints, problems, and values of cooperative effort will be studied in relation to organizations of varying size. Elementary, secondary and postsecondary education, differing size business organizations and industrial groups that involve differing levels of technical specialization are studied.

Credit 2

**IJCC-745 Career Concepts: Production****Registration #0615-745**

Credit 3

**IJCC-746 Career Concepts: Commerce****Registration #0615-746**

Credit 3

**IJCC-747 Career Concepts: Services****Registration #0615-747**

These three courses form a single set and are separated only to facilitate registration and scheduling flexibility.

Each of these three courses concentrates on particular careers. Production includes manufacturing, construction, mining, skilled trades, design and engineering related fields, and food processing and the field of agriculture, fisheries, etc. Commerce covers general business, banking and finance, sales and advertising, communications, hospitality and tourism, retail and wholesale distribution and related fields. Service includes allied health careers, education, government and civil service, law and criminal justice careers, and other service careers.

Each course is designed to present a foundation view of several types of a particular employer. Investigated will be systems of career opportunities, management, personnel policies, employer/employee relations, required training/educational levels, manpower long-range projections, philosophies, in-house education and training, competitive relationships, national/international affiliations, and civic/humanitarian expectations.

Credit 3

**IJCC-748 Information Retrieval Systems in Career Planning****Registration #0615-748**

The primary goal is the ability to use several data based computer systems for the storage and retrieval of career information. This includes a sufficient understanding of the computer systems, languages and dictionaries for efficient utilization.

Additional goals are an awareness of the other systems based upon media and print materials, and the ability to evaluate various systems. (CTAM-712 or equivalent, plus 20 hours).

Credit 4

**IJCC-749 Manpower Forecasting Fundamentals****Registration #0615-749**

Two different purposes that depend on a common base are goals for this course. The common base is an understanding of the techniques, theories and limitations of manpower forecasting as it applies to numbers in current occupations and to the probabilities of emerging careers.

The two purposes are: (1) the ability to provide, as a generalist having a broad knowledge of different careers, assistance to discipline specialists in feasibility studies for new educational programs, and (2) assisting people in making decisions in those careers for which insufficient information exists. The ability to assist people in making decisions about the pursuit of a career that is projected to be available several years later will be studied in order to develop a uniform and responsible judgement in those areas where probability statements are extremely important. (CTAM-712 or equivalent, plus 20 hours).

Credit 4

**IJCC-750 Career Seminar****Registration #0615-750**

This is a series of interdisciplinary discussions led by course participants from different teaching disciplines and outside resource persons. The topics concern the challenges involved in teaching, and in educational planning, leading to a better understanding of the total learning by the two-year college students (offered occasionally).

Credit 2

**IJCC-751 Occupational/Industrial Environments****Registration #0615-751**

This course offers educators firsthand exposure to industrial and/or occupational work environments with focus on the various components of the work force such as research, skilled trades, computer-related areas, production supervision, finance and retailing. Students will have presentations from executives, training directors, employment personnel and workers about skills required for entry-level jobs, application and interview procedures, scope of work, economic benefits, salary and wage scales, employment outlook, and worker and employer expectations.

Credit 3

**IJCC-752 Career Education in Colleges & Special Settings****Registration #0615-752**

The course goals are to develop the abilities and knowledge necessary to function effectively in college career education and information centers and other organizations helping adults develop career plans. Topics include career education components in community/junior and four year colleges and universities; multiple, middle, and late careers; advocacy; spouse and family concerns; and special settings for career assistance, (offered occasionally).

Credit 3

**IJCC-753 Group Dynamics for Career Development****Registration #0615-753**

This course concentrates on the abilities needed to plan, conduct and evaluate various group counseling and peer assistance processes as used in assisting individuals to formulate career plans. Each participant will understand the appropriate functions, advantages and disadvantages of different group dynamic procedures and will demonstrate the required "attending," listening, guidance, problem solving, and decision making skills needed to plan and moderate such sessions.

Credit 4

**IJCC-754 Human Resources Topics****Registration #0615-754**

This course provides classroom studies, research, and experiential learnings that relate general knowledge about occupations and careers to information about individual and personal characteristics needed for success in the careers. The specific topics and objectives will vary each time the course is offered in order to meet differing needs. They will, however, relate to career development, planning, advising and counseling. Applications to human resource planning, personnel administration, career education, and career assistance will be stressed. Interested persons should understand the particular objectives for a scheduled offering of the course prior to registration. Because of the differences in selected concentrations within the general goal, the course may be repeated for credit if the topic is changed.

Credit variable (1-4 credits)

**IJCC-760 Career Counseling Skills****Registration #0615-760**

Students are introduced through demonstration and role playing to selected interviewing and counseling skills including attending, listening, questioning, paraphrasing, reflection of feelings, giving directions, and interpreting. The primary tenets of related counseling theories are presented and discussed.

Credit 4

**IJCC-777 Career Development Project****Registration #0615-777**

This is a variable (1-3) credit course that is required of all students unless they have had sufficient approvable experience. It is an opportunity to practice one or more of the defined functions in career education or human resource development. Proposals approved by director required prior to enrollment. (IJCC-742, IJCC-760, 20 additional hours of coursework)

Credit variable (1-3 credits)

**IJCC-840 Teaching Internship****Registration #0615-840**

An individual arrangement with an appropriate community or junior college will be made for those persons not having sufficient experience. This will provide definite teaching assignments and responsibilities, together with participation in other faculty functions, including advising, committee work, planning, and student evaluation on a full semester or term basis at a two year college. Supervision, assistance, and evaluation will be provided by a mentor in the participating college and by the CHRD. Proposals approved by director required prior to enrollment. (IJCC-742, IJCC-760, 20 additional hours of coursework)

Credit variable (1-3 credits)

**IJCC-850 Special Projects****Registration #0615-850**

This course provides for independent study, investigation, or research activity in subject matter areas not formalized by the Center's program, but having special-indeed value. Proposals approved by director required prior to enrollment. (IJCC-742, IJCC-760, 20 additional hours of coursework)

Credit variable (1-3 credits)

## Department of Packaging Science

Packaging Science core courses are offered at least once each year. Research courses are offered on demand, in consultation with the instructor.

### Graduate Courses

**IPKG-701 Research Methods in Packaging****Registration #0607-701**

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 Economics****Registration #0607-731**

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 Computer Applications****Registration #0607-770**

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 the 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.  
Credit variable (may be taken for a maximum of 8 credits)

**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)

## Graduate Faculty College of Applied Science and Technology

**Dennis C. Nystrom**, Ed.D., Texas A&M University—Dean, Professor

**William Stratton**, MS, SUNY at Buffalo—Associate Dean, Associate Professor

**Wiley R. McKinzie**, MS, SUNY at Buffalo—Director, School of CS & T, Associate Professor

**David L. Olsson**, Ph.D., Michigan State University—Director, Department of Packaging Science, Professor

**Clinton J. Wallington**, Ph.D., University of Southern California—Director, Departments of Instructional Technology and Career and Human Resource Development, Professor

### School of Computer Science and Technology

**Wiley R. McKinzie**, MS, SUNY at Buffalo—Director, School of Computer Science and Technology, Associate Professor

**Peter G. Anderson**, Ph.D., Massachusetts Institute of Technology—Chairman, Graduate Studies, Professor

**Rodger Baker**, MS, University of Rochester—Associate Professor

**John A. Biles**, MS, University of Kansas—Assistant Professor

**James R. Carbin**, MS, Rensselaer Polytechnic Institute—Professor

**Warren Carithers**, MS, University of Kansas—Assistant Professor

**Chris Comte**, MS, Rochester Institute of Technology—Assistant Professor

**Lawrence Coon**, Ph.D., Ohio State—Associate Professor

**Roy Czernikowski**, Ph.D., Rensselaer Polytechnic Institute—Professor

**John L. Ellis**, Ph.D., University of Toledo—Associate Professor

**Henry Etlinger**, MS, Syracuse University—Associate Professor

**James Hammerton**, MBA, New York University—Assistant Professor

**James Heliotis**, Ph.D., University of Rochester—Assistant Professor

**Jack Hollingsworth**, Ph.D., University of Wisconsin—Professor

**Guy Johnson**, MS, Syracuse University—Professor

**Andrew Kitchen**, Ph.D., University of Rochester—Associate Professor

**Donald L. Kreher**, Ph.D., University of Nebraska—Assistant Professor

**Jeffrey Lasky**, MBA, City University of New York; MS, University of Minnesota—Assistant Professor

**Michael J. Lutz**, MS, SUNY at Buffalo—Chairman, Undergraduate Studies; Associate Professor

**Rayno Niemi**, Ph.D., Rensselaer Polytechnic Institute—Associate Professor

**Stanislaw Radziszowski**, Ph.D., University of Warsaw—Assistant Professor

**Kenneth Reek**, MS, Rochester Institute of Technology—Associate Professor

**Margaret Reek**, MS, Rochester Institute of Technology—Assistant Professor

**Evelyn Rozanski**, MS, Syracuse University—Associate Professor

**Nan C. Schaller**, MS, Union College—Assistant Professor

**William Stratton**, MS, SUNY at Buffalo—Associate Dean, Associate Professor

**Walter Wolf**, Ph.D., Brandeis University—Lecturer

### **Adjunct Faculty- School of Computer Science and Technology**

**Vishwas Abhyankar**, Ph.D., University of Rochester

**Larry Hoffman**, Ph.D., Iowa State University

**Ralph Longobardi**, Ph.D., Syracuse University

**Walter Maurer**, MS, Rochester Institute of Technology

**Werner Schenk**, MBA, University of Rochester

**Edward Taylor**, MS, Rochester Institute of Technology

**Lawrence Ting**, MS, Old Dominion University

### **Department of Instructional Technology**

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**Thomas H. Zigon**, MS, Rochester Institute of Technology—Instructor

### **Adjunct Faculty**

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**Paul Kazmierski**, Ph.D., Syracuse University

**Russell Kraus**, Ed.D., University of Massachusetts

**Richard Riley**, Ed.D., University of Rochester

**Albro C. Wilson**, MS, Rochester Institute of Technology

**Carl Winkelbauer**, M.Ed., University of Rochester

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**Andrew Dougherty**, MBA, Bradley University—Distinguished Lecturer

**Dennis C. Nystrom**, Ed.D., Texas A & M University—Professor

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**James Austin**, MS, Rochester Institute of Technology

**Carolyn B. Dehority**, MS, Rochester Institute of Technology

**Paul Kazmierski**, Ph.D., Syracuse University

**Nancy Neville**, MA, Fordham University

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### **Department of Packaging Science**

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**A. Ray Chapman**, MBA, Rochester Institute of Technology—Assistant Professor

**Daniel L. Goodwin**, MS, Michigan State University—Associate Professor

**Karen L. Proctor**, MBA, Rochester Institute of Technology—Assistant Professor

**Fritz J. Yambrach**, MBA, Utah State University—Assistant Professor

# College of Business

**Dr. Walter F. McCanna**, Dean  
**Dr. Karen Paul**, Chairman,  
Graduate Business Programs

The College of Business offers the master of business administration, or MBA, with option areas in corporate accounting, public accounting, finance, marketing, management and personnel/human resources. The program is balanced in several respects. Both the quantitative and qualitative sides of management are included. Both the applied dimension of managing real problems in actual companies, and the theoretical underpinnings of decision-making strategies are integral parts of the MBA program. And last, the student is considered as a whole person . . . attention is paid to both personal growth and achievement and to developing the professional skills necessary for intelligent management in today's business community.

The strength of the MBA program comes from several sources. Faculty are nationally recognized. Applied research and writing bring recognition from both academic and business centers, while consulting activities link the faculty firmly to the business community.

Another part of RIT's strength is the long-standing institutional commitment to technological leadership and career development. An internship program at the graduate level, as well as ongoing special courses and seminars, develop the interpersonal skills and career objectives of students.

Finally, students themselves bring a unique mix of talents and experiences to the MBA program. A group of full-time students works closely with faculty on a variety of academic and research projects. And a group of part-time students brings information, insights, and ideas to the classroom from their collective work experience. At last count, more than 200 different work organizations were represented by students in the MBA program.

A synergy flows from the combination

of a carefully planned program, outstanding faculty, and talented and experienced students. Many graduates of the MBA program have gone on to positions of leadership in a number of large corporations, and many have done well as entrepreneurs developing their own business enterprises.

## Master of Business Administration

The purpose of the MBA program is to enhance the depth and breadth of general management capabilities of the student. This is accomplished by providing the student with a basic core of coursework in the disciplines of management, economics, statistics, management science, and information systems. Functionally oriented courses include accounting, finance, marketing and operations. These are followed by advanced courses, some of which are directed toward an area of concentration, while the remainder are chosen in elective areas designed to provide breadth to the student's program.

The MBA program requires 76 quarter credit hours (19 courses) and is designed so that a student will progress through the program in a logical sequence while allowing some program flexibility. Those students with previous coursework in business may reduce the number of courses required through waiver examinations. Students with a sufficient background may be able to complete the program with as few as 48 quarter credit hours (12 courses).

Students entering the program have widely varied academic backgrounds. To assure that all students are adequately prepared in the areas of mathematics and statistics, diagnostic tests are administered to all new students. Those students with inadequate skills will be required to take additional coursework in mathematics



and/or statistics during their first quarter of study.

Option areas enable students to take course concentrations in: corporate accounting, public accounting, finance, marketing, management and personnel/human resources.

The MBA with the public accounting option provides students with general management skills and prepares them for public accounting careers. Graduates of this program meet the educational requirements for either the Uniform Certified Public Accounting Examination or the Certificate in Management Accounting Examination.

## General Information and Procedures

### Facilities

The College of Business is housed in the Max Lowenthal Memorial Building on RIT's Rochester campus. Facilities include a Learning Support Center, time-sharing computer terminals on-line with RIT's new computer system and extensive software support, and an up-to-date business collection of texts, periodicals and reference services in the Wallace Memorial Library.

### Admission

Admission to the MBA program will be granted to graduates of accredited baccalaureate degree programs who, in the opinion of the Graduate Review Committee of the College of Business, have demonstrated their potential to successfully complete graduate business studies through their achievements in their undergraduate program and through the results of the Graduate Management Admission Test.

All applicants who are admitted prior to the conclusion of their baccalaureate program are required to submit their final transcript by the end of the first quarter of graduate work.

College of Business graduate programs are appropriate to persons holding a wide variety of undergraduate degrees in business and non-business fields.

Students who have been accepted in a program are allowed to defer enrollment (admission) for two quarters. If a student wishes to defer enrollment beyond two quarters, credentials will be re-evaluated on the basis of current admission standards.

### Mathematics/statistics competency

All students entering the program are required to take a mathematics/statistics diagnostic test prior to registration to demonstrate that they have the mathematics/statistics competencies needed for successful completion of graduate studies. Students whose mathematics/statistics competencies are inadequate must successfully complete appropriate mathematics/statistics courses.

### Foreign students

Applicants from foreign countries where a degree or diploma is granted by an institution not holding accreditation may be admitted provided their study and performance approximates the standards of an accredited bachelor's degree and an ability to meet graduate standards is indicated. The TOEFL score (minimum 525) must be submitted by applicants with limited or no experience in an academic program in the United States.

### Procedures

To be considered for admission it is necessary to file an application and submit transcripts of all previous undergraduate and graduate work, and results of the Graduate Management Admission Test. Information may be obtained from the College of Business or by writing the Graduate Management Admission Test, Educational Testing Service, Box 966, Princeton, N.J., 08540. The test is usually given four times a year in convenient locations, including RIT.

### Orientation

All new students are required to attend an evening orientation session prior to enrolling in courses. At the same time, the mathematics/statistics diagnostic tests are administered. Students are given information regarding course selection, career planning, program planning and academic advising during the orientation. Student handbooks and registration materials are distributed at this time. A more extended Saturday orientation introduces students to the library, the computer system, and the many recreational facilities available at RIT.

### Non-matriculated students

Students may apply to take a limited number of courses on a non-matriculated basis. If these courses are passed with an acceptable grade, and if the student later matriculates, these credits may be applied to the student's degree program. The regular admissions process should be followed by non-matriculated students who wish to be admitted to the MBA program.



Students may find it convenient to begin MBA courses on a non-matriculated basis while they are deciding whether or not to enter the program formally, or while they are waiting for their GMAT scores to be reported.

#### **Financial aid**

Graduate research assistantships are available to deserving full-time graduate students. Assistants work with faculty on research projects, thus enhancing their education, and receive in turn tuition remission. The amount of the grant is dependent upon the nature of the appointment. Interested individuals should write to Graduate Business Programs Office, requesting an assistantship and indicating the quarter or quarters in which they desire aid.

Assistantships and most other forms of financial aid are available only to full-time students. For the part-time student, scholarship aid is available in the form of a tuition remission.

Other forms of financial aid such as fellowships, loans, and grants should be investigated through the Graduate Business Programs Office and the director of financial aid at RIT's Financial Aid Office.

#### **Placement service**

Students seeking employment after graduation should register with RIT's Center for Cooperative Education and Career Services approximately one year prior to graduation. This lead time will enable the student to take full advantage of resume preparation aid and offers the opportunity to interview a wide variety of local and national firms as they visit the campus.

#### **Credit hour requirement**

Credit hour requirements vary depending on the particular program and a student's prior academic achievements. Normally, 76 quarter credit hours are required in the master of business administration program. Each course carries four quarter credit hours. In certain cases, total credit hour requirements may be reduced by the use of waiver credit and/or transfer credit.

An admitted student with appropriate undergraduate business courses taken prior to entry in the MBA program may waive some courses and thus reduce the total required hours accordingly.



#### **Transfer credit**

A maximum of 12 quarter credit hours may be awarded as transfer credit from other graduate programs provided the courses in question carry a grade of "B" or better. Any questions concerning waiver or transfer credit should be referred to the Graduate Business Programs Office.

#### **Waiver credit**

All waiver credit will be based on a test prepared and evaluated by the department responsible for the subject. If a student should waive more than 28 credit hours, he/she must take additional electives to meet the RIT 48 credit-hour requirement for the degree.

#### **Academic standards**

The average of the grades for all courses taken in the College of Business and credited toward the master's degree must be at least a "B" (3.0). Transfer credits from other colleges or institutions, waiver credits, or undergraduate course credits are not counted in the grade point computation. The policy on probation and suspension is explained in the section "Steps Toward Degree" in this Bulletin. The student must pay careful attention to that policy.

#### **Full-time program**

Those students desiring to minimize their time in school will find that four or five quarters of intensive study will allow them to complete degree requirements, if previous undergraduate or graduate work permits maximum course waivers and a 12 credit hours per quarter course load is carried.

Actual credit hour requirements will vary depending on the student's background and the major concentration.

Full-time students typically will take two regular day classes, generally scheduled Friday morning and Friday afternoon, and a third class from among the evening offerings.

#### **Part-time program**

In addition to full-time study, all graduate programs are available on a part-time basis. Course requirements, faculty, and admission procedures correspond to the full-time program. The part-time MBA allows individuals from the greater Rochester area to prepare themselves for advancement in management without interrupting their careers. A feasible course load for the part-time student is one to two courses per quarter, permitting program completion in approximately three to four years if no courses are waived. Credit hour requirements and curriculum will be found in the following material.

**Program completion**

Institute policy requires that a graduate program be completed within seven years of the student's initial registration.

**Internship program**

An internship affords graduate students the opportunity to gain working experience with an organization. Internships are generally paid positions lasting three to six months. No academic credit is granted, and an internship may extend the length of a student's program. Graduate students must apply to the internship program early in their graduate program. Students accepted into the internship program will be eligible to interview with organizations as they complete their first-year coursework. Students must maintain good academic standing (GPA 3.0) to remain eligible for interviews. RIT will attempt to provide internships for qualified students, but is unable to guarantee that all students will be placed.

**Course offerings**

Information concerning courses to be offered in a given quarter will be available through the Graduate Business Programs Office. The Institute reserves the right to make any necessary changes in course schedules or instructors, including the right to cancel courses, without prior notice. Day and evening courses meet once a week. The Institute makes no guarantee that every catalog course will be offered in any given year or that courses will be offered in a particular quarter or sequence.



# Master of Business Administration Curriculum

The following sequence is recommended. Students who find it necessary to vary this sequence should seek counseling from the Graduate Office.

<p><b>Quarter 1</b>                  BBUA-703 Accounting Concepts for Managers                  BBUB-740 Organizational Behavior                  BBUQ-780 Management Science</p>	<p><b>Quarter 2</b>                  BBUQ-782 Applied Statistical Analysis                  BBUE-711 Microeconomics                  BBUB-741 Organization &amp; Management</p>
<p><b>Quarter 3</b>                  BBUF-721 Financial Management I                  BBUM-761 Marketing Concepts                  BBUQ-743 Operations Management</p>	<p><b>Quarter 4</b>                  Elective                  Elective                  BBUF-722 Financial Management II                  BBUE-712 Macroeconomics</p>
<p><b>Quarter 5</b>                  Elective                  BBUQ-790 Information Systems                  BBUB-745 Business and Public Policy</p>	<p><b>Quarter 6</b>                  Elective                  Elective                  BBUB-759 Integrated Business Analysis</p>

**MASTER OF BUSINESS ADMINISTRATION CURRICULUM  
 Required Courses:**

Course Number and Title	Credit Hours
*BBUA-703 Accounting Concepts for Managers	4
*BBUB-740 Organizational Behavior	4
*BBUQ-780 Management Science	4
*BBUQ-782 Applied Statistical Analysis	4
*BBUE-711 Microeconomics	4
BBUB-741 Organization & Management	4
BBUF-721 Financial Management I	4
*BBUM-761 Marketing Concepts	4
BBUQ-743 Operations Management	4
BBUF-722 Financial Management II	4
BBUQ-790 Information Systems	4
*BBUE-712 Macroeconomics	4
BBUB-745 Business & Public Policy	4
BBUB-759 Integrated Business Analysis	4
	<b>56</b>

**Option Courses:** Approved options are illustrated in the following material: Option Area Courses

12

**Free Electives:** Free electives may be selected from graduate level courses offered by the College of Business outside the group from which the option was selected, or from graduate level courses offered by other colleges of the Institute provided they have prior approval of the graduate office.

Free Electives 8

Total Hours 76

The course sequence followed by a student should generally be in the order in which the courses are listed above. *Students must adhere to the pre-requisite requirements.*

\*Can be waived by examination, reducing the number of courses required for graduation.

**Option Area Courses**

Students select option courses in order to concentrate in one of the following areas:

**CORPORATE ACCOUNTING OPTION**

Course Number and Title	Credit Hours
BBUA-704 Accounting Theory I	4
BBUA-705 Accounting Theory II	4
BBUA-706 Cost Accounting	4
Two free electives	8
	<b>20</b>

Suggested electives:

BBUF-723 Theory of Finance  
BBUF-724 Problems in Finance  
Approved computer science courses

**PUBLIC ACCOUNTING OPTION**

Course Number and Title	Credit Hours
*BBUA-704 Accounting Theory I	4
*BBUA-705 Accounting Theory II	4
*BBUA-706 Cost Accounting	4
BBUA-707 Advanced Accounting	4
BBUA-708 Auditing	4
*BBUA-709 Basic Taxation Accounting	4
BBUB-754 Business Law	4
Two free electives	8
	<b>36</b>

\*Can be exempted with equivalent undergraduate courses and approval of the director. If exempted, these courses must be replaced by 800-level accounting courses(s).

Suggested electives:

BBUF-723 Theory of Finance  
BBUF-724 Problems in Finance  
Approved computer science courses

This option meets the educational requirements for the Uniform Certified Public Accounting Examination and the Certificate in Management Accounting Examination.

**FINANCE OPTION**

Course Number and Title	Credit Hours
BBUF-723 Theory of Finance	4
Two courses from Group A	8
Two free electives	8
	<b>20</b>

**Group A**

BBUF-724 Problems in Finance  
BBUF-725 Securities & Investment Analysis  
BBUF-726 Capital Markets  
BBUF-729 Seminar in Finance  
Suggested electives:  
BBUE-713 Advanced Microeconomics  
BBUE-714 Advanced Macroeconomics  
BBUA-706 Cost Accounting  
BBUA-709 Basic Taxation Accounting  
Approved Statistics, Computer Science Courses

**MARKETING OPTION**

Course Number and Title	Credit Hours
BBUM-762 Advanced Marketing Management	4
Two courses from Group A	8
Two free electives	8
	<b>20</b>

**Group A**

BBUM-763 Consumer Behavior  
BBUM-764 Marketing Logistics  
BBUM-765 Sales Management  
BBUM-766 International Marketing  
BBUM-767 Marketing Communications  
BBUM-769 Seminar in Marketing

Suggested electives:  
BBUB-770 Research Methods

**MANAGEMENT OPTION**

Course Number and Title	Credit Hours
Three courses from Group A	12
*Two free electives	8
	<b>20</b>

**Group A**

BBUB-746 Management & Career Development  
BBUB-748 Employee & Labor Relations  
BBUB-750 Personnel Systems  
BBUB-753 Small Business Administration  
BBUB-758 Seminar in Management

**PERSONNEL/HUMAN RESOURCES OPTION**

Course Number and Title	Credit Hours
BBUB-748 Employee & Labor Relations	4
BBUB-750 Personnel Systems	4
One course from Group A	4
*Two free electives	8
	<b>20</b>

\*The following courses are considered free electives for the two management options:  
BBUB-742 Technology, Business & Society,  
BBUB-751 Legal Environment of Business,  
BBUB-770 Research Methods

**Group A**

BBUB-746 Management & Career Development  
BBUB-755 Compensation & Reward Systems  
BBUB-758 Seminar in Management

**Graduate Business Courses****Accounting****BBUA-703****Accounting Concepts for Managers****Registration #0101-703**

An introduction to financial and managerial accounting concepts, with particular emphasis placed on their use for managerial 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 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 reporting problems. Included here are the Statement of Changes in Financial Position, pensions, leases, and accounting for changes in the price level. (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 and Theory**Registration #0101-707**

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 tax credits. (BBUA-703)

Credit 4

**BBUA-810** Advanced Taxation Accounting**Registration #0101-810**

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 non-taxable 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

**BBUA-811** Auditing Theory**Registration #0101-811**

Advanced course in auditing where classical auditing cases, uses of computer and statistical accounting techniques, current official auditing pronouncements and changes in legal and ethical considerations are fully explored. (BBUA-708 or equivalent)

Credit 4

**BBUA-812** Accountancy Seminar**Registration #0101-812**

A variety of advanced accounting topics are covered, depending on the instructor. Topics included would be: CPA problems, SEC accounting, small business accounting, non-profit accounting, internal auditing. (BBUA-705 or equivalent)

Credit 4

**BBUA-813** Financial Accounting Theory**Registration #0101-813**

An advanced course in financial accounting theory that examines the basic assumptions, principles and postulates upon which current practice rests; and alternative theories of valuation and measurement. Critical analysis of the historical cost model and the several major current value models is the main emphasis throughout discussions of financial statements and their individual components. (BBUA-707 or equivalent)

Credit 4

**BBUA-814** Accounting Information Systems**Registration #0101-814**

A complete analysis of management's need for financial data in decision making and the various alternatives available to provide the information in a timely, cost-effective manner. Topics covered will include manual, mechanical, and computerized alternatives to the capturing, compiling, and reporting of relevant data. (BBUA-703)

Credit 4

**Management****BBUB-740** Organizational Behavior**Registration #0102-740**

The importance of human behavior in reaching organizational goals. The course emphasizes: managing individual and interpersonal relations, group and inter-group dynamics, leadership, communication and motivation skills in managing organizational performance and change.

Credit 4

**BBUB-741** Organization and Management**Registration #0102-741**

A study of organizations as systems, including their subsystems and inter-relationships 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, Business and Society**Registration #0102-742**

A study of changing technologies and their impact on organizations and managers. Consideration of national policy and organizational practices concerning research and implementation of new technologies in areas such as artificial intelligence, robotics, and automation of the service sector. Special attention is paid to social problems deriving from the use of new technologies. (BBUB-740)

Credit 4

**BBUB-745** Business and Public Policy**Registration #0102-745**

Legal issues in areas such as consumer protection, environmental law, occupational safety and health, employment discrimination, labor management relations, antitrust policies, and industrial policy. Ethical, economic, political, legal, and cross-cultural perspectives are considered.

Credit 4

**BBUB-746** Management and Career Development**Registration #0102-746**

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 Relations**Registration #0102-748**

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)

Credit 4

**BBUB-750 Personnel Systems****Registration #0102-750**

A study of personnel systems or the methods of the personnel and human resource management function in organizations. The major personnel topics studied include organizational staffing (selection and recruitment), training and development, compensation, safety and health, equal employment opportunity, human resource forecasting, and performance appraisal. Course includes experiential learning in such topics as job design, job analysis, selection interviewing, and performance evaluation. (BBUB-740, BBUQ-782)

Credit 4

**BBUB-751 Legal Environment of Business****Registration #0102-751**

An introduction to legal principles and their relationship to business practices. Business ethics and the environmental impact of the federal administrative agencies are stressed. Among the agencies considered will be the EPA, EEOC, FDA, OSHA, FTC and the NLRB. (BBUA-703, BBUB-740)

Credit 4

**BBUB-753 Small Business Administration****Registration #0102-753**

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, BBUQ-721, BBUM-761)

Credit 4

**BBUB-754 Business Law****Registration #0102-754**

An introduction to the law of contracts, sales, agency, commercial paper, and partnerships. Among the subjects covered are: consumer management. Seminar topics have included organizational power and politics, improving individual and managerial effectiveness, business community. (BBUA-703, BBUB-740)

Credit 4

**BBUB-755 Compensation and Reward Systems****Registration #0102-755**

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, BBUB-750)

Credit 4

**BBUB-756 Conflict Management and Negotiating Skills for Managers****Registration #0102-756**

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. (BBUB-740)

Credit 4

**BBUB-757 Interpersonal Skills for Managers****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 of effective management. (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, 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. (Varies with instructor)

Credit 4

**BBUB-759 Integrated Business Analysis****Registration #0102-759**

Also referred to as business strategy and policy, 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 the 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 is used extensively. Since this is a capstone course, the workload is considerably above average. (All other required courses)

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-771 Research Option****Registration #0102-771**

A practicum of thesis alternative permitting the student to confront a real management problem. Requirements include steps from design to completed management report. (To be developed with selected faculty)

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. (To be developed with selected faculty)

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. (BBUQ-780)

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 application 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 Theory****Registration #0103-713**

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 Theory**Registration #0103-714**

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, BBUF-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, BBUF-722)

Credit 4

**BBUF-725** Securities & Investment Analysis**Registration #0104-725**

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, BBUF-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, BBUF-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. (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. (BBUA-703 or BBUE-711)

Credit 4

**BBUM-762** Advanced Marketing Management**Registration #0105-762**

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 marketing 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; inter-relationships with other functions; and product, pricing, promotion, and channel strategy. (BBUM-761)

Credit 4

**BBUM-767 Marketing Communications****Registration #0105-767**

A study of inter-relationships 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 inter-relationships 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)

Credit 4

**Decision Sciences****BBUQ-743 Operations Management****Registration #0106-743**

Case and laboratory oriented study of the production of goods and services. Topics include quality assurance, resource planning, scheduling, materials and capacity control, inventory management, project management, system design, and strategic considerations. (BBUQ-780, BBUQ-782)

Credit 4

**BBUQ-780 Management Science****Registration #0106-780**

An introduction to quantitative approaches to decision making. Topics covered include linear programming, goal programming, integer programming, computer simulation, and calculus-based solution procedures. The emphasis is not on the techniques per se, but rather on 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

**BBUQ-786 Mathematical Programming****Registration #0106-786**

An in-depth study of the application of mathematical programming to business decision making. The objective of this course is to present state-of-the-art methodology and applications of mathematical programming. (BBUQ-780) (Not offered in 1985-86)

Credit 4

**BBUQ-788 Survey Design & Sampling****Registration #0106-788**

This course will cover the following topics in survey design and sampling: (1) questionnaire design, (2) types of sampling techniques, (3) determination of sample size, (4) methods for increasing the response rate, (5) use of appropriate statistics to analyze results. (BBUQ-782) (Not offered in 1985-86)

Credit 4

**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, BBUQ-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 are also covered. Hands-on application of personal computer software is required. (BBUA-703, BBUQ-721, BBUB-740, BBUB-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

**BBUQ-794 Multivariate Methods in Business****Registration #0106-794**

An introduction to the use of multivariate techniques (other than multiple regression analysis) and their use in analyzing business data. The major objective will be to demonstrate the proper use of a variety of multivariate techniques using several large-scale data sets. The student will be required to use a standard statistical package. A major objective will be to teach the student how to interpret the output of a computer package in terms of the decision-making situation underlying the problem being investigated. (BBUQ-785) (Not offered in 1985-86)

Credit 4

**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

## Graduate Faculty College of Business

**Walter F. McCanna**, Ph.D., University of Wisconsin-Madison—Dean; Professor, Management

**Thomas E. Comte**, Ph.D., University of Missouri; MBA, Columbia—Associate Dean; Associate Professor, Management

**Karen Paul**, Ph.D., Emory University—Chairman, Graduate Business Programs; Associate Professor, Management

### Department of Management

**Robert Pearse**, Ph.D., University of Chicago—Distinguished Lecturer and Chairman

### Management Faculty

**Robert J. Barbato**, Ph.D., Michigan State—Associate Professor, Management

**Janet C. Barnard**, Ed.D. University of Rochester—Assistant Professor, Management

**Andrew J. DuBrin**, Ph.D., Michigan State; MS, Purdue—Professor, Management

**Kenneth Graham, Jr.**, Ph.D., MBA, Union College—Assistant Professor, Management

**David T. Methe**, BA, SUNY Oneonta, MPA, Syracuse University, Ph.D., University of California at Irvine—Associate Professor

**William L. Mihal**, Ph.D., University of Rochester; MS, Clarkson—Associate Professor, Management

**William A. Nowlin**, Ph.D., in progress SUNY Buffalo; MPA SUNY Brockport—Lecturer, Management

**George Sullivan**, JD, Seton Hall University; LL.M., LL.M., New York University—Assistant Professor

**Philip R. Tyler**, DBA, MBA, Michigan State—Associate Professor, Management; Director, Center for Management Development

**Nathan B. Winstanley**, Ph.D., Purdue University—Distinguished Lecturer

## Department of Decision Sciences

**George A. Johnson**, DBA, MBA, Indiana University—Professor and Chairman

### Decision Science Faculty

**Terry L. Dennis**, Ph.D., MSIA, Purdue—Associate Professor, Operations Systems

**Bernard J. Isselhardt**, Ph.D., University of Iowa—Assistant Professor

**Daniel A. Joseph**, Ph.D., SUNY Buffalo; MBA McMaster—Assistant Professor

**A. Erhan Mergen**, Ph.D., Union College—Assistant Professor

**Thomas F. Pray**, Ph.D., Rensselaer Polytechnic Institute—Associate Professor, Operations Systems

**William J. Stevenson**, Ph.D., MBA, Syracuse University—Associate Professor, Operations Systems

**Thomas A. Williams**, Ph.D., Rensselaer Polytechnic Institute—Professor

### Department of Marketing

**Eugene F. Fram**, Ed.D., SUNY at Buffalo—Professor and Chairman

### Marketing Faculty

**Yusuf A. Choudhry**, Ph.D., MBA, Syracuse University—Assistant Professor, International Business and Marketing

**Dale F. Gibson**, MBA, Pennsylvania—Associate Professor, Marketing

**Dean C. Siewers**, Ph.D., North Carolina-Chapel Hill; MBA, Duke University—Assistant Professor, Marketing

**Patricia A. Sorce**, Ph.D., MS, University of Massachusetts—Assistant Professor, Marketing

**Stanley M. Widrick**, Ph.D., Syracuse University; MBA, SUNY at Buffalo—Associate Professor, Marketing

**Julian E. Yudelson**, Ph.D., Northwestern; MBA, Emory—Associate Professor, Retailing/Marketing

## Department of Accounting

**Jose A. Rullan**, MS, Rochester Institute of Technology; CPA—Instructor and Chairman

### Accounting Faculty

**Stanley M. Dye**, BA, Haverford; CPA—Distinguished Lecturer, Accounting, Former Partner, Coopers, Lybrand

**Paul A. Lebowitz**, Ph.D. in progress, Syracuse University; MS Accountancy, Rochester Institute of Technology; CPA—Assistant Professor

**E. James Meddaugh**, Ph.D., Pennsylvania State; MBA Drexel; CPA—Professor

**Bruce Oliver**, BBA, MBA, University of Cincinnati, Ph.D., University of Washington—Professor

**Daniel D. Tessoni**, Ph.D. in progress, Syracuse University; MS, Clarkson; CPA—Assistant Professor, Accounting

### Department of Finance and Economics

**John S. Zdanowicz**, Ph.D., MBA, Michigan State—Associate Professor and Chairman; Director, School of Retail Management

### Finance and Economics Faculty

**Donald R. Chambers**, Ph.D., University of North Carolina-Chapel Hill—Associate Professor, Finance

**James C. Galloway**, Ph.D., University of Virginia; MBA, Pennsylvania—Assistant Professor, Finance

**Steven C. Gold**, Ph.D., SUNY at Binghamton—Assistant Professor, Economics

**Angela M. Hardy**, Ph.D. in progress, SUNY at Binghamton; MBA, University of Pittsburgh—Assistant Professor, Finance

**John A. Heimuth II**, Ph.D., South Carolina—Assistant Professor, Economics

**Ralph W. Sanders, Jr.**, Ph.D. in progress SUNY at Buffalo; MS, University of Rochester—Lecturer, Finance

# College of Continuing Education



## Master of Science Degree in Applied and Mathematical Statistics

**John D. Hromi**, Frederick H. Minett  
Professor; Director, Center for Quality and Applied Statistics: 475-2002

**Edward G. Schilling**, Paul A. Miller  
Professor; Chairman, Graduate Statistics: 475-6129

### Objectives

Statistics today is defined as the science of making decisions in the face of uncertainty. To aid those needing the basic statistical tools to collect and analyze data, and to aid those needing

to update their present statistical skills, the graduate program in statistics is offered by the College of Continuing Education at RIT through the Center for Quality and Applied Statistics.

### Candidates

The master of science degree in applied and mathematical statistics is offered to full-time students and, on a part-time evening basis, to employees of business, industry and non-commercial sectors.

Currently, the students are engineers, managers, scientists, auditors, production and inspection personnel, and those interested in industrial research, quality control, reliability, metrology, and testing. Generally, the degree offers opportunity for immediate advancement in many early careers, and for career changes. The uniqueness of the

program is its intent to help on the job today, or in the near future.

### Part-time evening program

The program in applied and mathematical statistics is conducted on a *part-time evening basis* and is intended primarily for full-time employees of business and industry. Each class meets once a week for three hours 6:30-9:30 p.m., unless otherwise arranged, with approximately six hours of homework. Normally, it takes two years to complete the program, attending two nights a week. Students from other programs at RIT may also participate, as may those without a degree objective who desire specialized training in particular statistical fields. Also, those in industry desiring to update their skills or extend their education in statistics further will find this program well-suited to their needs.

### No entrance exam

Courses are offered on an open enrollment basis which is supportive of the RIT commitment to recurrent education. There are no entrance exams, and the program is self-contained at RIT. Students are expected to take an oral examination after completing the core courses.

### A practical program

Both teachers and students work to put job experience and class studies together. For example, theses and papers often have job supervisor's approval and result is being put into effect rather than into the library. Theory is used for understanding, but is not necessarily an end in itself. Here theory means gaining knowledge of the underlying mathematical principles and learning how to solve problems intelligently.

### Requirements

For the master of science in applied and mathematical statistics degree, the satisfactory completion of the following quarter courses is required:

**Two basic courses:**

(These may be waived by the department chairperson upon evidence of equivalent learning, experience or competency.)

CQAS-711 and 712 Fundamentals of Statistics I & II

**Eight core courses:**

CQAS-801 and 802 Design of Experiments I & II

CQAS-821 and 822 Theory of Statistics I & II

CQAS-841 and 842 Regression Analysis I & II

CQAS-851 Nonparametric Statistics

CQAS-881 Bayesian Statistics

**Seven electives:**

Taken from other courses listed under "Course Descriptions" in such areas as quality control, managerial decision making, multivariate analysis, sample surveys, reliability, and probability theory.

The total of 15 or 17 courses, each counting 3 quarter credits, comes to 45 or 51 credits depending on whether the basic courses (711-712) are waived. As indicated above, studies are normally

completed in two to four years by attendance one or two nights a week.

The core courses are expected to be completed early in a student's program. Upon completion of the core courses or after 30 hours of instruction, an oral examination is required. After successful completion of the examination, the remainder of the program is prepared with the advice and counsel of the department.

**Levels of courses**

There are 700 and 800 courses. The 700 level furnishes most of the standard methods currently used in industry; the 800 series covers theory and applications in special areas like the design of experiments. Generally, the 800 level is more advanced. From time to time, special courses are offered in topics of particular interest when requested by the students or as new fields of statistics open up.

**Career guidance**

The minimum of 24 credits in the 800 series (core courses above) is required. All other courses are elective. In consultation with a departmental advisor, a total program structured to achieve individual professional objectives is worked out with each person interested in such guidance.

**Admission**

Admission to the degree program will be granted to qualified holders of a baccalaureate degree from an accredited college or university who has acceptable mathematics credits through integral calculus. Applicants who fail to meet the latter requirement may, at the discretion of the department chairperson, be required to complete two or three undergraduate mathematics courses before being able to matriculate in the regular graduate program.

Although students are encouraged to begin their graduate studies at any time, it is highly advisable to formally seek admission to the program no later than after completion of the core courses. This will assure proper selection of courses, adequate administrative time for transcripts, etc., and an early oral exam to indicate student capability to attain the MS degree.

**Procedure**

To be considered for admission it is necessary to file an application, submit transcripts of all previous under-

graduate and graduate work, obtain two letters of recommendation, and pay a \$25 application fee. RIT graduates do not have to pay this fee. Forms and instructions, including quarterly offerings and registration forms, may be obtained by writing to:

Director of Admissions  
Rochester Institute of Technology  
One Lomb Memorial Drive  
P.O. Box 9887  
Rochester, NY 14623

**Transfer and interdisciplinary credits**

Credit for courses of graduate stature in statistics, mathematics, computer programming, operations research, and other quantitative fields related to statistics may be accepted toward fulfillment of degree requirements at the discretion of the department chairperson with due regard to the candidate's objectives. However, to insure credit toward the degree, candidates should write the chairperson indicating courses for which he or she would like transfer credit for work in the past and to obtain prior approval of courses for which transfer credit is sought. While these matters would be discussed with either the candidate's advisor or the department at various times during the advisement process, it is essential that all agreements be documented *in writing*. A letter to the departmental chairperson will assure proper recognition of outside work accomplished toward the degree.

**Non-matriculated students**

It is not necessary to be formally admitted or matriculated into the MS in statistics program in order to register for course offerings. Those who are eligible, however, should matriculate as early as possible, as recommended above. Those who do not have college degrees may be admitted to courses in fields of their special interest by consent of the department chairperson.

**Grades, exams and theses**

The candidate must attain an overall average grade of 3.0 (B) for graduation. An oral examination is required at the completion of the core courses to assure subject matter and verbal proficiency as well as ability to perform as a statistician in a working environment. Successful completion of each quarter course normally requires passing a final exam, submission of a written paper or thesis, or completion of a group project, as determined by the



instructor. Students are encouraged to develop their writing and speaking skills as well as to use the computer as ways to improve their knowledge.

### Location

Courses are offered at the Henrietta campus, at selected off-campus locations, and at in-plant training facilities.

### Plans of study

Students may, with the permission of the departmental chairperson, secure credits toward the master's degree in two ways:

First, a student may complete the required 45 or 51 quarter credits, depending on whether the basic "Fundamentals" courses are waived by formal *classroom* attendance and receipt of satisfactory grades.

Second, three, six or nine of these credits may be obtained by submission of a satisfactory research project and

*thesis*. The project and credits must be approved by the department chairperson prior to registration. A letter outlining the project and requesting this approval must be addressed to the chairperson by the candidate prior to the regular registration periods. The depth of the project will determine the number of credits received. Generally this type of credit should be sought at the end of the program after sufficient knowledge of the subject is available for use. CQAS-896, 897, and 898 are the registration numbers used for thesis work.

### Faculty

Two full-time and some 15 adjunct faculty normally teach in the master's program in applied and mathematical statistics. All instructors have an industrial background. This is reflected in their realistic approach to the subject matter. Many of the faculty hold jobs

which require them to apply daily what they teach at night; e.g., the quality control instructor installs quality control systems for his company. As with many others dedicated to continuing education, faculty members have a commitment to give the students personal attention. This often involves career counseling.

The faculty select textbooks, determine subjects to be taught, and keep students up to date with new developments in their fields. Quarterly meetings of the faculty provide a continuous avenue of communication. An Industrial Advisory Committee periodically advises the Chairperson and collegiate administrators on academic and administrative matters. It assists in the determination of how RIT can best serve local and regional needs.

## Graduate Courses in Applied and Mathematical Statistics

### 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 the uncertain; concepts of random variables and their associated probability models; meaning and practical use of the Central Limit Theorem. (Consent of the department)

Credit 3 or 4 (offered each quarter)

### CQAS-712 Fundamentals of Statistics II

#### Registration #0280-712

Continuation of CQAS-711.

Topics: concepts and strategies of statistical inference for making decisions about a population 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. (CQAS-711 or equivalent)

Credit 3 or 4 (offered each quarter)

### CQAS-721 Quality Control: Control Charts

#### 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 for attributes; computerization procedures for control charts; tolerances, specification, and process capability studies; basic concepts of total quality control, and management of the quality control function. (Consent of the department)

Credit 3 (offered in Fall and Spring Quarters)

### CQAS-731 Quality Control: Acceptance Sampling

#### Registration #0280-731

Investigation of modern acceptance sampling techniques with emphasis on industrial application.

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. (Consent of the department)

Credit 3 (offered in Winter and Summer Quarters)

### CQAS-761 Reliability

#### Registration #0280-761

A methods course in reliability practices; what a reliability engineer must know about reliability prediction, estimation, analysis, demonstration, and other reliability activities. Covers most methods presently 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. (CQAS-712 or equivalent)

Credit 3 (offered in Spring Quarter)

### 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 designs. Practical applications to civil engineering, pharmacy, aircraft, agronomy, photoscience, genetics, psychology, and advertising. (CQAS-712)

Credit 3 (offered each quarter)

### CQAS-802 Design of Experiments II

#### Registration #0280-802

Continuation of CQAS-801.

Topics: factorial experiments; fractional, three level, mixed; response surface exploration. Practical applications to: medical areas, alloys, highway engineering, plastics, metallurgy, animal nutrition, sociology, industrial and electrical engineering. (CQAS-801)

Credit 3 (offered in Fall, Spring and Summer Quarters)

**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. (Consent of department)

Credit 3 (offered in Fall Quarter)

**CQAS-822** Theory of Statistics II**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. (CQAS-821 or equivalent)

Credit 3 (offered in Winter Quarter)

**CQAS-830** Multivariate Analysis I**Registration #0280-830**

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 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-test, ANOVA, regression analysis, repeated measures, quality control and profile analysis. (CQAS-801, 802)

Credit 3 (offered in Spring Quarter)

**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 variables. Practical applications will be emphasized. (CQAS-830)

Credit 3 (offered in Summer only)

**CQAS-841** Regression Analysis I**Registration #0280-841**

A methods course dealing with the general relationship problem.

Topics: the matrix approach to simple and multiple linear regression; analysis of residuals; dummy variables; orthogonal models; computational techniques. (CQAS-802 or equivalent)

Credit 3 (offered in Winter Quarter)

**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. (CQAS-841 or equivalent)

Credit 3 (offered in Spring Quarter)

**CQAS-851** Nonparametric Statistics**Registration #0280-851**

Distribution-free testing and estimation techniques with emphasis on applications.

Topics: sign tests; Kolmogorov-Smirnov statistics; run tests; Wilcoxon-Mann-Whitney test; Chi-Square tests; rank correlation; rank order tests; quick tests. (CQAS-712 or equivalent)

Credit 3 (offered in Fall, Spring and Summer Quarters)

**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 Bayesian theory; many action problems; optimal sample size; decision diagrams. Applications to marketing; oil drilling; portfolio selection; quality control; production; and research programs. (CQAS-881 or equivalent)

Credit 3 (offered in Winter Quarter)

**CQAS-856** Interpretation of Data**Registration #0280-856**

Advanced topics related to use of statistics in investigational analysis including narrow limit gauging, practical designs of experiments, analysis of small sample data, analysis of means, identifying assignable causes and other methods for troubleshooting with statistical methods. (CQAS-712 or equivalent)

Credit 3 (offered in Spring Quarter)

**CQAS-871** Sampling Theory and Applications**Registration #0280-871**

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. (CQAS-712 or equivalent)

Credit 3 (offered in Winter and Summer Quarters)

**CQAS-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. (CQAS-841 or equivalent)

Credit 3 (offered in Fall Quarter)

**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. (CQAS-802, 842)

Credit 3 (offered in Winter Quarter)

**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 multi-variable case. (CQAS-712 or equivalent)

Credit 3 (offered in Fall Quarter)

**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. (CQAS-712 or equivalent)

Credit 3 (offered in Summer Quarter)

**CQAS-891, 892, 893** Special Topics in Applied Statistics**Registration #0280-891, -892, -893**

This course provides 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/Qtr.

**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 (offered each quarter)

**CQAS-896, 897, 898** Thesis**Registration #0280-896, -897, -898**

For students working on the MS degree in applied and mathematical statistics who use a research project and thesis for three, six or nine credits. (Consent of the department required)

Credit 3 (offered each quarter)



## Graduate Faculty College of Continuing Education

**Donald D. Baker**, 8A, Trinity College; ME, MBA, Ed.D., University of Rochester—Associate Professor, Dean  
**John D. Hromi**, BS, Carnegie-Mellon University; BEE, Clemson University, M. Litt., University of Pittsburgh, D. Engr., University of Detroit—Frederick H. Minett Professor, Director, Center for Quality and Applied Statistics.

**Edward G. Schilling**, B.A., M B A., University of Buffalo, M.S., Ph.D., Rutgers University—Paul Miller Professor, Chairman, Graduate Statistics.

**Thomas B. Barker**, BS, MS, Rochester Institute of Technology—Assistant Professor

**Daniel C. Smialek**, BS, AAS, Rochester Institute of Technology—Assistant Professor

**Mason E. Wescott**, Ph.D., Northwestern—Professor Emeritus, Statistics

**James L. Bossert**, BA, St. John Fisher; MS, Rochester Institute of Technology

**J. Douglas Ekins**, BS, Virginia Military Institute; MS, University of Rochester

**David L. Farnsworth**, BS, Union College; MA, Ph.D., University of Texas

**John K. Lynch**, BS, MS, University of Wyoming

**Martin J. Madigan**, BS, MS, Rochester Institute of Technology

**Charles S. Masick**, BS, MS, MBA, University of Rochester

**Robert M. Meisel**, BS, ME, Rensselaer Polytechnic Institute; MS, Rochester Institute of Technology

**John L. Pabrinkis**, BS, MS, University of Rochester

**Jacob C. Rubin**, BS, College of the City of New York; MS, Rochester Institute of Technology

**Richard R. Scott**, BS, MS, Rochester Institute of Technology

**William A. Swagler, Jr.**, BSIE, General Motors Institute; MS, Rochester Institute of Technology

**Ronald E. Swanson**, BSIE, MSIE, MS, Lehigh University, Ph.D., Arizona State University

**Madhusudan C. Trivedi**, MS, MS University (India); MS, Virginia Polytechnic Institute; MS, Michigan State University; MA, Ph.D., MBA, University of Rochester

**Harry B. Trulli**, BS, U.S. Naval Academy; MS, Rochester Institute of Technology

**Thomas K. Witt**, BS, Kansas State University; MS, Rochester Institute of Technology

**Donald A. Wright**, BS, MS, University of Rochester

**Hubert D. Wood**, BS, George Washington University; MS, University of Rochester

**Nicholas A. Zaino, Jr.**, BS, Rochester Institute of Technology; MSEE, Pennsylvania; MA, University of Rochester

# College of Engineering



**Richard A. Kenyon, Dean  
Engineering**

## **Master of Engineering degree**

### **Master of Science degree in Electrical or Mechanical Engineering**

The College of Engineering offers graduate programs leading to the master of engineering degree, or the master of science degree in electrical or mechanical engineering. The purpose of the graduate programs in engineering is to equip the graduate student with the insight, understanding and competence commensurate with demands of current and future positions in engineering.

Degree programs are available on either a part-time or a full-time basis.

### **Part-time study**

The College of Engineering encourages practicing engineers in the greater Rochester industrial community to pursue a program toward the master of science degree without interrupting their work at their place of employment. Consequently, many of the courses in the graduate programs in engineering are normally scheduled in the late afternoons or early evenings.

Students employed full-time in industry are limited to a maximum of two courses or eight credits each quarter. A student who wishes to register for more than eight credits while employed in full-time industry must obtain the permission of his or her advisor and the approval of the department head.

It is possible for a student to obtain the MS degree in two academic years (or six academic quarters) by taking courses in late afternoons or early evening only.

A student in the master of engineering degree program may earn academic credits for industrial experience which will be treated as internship experience while the student is enrolled in the program.

### Full-time study

Even though graduate programs in engineering serve the need of a large number of practicing engineers who wish to pursue a part-time program, the different programs may also enroll full-time graduate students. A full-time student may take up to 16 credits per quarter.

A full-time student in the master of engineering degree program alternates academic quarters with his or her internship. A full-time student can normally complete the degree requirements in one calendar year.

### Financial aid

A limited amount of financial aid is available to the full-time student. Detailed information on aid can be obtained from the individual department heads.

### In-plant graduate courses

In order to enable the practicing engineer to take graduate courses with the minimum amount of inconvenience, a number of courses for RIT credit are offered in selected industrial locations.

## Admission

### Admission

Any student who wishes to become a candidate for the master's degree must first be formally admitted to the appropriate graduate program. Formal admission to a graduate program gives matriculated status to a student.

An applicant is admitted as a graduate student if he or she has received a bachelor's degree from an approved undergraduate school, and if an examination of the required documents indicates the qualifications to undertake a graduate program.

Graduate applicants who do not fully satisfy all admission criteria (such as appropriate baccalaureate degree, grades, and other credentials) may be considered for admission with the condition that they will be required to take additional undergraduate courses to make up their deficiencies. Such courses will not normally count toward the graduate credits required for the master's degree.

All applicants who are admitted prior to the conclusion of their baccalaureate program are required to submit their final transcript by the end of the first quarter of graduate work.

To be considered for admission it is necessary to file an Application for Admission to Graduate Study accompanied by the appropriate transcripts of previous undergraduate and graduate study, and two letters of recommendation.

### Non-matriculated status

An applicant is permitted to take graduate courses as a non-matriculated student if he or she has a bachelor's degree from an approved undergraduate school and the necessary background for the specific courses in which he or she wishes to enroll. The courses taken for credit can usually be applied toward the master's degree when the student is formally admitted to the graduate program at a later date. However, the number of credits that will be transferred to the degree program from courses taken at RIT as a non-matriculated student will be limited to an absolute maximum of 12 credits.

An applicant who wishes to enroll in a graduate course as a non-matriculated student must obtain permission from the person in charge of the graduate program in each department and the appropriate faculty member.

### Graduate Record Examination

The College of Engineering does not require graduate applicants to take the Graduate Record Examination.

### Plan of study

The programs are flexible and afford students an opportunity to plan a course of study suited to their own interests and directed toward their own objectives. Each graduate student should submit a plan of study to the department office within the first year after admission as a graduate student. To assure a coherent program and one which reflects the student's maturing capacities and aims, the plan may be revised on request.

### Transfer credits

A maximum of nine quarter credits in a 45 credit hour program or 12 quarter credits in a 48 credit hour program can be transferred from graduate courses taken outside the Institute. To be considered for transfer credit, the course must have been taken within a five-year period prior to the date of the student's initial entry into a graduate program in engineering at RIT as a non-matriculated or regular student. Courses taken at another institution after the student's

initial entry into a graduate engineering program at RIT are also eligible for transfer credit. However, to insure transferability, prior approval should be obtained. The student should contact the individual department office about the procedure for obtaining transfer credits.

### Faculty advisor

A member of the graduate faculty is appointed as a faculty advisor for each graduate student. The faculty advisor supervises the progress of the student towards the master's degree. Non-matriculated students should direct their questions to either the department head or the chairperson of the department's Graduate Committee.

### Course descriptions

For a complete outline of courses, refer to the course description section.

### Grade requirements

The average of the grades for all courses taken at the Institute and credited toward the master's degree must be at least a "B" (3.0). Transfer credits from other institutions and internship credits are not included in the computation of the cumulative grade point average. The policy on probation and suspension is explained in the section "Steps Toward Degree" in this Bulletin. The student must pay careful attention to that policy. If a student fails any required examination, the student's advisor may recommend to the dean that the student's performance be reviewed and appropriate action taken.

### Thesis

The thesis requirements vary among the different departments. The requirements of an individual department are stated in the sections describing each department's programs.

The thesis must comply with the following regulations:

The thesis must be completed and accepted at least 30 days before the last day of scheduled classes of the quarter in which the student expects to receive a degree. The original and two copies of the thesis must be submitted to the departmental office before the above deadline. These copies are for transmittal to the Institute library, the departmental office, and the student's thesis advisor. For detailed instructions about the organization of the thesis, the student should consult the brochure

"Thesis Format," available at the departmental office.

#### **Maximum limit on time**

The required credits for the master's degree must be completed within **seven** years after the student's initial registration in graduate courses at the Institute as a regular or non-matriculated student.

#### **Courses of instruction**

Information about the courses that will be offered in a particular quarter will be available from the departmental office prior to registration. The Institute reserves the right to withdraw any course for which enrollment is insufficient, or to make any changes in the schedule of courses if necessary.

## **Master of Engineering Degree Program**

This is a post-baccalaureate internship program leading to the professional degree of master of engineering. The objective of the program is to provide the engineering BS graduate the means for earning a terminal master's degree, substituting a well organized industrial internship for the conventional thesis or equivalent requirement for an MS degree.

#### **Special features of the program**

An industrial internship of duration equivalent to two academic quarters in a full-time engineering position is an integral part of the program. A minimum of eight and a maximum of 16 credits may be earned by the student's internship experience. The internship is selected to reflect each student's primary professional interest and is integrated with his or her curriculum.

In a limited number of cases, where a regular internship is not practical due to extraordinary circumstances, case studies may be substituted for internship. Such a substitution has to have the prior approval of the department head and the director of graduate programs.

The program, although rooted in engineering, will be significantly interdisciplinary. By design, a student's program may range over several colleges of the Institute in assembling

courses which will best help the student meet professional objectives. A maximum of 16 credits can be taken by the student in courses outside the traditional area of engineering and the sciences, subject to advisor approval.

#### **Admission requirements**

The requirements and general standards for admission and the selection procedure will be essentially similar to those for the MS degree programs.

#### **Degree requirements**

A minimum of 48 credits, including the academic credits awarded for the internship experience, are required for the master of engineering degree.

#### **Faculty advisor**

Each student will be assigned a faculty advisor as soon as he or she is formally admitted to the program.

In cases where the student's background warrants it, a committee of two advisors will be assigned. The faculty advisor will assist the student in preparing a meaningful plan of study. The advisor will also monitor and evaluate the student's internship experience (in cooperation with the student's industrial supervisor) and recommend to the Graduate Committee of the College of Engineering the number of academic credits to be awarded for the internship experience.

#### **Master of Science Degree in Materials Science and Engineering**

A degree program leading to the master of science degree in materials science and engineering is offered jointly by the Colleges of Engineering and Science. A detailed description of this program is contained in the College of Science section of this bulletin.

#### **For information**

Specific questions on the individual department programs:

Computer Engineering 475-2987

(Dr. Czernikowski)

Electrical Engineering 475-2167

(Dr. Unnikrishnan)

Industrial Engineering 475-2147

(Dr. Reeve)

Mechanical Engineering 475-2163

(Dr. Karlekar)

Questions on course schedules and registration:

Computer Engineering 475-2987

Electrical Engineering 475-2167

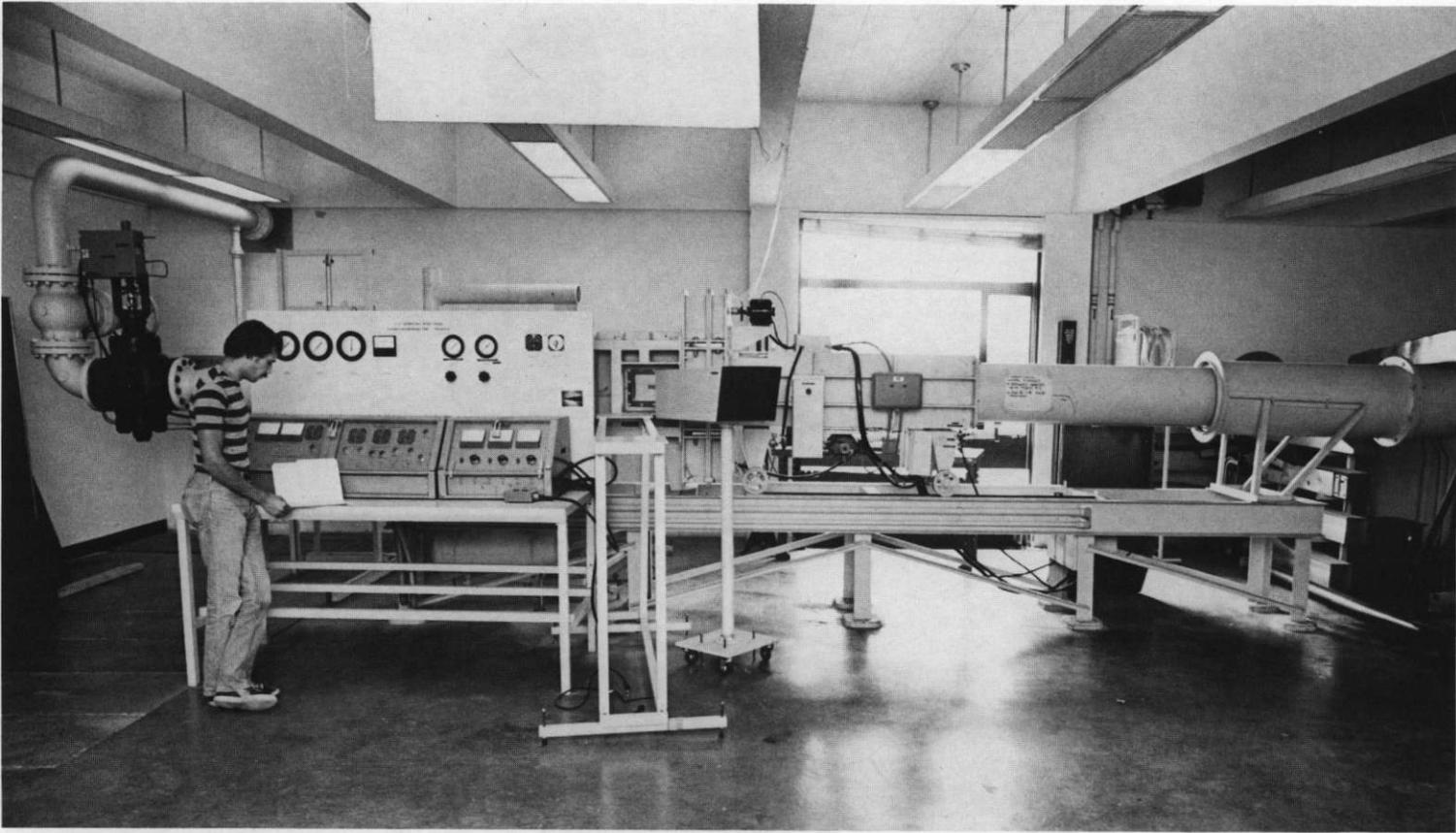
Industrial Engineering 475-2598

Mechanical Engineering 475-2163

## **Computer Engineering Department**

**Roy Czernikowski,**  
Department Head

The College of Engineering offers a master of engineering degree; one of the options is in computer engineering. This option is intended to build upon a bachelor of science degree in computer engineering. It is expected to accommodate recipients of BS degrees in electrical engineering or computer science after some additional course work. The degree requires 48 quarter credits starting at the core curriculum as specified below. The degree requires five courses in a core curriculum, an area of concentration, graduate electives subject to faculty advisor's approval, and eight quarter credits of graduate internship. Both the area of concentration and the graduate internship or project work must be approved by a student's graduate committee consisting of at least three faculty members, the majority of whom are computer engineering faculty. This allows a student to pursue an area of specialization in the field of computer engineering by completing a cohesive set of two or three courses apart from



the background core requirements. The chairman of the student's graduate committee will normally serve as the student's faculty advisor. The intent is to allow students reasonable creativity in articulating an area of concentration.

#### **CORE Curriculum for Master's Degree in Computer Engineering**

##### **Core Courses:**

ICSS-706 Foundations of Computing

Theory (Fall, Winter, Spring)

ICSS-709 Programming Language

Theory (Fall, Spring, Summer)

EECC-722 Advanced Computer

Architecture (Winter)

EECC-759 Digital Interface Circuits

(Spring)

EECC-756 Small Systems Workshop

(Spring)

The graduate curriculum will require the following courses beyond a BS degree in computer engineering:

5 courses in core (20 quarter credits)

5 courses in concentration/graduate electives (20 quarter credits)

8 credits in graduate internship project

48 quarter credits total

The area of concentration builds some expertise in preparation for conducting a successful graduate

project in an area within the discipline of computer engineering. The graduate internship project is generally expected to be an appropriate industrial project that is supervised and approved by the graduate faculty committee; other forms of graduate project work may be necessary in unusual circumstances. The student may choose graduate electives subject to the approval of his/her faculty advisor. The total of all graduate courses transferred from other appropriate institutions of higher learning may not exceed 12 quarter credits, and the total of 600-level courses applicable to the program will not exceed eight quarter credits. No graduate credit will be considered for courses below the 600 level. The usual RIT graduate school requirements will apply; e.g., a grade of B or better for all transfer courses and maintenance of a grade point average of 3.0 or better out of 4.0.

## **Electrical Engineering Department**

**Swaminathan Madhu,**  
Department Head

**Raman Unnikrishnan,**  
Associate Head

#### **Admission Requirements**

Admission into the graduate program in electrical engineering requires a BSEE degree from an accredited university. An applicant with a strong undergraduate record in a different engineering discipline may be considered provided he or she completes a certain number of undergraduate courses in electrical engineering with at least a B average. For further information, contact Dr. Unnikrishnan.

#### **Master of Science Degree Program**

The master of science degree in electrical engineering is awarded upon the successful completion of an approved graduate program consisting of a minimum of 45 credit hours. Under certain circumstances, a student may be required to complete more than the minimum number of credits.



### Core Courses

Three courses are required of all candidates for the MS degree in electrical engineering: EEEE-754, -755, -756 Analytical Techniques I, II, III. A waiver of any of the above courses can be granted to a student who can clearly demonstrate to a designated faculty member that he or she has a solid background in the topics covered in them.

A graduate student will be expected to take the required core courses during the first year of his or her program, since they are prerequisites for many of the other graduate courses.

### Elective Courses

A maximum of 12 credits can be chosen from graduate or advanced undergraduate courses offered by any department of RIT with the *prior approval* of the faculty advisor. The remaining credits for the degree must be earned from graduate courses in electrical engineering.

### Thesis

The inclusion of a thesis as a formal part of the master of science degree program in electrical engineering is optional. Students who decide to write

a thesis can earn a minimum of six credits and a maximum of 12 credits toward their degree from the thesis.

### Non-thesis options

Students who do not wish to write a thesis may choose one of the following non-thesis options:

#### Option 1

A student with significant industrial experience of at least six years after earning the baccalaureate degree may be permitted to make an oral technical presentation on an engineering project the student has worked on. The technical presentation carries no academic credits and the student will earn all the required credits for the degree in course work. Proposals for such a technical presentation must be submitted to the chairperson of the Graduate Committee on or before January 21 of the academic year in which the presentation is to be made.

#### Option 2

A student may choose to write a "graduate paper" in lieu of a thesis. The graduate paper is an extensive term

paper on a topic of professional interest. The objective of the graduate paper is to enable the student to undertake an independent and in-depth literature search, and write a report summarizing the findings. A faculty member interested in the topic of the paper will serve as the student's supervisor and direct the scope and depth of the paper as well as the format of the final written version. The student must first consult a faculty member about a suitable topic for the paper and obtain consent. The course number EEEE-800 Graduate Paper is used in registering for the paper. The student choosing this option will earn the remainder of the required credits for the degree by means of course work.

All electrical engineering students also see table—page 63

## Industrial Engineering Department

**N. Richard Reeve**, Department Head

Although there is no master of science degree in industrial engineering at present, the master of engineering degree can be earned with specialization in the following fields: industrial engineering; systems engineering; engineering management. Close cooperation with the College of Business and the School of Computer Science assures the master of engineering candidate of a wide selection of courses and a unique opportunity to build a program tailored to her or his professional interests and goals. The practice of emphasizing computer methods to realistic problem solving is employed in all the above specialties.

### Admission Requirements

Admission into the graduate ME program within industrial engineering requires a BS degree in an engineering discipline. Exceptions are made for the related fields of math and physics. Students with other backgrounds are considered for admission only after completing significant undergraduate course work in the engineering sciences. All applicants should have a fundamental knowledge of computers (FORTRAN), and Probability/Statistics.

### Program of Study

The student, in conjunction with his/her advisor formulates a program of study based on the individual's academic background, professional goals, master of engineering degree requirements, and the schedule of course offerings.

## Mechanical Engineering Department

**Bhalchandra V. Karlekar**,  
Department Head

### Master of Science degree program

The master of science degree in mechanical engineering is awarded upon successful completion of an

approved graduate program consisting of a minimum 45 quarter credit hours. A minimum of 33 credits are to be earned in course work, while independent work carries a minimum of five credits and a maximum of 12 credits.

### Independent Work

There are four options offered by the department with regard to completing the requirements of the master of science degree. Each student is free to select a design project, literature search, a thesis, or additional course work with a comprehensive examination. A minimum of five credits is to be earned by doing an independent piece of work if a student does not elect to take a comprehensive examination.

Each student completing an independent work will be required to make a successful oral presentation of the work. The comprehensive examination, when elected by a student, will be based on the core subjects and will be taken near the end of the formal program of study, but no earlier than the completion of 32 graduate credits.

### Core Courses

All graduate students are required to complete the following:

Course number and title	Credits
EMEM-871 Mathematics for Engineers	4
EMEM-872 Mechanics	4
EMEM-873 Heat Transfer	4
EMEM-874 Numerical Methods	4
EMEM-875 Instrumentation and Experimental Analysis	4

In those cases where students have had graduate level courses equivalent to any of the core courses, the departmental Graduate Committee may permit substitution or award transfer credit for the appropriate course. The maximum number of transfer credits permitted is nine.

Students changing their major discipline to mechanical engineering from another field, or having graduated from a non-accredited undergraduate program, should anticipate additional requirements.

### Elective Courses

The following elective courses are available to the student for graduate credit.

Course number and title	Credits
EMEM-810 Introduction to Continuum Mechanics	4
EMEM-811 Theory of Elasticity	4
EMEM-812 Theory of Plates and Shells	4
EMEM-813 Theory of Plasticity	4
EMEM-815 Experimental Stress Analysis	4
EMEM-816 Finite Elements	4
EMEM-820 Advanced Optimal Design	4
EMEM-821 Vibration Theory and Applications	4
EMEM-833 Heat Exchanger Design	4
EMEM-838 Ideal Flows	4
SESM-701 Introduction to Materials Science	4
SESM-710 Properties and Selection of Engineering Materials	4
EENG-801 Design for Manufacture	4
EMEM-864 Production Tool Design	4
EMEM-865 Applications of the Finite Element Method Using NASTRAN	4

Students with a background deficient in engineering materials are strongly advised to take SESM-701 as an elective. Also, special courses listed later may be offered as electives in the event of sufficient demand.

When the needs of a particular program require additional courses, the student may elect to take up to 12 credits from other departments in the Institute. Graduate students are allowed to take for graduate credit a maximum of two upper level undergraduate electives in mechanical engineering specified in the course description catalog as EMEM-6XX (for example, Advanced Strength of Materials, Fluid Mechanics of Turbomachinery, and Stress Analysis).

A student also may earn a limited number of credits by doing an independent study with guidance from a member of the faculty. Some of the areas for independent study are in applied mathematics, theory of elasticity, energy methods in mechanics, analytical mechanics, lubrication, convective and radiative heat transfer, thermodynamics, fluid mechanics, wind and solar energy, and control systems.



### **Course descriptions**

For a complete outline of graduate courses offered, please consult the course description section.

### **Assistantships and fellowships**

Some assistantships and fellowships may be available for full-time students. Appointment as a teaching assistant carries a 12-hour per week commitment to a teaching function, and usually

permits a student to take graduate work at the rate of 8 credits per quarter. Appointment as a research assistant also usually permits taking 8 credits per quarter while the remaining time is devoted to the research effort, which often serves as a thesis subject. Fellowships generally permit taking courses at the rate of 16 credits per quarter. Applicants for financial aid should write directly to the department head for details.

### **Course calendar**

The core courses are offered every quarter so that, in a given academic year, a student can fulfill the core requirements. The elective courses are generally given at least every other year. For further information on current course offerings, the student should contact the office of the Mechanical Engineering Department (716-475-2163).

## Graduate Courses Computer Engineering

### EECC-620 Design Automation of Digital Systems

#### **Registration #0306-620**

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 ICSS 720)

Class 4, Credit 4 (S)

### EECC-630 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 are 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. (5th year status in Computer Engineering, Computer Science, Electrical Engineering or Microelectronic Engineering)

Class 4, Credit 4 (F,S)

### EECC-722 Advanced Computer Architecture

#### **Registration #0306-722**

This course will emphasize the impact of VLSI and communication issues on computer architecture. Topics covered will include highly concurrent, multi-processor 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-756 Small Systems Workshop

#### **Registration #0306-756**

This course will cover the general guide lines, 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 the 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 3, Lab 3, Credit 4 (Spring)

### EECC-758 Fault Tolerant Digital Systems

#### **Registration #0306-758**

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; or EECC 550 or ICSS 720)

Class 4, Credit 4 (S)

### EECC-759 Digital Interface Circuits

#### **Registration #0306-759**

Standard bus interfaces—parallel and serial. LSI interface devices. Interface design—peripherals and memory. Data acquisition—A/D & D/A converters, multiplexing. Logic—PIA, ROM based designs, spectral techniques. Error detection and correction. (EECC 560 or permission of instructor)

Class 4, Credit 4 (S)

## Department of Electrical Engineering

The courses listed below are normally open to students who have been formally admitted into the graduate electrical engineering programs. Students with a baccalaureate degree in engineering or science may be permitted to enroll in any of these courses as non-matriculated students if they have already completed the stated prerequisites for a particular course. Undergraduate students may be permitted to take some of these courses as undergraduate technical electives provided they are fifth year students and have already completed the prerequisites. The permission of the director of graduate programs is required for enrolling in these courses except in the case of matriculated graduate students.

### 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 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 Devices I

#### **Registration #0301-724**

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 process measurement and testing. (EEEE 723)

Credit 4

### EEEE-725 Physics of Semiconductor Devices II

#### **Registration #0301-725**

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 4

### 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-728 IC Operational Amplifiers

#### **Registration #0301-728**

Analysis of operational amplifier circuits using the ideal op amp; development of circuit models to predict non-ideal op amp characteristics; study of feedback systems, stability (using Bode plots), and compensation; direct coupled amplifiers and operational amplifier design; interpretation of manufacturers' specifications and basic applications with emphasis on practical aspects. (EEEE-442, -754, -755)

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 converters, and more. The students will participate in design projects including circuit design, layout, and SPICE simulation. (EEEE-726)

Class 4, Credit 4, Lab 0



**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 title 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 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 demonstrations. (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 detectors used in fiber optical systems. Applications to communications and other areas will be discussed. (EEEE-775, -776, -777)

Credit 4

**EEEE-779****Digital Image Processing****Registration #0301-779**

Introduction to digital image processing concepts, image digitization, 2D discrete Fourier transforms; topics on image enhancement including contrast equalization, false color displays, and edge enhancement techniques; topics in image reconstruction to include causes of image degradation, deblurring procedures, and homomorphic filters; 3D image reconstruction from 2D projections. (EEEE-754, -755, 677)

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 in differential and integral forms. Solution of Maxwell's equations for the plane waves, transmission lines, waveguides, and antennas.

Credit 4

**EEEE-782****Boundary Value Problems****Registration #0301-782**

Techniques for solving boundary value problems. Numerical methods, analog and relaxation 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 4

**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 the 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 applications. (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-792****Advanced Topics in Signal Analysis****Registration #0301-792**

A continuation of EEEEE-791. Topics chosen from: signal and system parameter estimation pole-zero modeling; maximum likelihood methods, maximum entropy methods; Prony's method; pencil of functions method; quantization effect in discrete processing techniques; spectral estimation; windowing; generalized transforms including Walsh-Hadamard. (EEEE-791)

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 fundamental 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; band-width vs. accuracy. (EEEE-756)

Credit 4

**EEEE-795 Optical Engineering II****Registration #0301-795**

A continuation of EEEE-776, Electro-optics, that emphasizes the application of wave optics to optical systems. Interference and interferometers. Thin films. Diffraction. Partial coherence. Fourier optics. Discussion of holography, optical data processing, imaging and other topics of current interest. (EEEE-776)

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 Master's Thesis****Registration #0301-890**

An independent engineering project or research problem to demonstrate professional maturity, preferably involving the reduction of theory to practice. 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 number is 9 credits.

Credit variable

## Department of Industrial Engineering

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

**EIEI-715, 716 Statistical Analysis for Engineers I & II****Registration #0303-715, -716**

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 Research I****Registration #0303-701**

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 Research****Registration #0303-705**

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 Factors I****Registration #0303-730**

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 Factors II****Registration #0303-731**

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

## Department of Mechanical Engineering

The courses EMEM-871, EMEM-872, EMEM-873, EMEM-874, and EMEM-875 are offered every year. The other courses (except those listed as "offered on sufficient demand") are typically offered every other year.

### EIEI-732 Biotechnology and Human Factors III

#### **Registration #0303-732**

Theoretical fundamentals of human body mechanics. Development and applications of biomechanics and biomechanical models. Kinematics of the link system of the body and extremity joints.

Credit 4

### EIEI-733 Biotechnology and Human Factors IV

#### **Registration #0303-733**

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

Special courses related to a particular student's interest can be arranged via the following course:

### EIEI-740 Numerical Control and Manufacturing

#### **Registration #0303-740**

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-assemblers, 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 A/D, 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

### EIEI-771, -772, -773, -774, -775 Special Topics in Industrial Engineering

#### **Registration #0303-771, -772, -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 approval of 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 function and manufacturability, design for manual and automated assembly, methods and systems for computer-aided design and manufacturing, simulation of manufacturing systems, and the role of robotics in manufacturing. Students will gain hands-on experience with the RIT computer facilities, robots, and CAD/CAM laboratories as these relate to modern trends in the design for manufacture.

Credit 4 (TBA)

### 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 function and manufacturability, design for manual and automated assembly, methods and systems for computer-aided design and manufacturing, simulation of manufacturing systems, and the role of robotics in manufacturing. Students will gain hands-on experience with the RIT computer facilities, robots, and CAD/CAM laboratories as these relate to modern trends in the design for manufacture.

Credit 4 (TBA)

### 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, thermo-elasticity, viscoelasticity, and fluid mechanics. (EMEM-871)

Credit 4 (TBA)

### EMEM-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. (EMEM-810)

Credit 4 (TBA)

### 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 stresses in plates. Membrane theory of shells, cylindrical shells, pressure vessels, and shells of revolution. (EMEM-685 or equivalent)

Credit 4 (TBA)

### 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)

Credit 4 (TBA)

### 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. Laboratory tests of models. (EMEM-694 or equivalent)

Credit 4 (TBA)

### EMEM-816 Finite Elements

#### **Registration #0304-816**

Development of theory from variational principles. Two-dimensional applications to elastic continua, considering plane stress, plane strain, and axisymmetric loading examples. Problem-solving sessions using RIT computer. Applications in structural mechanics, considering beam elements, plate elements, and shell elements. Utilization of these elements in solving specific structural problems. Introduction to three-dimensional stress analysis. Features of large general-purpose computer programs. (EMEM-694 or equivalent)

Credit 4 (TBA)

**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 sub-problem of the line search. Applications to the solution of practical nonlinear optimization problems using the digital computer. Decomposition strategies for improving efficiency in the search process. (EMEM-871 and EMEM-874)

Class 4, Credit 4 (TBA)

**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)

Credit 4 (TBA)

**EMEM-828, -829** **Special Topics in Applied Mechanics****Registration #0304-828, -829**

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 special courses is found at the end.

Credit variable (maximum of 4 credits/quarter) (TBA)

**EMEM-833** **Heat Exchanger Design****Registration #0304-833**

The 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)

Credit 4 (TBA)

**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; theory of complex variables; airfoil and wing theories. (EMEM-871)

Credit 4 (TBA)

**EMEM-848, -849** **Special Topics in Thermo Fluid Systems****Registration #0304-848, -849**

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 special courses is found at the end.

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 production of manufacturable items. Consideration of cutting and forming force analyses, as well as locating, positioning and clamping requirements. Simulation of tool path motions on modern computer work-stations.

Credit 4 (TBA)

**EMEM-865** **Applications of the Finite Element Method Using NASTRAN****Registration #0304-865**

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. The industrial software package, NASTRAN, is used for these applications where the general structure, operating characteristics, and usage of this complex program is presented. Topics include: the finite element method; shape factors, element formulations, and the NASTRAN element library; NASTRAN 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 analyses such as acoustics, illumination, etc.

Credit 4 (TBA)

**EMEM-871** **Mathematics for Engineers****Registration #0304-871**

Topics include linear constant coefficient ordinary differential equations; partial differentiation, including the chain rule, Jacobians and optimization problems; multiple integration including change of coordinates and surface integrals; vector analysis, including the directional derivative, the gradient, the Divergence Theorem and Stokes' Theorem; Laplace Transforms; and an introduction to Fourier Series and Integrals. (Graduate standing)

Credit 4 (F)

**EMEM-872** **Mechanics****Registration #0304-872**

Advanced dynamics and vibrations are emphasized. Newtonian vector mechanics and energy formulations are applied to two- and three-dimensional problems of single and multi-degree of freedom. The concepts of Virtual Work, Hamilton's Principle, and Lagrange's equations are covered. The vibration of discrete multi-mass systems includes the formulation and eigen-value solutions by computer, and the method of finite elements are included. The vibration of continuous systems and discrete modeling is introduced. (EMEM-871 and EMEM-543)

Credit 4 (W)

**EMEM-873** **Heat Transfer****Registration #0304-873**

This is an advanced course in conduction heat transfer. The formulation of the heat conduction equation is introduced using lumped, differential and integral approaches. Mathematical preliminaries of separation of variables technique, superposition technique, Sturm-Liouville system, orthogonal functions, generalized Fourier series, Bessel and Legendre functions are treated with examples from heat conduction. Solutions of the two and three-dimensional steady heat convection equation are obtained for different geometrical shapes. Multi-dimensional unsteady heat conduction problems are solved. (EMEM-514 and EMEM-871)

Credit 4 (W)

**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 actually implement these techniques. The methods are developed for: Algebraic and transcendental equations for single variable; systems of linear algebraic equations with both direct and iterative techniques of solution; systems of non linear equations, interpolation and approximation theory; numerical differentiation and integration, initial value problems for ordinary differential equations; boundary value problems for ordinary linear and non linear differential equations. Extensive use of the computer will be required. (Graduate standing; knowledge of FORTRAN, experience in the use of digital computers)

Credit 4 (TBA)

**EMEM-875** **Instrumentation and Experimental Analysis****Registration #0304-875**

Various displacement, strain, velocity, acceleration, pressure transducers will be discussed along with the associated electronic equipment and recorders to measure and record the variables. A laboratory session will be substituted in place of class when experiments are assigned. The static and dynamic characteristics of the instruments will be obtained as these instruments are mathematically modeled and subjected to impulse, step and ramp frequency functions of time. (Graduate standing)

Credit 4 (Sp)

**GRADUATE COURSE OFFERINGS  
DEPARTMENT OF INDUSTRIAL ENGINEERING**

**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.

**EMEM-890** Thesis, Design Project, or Literature Search

**Registration #0304-890**

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. Credit variable (5 to 12 credits total) (F, W, Sp, Su)

**SESM-701** Introduction to Materials Science

**Registration #1028-701**

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 (F)

**SESM-710** Properties and Selection of Engineering Materials

**Registration #1028-710**

This course is designed to acquaint the student with material structure and properties for engineering design selection purposes. The nature, structure and properties of polymeric materials, ceramics, plain carbon and alloy steels, cast irons, and nonferrous alloys are studied. In addition to material properties, their limitations, thermal and mechanical processing, and especially their selection and specification for engineering design is emphasized. (SESM-701 or equivalent)

Credit 4 (TBA)

Special topics 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  
Advanced Fluid Dynamics  
Control Systems  
Thermal Stresses

<b>FALL</b>	<b>WINTER</b>	<b>SPRING</b>
EIEI 715- Statistical Analysis	EIEI 716- Registration	EIEI 630- Comp. Aided Mfg
*EIEI 625 Comp. Aided Mfg. I	EIEI 730 Human Factors I	EIEI 734 Safety Engr.
EIEI 7XX Special Topics/ Reliability	EIEI 7XX Special Topics/ SLAM	EIEI 720 Production Control
EIEI 7XX Special Topics/ Decision Analysis	EIEI 7XX Special Topics/ Multiobjective Analysis	EIEI 7XX Special Topics/ Case Studies

Odd Years (e.g., 85/86, 87/88, etc.)

<b>FALL</b>	<b>WINTER</b>	<b>SPRING</b>
EIEI 715 Statistical Analysis	EIEI 716 Regression	EIEI 630 Comp. Aided Mfg.
*EIEI 625 Comp. Aided Mfg. I	EIEI 620 Engrg. Economy	EIEI 734 Safety Engrg.
EIEI 701 Linear Programming	EIEI 731 Human Factors II	EIEI 702 Non-Linear Prog
EIEI 7XX Special Topics/ Design of Experiments	EIEI 710 Simulation (GPSS)	EIEI 601 Value Analysis
		EIEI 7XX Special Topics/ Advanced Engrg Economy

The following courses are offered upon demand:

EIEI 732, 733	Human Factors III, IV
EIEI 723	Facilities Planning
EIEI 718	Inventory Design

\*If the 5th year class is B block, this course is shifted to the Winter Quarter (85/86, 88/89, etc.)

**Schedule of Graduate Courses in Electrical Engineering**

	1985-86			1986-87		
	Fall	Winter	Spring	Fall	Winter	Spring
<b>REQUIRED COURSES</b>	754 Analytical Tech. I	755 Analytical Tech. II	756 Analytical Tech. III	754 Analytical Tech. I	755 Analytical Tech. II	756 Analytical Tech. III
<b>MICRO-ELECTRONICS</b>	726 Analog IC Circuits	730 Adv. Analog IC Design	*728 IC Op Amps 727 VLSI Design	723 Semicond. Physics	724 Phys. of Semicond. Devices I	725 Phys. of Semicond. Devices II
<b>DIGITAL SYSTEMS</b>		745 Topics in Digital Sys. I	746 Topics in Digital Sys. II	*747 Topics in Switching Theory	742 Adv. Micro. Software Design	748 Microproc. in Instrum. & Control 744 Adv. Micro Systems Design
<b>CONTROL SYSTEMS</b>	764 Digital Control Systems	*762 Nonlinear Control	761 Modern Control Theory	763 Stochastic Estim. & Control	765 Optimal Control	767 Power Semicond. Circuits
<b>OPTICAL ENGINEERING</b>	*778 Fiber Optics	779 Digital Image Proc.		775 Optical Engg. 1	776 Electro Optics	777 Optical Engg. II
<b>ELECTRO MAGNETICS</b>	786 Microwave Devices	787 Radar Engg.	781 Electro-mag Fields	783 Antennas & Ant. Sys.	*784 Adv. Elec. Theory	*782 Boundary Value Probs.
<b>COMMUNICATIONS</b>	790 Random Sig. and Noise	791 Topics in Sig. Analy.	792 Adv. Topics in Signal Analysis	*794 Inform. Theory		793 Error Det. & Correc. Codes

These courses are scheduled as shown here, but may not be offered unless certain conditions (such as minimum enrollment) are met.

The above two-year cycle is repeated on a regular basis, but is subject to alterations based on periodic curriculum changes in the master's program.

## Graduate Faculty College of Engineering

**Richard A. Kenyon**, Ph.D., P.E., Syracuse—Dean, Professor, Mechanical Engineering

**Charles W. Haines**, Ph.D., Rensselaer Polytechnic Institute—Associate Dean; Associate Professor, Mechanical Engineering

### Computer Engineering Department

**Roy Czernikowski**, Ph.D., RPI—Professor and Department Head, Real-Time-Computation, Computer Architecture, and Distributed Systems

**George Brown**, MSEE, University of Rochester—Professor, Systems and Control

**Tong-han Chang**, Ph.D., Chinese Academy of Science, Beijing—Associate Professor, System Design Methodology, Communication and Computation

**John L. Ellis**, Ph.D., University of Toledo—Associate Professor, VLSI, Computer Architecture, Networks, Data Communications

**Kenneth Hsu**, Ph.D., Marquette—Assistant Professor, Microcomputers and Control Systems

**Pratapa Reddy**, Ph.D., Indian Institute of Technology—Assistant Professor, Digital Systems

### Electrical Engineering Department

**Swaminathan Madhu**, Ph.D., University of Washington—Professor, Communication Theory, Logic Design, Department Head

**Soheil A. Dianat**, Ph.D., George Washington University—Assistant Professor, Control Systems

**Lynn Fuller**, Ph.D., Buffalo—Associate Professor, Solid State Devices and Microelectronics

**Roger Heintz**, Ph.D., Syracuse—Associate Professor, Solid State Devices

**Robert E. Lee**, Ph.D., University of Rochester—Associate Professor, Systems and Control

**A. V. Mathew**, Ph.D., Queens University (Ontario)—Associate Professor, Control Systems

**James E. Palmer**, Ph.D., Case Institute of Technology—Professor, Digital Systems

**David Perlman**, MS, Cornell University—Associate Professor, Electronics

**Alton Riethmeier**, M.S., Rochester—Associate Professor, Digital Systems

**Edward R. Salem**, Ph.D., Buffalo—Professor, Digital Processing, Microcomputers

**Tapan K. Sarkar**, Ph.D., Syracuse—Associate Professor, E. M. Fields, Antenna Theory

**David Sumberg**, Ph.D., Michigan State—Associate Professor, Optics

**Fung-I Tseng**, Ph.D., Syracuse—Associate Professor, Electromagnetic Theory

**Renan Turkman**, Ph.D., Paris—Assistant Professor, Solid state devices

**Raman M. Unnikrishnan**, Ph.D., Missouri—Associate Department Head; Associate Professor, Power Electronics, Control Systems

**Jayanti Venkataraman**, Ph.D., Indian Institute of Science—Assistant Professor, Electromagnetic Theory

**Watson F. Walker**, Ph.D., Syracuse—Professor, Communication Theory

### Adjunct Faculty in Electrical Engineering

**J. Christopher Cassidy**, Ph.D., Cornell—Eastman Kodak Co., Solid State

**Robert Houde**, Ph.D., University of Michigan—Speech Recognition Systems, Communication Systems and Speech Processes

**James Schueckler**, MS, RIT—Eastman Kodak Company, Microcomputers

### Industrial Engineering Department

**Richard Reeve**, Ph.D., Buffalo—Professor, Applied Operations Research; Department Head

**Barbara J. Brenner**, MSIE, Purdue University—Assistant Professor, Simulation, Organizational Behavior, Work Measurement

**Rajendra B. Nalavade**, Ph.D., Ohio State University—Assistant Professor, Statistics, Man-Machine Systems

**Sudhakar R. Paidy**, Ph.D., Kansas State University—Associate Professor, Statistics, Reliability, and Operations Research

**Jasper E. Shealy**, Ph.D., SUNY at Buffalo—Professor, Human Factors

**Kai Sung**, Ph.D., Case Western Reserve—Associate Professor, Systems Engineering, Operations Research

### Mechanical Engineering Department

**Bhalchandra V. Karlekar**, Ph.D., P.E., University of Illinois—Professor and Department Head, Heat Transfer, Applied Mathematics, Energy

**Richard G. Budynas**, Ph.D., P.E., Massachusetts—Professor, Applied Mechanics

**Robert A. Ellson**, Ph.D., P.E., University of Rochester—Associate Professor, Energy Conversion, Fluid Mechanics

**Hany A. Ghoneim**, Ph.D., Rutgers—Assistant Professor, Finite elements

**Amitabha Ghosh**, Ph.D., Mississippi State University—Assistant Professor, Computational Fluid Dynamics

**Surendra K. Gupta**, MS, Notre Dame—Instructor, Materials Science and Computer Science

**Charles W. Haines**, Ph.D., Rensselaer Polytechnic Institute—Associate Professor, Applied Mathematics

**Robert Hefner**, Ph.D., Georgia Inst. of Tech.—Associate Professor, Systems Analysis, Heat Transfer

**Richard B. Hetnarski**, Dr. Tech. Sci., P.E., Polish Academy of Sciences—Professor, Thermoelasticity



**Satish G. Kandlikar**, Ph.D., Indian Institute of Technology—Assistant Professor, Thermal Systems and Energy

**Richard Kenyon**, Ph.D., P.E., Syracuse—Professor, Thermodynamics and Fluid Mechanics

**Raj Khanwalkar**, Ph.D., Johns Hopkins—Assistant Professor, Wave Propagation, Elasticity

**George T. Komorowski**, MS, Rochester Institute of Technology—Assistant Professor, Computer Science

**Chris Nilsen**, Ph.D., P.E., Michigan State—Associate Professor, Metallurgy and Materials Science

**Alan H. Nye**, Ph.D., University of Rochester—Associate Professor, Fluid Mechanics

**Frank Sciremammano, Jr.**, Ph.D., University of Rochester—Assistant Professor, Geophysical Fluid Dynamics and Environmental Control

**Robert L. Snyder**, Ph.D., P.E., Iowa State—Professor, Materials Science, Chemistry

**Wayne W. Walter**, Ph.D., P.E., Rensselaer Polytechnic Institute—Associate Professor, Applied Mechanics

**Paul Wojciechowski**, Ph.D., University of Rochester—Associate Professor, Systems Analysis, Environmental Studies, Energy

# College of Fine & Applied Arts

**Robert H. Johnston**, Dean  
**Peter Giopulos**, Associate Dean  
 (475-2634)

**Master of Fine Arts**  
**Master of Science for Teachers**

The College of Fine and Applied Arts, in its School for American Craftsmen, and in the industrial and interior design, graphic design, medical illustration,\* painting, printmaking, and computer graphics design programs of the School of Art and Design, prepares artists, craftsmen and designers to operate their own studios and shops, as self-employed professionals, and to work in business and industry as artists and designers. It prepares graduates to teach at colleges and at secondary levels through a concentration in art education.

The College of Fine and Applied Arts provides a center for advanced study in the graphic, plastic and the fine arts in which the student has the opportunity to work in a professional environment; it stimulates and encourages work of the highest quality. Students of superior ability who possess a baccalaureate degree in art, crafts or design may increase their competence in the field of their major interest under the guidance of accomplished professional artists and craftsmen. For those students who have a background in graphic design, industrial and interior design, painting, sculpture, printmaking, illustration, computers or one of the five craft areas, there is opportunity to develop new areas of competence. The master's programs are also designed to enable students to broaden their experience in the practice of art in areas other than their majors and to increase their understanding of the arts in the humanistic sense. Students are expected to participate in the planned non-credit program of assemblies, seminars, and exhibits as well as their formal class requirements.

\*Only MFA In Medical Illustration and Computer Graphics Design.





### Graduate degrees

The College of Fine and Applied Arts offers two graduate degrees. The master of science for teachers may be taken in nine studio areas and in art education. The art education concentration leads toward permanent art N-12 certification to teach in the public schools of the State of New York and involves pedagogical studies and student teaching. The master of science for teachers may also be pursued in the studio areas of graphic design, industrial and interior design, painting, printmaking, ceramics and ceramic sculpture, glass, metalcrafts and jewelry, weaving and textile design and wood-working and furniture design. This MST in studio may also lead to certification if provisional or temporary certification has been previously earned as an undergraduate. Students may select the summer option or one year full-time study for this studio concentration.

The second graduate degree is the master of fine arts, considered the highest degree of study in the studio arts. This involves the presentation of a thesis and usually requires two years of full-time study.

### Objectives

The MFA and MST programs are constituted to reflect the goals of Rochester Institute of Technology.

The programs are designed to graduate artists, designers, craftsmen and teachers who are cognizant of the contemporary situation and desire to better it by devotion to their work and high standards of personal discipline.

### Requirements for admission to the MST degree programs

The applicant should have received the baccalaureate degree in a field of the arts from a regionally accredited college or university in the United States or Canada with a major concentration in art, art education, or industrial arts education. Applicants with different backgrounds should refer to the section on non-matriculated students. The undergraduate studies should include a minimum of 54 quarter credit hours (36 semester hours) in drawing, painting, design, or the crafts. If the applicant for admission holds the BA or BFA degree and seeks the MST degree in art education, the undergraduate program must have included the studio course distribution required by the New York State Education Department. For those holding the BS degree in art education and the provisional certification, the graduate concentration should be in the studio area, and the program must include a minimum of 10 quarter credit hours in liberal studies or humanities.

A student is accepted into the program with the understanding of full-time status unless granted part-time status at admission.

### Requirements for admission to the MFA degree programs

The applicant should hold the baccalaureate degree in a field of the arts, science or education from a regionally accredited college in the United States or Canada and demonstrate, in the quality of the undergraduate record and creative production, a genuine, professional potential. (See also non-matriculated students.) The undergraduate degree should include 75 quarter credit hours (50 semester hours) in studio courses.

### Acceptance for graduate study

Students are admitted to graduate study by action of the Graduate Committee. Enrollment in graduate courses does not constitute admission to the graduate program, and credit is not given for courses taken prior to acceptance unless the grade received in the course is a "B" or higher; in such a case the student, if admitted to graduate study, may petition for a grant of credit, but not in excess of 12 quarter credit hours.

A student may be admitted who needs additional undergraduate study

requirements. This study will be structured for breadth or increased performance in areas designated and will be determined at the time of acceptance.

Such prerequisites must be satisfied as defined in the letter of acceptance which students will receive prior to admission as a graduate student. Extended study may require additional time on campus.

Human Gross Anatomy and biology or equivalent content is necessary for the MFA in medical illustration. Human Gross Anatomy is taught by the University of Rochester, and a surcharge for tuition is required.

Upon full acceptance into any of the graduate programs the student is considered qualified to pursue the degree. This status would be changed by evidence of poor performance in the program. A 3.0 grade point average must be maintained. A student is accepted into the program with the understanding of full-time status unless granted part-time status at admission.

#### **Teacher education and certification**

The teacher of arts and crafts in college or high school, the teacher or administrator of art programs in schools and community centers, the instructor in occupational skills, and the private teacher of art will find in the depth and breadth of the master's program a way of extending and improving the skills and content background necessary for effective teaching. The student who possesses a baccalaureate degree with provisional certification for the teaching of art or industrial arts in the State of New York can achieve permanent certification within the structuring of the master of science for teachers program (studio concentration) or the master of fine arts.

#### **Admission as non-matriculated students**

Students who have a baccalaureate degree and who wish to take particular courses may be admitted as non-matriculated students to courses for which they are qualified. They may receive graduate credit, but it may not be submitted toward degree requirements. Students deficient in admission requirements, or competence, may take undergraduate courses, as advised to qualify for admission.

Those coming from foreign countries where the baccalaureate is not given for programs in the practice of art may be admitted to graduate study if the

diploma or certificate received approximates the standards of the BFA, BA, or BS degrees, and their academic record and portfolio indicate an ability to meet graduate standards.

#### **Admission procedure**

To apply for admission to graduate

study a student must submit evidence of his or her baccalaureate degree, a portfolio of 20-24 slides or other evidence of creative work, a statement of purpose, and references.

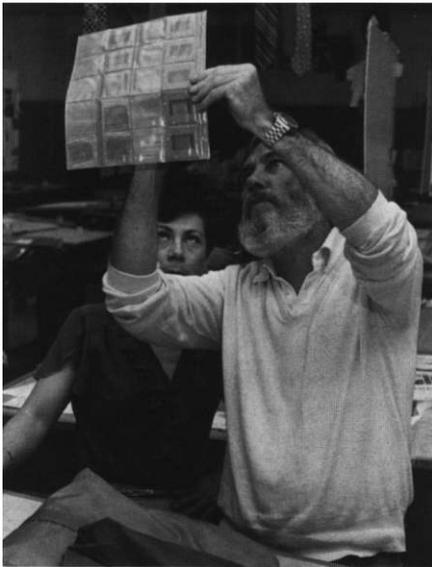
All correspondence concerning applications, catalogs and portfolios should



be addressed to Director of Admissions, Rochester Institute of Technology. Program inquiries should be addressed to Graduate Programs, College of Fine and Applied Arts.

### Transfer of credit

Graduate work pursued to the extent of 12 quarter hours (nine semester hours) may be applied at the discretion of the Graduate Committee to specific course requirements, depending on the nature of the student's program and major, if completed within the five preceding years. This evaluation will be made after one quarter of full-time study.



### Policy regarding student work

The College of Fine and Applied Arts reserves the right to retain student work for educational use or exhibition for a period of time not to exceed one and one-half quarters beyond the year the object has been made.

### Bevier Gallery

During the year, the Bevier Gallery presents a continuing series of important exhibitions planned to present new directions in the fields of the arts, design, and the crafts, as well as to do honor to the works of the past. The gallery, architecturally impressive, and a part of the college, serves to enrich the cultural life of the community, the Institute at large, and to inform and inspire the college's graduate body.

The Faculty Show, Graduate Thesis Show, and Student Honors Show are annual events on the gallery calendar.

### The MFA and MST degrees

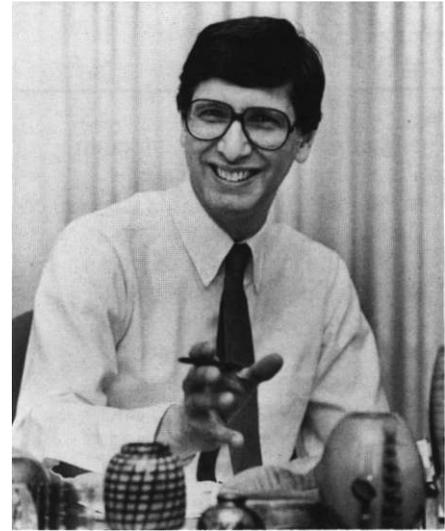
The MFA degree is designed as a professional degree for the practicing artist, craftsman, or designer, and for

those wishing to teach at the college or university level. This is earned normally in two years of full-time study and the completion of a minimum of 90 credit hours including the presentation of an acceptable thesis. Those who have entered the MST program and who may wish to change to the MFA program must petition the graduate faculty for permission to change the degree objective. In view of the pronounced difference in entrance requirements, students requesting a transfer from MST to the MFA program may be required to take additional undergraduate or graduate courses. Such students must also have demonstrated their professional potential by establishing a "B" average (3.0) in at least one quarter (or one summer session) of the MST course of study.

The MST degree may be earned normally in one academic year or in summer sessions through the satisfactory completion of a minimum of 48 credit hours in course work. It is arranged for the student holding the BFA degree (or a BA degree with an art major) who wishes to earn teacher certification (with a BS or BA degree in art or industrial arts education) and seeks permanent certification. The MST degree may also be taken as a concentration in the studio areas with supporting courses on the basis of need and interest from graduate offerings in other schools and departments of the Institute. This major in art education integrates public school teaching, social sciences and studio classes. In contrast, the studio MST candidate selects one of the nine art areas: graphic design, industrial and interior design, painting, printmaking, ceramics, metals, textiles, wood or glass. Summer sessions can accommodate teachers seeking permanent certification through study in an art area. The art education concentration has a September start, and is earned in one academic year.

### Attendance regulations

The programs of the college utilize the studios and shop experiences as an essential part of the educational program; therefore it is imperative that the student regularly attend all classes unless specifically excused for special projects or activities by the instructors. Failure to attend classes, and to complete assignments, will be taken into consideration in grading.



Peter Giopulos

## Graduate art students 'usually know where they're going'

"Today's art student is not just interested in courses, but in a program of study that's well planned," says Peter Giopulos, coordinator of graduate programs in the College of Fine and Applied Arts.

"Most of our graduate students have been through an experimental stage, both in their lives and in their creative work. They've learned how to bring that experimentation into focus, whether personally or artistically. And they usually know where they're going."

RIT offers a variety of graduate programs through the School for American Craftsmen and the School of Art and Design, but all of them, Giopulos says, have "depth within the major and allow for a minor sequence and electives, which are available from many other programs."

In the graduate program, study is geared to the person "who has gained a marketable skill as an undergraduate or in other previous experience," Giopulos says. "These are people with very definite ideas about where they're going artistically."

Giopulos is a graduate of Syracuse University (BFA), and Pennsylvania State University (M.Ed., Ph.D.). He has been on the faculty of the College of Fine and Applied Arts for 17 years, and has been named associate dean of that college and coordinator of graduate programs.

## The programs

The **Master of Fine Arts** program includes six categories of study:

- 1. Major concentration 30 cr.  
Designed to give depth of experience in the area of the student's major interest and chosen from one of the eleven areas: ceramics and ceramic sculpture, metalcrafts and jewelry, woodworking and furniture design, weaving and textile design, glass, industrial and interior design, graphic design, fine art (painting), fine art (printmaking), medical illustration, computer graphics design.
  - 2. Minor Concentration\* 15  
From the above, to consist of studio and related electives other than major.
  - 3. Electives 18
  - 4. Graduate Forum 3
  - 5. Humanities, art history 10
  - 6. Thesis 14
- Total 90 cr.

The **Master of Science for Teachers** program requirements include two categories of studies:

### MST ART EDUCATION

- 1. Master of Science for Teachers in *art education* for those holding the BFA or BA (art major) degree and seeking permanent certification for teaching in the public schools.

- The degree offers a concentration consisting of background courses in Education, Psychology and Sociology 20 cr
- Art Education Concentration: 22
- Methods and Materials in Art Education, Seminar in Art Education, Practice Teaching
- Studio elective 6
- Total 48 cr.



### MST STUDIO

- 2. Master of Science for Teachers in *studio art* (for those holding the BS degree in art education or industrial arts education, who desire permanent certificates, or for the BA or BFA student wishing advanced study).

The degree offers a major concentration of studies designed to meet the needs of individual students, and may include appropriate or relevant courses from other schools and departments of the Institute.

The following general pattern of studies covers requirements for the degree.

Major Concentration:	
Studio art, or crafts	24 cr.
Humanities, art history	10
Minor Concentration	9
Electives	5
Total	48 cr.

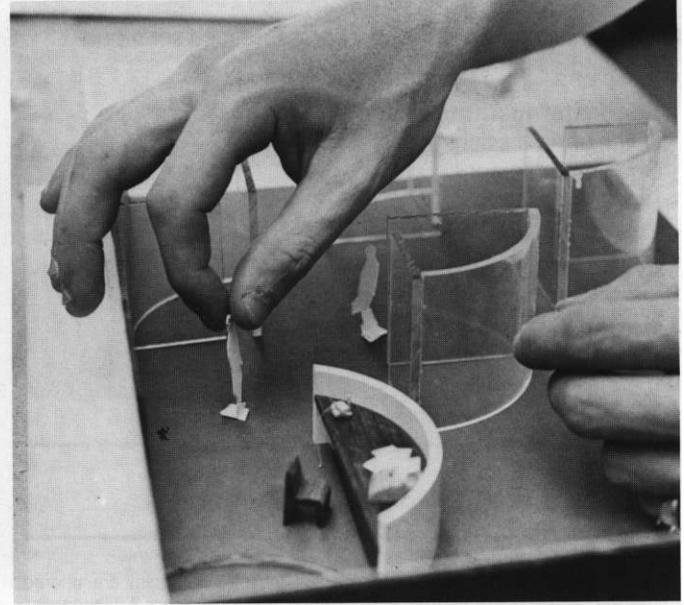
### The City Center

The College of Fine and Applied Arts graduate painting and art education programs are housed in downtown Rochester's historic area, within its cultural, education, and business center, at 50 West Main Street. This provides students who enroll in these programs with stimulating surroundings, city resources, and ample work space.

	MFA	MST STUDIO	MST ART EDUCATION
Major	30 credits	24 credits	22 credits
Minor	15	14	
Humanities	10	10	20 Social Sciences
Graduate Forum	3		
Electives	18		6
Thesis	14		
	90 credits	*48 credits	**48 credits

\*In certain cases the minor concentration or courses may be taken elsewhere in the Institute (photography, printing, etc.) when related to the objectives of the student. Such courses must be approved in advance, normally after arrival on campus, by the advisor and the deans of the colleges involved. The minor supports the spirit of the MFA degree.

\*One year or summers  
\*September start only



## Portfolio Guidelines For Graduate Applicants

The following guidelines are presented for all graduate students applying to the College of Fine and Applied Arts.\* Presentation of the portfolio is one of the requirements used in totally assessing the performance and academic capabilities of the applicant.

1. The portfolio should contain examples of at least 20-24 pieces of the applicant's best work—35mm slides are preferred, displayed in an 8V2" x 11" vinyl slide protector page.
2. Slides will be returned by the College of Fine and Applied Arts only when return postage is enclosed.
3. While every precaution will be taken to insure proper care and handling, the Institute assumes no responsibility for loss or damage to slides.
4. Identify slides by name and address. Please send portfolio and all other application materials to:

### Rochester Institute of Technology

Office of Admissions  
One Lomb Memorial Drive  
Box 9887  
Rochester, New York 14623  
Telephone: (716) 475-6631

\*Industrial and interior design and art education majors are offered only during Fall, Winter and Spring Quarters. Art education applicants should arrange a personal interview with Dr. Peter Giopulos, associate dean, College of Fine and Applied Arts (716) 475-2634.

## School of Art and Design

Courses for the education concentration of the MST program are offered through the College of Liberal Arts, and college of Applied Science & Technology.

### Art Education

#### FADA-701, 702 (MST) Methods and Materials in Art Education

#### **Registration #0401-701, -702 (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 (offered every year—Fall, Winter)

#### 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 (offered every year—Spring)

#### FAPA-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 (offered every year—Spring)

## Graphic Design

#### FADC-750 Graphic Design

#### **Registration #0402-750 (elective, minor)**

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

#### **Registration #0402-780 (Major)**

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)

## Industrial and Interior Design

#### FADD-750 Industrial and Interior Design

#### **Registration #0403-750 (elective, minor)**

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

#### **Registration #0405-750 (elective, minor)**

The study of the techniques and concepts of present day painting and its relation to the great sweep of the painting of the past for those who intend to paint and to teach.

Lab. 6, Credit 3 (offered every quarter)

#### FADP-751 Drawing Problems

#### **Registration #0405-751 (elective painting minor)**

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

#### **Registration #0405-780 (Major)**

The pursuit of the pertinent, the ecstatic, the beautiful, by a small group of those dedicated to the art. The student will become familiar with the trends and questings of modern painting, and by strengthening both intellectual and technical faculties, be prepared for a career as a professional painter. The work leads toward the master's thesis.

Lab. 9-27, Credit 3-9 (offered every quarter)

## Printmaking

### FADR-750 Printmaking

#### **Registration #0406-750** (elective, minor)

Advanced techniques in etching, lithography and woodcutting, as well as in many experimental areas including color processes, photo-etching, 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

#### **Registration #0406-780** (Major)

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

#### **Registration #0407-750** (Elective)

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

#### **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** (MFA Major)

A course emphasizing the use of titles, 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 to needs presented, culminating in a personal project.

Lab. 6, Credit 3 (offered each year)

### FADM-783 Medical Illustration Anatomical Studies

#### **Registration #0408-783** (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 Operative Procedures

#### **Registration #0408-784** (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-785 Medical Illustration Exhibits and Design

#### **Registration #0408-785** (MFA Major)

Students will learn to plan, cost-analyze, and construct three dimensional illustrations for in-house presentation or for traveling displays. Practical experience will be given in the problems of collaborating with clients, selecting appropriate display techniques and modes, and developing a manageable display.

Lab. 6, Credit 3 (offered each year)

### PPHB-781 Medical Illustration Photography

See description under School of Photography

## Computer Graphics Design

### FAPG-780 Introduction to Computer Graphics Design

#### **Registration #0432-780** (MFA Major)

An introduction to programming for the design of computer graphics. Basic familiarity with using the keyboard, CRT, disk drive, tablet, printer, plotter and image digitizer to create imagery. Emphasis on creating shape files, pictures and writing simple programs.

Lab. 9, Credit 3 (offered each year)

### FADG-781 Two-Dimensional Computer Graphics Design

#### **Registration #0432-781** (MFA Major)

Exposure to computer graphic algorithms, design heuristics, design methodology, language data structures, and program structures for two-dimensional imagery. Projects involve complex programming.

Lab. 9, Credit 3 (offered each year)

### FADG-782 Three-Dimensional Computer Graphics Design

#### **Registration #0432-782** (MFA Major)

Extension of previous experience to include three-dimensional objects, hidden lines and surfaces, solid modelling, perspective, etc. Projects involve complex programming.

Lab. 9, Credit 3 (offered each year)

### FADG-783 Visual Semiotics/Graphic Design

#### **Registration #0432-783** (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

#### **Registration #0432-784** (MFA Major)

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 Design

#### **Registration #0432-785** (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 Animation

#### **Registration #0432-786** (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 Graphics Design

#### **Registration #0432-787** (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. 18, Credit 6 (offered each year)

## Thesis

### FAD (C, D, P, R, M, or G)-890 Research and Thesis Guidance

#### **Registration #040(2, 3, 5, 6, 8, 32)-890** (Major MFA only)

The development of a thesis project instigated by the student and approved by a faculty committee and the Special Assistant to the Dean for Graduate Affairs. Primarily a 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-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. Points of view will be clarified through critical writing and class presentation. Required for MFA; to be taken prior to Thesis.

Class 2, Credit 3

**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 hollow ware and jewelry areas will be explored. It is designed to give the student a broad exposure to metal-working 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, inaugurated by the student and overseen by the faculty.

Lab. 9-27, Credit 3-9 (offered every quarter)

**School for American Craftsmen****Ceramics and Ceramic Sculpture****FSCC-750** **Ceramics and Ceramic Sculpture**

**Registration #0409-750** (elective, minor)  
Basic instruction and experience in ceramic design, fabrication and production of ceramic forms. 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 Sculpture**

**Registration #0409-780** (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, inaugurated by the student and overseen by the faculty. Lab. 9-27, Credit 3 (offered every quarter)

**Glass****FSCG-720** **Stained Glass**

**Registration #0411-720** (elective, minor)  
This elective explores stained glass designing, cutting, soldering, foiling, leading, glazing, and other fabrication techniques. Lab. 6, Credit 3 (offered each year)

**FSCG-750** **Glass**

**Registration #0411-750**  
Various techniques in both cold and hot glass will be considered: casting, slumping, faceting, blowing, cutting, electroplating, lamp working, enameling, and sculptural construction. Lab. 6, Credit 3 (offered every quarter)

**FSCG-780** **Glass**

**Registration #0411-780** (Major)  
The study and manipulation of hot glass, including refinement of traditional and innovation of new techniques will be undertaken: design, cold glass, sagging, slumping, casting, industrial and studio glass lines, copper wheel and stone engraving along with glass technology and history. The program is structured on individual needs, interests and background preparation as they may be determined through faculty counseling. This sequence leads to the master's thesis, inaugurated by the student and overseen by the faculty.

Lab. 9-27, Credit 3-9 (offered every quarter)

**Metalcrafts and Jewelry****FSCM-750** **Metalcrafts and Jewelry**

**Registration #0412-750** (elective, minor)  
This is the study and manipulation of metals for hollow ware/jewelry. Design sensitivity and concepts are approached through the raising, forming and planing or casting, forging, and fabricating techniques.

Lab. 6, Credit 3 (offered every quarter)

**Weaving and Textile Design****FSCCT-750** **Weaving and Textile Design**

**Registration #0413-750** (elective, minor)  
This course is designed for the development of studies and an appreciation in a number of textile processes. Each quarter two different techniques are studied, such as: surface design/printing of fabrics, batik, French dye painting, crochet, knitting/twining, soft sculpture, quilting, frame loom tapestry. Design concepts are integrated.

Lab. 6, Credit 3 (offered every quarter)

**FSCCT-750** **Business Practices for the Crafts**

**Registration #0413-750** (elective, minor)  
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)

**FSCCT-780** **Weaving and Textile Design**

**Registration #0413-780** (Major)  
A program structured on the basis of individual needs, interests and background preparation as they are determined through faculty counseling. Techniques offered are combination weaves and pattern design, double weave, embroidery and stitchery, finn-weave, ikat, multiple layer, dyeing, non-loom, pile rug, printed surface, silkscreen, tapestry, and soft sculpture. Design concepts are integrated with the techniques. This sequence leads to the master's thesis, inaugurated by the student and overseen by the faculty.

Lab. 9-27, Credit 3-9 (offered every quarter)

**Woodworking and Furniture Design****FSCW-750** **Woodworking and Furniture Design**

**Registration #0414-750** (elective, minor)  
A course in woodworking techniques and procedures. It enables the student to gain design and technical competency and develop individual and creative furnishings.

Lab. 6, Credit 3 (offered every quarter)

**FSCW-780** **Woodworking and Furniture Design**

**Registration #0414-780** (Major)  
A program structured on the basis of individual needs, interests and background preparation as they are determined through faculty counseling. 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, inaugurated by the student and overseen by the faculty.

Lab. 9-27, Credit 3-9 (offered every quarter)

**Thesis****FSC (C, G, M, T, or W)-890** **Research and Thesis Guidance**

**Registration #04 (09, 11, 12, 13 or 14)-890** (Major MFA only)  
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)

## Graduate Faculty College of Fine and Applied Arts

**Robert H. Johnston**, Ph.D., Pennsylvania State University—Dean

**Peter Giopulos**, Ph.D., Pennsylvania State University—Associate Dean

**Philip W. Bornarth**, MAE School of the Art Institute—Professor, Painting, School of Art and Design

**Donald G. Bujnowski**, MA, University of Minnesota—Professor, Weaving and Textile Design, School for American Craftsmen

**Wendell Castle**, MFA, University of Kansas—Artist-in-Residence; Chair, School for American Craftsmen; Professor

**David Dickinson**, MFA, Rochester Institute of Technology—Associate Professor, Printmaking, School of Art and Design

**Robert Heischman**, U.C.F.A., Ruskin School of Drawing and Fine Art, Oxford University—Associate Professor, Painting, School of Art and Design

**Robert K. Keough**, MFA, Rochester Institute of Technology—Assistant Professor, Computer Graphics Design, School of Art and Design

**William Keyser**, MFA, Rochester Institute of Technology—Professor, Woodworking and Furniture Design, School for American Craftsmen

**Max Lenderman**, MFA, University of Kansas; MS, Indiana State University—Professor, Weaving and Textile Design, School for American Craftsmen

**Graham Marks**, MFA, Alfred University—Assistant Professor, Ceramics, School for American Craftsmen

**Craig McArt**, MFA, Rochester Institute of Technology—Professor, Industrial and Interior Design, School of Art and Design

**Fred Meyer**, MFA, Cranbrook Academy of Art—Professor, Painting, School of Art and Design

**Albert Paley**, MFA, Tyler School of Art—Artist-in-Residence; Chair, School for American Craftsmen; Professor

**R. Roger Remington**, MS, University of Wisconsin—Professor, Graphic Design, School of Art and Design

**Robert Schmitz**, MFA, University of Wisconsin; MS, Alfred University—Professor, Ceramics, School for American Craftsmen

**Douglas Sigler**, MFA, Rochester Institute of Technology—Associate Professor, Woodworking and Furniture Design, School for American Craftsmen

**Mark Stanitz**, MA, Kent State University—Assistant Professor, Metalcrafts and Jewelry, School for American Craftsmen

**Michael Taylor**, MFA, East Tennessee State University—Assistant Professor, Glass, School for American Craftsmen

**Toby Thompson**, MFA, Rochester Institute of Technology—Professor, Industrial and Interior Design, School of Art and Design

**Leonard A. Urso**, MFA, State University of New York at New Paltz—Assistant Professor, Metalcrafts and Jewelry, School for American Craftsmen

**James C. Ver Hague, Jr.** MFA, State University of New York at Buffalo; MS, Rensselaer Polytechnic Institute—Professor, Computer Graphics Design, School of Art and Design

**Robert Wabnitz**, Diploma, Rochester Institute of Technology—Associate Professor, Medical Illustration, School of Art and Design

**Lawrence Williams**, MFA, University of Illinois—Professor, Printmaking, School of Art and Design

**Norman Williams**, MS, Syracuse University—Associate Professor, Art Education, School of Art and Design



# College of Graphic Arts and Photography



## Master of Science Degree in Printing Technology

Mark F. Guldin, Dean

Technology in the printing industry continues to evolve rapidly with the incorporation of innovative materials and concepts from other disciplines. This evolution covers all aspects of graphic communication as well as such non-communicative graphics as circuit printing and textile decorating. The graduate program is designed to help the student remain current after leaving RIT.

The graduate program is specifically arranged for students so that completion prepares them for participation in a volatile industry whether in production, research or other functions, as well as for the possibility of a career in teaching. In this regard, the program rests on theory and the applications of basic theory along with training in the use of modern equipment. The student must complete a thesis allowing him or her to bring to bear acquired knowledge on a specific problem. Thesis work affords the student the opportunity to contribute to the knowledge of the printing technologies. This work is done under the guidance of faculty experienced in that area of printing on which the student has chosen to focus.

The graduate program recognizes the value of aesthetics in the graphic arts and allows opportunity for the student to bring technology to bear on design and attractive form. Those students whose interests run heavily to this aspect of printing, such as book design, are encouraged to master the technology so that thesis work can apply technology to aesthetic goals. The program remains a technical one, however, with strongest attraction for the students primarily interested in technology.

### The Program

The curriculum leading to a master of science degree in the School of Printing is a professional program designed to provide graduate education in printing

for students whose undergraduate majors were in the arts, sciences, education, or other non-printing areas, as well as for graduates with a major in printing. Candidates who do not have adequate undergraduate work in printing must make up foundation courses prior to matriculating into the program.

The printing technology major provides graduate level study in printing technology and in research methods. The program is not intended to give a broad exposure of the printing field, but to provide the student an opportunity to specialize in a particular area, and to develop research skills useful to the graphic arts. This objective is accomplished through the program's core courses, selection of electives, and the development of the thesis. The goal of the program is to educate students who will have, in addition to an understanding of the procedures and theoretical concepts in printing processes, an appreciation of particular problems in special areas at an advanced level. The students wishing to take additional course work to explore areas beyond the course requirements of the program are encouraged to take additional course work to broaden their experience in the printing field.

The printing technology major is a full-time master's degree program. The length of time required to earn a degree varies according to the student's undergraduate preparation in printing, mathematics, and science. All students must earn 48 credits as a graduate student, 36 of which must be taken at RIT, to earn the master of science degree. The program generally requires one academic year at the graduate level. Candidates who wish to enter the program, but lack adequate preparation, must take as many as 30 credits of foundation courses in printing, mathematics and science prior to matriculation. Foundation courses can be accomplished in two quarters, or one quarter and the Summer Session. With foundation course work completed, the candidate will normally start the graduate program sequence with the Fall Quarter. Some flexibility in the program does allow candidates to enter at other times during the school year.

### Program Objectives

The goal of the technology major is to graduate well-educated students in both the theoretical and practical aspects of graphic arts technology. The program

will provide graduates with the necessary education to approach solutions to printing problems by an orientation to processes and materials based on systematic analysis.

Preparation in the technology major provides entry as a professional into the printing field in areas such as production management, research and development, technical sales representative, quality assurance, administration, marketing, etc. Because the printing industry is large and extremely varied, the student's overall preparation, interest and background would allow for entry level positions in these and in a number of other areas in the printing industry.

### The Foundation Program

The technology major is designed for the candidate with an undergraduate degree in printing, or for the candidate who has an undergraduate degree in a discipline other than printing. The program offers an excellent opportunity for the individual who wishes to change his or her career goals, by preparing them for entry level positions in the printing field. Candidates with the necessary undergraduate course work will start the program as a matriculated graduate student.

Candidates without adequate undergraduate work in printing must take foundation courses *prior* to matriculation into the graduate program. These students will enter the School of Printing as non-matriculated "Special Students." This will help identify the candidate in foundation courses, and allow for guidance from the program coordinator.

In addition to basic printing courses, course work in mathematics and science is expected if these courses are not indicated on the candidate's transcript. A technology degree requires entering students to have a minimum level of competency in mathematics and science. This will be helpful in the program and in the student's research activities. Basic knowledge of printing before matriculation will be helpful in giving the student more direction in terms of career goals, and assist in the development of a thesis topic at an early stage in the graduate program. Students who require foundation courses must take as many as 30 credits in printing, mathematics, and science. In the process of creating a foundation, however, they may find it desirable to draw upon the rich array of undergraduate offerings at the School



*Joseph Noga (center)*

of Printing by taking more courses than the minimum requirements. Six basic undergraduate printing courses, two in mathematics and one course in the physical sciences, are required.

Because foundation course work can be made up in two quarters or one quarter plus the Summer Session, most of the foundation courses are offered each quarter. To aid the candidate with the science requirement, a special chemistry course is offered in the School of Printing's Summer Session program, Chemistry Preparation for Printing Graduate Study.

Foundation courses must be completed before a student can matriculate into the graduate program, and the student must earn an overall B average in these undergraduate foundation courses to be matriculated. As students approach completion of the foundation course work, they will each petition for matriculation. Only under unusual circumstances will a student be allowed to combine a foundation course with the program core courses in order to maintain a full schedule. This will require approval of the program coordinator.

### Foundation Courses

The courses listed below represent the graphic arts areas required to meet foundation course requirements.

#### Printing (Six Courses)

- PPRT-200 Introduction to Printing  
OR
- PPRT-207 Printing Plates
- PPRT-206 Reproduction  
Photography
- PPRT-208 Lithographic Press
- PPRT-311 Planning and Finishing
- PPRM-301 Application of  
Computers to the Graphic Arts
- PPRT-201 Typography I

NOTE: These are the only printing subject areas acceptable to meet the foundation course requirements. Printing courses in other subject areas will not be accepted.

Mathematics (Select Two Courses)  
 SMAM-204 College Algebra  
 or  
 SMAM-214 Introductory Calculus  
 or  
 SMAM-225 Algebra for Management Sciences  
 or  
 SMAM-226 Calculus for Management Sciences  
 PPRM-210 Financial Controls I

Physical Science (Select One Course)  
 General College Chemistry  
 General College Physics  
 PPRM-560 Chemistry Preparation for Printing Graduate Study

### Program Requirements

The master of science degree program in printing technology requires the completion of 48 quarter credit hours of study including eight hours for the thesis. If foundation courses are not required, the program can be completed in one academic year. The program's length is based on each individual's program of study and the length of time each student chooses to complete his or her thesis work. Students who are qualified in one or more of the required courses may substitute other course work with the permission of the program coordinator.

### Technology Major

Required Courses	Credits
701-Research Methods	4
709-Trends in Printing Technology	4
702-Graphic Reproduction Theory	4
703-Statistical Inference	4
713-Photo Typography Procedures	4
711-Tone and Color Analysis	4
754-Ink, Color and Substrates	4
-Electives	12
890-Thesis	8
Total	48

### A Typical Schedule of Courses

Fall	
702-Graphic Reproduction Theory	4
703-Statistical Inference	4
713-Photo Typography Procedures	4
-Elective	4
Total	16

Winter	
701-Research Methods	4
709-Trends in Printing Technology	4
-Electives	8
Total	16

Spring	
711-Tone and Color Analysis	4
754-Ink, Color and Substrates	4
890-Thesis	8
Total	16

### Admission Requirements

Prior to being admitted to the master of science degree program, applicants must satisfy the Graduate Admission Committee of the School of Printing that their previous training, ability, and practical experience indicate a reasonable chance of success. Applicants may be admitted who hold a baccalaureate degree from an accredited institution. The School of Printing encourages applicants with undergraduate records at the B (3.0) level or higher. Applicants are also encouraged to take the Graduate Record Examination (GRE) as an aid in counseling during the development of the individual's program of studies.

Requirements are:

- Written RIT application
- Earned baccalaureate degree
- Official undergraduate transcript
- Two recommendations
- An on-campus interview when possible
- Undergraduate GPA of 3.0 or higher
- Foundation course work 3.0 or higher, if required
- TOEFL score of at least 525 (international students)

If the applicant's credentials are in order, except for the necessity to take foundation courses, the candidate will be accepted as a Special Student. This means that the candidate will be allowed to take foundation courses as a non-matriculated student. The applicant will be notified as to which courses will be needed to meet foundation requirements. When all of the required foundation courses have been completed (with an overall B average), the student will petition for matriculation into the graduate program.

### Summer Session

The School of Printing operates a unique Summer Session program that offers undergraduate course work in two-week, concentrated sessions. This allows the candidate for the graduate program to take several foundation courses, including the special foundation course in chemistry. It also provides an opportunity for the student to take part in a wide assortment of the school's undergraduate course offerings, beyond the required foundation courses. There are no graduate courses offered during the Summer Session.

### Special Libraries

Students may use two special libraries related to the school. The Technical and Education Center of the Graphic Arts maintains a library of current printing-related information. Some students find employment in the center writing abstracts for its publications. The School of Printing has the Melbert B. Cary, Jr. Graphic Arts Collection, composed of more than 9,000 volumes including many rare books and other materials illustrating past and present fine printing, book design and illustrations, papermaking, binding, and other aspects of the graphic arts. The Frederick W. Goudy-Howard W. Coggeshall Memorial Workshop contains letters, papers and memorabilia of Mr. Goudy along with cases of Goudy types that can be seen only at RIT, because matrices for their manufacture were destroyed by fire in 1939.

### Additional information

Joseph L. Noga  
 Graduate Program Coordinator  
 School of Printing  
 (716)475-2849

# Printing Courses

## Foundation Printing Courses

### PPRT-200 Introduction to Printing

#### Registration #0911-200

For packaging science students; study of different printing processes; analysis of process advantages and disadvantages relative to a variety of applications; examination of procedures for each process, from design through finished product; practice of basic operations necessary for the production of a simple package printing job.

Class 2, Lab. 3, Credit 3

### PPRT-201 Typography I

#### Registration #0911-201

Conventional rules of good traditional typography are reviewed through familiarization with basic terminology, type classification and typeface recognition; course includes lectures and laboratory exercises.

Class 2, Lab. 3, Credit 3

### PPRT-207 Printing Plates

#### Registration #0911-207

An introductory course in the principles and practices of platemaking for letterpress, flexographic, planographic, and gravure printing processes. It covers a survey of major printing processes with emphasis on their plate characteristics and platemaking requirements; important physical as well as chemical principles that are applicable to the plate image-forming process; laboratory work that deals with plate processing variables; also an introduction to recent development in printing plate technology.

Class 2, Lab. 3, Credit 3

### PPRT-206 Reproduction Photography

#### Registration #0911-206

A basic course in the fundamental principles, procedures, techniques, and applications of the photographic process as it is related to the production of film negatives or film positives for the major printing processes.

Class 2, Lab. 3, Credit 3

### PPRT-208 Lithographic Press

#### Registration #0911-208

An introductory study of the principles and methods of offset presswork; press functions; operations and care of presses; exercise in running simple jobs.

Class 2, Lab. 3, Credit 3

### PPRT-311 Planning and Finishing

#### Registration #0911-311

Printing production planning to correlate pre-press and post-press operations. Topics include preparing layouts, forms and a study of how they are affected by various bindery operations. Laboratory experiments include the operation of modern bindery equipment, evaluation and application of adhesives, binding materials and book performance testing. Several projects are followed through from design, signature layout to a finished product, including a gold stamped, hardcover bound book.

Class 2, Lab. 3, Credit 3

### PPRM-301 Application of Computers to the Graphic Arts

#### Registration #0910-301

A study of the applications of electronic computer systems to the graphic arts industry. Topics include fundamental data processing concepts, software development, and technical and managerial graphic arts applications.

Class 4, Credit 3

## Foundation Math Courses

### SMAM-204 College Algebra

#### 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.

Class 4, Credit 4 (offered every year) (F,S)

### SMAM-214 Introductory Calculus

#### Registration #1016-214

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)

Class 3, Credit 3 (offered every year) (F, W)

### SMAM-225 Algebra for Management Sciences

#### Registration #1016-225

Introduction to functions including linear, quadratic, exponential, and logarithmic functions with applications to supply and demand, cost, revenue, and profit functions. Additional topics include matrices, solution of simultaneous linear equations, 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, partial differentiation and, as time permits, integration. (SMAM-225)

Class 4, Credit 4 (offered every year) (F, W, S)

### PPRM-210 Financial Controls I

#### Registration #0910-210

Gives the line manager an understanding of the firm's financial accounting system so that he or she can work with the accountant to use that system effectively. Includes balance sheet, income, funds and cash statements, ratio analysis and asset vs. expense decisions.

Class 4, Credit 3

### BBUA-210 Financial Accounting

#### Registration #0101-210

Basic accounting principles and techniques within a framework of sound modern theory. Methods of accounting for revenues, costs, property and debt. Typical records for various types of business enterprise. Preparation and use of classified financial statements.

Class 4, Credit 4

### BBUA-215 Survey of Accounting Concepts

#### Registration #0101-215

A course for non-business majors. An introduction to the purposes and functions of accounting in a dynamic society. Emphasis is placed upon essential financial and managerial accounting concepts necessary for management planning and control.

Class 4, Credit 4 (offered upon demand)

## Foundation Science Course

### PPRT-560 Chemical Preparation for Printing

#### Registration #0911-560

#### Graduate Study

A study of the fundamentals of chemistry with emphasis on its relationship to printing sciences and technology. An emphasis on the role of material properties in printing processes with regard as to how chemistry determines such properties.

Class 4, Credit 4 (Summer Session Only)

Course only for Graduate Program Candidates

## Printing Technology

### PPRT-701 Research Methods in Graphic Arts

#### Registration #0911-701

Theory and application of principles of laboratory oriented research in the graphic arts, analysis of research techniques, interdisciplinary relationships, conditions for technology transfer and synergism; status of research in the graphic arts including organization, basic vs. applied research and organization of literature including patents, illustrations of techniques and research programs and methods followed in various research situations; systematic study theory of scientific methods including induction, deduction, hypothetico-deduction, hypothesis formation, theory development, etc.

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.

Credit 4

**PPRT-703** Statistical Inference**Registration #0911-703**

Descriptive statistics, patterns of variability, measures of variability, working with the normal curve, tests of hypotheses for means, tests of hypotheses for variance, internal estimates for means, internal estimates for variance, sample size for variables, introduction to analysis of variance, and applications of applied statistics to graphic arts.

Credit 4

**PPRT-709** Trends in Printing Technology**Registration #0911-709**

A study of the forces which have influenced the development of printing with emphasis upon the technological factors involved; examinations of the relationships of aesthetics and craft concepts to modern industrial techniques.

Credit 4

**PPRT-711** Tone and Color Analysis**Registration #0911-711**

Methods of instrumentation necessary for the evaluation and process control of printed tone and color and the photographic intermediate images required for the photomechanical reproduction of tone and color.

Credit 4

**PPRT-713** Photo Typography Procedures**Registration #0911-713**

An introductory course in the basic tenets of traditional typography. Areas that will be covered are: terminology, style, copyfitting, point systems, legibility, initials and typeface recognition. Laboratory demonstrations will be given to illustrate the theoretical areas covered in the lectures. Emphasis is placed on photo composition and the systems approach.

Credit 4

**PPRT-890** Research and Thesis Guidance**Registration #0911-890**

An experimental survey of a problem area in the graphic arts.

Credit 8

**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 will be covered. Emphasis is given to the problems of color, ink, and substrates in each printing process.

Credit 4

## Elective Graduate Courses

**PPRT-704** Design of Experiments**Registration #0911-704**

Analysis of variance, components of variance, crossed vs. nested experiments, studying individual effects, introduction to matrix algebra, regression analysis, planning experiments from a statistical point of view, basic experimental designs, factorial experiments, fractional factorials, determination of optimum conditions, introduction to nonparametrics and quality control concepts (as time allows).

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)

Credit 4

**PPRT-850** Research Projects**Registration #0911-850**

Individualized 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 required.

Credit 1 to 4

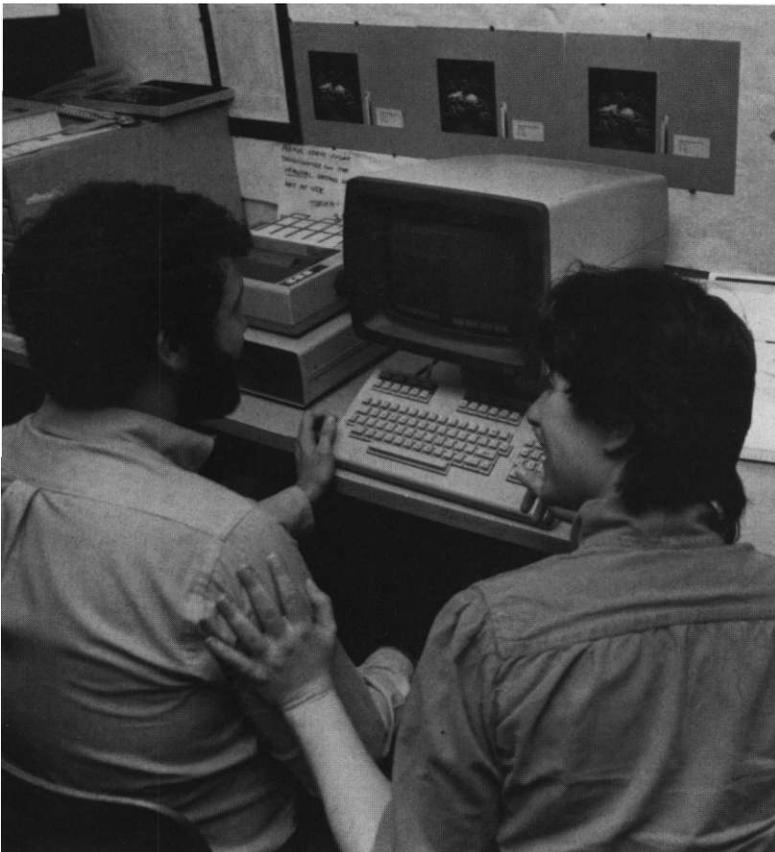
**PPRM-702** Computers in Management**Registration #0910-702**

Discussion of printing requirements in relation to computer system configurations; applications of computers to management and production control problems; investigation of computer-oriented production control techniques. (PPRM-301)

Credit 4

**Additional Electives**

Electives may be selected either from the graduate course listings or from advanced undergraduate course listings in the School of Printing. The student can select up to 12 undergraduate elective credits to meet degree requirements. Graduate elective courses can also be taken in the other schools of the Institute. This allows a student to concentrate in a special area of interest. Electives must be approved by the Graduate Program Coordinator as being an integral part of the student's program at the time of matriculation.



## Graduate Faculty School of Printing

**Mark F. Guldin**, Ph.D., University of Iowa—Dean; Professor, School of Printing

**Sven Ahrenkilde**, MS, Polytechnic University, Denmark—Research Associate, Technical and Education Center of the Graphic Arts

**William H. Birkett**, MBA, University of Michigan, C.M.A.—Associate Professor, Printing Management

**Joseph E. Brown, Jr.**, MS, Kansas State—Professor, Paper Technology

**Walter A. Campbell**, M. Ed., MBA, University of Rochester—Professor, Printing Management

**Robert Y. Chung**, MS, Rochester Institute of Technology—Assistant Professor, Computer Technology

**W. Frederick Craig**, M. Ed., University of Rochester—Associate Professor, Newspaper Production Management

**Chester J. Daniels**, MS, Rochester Institute of Technology—Senior Technologist, Technical and Education Center of the Graphic Arts

**Hugh R. Fox**, Ph.D., Rutgers University—Assistant Professor, Printing Management

**Clifton T. Frazier**, M. Ed., University of Rochester—Associate Professor, Photo-Lithography Technology

**Robert G. Hacker**, Ph.D., University of Iowa—Paul and Louise Miller Professor in Newspaper Management, Computer Applications

**Walter G. Home**, M. Ed., University of Rochester—Professor, Printing Plate Technology

**James I. Horton**, M. Ed., University of Rochester—Associate Professor, Layout and Design

**Joseph L. Noga**, MS, University of Bridgeport—Associate Professor, Reproduction Photograph, Graduate Program Coordinator

**Archibald D. Provan**, M. Ed., University of Rochester—Associate Professor, Typography

**Harry Rab**, MSME, Newark College of Engineering—Assistant Professor, Electro-Mechanics of Printing

**Emery E. Schneider**, M. Ed., University of Rochester—Associate Professor, Phototypesetting

**Franz Sigg**, MS, Rochester Institute of Technology—Research Associate, Technical and Education Center of the Graphic Arts

**Julius L. Silver**, Ph.D., Connecticut—Professor, Ink Technology, Graphic Theory

**Miles F. Southworth**, M. Ed., University of Rochester—Professor, Reproduction Photography

**Robert J. Webster**, MS, Ball State—Associate Professor, Screen Printing Technology

**Charles J. Weigand**, MS, SUNY at Oswego—Associate Professor, Flexographic Technology

### Associates of the Graduate Faculty

**Bekir E. Arpag**, BS, Rochester Institute of Technology—Associate Professor, Photo-Mechanical Reproduction Processes

**Zenon A. Elyjiw**, Senior Technologist—Technical and Education Center of the Graphic Arts

**Alfred F. Horton**, AAS, Rochester Institute of Technology—Melbert B. Cary, Jr., Professor in Graphic Arts, Layout and Design

**Herbert H. Johnson**, BS, Rochester Institute of Technology—Associate Professor, Book and Magazine Production

**James V. Mannino**, BS, Rochester Institute of Technology—Instructor, Typography

**Werner Rebsamen**, Diploma, Academy of Fine Arts, Zurich—Associate Professor, Planning and Finishing

**Anthony R. Sears**, BS, Rochester Institute of Technology—Professor, Photo-Lithography Technology

**Robert S. Tompkins**—Assistant Professor, Composition Specialist



## Master of Science Degree in Imaging and Photographic Science

**Dr. Ronald Francis**, Coordinator  
MS Program, (716) 475-2786

The basic objective of this program is to prepare men and women holding a baccalaureate degree in science or engineering for higher level positions in the imaging and photographic sciences industry or in the application of photography to problems of science and engineering. Formal course work includes the physics and chemistry of radiation-sensitive materials and processes, geometrical and physical optics as applied to photo-optical systems, the mathematics of image forming systems, and the statistics of experimental design and quality control. Technical electives at the graduate level may be selected from courses offered

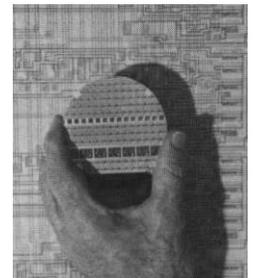
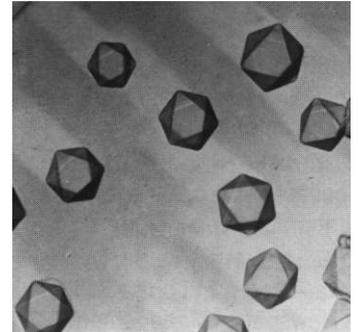
in engineering, science, mathematics, graphic arts, and imaging and photographic science. A thesis is required.

Faculty members within the department supervise research in areas of the chemistry and physics of radiation-sensitive materials and processes, color science, digital image processing, remote sensing, photo-optical instrumentation, and objective and subjective image evaluation. Thesis work may be done in the field of graphic arts in conjunction with the Technical and Educational Center of the Graphic Arts. Other interdisciplinary efforts are possible with the colleges of Engineering and Science. Opportunities also exist to perform thesis work under the direction of selected scientists and engineers in industries nationwide who act as adjunct faculty.

The department offers three programs of study leading to the master of science degree in imaging and photographic science:

### 1. Bachelor of Science and Master of Science in Imaging and Photographic Science

This program offers qualified undergraduate students in the department the opportunity to obtain both the bachelor of science and master of science degrees simultaneously after five years of study. Admission into this program is usually requested by the student at the end of the third year, at which time permission may be granted to replace the normal fourth year departmental required courses and thesis by technical electives. If qualified, the student will be formally admitted to the graduate program. Upon completion of the required graduate courses and thesis, the bachelor of science and master of science degrees are awarded simultaneously. A description of both the undergraduate and graduate phases of this program is given in the undergraduate bulletin. Persons interested in this program should request information through the coordinator of the graduate program.



*Clockwise from above: Finger Lakes Area of New York State (courtesy NASA/USGS EROS Data Center); bullet slices playing card (Andrew Davidhazy photograph); micrograph of silver halide crystals magnified 10,000 times (courtesy Eastman Kodak Company); a silicon wafer containing more than 100 chips, each chip having thousands of circuit elements; optical instrumentation lab*

## 2. Master of Science in Imaging and Photographic Science (Full-time)

This program is designed for persons holding a bachelor's degree in science or engineering.

Before admission to candidacy and beginning in the graduate level courses in imaging and photographic science, the student must have an adequate foundation in principles of imaging science. This knowledge may be acquired by enrolling in the full-time summer course, Principles of Photographic Science, PPHS-600. This course begins in June and runs for 10 weeks.

Although the 45 graduate credits required can be accumulated in three quarters, it has been found that only in exceptional cases is this time sufficient for successful completion of the experimental work and for the preparation of the written thesis. Hence full-time students should plan on at least five quarters of residence, beginning with the first Summer Quarter.

## 3. Master of Science in Imaging and Photographic Science (Part-time)

This program is identical to the full-time program except that the requirements can be met on a part-time basis. The necessary knowledge in the principles of imaging and photographic science may be obtained by taking Principles of Photographic Science, PPHS-601, 602, 603 which is equivalent to PPHS-600 in content. This sequence is offered during the evening, with Saturday laboratory sessions. Part-time students must plan to complete the graduate requirements within seven years. The courses will be rotated in the evening in alternate years on a schedule such that part-time students may complete them in three or four years.

Information concerning the particular courses to be offered during a particular academic year may be obtained from the coordinator of the graduate program.

### Admission

Admission to the full-time or part-time programs will be granted to graduates of accredited degree granting institutions whose undergraduate studies have included at least the following courses in the major areas of study: mathematics through calculus; a full-year, college-level course in physics, with laboratory; a similar course in chemistry.

Applicants must demonstrate to the Graduate Committee (MS) of the School of Photographic Arts and Sciences that they have the capability to pursue graduate work successfully. Normally this will include an interview, the submission of a statement of purpose, presentation of the undergraduate academic record, letters of evaluation from individuals familiar with the applicant's capabilities, and any other pertinent data furnished by the applicant. While previous high academic achievement does not guarantee admission, such achievement or other unusually persuasive evidence of professional promise is expected.

### Requirements for the degree

For graduation, 45 credits in graduate-level courses are required. Of this total, 36 credits must be in courses other than Research and Thesis Guidance and must include the courses shown in the following table, the submission of an acceptable thesis, and an oral examination.

Certain upper class elective courses in supporting areas may be accepted toward the degree requirements in imaging and photographic science, provided they were agreed to in writing by the Graduate Program coordinator prior to the beginning of the course.\*

### The thesis

The thesis is to be based on experimental evidence obtained by the candidate in an appropriate field as arranged

between the candidate and his or her advisor. The minimum number of thesis credits required is nine. The thesis requirement may be fulfilled by experiments in Institute laboratories. In some cases, the requirement may be fulfilled by work done in other laboratories. An example might be the candidate's place of employment, under the following conditions: 1. The results must be fully publishable. 2. The candidate shall have an advisor assigned by the Department. 3. The thesis must be based on the candidate's independent, original work, as it would be if the work were done in Institute laboratories. The work shall not have started prior to the assignment of the advisor. 4. In exceptional cases, it may be possible that the candidate is able to present published original work done outside of RIT which can be accepted in lieu of a thesis, and essentially fulfills the requirements for a completed thesis. Then, the thesis requirements may be substituted by elective courses.

### Grades

The average of the grades for all courses taken at the Institute and credited toward a master's degree must be at least a "B" (3.0). Research and Thesis Guidance does not carry a letter grade and, hence, is not included in the average.

One of the most interesting courses in the program is PPHS-600 Principles of Photographic Science, our summer

Course title and number	Quarter Credit Hours		
	Fall	Winter	Spring
Principles of Photographic Science— PPHS-600 or PPHS-601, 602, 603	No Graduate Credit <sup>1</sup>		
Theory of the Photographic Process— PPHS-711,712, 713	3	3	3
Statistics and Computer Techniques for Photographic Systems—PPHS-721,722 <sup>(2)</sup>	4	4	
Instrumental and Photographic Optics— PPHS-731, 732, 733	3	3	3
Analysis and Evaluation of Imaging Systems— PPHS-741, 742, 743	3	4	3
Research and Thesis Guidance— PPHS-890 <sup>(3)</sup>	1	1	

(1) The three quarters cover photographic chemistry, instrumentation radiometry, sensitometry, tone reproduction, and color. Courses PPHS-600, 601, 602 and 603 are intended for students who previously received acceptance into the MS program in photographic science. Other students are welcome if they have the necessary background in physics, mathematics, and chemistry. Consent of the Graduate Coordinator is necessary for registration. Each quarter of PPHS-601, 602, 603 carries 5 undergraduate quarter credits. PPHS-600 carries 15 quarter credits.

(2) Students in the part-time program may substitute College of Continuing Education courses CTAM-711, CTAM-712, and CTAM-801. PPHS-721, 722 is not offered during the evening hours.

(3) The remaining 7 credits are distributed as required by thesis work.

\*All graduate courses applied toward the degree, including Research and Thesis, must be completed within seven years. No more than three consecutive quarters without registration are allowed. Diligence at all times is expected.

liberal art and as a technical art. The program provides each student an opportunity to pursue graduate study in photography as a means to personal, aesthetic, intellectual and career development.

The MFA curriculum is not based on a fixed pattern of study, but rather on a flexible one which is continually sensitive to the needs of each student and builds upon the strengths that he or she brings to the program. Flexibility extends beyond what is to be learned to *where* it can be learned and *how* it can be learned and validated.

Photography is offered as a major with minor concentrations in other imaging areas. Successful completion of the program enables a student to pursue careers in education, museums, business and as self-employed professionals.

#### **The broad goals of the program are to:**

1. Provide students with the opportunity to use photography as a means to pursuing a career and earning a livelihood.
2. Provide students with the opportunity to use photography as a means of enriching their personal lives and the lives of society.
3. Provide an environment that encourages a sense of community, creativity, scholarship and purpose.

#### **Electives and minors**

No minor concentration is required, but a grouping of electives in a particular area of interest is available. Minors can be pursued in printmaking, film making, museum practice and printing. Minor concentration must be planned with and approved by the coordinator. Elective courses are available in film making, video, video discography, printmaking, painting, communications design, museum studies, crafts, bookbinding, typography, color photography, mixed media, studio photography, advertising photography, perception, sensitometry, computer graphics, and materials and processes of photography. There are also opportunities for independent studies and experiential study.

#### **Museum Studies**

This program is designed to train individuals in the care, management and interpretation of photographic collections. Theoretical training, which takes place in seminars at Rochester Institute of Technology and the Visual Studies Workshop, is complemented by experiential learning at the Visual Studies Workshop and the International Museum of Photography at the George Eastman House.

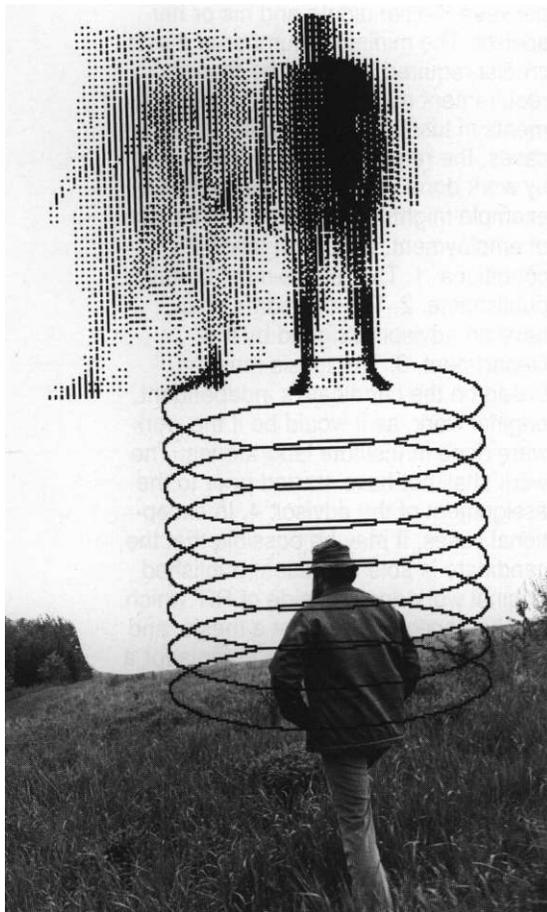
#### **The faculty**

The MFA photography program is supported by a staff of 60 faculty members within the School of Photographic Arts and Sciences and adjunct faculty members at the International Museum of Photography, George Eastman House and the Visual Studies Workshop.

Faculty and course work are also available from the School of Printing, College of Fine and Applied Arts and College of Liberal Arts.

#### **Admission requirements**

Students with a baccalaureate degree from an accredited college or university are eligible for admission provided they present a portfolio of work that demonstrates their photographic skills, visual sophistication and aesthetic awareness. (Museum Studies applicants will present different documentation.) Acceptance is on the strength of their portfolios as judged by the graduate faculty, on their past academic performance, letters of recommendation and their personal statements of purpose.



*Photo credit: Robert Keough*

transfer course. It presents an enormous amount of very basic information and provides access to an astonishing number of fields that use photography and imaging science in some way, such as microelectronics, photographic chemistry, color science, remote sensing, micrographics, graphic arts, photographic manufacturing, and many others. We are always delighted to have students from other disciplines take the course and apply the information to other fields.

## **Master of Fine Arts Degree in Photography**

The master of fine arts program in photography emphasizes photography as an art form, with the intention of inspiring and nurturing the individuality of each student as a creative, productive person. It is rooted in the belief that the study of photography as a fine art can be enhanced by the study of photography as an applied art, as a

Applicants who are capable of good academic work as well as artistic visual expression and who demonstrate an interest in the exploration of new artistic ideas and experiences will be favored. The graduate faculty will make recommendations to the coordinator of the program based on the above interlocking criteria.

Students who are judged to need more study in the general areas of art and photography will be advised to take such courses either prior to entrance or during their first year of study. Recommendations will be made by the coordinator with advice from the appropriate faculty member. Areas of art and photography include art history, photographic history, aesthetics, criticism, and general studio work in any form of image making.

### Transfer credit

Course work taken prior to admission to the program should be submitted for approval upon entrance into the program. Up to 12 quarter credit hours of B or better (nine semester hours) of graduate work is transferable toward the degree with the approval of the coordinator.

### Portfolio

Selection of candidates for the graduate program is a difficult process. Along with written records of accomplishment and recommendations, the portfolio serves to inform the faculty of the applicant's photographic accomplishments. It is a pictorial statement of the candidate's performance to date in terms of her or his photographic skills and visual sophistication.

About 15 black-and-white and/or color photographs that represent a cohesive body of work should be sent. (The word *photograph* includes such photo-related media as printmaking, screen printing, electrophotography, color proofing, gum bichromate, cyanotype and albumen.)

*Original* prints, slides or transparencies provide the best means of assessment. Original slides should be sent in pocketed plastic sheets. *Copy slides of original work are discouraged.* Prints can be sent mounted or unmounted. Please put your name on each print or slide.

Museum Studies applicants need not send a portfolio of photographs. Instead, documentation supporting the ability to perform well in such a program must be provided. This would include such things as publications, papers presented, curated shows and other relevant experience.

The portfolio should be packaged in such a way as to facilitate handling (unpacking, viewing, repacking and shipping). A label with a return address would be helpful. Be sure to include a check or money order sufficient to cover return postage or shipping. The portfolio or Museum Studies documentation should be sent directly to the coordinator of the MFA photography program. Applications and portfolios are accepted beginning in September of each year.

### Advisors

The MFA coordinator is the advisor for all candidates.

### Degree requirements

The MFA degree in photography normally requires a minimum of two years of full-time resident graduate study. A minimum of 85 quarter credit hours of graduate work is outlined below. These minimums may be exceeded through the intent of the candidate or as a result of necessity to cover certain areas of study.

The 85 hours do not include undergraduate work required by action of the MFA admission committee in accepting a particular applicant, or undergraduate course prerequisite for graduate courses.

	Quarter Credit Hours
<b>Major</b>	
Designed to give depth of experience to photography	36
<b>Electives</b>	
Designed to broaden the student's interests and experience in the arts and related areas and to provide an opportunity to pursue a specific area in depth	29
<b>Humanities</b>	8
<b>Research and Thesis</b>	<u>12</u>
Total	85

Distribution of work within these guidelines is subject to modification based upon the candidate's background, abilities, and interests. An individualized course of study will be prepared with the help of the MFA coordinator and made a matter of record. Modifications in this prescribed program thereafter must be approved and recorded.

### Humanities

The required 8 quarter credit hours of humanities courses are usually taken in the College of Liberal Arts. Depending upon the student's academic background, part or all of this requirement can be waived (but need not be), and the credit hours can be used elsewhere. Should hours become available in this fashion, students can either explore an additional area, or can improve their involvement in either their major or their minor field.

### Grade and time limit

The *average* of all grades for graduate courses taken at the Institute must be at least a "B" (3.0) to qualify for the MFA Photography degree.

Thesis hours are usually taken over several quarters. Only the letter "R" is recorded, indicating a thesis in process. No letter grade is assigned. Acceptance or rejection of the thesis is made by the candidate's thesis board.

All course work, including an accepted thesis, must be completed within seven years of entrance into the program.

### Photo Gallery

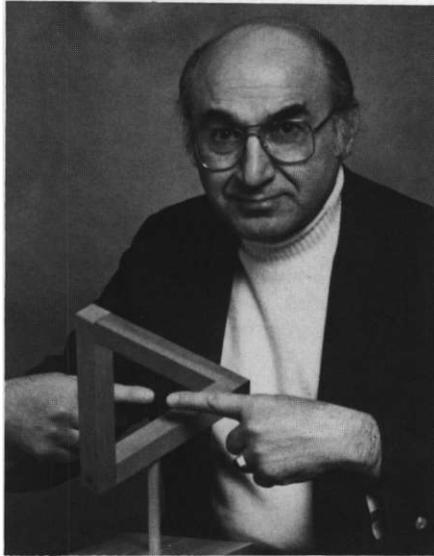
The gallery, which is part of the MFA Center, is used to exhibit graduate thesis work, student work and works of contemporary photographers. A conference telephone is available in the gallery area to conduct seminars with photographers whose work is being exhibited.

### Visiting artists

Through the assistance of grants from the National Endowment for the Arts (NEA) prominent personalities in the field of photography are brought to campus to enrich the program. They usually give a lecture on campus Wednesday evening, which is open to the public, and then meet on Thursday morning in a two-hour seminar with MFA students.

### Thesis

The thesis exhibition should be an original body of work appropriate to the major commitment of the degree candidate. A written thesis of record will be prepared for inclusion in the library. Specific directions are available in the MFA handbook, which is given to the student upon entrance into the program.



Dr. Richard D. Zakia

Photograph by Thomas J. Shillea © 1994

**Richard D. Zakia**, Coordinator,  
MFA Program (475-2616)

Rochester is a unique place for anyone seriously interested in a broad pursuit

of photographic studies. Photography touches upon many other disciplines, and the opportunities for study are limited only by the student's interest. Fine art photography at RIT is keeping pace with some of the newer visual imaging methods by offering as photo electives courses in computer graphics, computer animation and video discography. The Rochester area is blessed with outstanding physical and human resources. In addition to those located in the College of Graphic Arts and Photography at RIT, there are resources to be found in two major additional institutions heavily involved in photographic education and innovation: the International Museum of Photography at the George Eastman House and the Visual Studies Workshop.

The MFA program in photography at RIT is unique in that it is the only such program housed in a School of Photographic Arts and Sciences with a support faculty of 60 highly specialized and diverse instructors. The program is designed to reflect this diversity. A

student has a wonderful opportunity to study photography as a fine art and as a visual probe to human expression and understanding.

The student is encouraged to make the most of the resources at RIT as well as those in the community and is reminded that a camera and film no more make a photographer than a paint brush and canvas make an artist.

Because RIT is a member of the Rochester Area Colleges Consortium, students are able to pursue additional course work at other member colleges at no additional charge.

Zakia is a native of Rochester and holds a BS degree in photographic science from RIT and a Ed.D. in educational psychology from the University of Rochester. Prior to joining RIT in 1959 he was employed as a photographic engineer with Eastman Kodak. He has also served for six years as director of Instructional Research and Development at RIT.

## Master of Fine Arts in Photography

### **PPHG-701, 702** History and Aesthetics of Photography

#### **Registration #0903-701, 702**

The course will survey the major issues throughout the development of the medium: (1st quarter) pre-history up to the 19th century; (2nd quarter) *fin de siècle* to present.

Credit 4/Qtr.

### **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 2/Qtr.

### **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 others' photographs, to meet with visiting artists on campus and to participate in a thesis sharing from time to time.

Credit 2/Qtr.

### **PPHG-707, 708, 709** Film History and Aesthetics

#### **Registration #0903-707, 708, 709**

An extended comparative survey of the History & 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/Qtr.

### **PPHG-719** Preservation Issues with Fine Art and Historical Photographs

#### **Registration #0903-719**

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 3/Qtr.

### **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 4/Qtr.

### **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.

Credit 4/Qtr.

### **PPHG-730, 731, 732** Cinematography

#### **Registration #0903-730, 731, 732**

Film making workshop. Individually planned studies in cinematography, as determined by faculty-student consultation, group critiques, seminars, studio and laboratory practice, field trips.

Credit 3-9/Qtr.

**PPHG-740, 741, 742** Photographic Museum Practice**Registration #0903-740, 741, 742**

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.

Credit 3-9/Qtr.

**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 3-9/Qtr.

**PPHG-753** Photographic Workshop for Teachers**Registration #0903-753**

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 6

**PPHG-755** Applied Sensitometry**Registration #0903-755**

This course presents relevant sensitometry and photographic theory, principles and practices in a manner sensitive to the background and needs of a fine art photographer.

Credit 4/Qtr.

**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 (offered on sufficient demand)

**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

**Master of Science in Imaging and Photographic Science****PPHS-600** Principles of Photographic Science**Registration #0907-600**

A course intended for students who have completed their undergraduate programs in engineering or the sciences and who desire to prepare themselves for entry into the graduate program in photographic science and instrumentation or who desire a working knowledge of photographic science at an undergraduate level. It is an intensive course, assuming working knowledge of undergraduate mathematics, physics and chemistry. Course topics include radiation and radiometry, properties of radiation-sensitive materials, chemistry of photographic processing, sensitometry, tone reproduction, principles of color measurement, color photographic systems, image microstructure, and photographic instruments. The course includes both lectures and laboratory work. (Registration requires consent of the graduate coordinator.)

Credit 15 (Summer only)

(Not applicable to the 45 required graduate credits in the photographic science and instrumentation graduate program)

**PPHS-601, 602, 603** Principles of Photographic Science**Registration #0907-601, -602, -603**

Equivalent to PPHS-600, but offered in the evening and Saturdays during the regular Fall, Winter, and Spring Quarters. (Preliminary admission to the MS program in Photographic Science or consent of graduate coordinator. Not offered every year. Consult coordinator of photographic science graduate program.)

Credit 5/Qtr.

(Not applicable to 45 required graduate credits)

**PPHS-711, 712, 713** Theory of the Photographic Process**Registration #0907-711,712, 713**

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/Qtr.

**PPHS-721, 722** Statistics & Computer Techniques for Photographic Systems**Registration #0907-721, 722**

A special graduate course in applied statistics and computer techniques involving those areas of direct concern in design, analysis, and evaluation of photographic systems.

Credit 4/Qtr.

**PPHS-731, 732, 733** Instrumental and Photographic Optics**Registration #0907-731, 732, 733**

The principles of geometrical and physical optics with application to photographic instrumentation systems. First-order imaging, aberrations and geometrical, image evaluation, mirror and prism systems, basic instrument systems, electromagnetic waves, polarization, interference and function description of imaging performance.

Class 3, Credit 3/Qtr.

**PPHS-741, 742, 743** Analysis and Evaluation of Imaging Systems**Registration #0907-741, 742, 743**

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 (Winter)

Class 3, Credit 3 (Fall and Spring)

**PPHS-751, 752, 753** Special Topics in Photographic Science**Registration #0907-751, 752, 753**

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 graduate program.)

Credit varies

**Principles of Remote Sensing &  
Image Analysis**

**PPHS-761, 762, 763**

**Registration #0907-761, 762, 763**

The principles of electromagnetic imaging, image processing and image analysis as they apply to remotely sensed information. 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.

Class 3, Lab 3, Credit 4

**PPHS-771**

**Colorimetry**

**Registration #0907-771**

An in-depth course exploring colorimetry, the quantitative specification of color. The emphasis is on the spectral characterization of chromatic stimuli using modern instrumental methods and deriving the relationships between appearance attributes and instrumental data. Advantages and disadvantages of various imaging systems will be evaluated using many available color metrics. The course will introduce the use of computers in colorimetric applications. Prerequisite: Graduate status.

Class 3, Lab 3, Credit 4

**Emphasis in Video and Optical Systems**

In September 1985 a new group of courses will be available to students currently enrolled in any RIT master's degree program. The emphasis in video and optical systems will provide a background in video and computer science and will be of particular interest to master's degree candidates in computer science, computer science applications, instructional technology, printing technology, MFA photography and MFA fine arts.

The offering consists of six courses and may be completed in three quarters. To be eligible, an individual must

have had course work and/or experience in one or more of the following areas: photography, video, film, fine arts, computer science or instructional technology. Faculty from the School of Photographic Arts and Sciences and the School of Computer Science and Technology will teach the courses. Students will have at their disposal the American Video Institute (AVI) Video-disc and Optical Publishing Laboratory, which contains over \$1 million in computer hardware and software. For more information contact, John Ciampa, chairman, AVI (475-6625).

**PPHS-772**

**Advanced Colorimetry**

**Registration #0907-772**

A detailed treatment and evaluation of specialized current problems and topics of color science, appearance, and technology. Topics include turbid media theory, computer colorant formulation for subtractive imaging systems, luminescent materials, and current research in color science. Prerequisite: PPHS-771. Class 3, Credit 3

**PPHS-773**

**Colorimetric Instrumentation  
and Standardization**

**Registration #0907-773**

This course will cover current methods in precisely measuring the spectral properties of object colors and of radiation sources. Proper procedures in calibration, standardization, data analyses, instrument maintenance, and standards selection will be presented. The use of standard reference materials in optical metrology will be dealt with and various measurement assurance programs introduced for diagnostic evaluation of current colorimetric instrumentation.

Class 2, Lab 6, Credit 4

	<b>Fall</b>	<b>Credits</b>
PPHV-731	Special Topics: Modern Storage Applications Design	4
PPHF-310	Video M&P	2
	<b>Winter</b>	
PPHV-	Special Topics: Modern Storage Applications Production	4
PPHV-	Special Topics: Micro Computer Controlled Video-disc Systems	4
	<b>Spring</b>	
PPHV-	Storage Applications Lab 2	4
	One of following three electives:	
PPHF-405	Advanced Video	3
PPHV-	Special Topics: Imagebank Mgmt.	4
PPHV-	Special Topics: Communication Theory	4

## Graduate Faculty School of Photographic Arts and Sciences

**Charles Arnold, Jr.**, MFA, Rochester Institute of Technology—Professor, Applied Photography

**Willem Brouwer**, Ph.D., Technical University, Delft, Holland—Visiting Professor; Chairman, Imaging and Photographic Science

**Robert A. Clark**, Ph.D., University of Maryland, Professor, Imaging and Photographic Science

**Andrew Davidhazy**, MFA, Rochester Institute of Technology—Associate Professor, Technical Photography

**Lothar K. Engelmann**, Ph.D., J. W. Goethe University, Germany—Professor, Technical Photography

**Ronald Francis**, Ph.D., Massachusetts Institute of Technology—Professor, Imaging and Photographic Science

**Franc Grum**, Ph.D., Richard S. Hunter Professor of Color Science, Appearance and Technology, Imaging and Photographic Science

**Russell Kraus**, Ed.D., Massachusetts—Associate Professor, Technical Photography

**James E. McMillion, Jr.**, MFA, Ohio University—Interim James E. McGhee Professor in Photographic Management

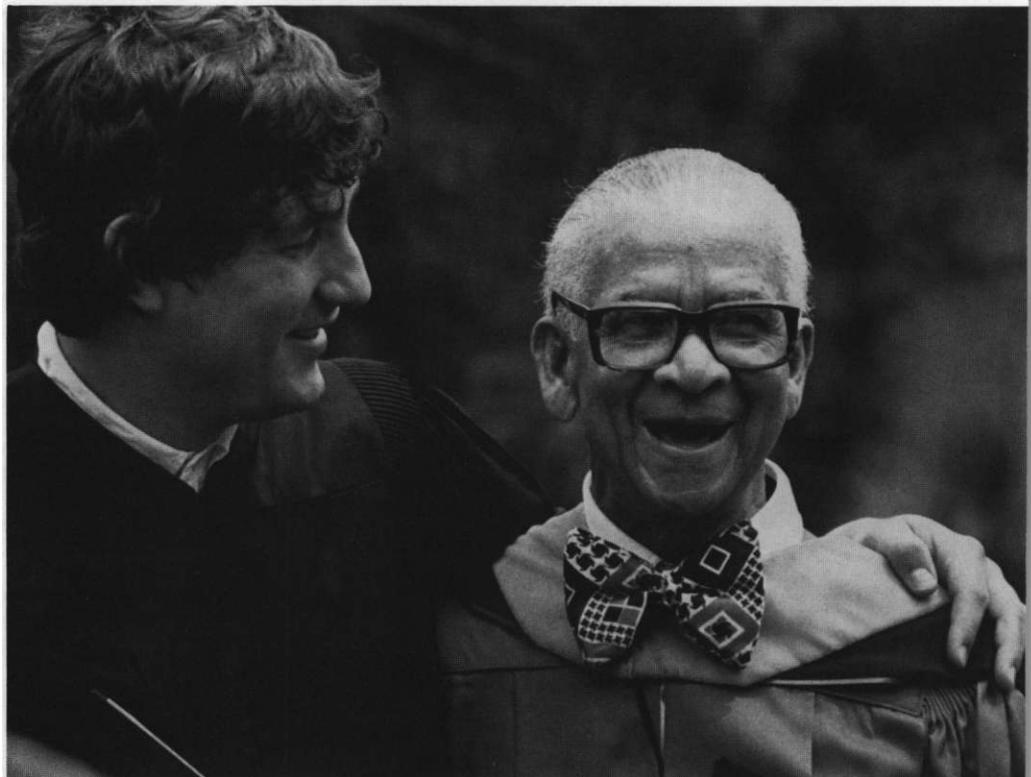
**Elliott Rubenstein**, MFA, SUNY, Buffalo; MA, St. John's University—Assistant Professor, Fine Art Photography

**John R. Schott**, Ph.D., Syracuse University—Assistant Professor, Imaging and Photographic Science

**Leslie D. Stroebel**, BS, Ed.D., University of Rochester—Professor; Chairman, Technical Photography

**Charles C. Werberig**, BFA, MS, Syracuse—Associate Professor, Film/Video

**Richard D. Zakia**, BS, Rochester Institute of Technology; Ed.D., University of Rochester—Professor; Chairman, Fine Art Photography



### Associates of Graduate Faculty

**Roy S. Burns**, Ph.D., Rensselaer Polytechnic Institute, Assistant Professor, Imaging and Photographic Science

**Owen Butler**, BFA, Rochester Institute of Technology—Assistant Professor, Applied Photography

**David A. Engdahl**, M.Ed., University of Rochester—Professor, Technical Photography

**Andrew H. Eskind**, MS, Illinois Institute of Technology—Interdepartmental Services, George Eastman House; Lecturer, Photography

**Richard Floberg**, MS, Boston University—Associate Professor, Film/Video

**Edward Granger**, Ph.D., University of Rochester—Lecturer, Photographic Science and Instrumentation

**Bradley T. Hindson**, BA, Rutgers; MFA, Ohio University—Associate Professor, Fine Art Photography

**Nathan Lyons**, Director, Visual Studies Workshop; Lecturer, Photography

**Robert Mayer**, Director, International Museum of Photography at the George Eastman House; BA, Fairleigh Dickinson University; MA, New York University

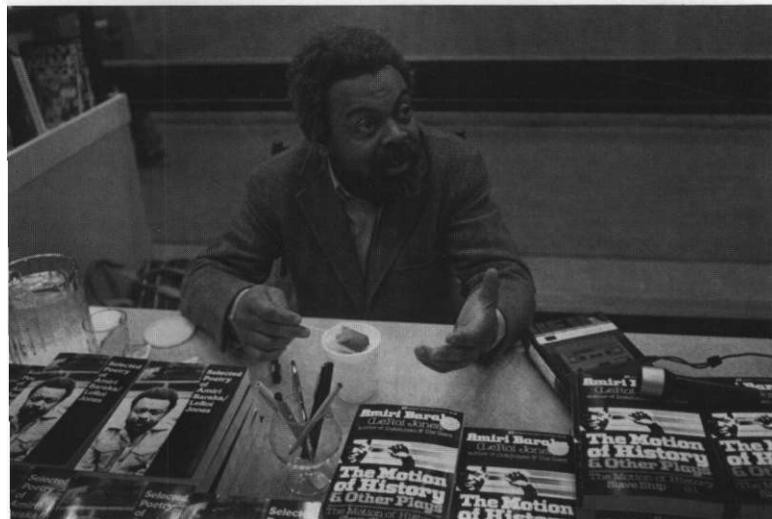
**Roger Merton**, BFA, Rochester Institute of Technology, MFA, SUNY Buffalo, Associate Professor, University of Rochester

**David J. Robertson**, MS, Columbia—Professor, Applied Photography

**Robert A. Sobieszak**, MA, Stanford—Director, Photographic Collections, International Museum of Photography, George Eastman House; Lecturer, Photography

**Tom Muir Wilson**, BFA, Cranbrook Academy of Art; MFA, Rochester Institute of Technology—Associate Professor, Fine Art Photography

# College of Liberal Arts



Mary Sullivan, Dean

The college provides a number of graduate courses as part of some of the master's degree programs of Rochester Institute of Technology. A primary objective of the course offerings is to complement the professional emphasis of these programs by contributing humanistic perspectives; that is, by exploring the humanistic implications embodied in these programs. In this way these courses play an integral role in professional education by making a direct and distinctive contribution to the student's preparation for a specialized career.

## Liberal Arts

### 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 Art Criticism

##### **Registration #0505-705**

A course for 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 occasionally)

#### 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 to 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 Societies

##### **Registration #0505-712**

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 will also 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.

Class 3, Credit 4 (offered occasionally)

**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 will also 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 artists' relationship to their society and to the character of the Baroque outlook.

Class 3, Credit 4 (offered occasionally)

**GSHF-717** **Music Literature****Registration #0505-717**

A comparison of various musical styles from the 17th to the 20th century with emphasis on music's relationship to the other fine arts and its socio-cultural environments. Representative composers include Bach, Beethoven, Chopin and Stravinsky.

Class 3, Credit 4 (offered on sufficient demand)

**GSHH-701** **History of American Educational Thought and Practice****Registration #0507-701**

This course traces the history of formal and informal education in America from the colonial era to the present. It examines the growth of progressive education, and the evolution of the open education movement of the 1960s and 1970s. The course evaluates the role of education among women and ethnic and religious minorities. Emphasis is given to such educative institutions as family, television, churches, factories, business corporations, public libraries and art galleries.

Credit 3, Credit 4 (offered annually)

**GSHP-705** **Seminar in Aesthetics****Registration #0509-705**

A range of questions will be addressed in the seminar. What is it to perceive something aesthetically? Are there any essential or defining properties shared by all works of art? Are our evaluations and interpretations of art works objective or subjective? Are an artist's intentions relevant factors in critical arguments? Understanding how answers to these questions are constrained by features of actual art works will be an important part of discussion.

Class 3, Credit 4 (offered occasionally)

**GSHP-706** **The Philosophy of Mind****Registration #0509-706**

An investigation into concepts concerning mental experiences. The basic question 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 experience in non-mentalistic terms? Can computers think? It will be the business of this course to explore these and related questions and to see what progress has been made in attempting to answer them.

Class 3, Credit 4 (offered occasionally)

**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)

**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.

Credit 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 of the College of Liberal Arts, and the 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)

## Graduate Faculty College of Liberal Arts

**Mary Sullivan**, Ph.D., Notre Dame-Dean, Professor

**Dane Gordon**, MA, Cambridge and Rochester—Associate Dean, Professor

**Lars Aagaard-Mogensen**, Lie. Theol., Aarhus University—Associate Professor

**Bruce Austin**, Ph.D., Temple University—Associate Professor, Communications

**Kathleen Chen**, Ph.D., Pennsylvania State—Professor, Psychology

**Douglas Coffey**, MA, Case Western Reserve—Associate Professor, Fine Arts

**Charles Collins**, Ph.D., University of Iowa—Visiting Assistant Professor, Fine Arts

**Robert Golden**, Ph.D., Rochester-Associate Professor, Language and Literature

**Warren Hickman**, Ph.D., University of Geneva, Switzerland—Professor, History

**Morton Isaacs**, Ph.D., Yeshiva—Professor, Psychology

**Tina Lent**, MA, University of California, Los Angeles—Instructor, Fine Arts

**Salvatore Mondello**, Ph.D., New York University—Professor, History

**David B. Suits**, Ph.D., University of Waterloo—Associate Professor

**Houghton Wetherald**, MA, Oberlin—Professor, Fine Arts

**Hans Zandvoort**, MFA, Royal Academy of Fine Arts, The Hague-Professor, Fine Arts

# College of Science

## Master of Science in Chemistry

**John D. Paliouras**, Dean,  
College of Science

**Terence C. Morrill**, Department Head,  
Chemistry (475-2497)

**Christian G. Reinhardt**, Chairman,  
Chemistry Graduate Committee  
(475-2477)

**Kay G. Turner**, Graduate Advisor  
(475-2077)

The Chemistry Department offers graduate programs leading to the master of science degree in chemistry on either a part-time or full-time basis with a variety of program options designed to fill the needs of both the practicing chemist in the greater Rochester industrial community and the full-time graduate student.

### Objectives

The objectives of the program are, through course work and research experience, to increase both the breadth and depth of the graduate student's background and to provide an opportunity for the student to attack scientific problems on his or her own initiative with a minimum of supervision.

Five program options are available to cover the differing needs of graduate chemists.

### Admission

Admission to the program will be granted to qualified graduates who are holders of a bachelor's degree from an accredited college or university. Before a student is admitted to candidacy for the MS degree, he or she must have experience equivalent to a full year's course in each of the following: analytical chemistry, organic chemistry, physical chemistry, physics, and calculus.

The student must further demonstrate mastery of analytical, organic, and physical chemistry in qualifying examinations administered by the RIT Chemistry Department.

An applicant is permitted to take graduate courses as a non-matriculated student if he or she has a bachelor's degree from an approved undergraduate school and the necessary background for the specific courses in which he or she wishes to enroll. The courses taken for credit can usually be applied toward the master's degree when the student is formally admitted to the graduate program at a later date. However, the number of credits that will be transferred to the degree program



from courses taken at RIT as a non-matriculated student will be limited to a maximum of 12 credits.

It is required that any applicant who wishes to enroll in a graduate course as a non-matriculated student obtain permission from the person in charge of the graduate program plus the appropriate faculty member.

### Full-time graduate work

A limited number of teaching assistantships are available to qualified students to undertake full-time graduate work that would include research experience. The Chemistry Department has a vigorous, research oriented faculty and excellent equipment and facilities to enable full-time graduate students to carry on a program of independent study which will develop their ability to attack scientific problems at the research level.

Students enrolled in the full-time program are expected to complete 45 hours of course work and submit an independent research thesis. A full-time student is permitted to take a maximum of 16 credits per quarter. Typically, all requirements are met within two years.

### Part-time study

The Department of Chemistry encourages practicing chemists in the Greater Rochester industrial community to pursue a program toward the master of science degree in chemistry without interrupting their employment.

Consequently, most of the courses in the graduate programs in chemistry are scheduled in the late afternoons or early evenings.

Students employed full-time normally take two courses each quarter.

The part-time MS program does not require a research thesis.

### Internship option

The Department of Chemistry recognizes that the in-plant experience of a number of chemists employed in local industry includes independent, creative research. This experience may be applied, to a maximum of 16 hours of research credit, towards the completion of the master of science degree in chemistry in either the full- or part-time program.

### Cooperative education option

The cooperative education option is to accommodate students at the master's level who have or are able to obtain industrial employment which allows for quarters of full-time academic work.



If industrial employment permits research, up to 16 of the 45 required credits may be obtained through the industrial internship option. If industrial employment does not permit research, research credits may be obtained within the Department of Chemistry.

### Community college teacher option

To better prepare the graduate student for a career as a chemistry instructor in a two-year college, the Department of Chemistry provides an opportunity through course work and actual teaching experience at two-year colleges, to obtain experience in the development of course material and instructional ability at the community college level.

This instructional development is provided in addition to the requirements of the full-time master of science in chemistry program which includes both independent research experience and a thesis.

### Program

Each student, together with an advisor, will arrange a program best suited to the student's interests and needs. This program will be subject to the approval of the department head and the chairperson of the Graduate Committee.

A deliberate effort will be made to strengthen any areas of weakness indicated by the student's undergraduate records and/or the qualifying examinations.

In order to qualify for the MS degree, a candidate must satisfy the following requirements:

1. A minimum of 45 quarter credits beyond the bachelor's degree. Courses in chemistry will be chosen from those with SCH-700 and SCH-800 numbers and should include one or more representing each of the four fields: analytical, inorganic, organic and physical.

Each student must select courses (subject to approval by the student's adviser and the graduate committee) which include the following core: SCHA-711, either SCHO-737 or SCHO-739, one of SCHP-741, SCHP-743 or SCHP-744, and one of SCHB-702, SCHI-762, SCHI-763 or SCHI-764. Demonstrated proficiency can supplant one of the core courses. As part of the required credits, each student must have one or two quarter credit hours in seminar SCHO-870, and six quarter credit hours from outside of the Department of Chemistry.

2. A minimum of nine quarter credit hours in research and submission of a satisfactory thesis. This may be waived for part-time students.
3. Demonstrated competence in a foreign or computer language.
4. Pass an oral thesis defense or comprehensive examination.

### Additional information

More information may be obtained by phoning the Chairman of the Graduate Committee (716) 475-2477, or the Department of Chemistry (716) 475-2497.

## Master of Science in Clinical Chemistry

**John D. Paliouras**, Dean,  
College of Science

**Alfred Bacharach**, Clinical Sciences  
Department Head (475-2978)

The clinical chemistry program is designed for either full-time or part-time graduate study. Required courses are offered during the late afternoon or evening on a regular basis in order to accommodate the work schedules of part-time students.

### Objectives

The program is designed to provide formal educational background for individuals aspiring to technical and managerial careers within the clinical chemistry laboratories of hospitals or industrial concerns.

### Admission

Qualified graduates who hold a bachelor's degree in chemistry, biology, medical technology, nuclear medicine technology, or a related field from an accredited college or university are invited to apply.

### Financial support

Teaching assistantship applications should be completed by March 15. Late applications may be considered under unusual circumstances. Information regarding other types of financial aid may be obtained from the RIT Financial Aid office.

### Program

Each student, together with the program director, will arrange a program that not only meets the minimum degree requirements but also considers educational and experiential backgrounds and the career goals of the student. Because of the diversity of backgrounds of applicants to the program, interested individuals are encouraged to write or phone the Clinical Sciences Department (716-475-2978) regarding program planning, prerequisites, transfer credits and course sequencing.



A minimum of 50 quarter credits beyond the bachelor's degree are required. Required courses include Biochemistry, SCHB-702; Biochemistry-Metabolism, SCHB-703; Advanced Clinical Chemistry, SCLC-820, 821, 822, 810, 811, 812; Organizational Behavior and Organization and Management, BBUB-740, 741; Statistics and Quality Control in the Clinical Laboratory, SCLC-712; Survey of Physical Chemistry, SCHP-742; Introduction to Electricity and Electronics, SPSP-331; Clinical Laboratory Computer Applications, SCLC-722; Clinical Chemistry Research,

SCLC-859 or 879; Mechanisms of Disease, SCLC-705.

In addition students are required to write a research proposal which is evaluated by committee. Subsequent to completion of the research project the student must orally defend his or her report or thesis.

## Department of Chemistry

### 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 spectrometry, 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 A.A., fluorimetry, coulometry,  $^{13}\text{C}$  and  $^1\text{H}$  NMR, polarography. Assignments depend on student background.

Lab. 6, Credit 2 (offered every year) (F, W)

### SCHB-702 Biochemistry–Biomolecular Conformation & Dynamics

#### **Registration #1009-702**

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 SCHA-340 or SCHA-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; active transport; metabolic diseases. (SCHB-702)

Class 3, Credit 3 (offered every year) (F, W)

### SCHB-704 Biochemistry–Nucleic Acids and Molecular Genetics

#### **Registration #1009-704**

The biochemistry of inheritance, expression of genetic information, protein biosynthesis, differentiation, genetic engineering, viral infection. (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 should be structured as ordinary courses and should have specified prerequisites, contact hours, and examination procedures.

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 Guidance

#### **Registration #1010-879**

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–Chemistry

#### **Registration #1010-899**

Credit variable (offered every year)

### SCHI-762

### Inorganic Chemistry I Composition & Structure

#### **Registration #1012-762**

Techniques for determining composition and structure, nomenclature and symbolism of inorganic compounds, modern electronic theories of composition, bonding, geometry, magnetic, electrical, mechanical and spectral properties of inorganic compounds (main group and transition elements). (SCHO-433, SCHA-442)

Class 3, Credit 3 (offered every year) (S, SR)

### SCHI-763

### Inorganic Chemistry II Stability & Reactivity

#### **Registration #1012-763**

Acid-base and other classifications of inorganic reactions; thermodynamic and kinetic aspects of controlling inorganic reactivity at both the laboratory and industrial level; nonaqueous solvent systems; use of isoelectronic and pseudoatom concepts in synthesis design. (SCHI-762, SCHA-442)

Class 3, Credit 3 (offered every year) (F, W)

### SCHI-764

### Inorganic Chemistry III Chemical Periodicity

#### **Registration #1012-764**

An integrated survey of descriptive inorganic chemistry (including industrial applications and geochemical origins) based on the periodic table and the structure and reactivity concepts developed in SCHI-762 and SCHI-763. (SCHI-762, -763).

Class 3, Credit 3 (offered every year) (S, SR)

### SCHI-765

### Preparative Inorganic Chemistry

#### **Registration #1012-765**

Laboratory oriented course designed to illustrate the characterization techniques presented in SCHI-762 and the various synthetic applications of thermodynamics and kinetics presented in SCHI-763. (SCHI-762; SCHI-763 may be taken concurrently)

Class 1, Lab 6, Credit 3 (offered every year) (F, W)

### SCHQ-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 Chemical Identification of Organic Compounds

#### **Registration #1013-736**

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 3, Credit 3 (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 3, Credit 3 (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 and SCHA-443)

Class 3, Credit 3 (offered every year)

### SCHO-832

### Stereochemistry

#### **Registration #1013-832**

Advanced treatment of steric relationships and stereoisomerism in organic compounds. (SCHO-433, SCHA-443)

Class 3, Credit 3 (offered upon sufficient request)

### SCHO-833

### Heterocyclic Chemistry

#### **Registration #1013-833**

The preparation, properties, and reactions of heterocyclic systems, especially heteroaromatic rings. (SCHO-433)

Class 3, Credit 3 (offered upon sufficient request)

**SCHO-835** Organic Chemistry of Polymers**Registration #1013-835**

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. (SCHO-433)

Class 3, Credit 3 (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 and SMAM-306)

Class 3, Credit 3 (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. This course may also serve as a review of physical chemistry for MS Chemistry students.

Class 3, Credit 3 (offered upon sufficient request) (W)

Not acceptable for BS in Chemistry

**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 3, Credit 3 (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 3, Credit 3 (offered alternate years)

**SCHP-746** Physical Chemistry of Polymers**Registration #1014-746**

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 3, Credit 3 (offered upon sufficient request)

**SCHP-747** Principles of Magnetic Resonance**Registration #1014-747**

A development of the principal ideas of magnetic resonance including the theory of resonance line shapes, magnetic interactions, experimental considerations, and spectral analysis. These concepts are discussed in terms of both pulsed and continuous wave nuclear magnetic and electron spin resonance spectroscopy. (SCHP-443)

Class 3, Credit 3 (offered upon sufficient request)

## Department of Clinical Sciences

**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.

Credit 3 (W 1983-84)

**SCLC-712** Statistics and Quality Control**Registration #1023-712**

Principles of statistics as they apply to biomedical sciences and to clinical laboratory analyses. Illustrative examples will involve clinical laboratory data. Probability, normal distributions, analysis of variance sampling, normal values, quality control, applications in patient care, hypothesis testing.

Class 3, Credit 3 (S 1984)

**SCLC-722** Clinical Laboratory Computer Applications**Registration #1023-722**

Data processing overview and terminology, hospital computer utilizations, evaluation of the need for computers in the laboratory, design of laboratory and hospital systems, evaluation-selection-installation of computer systems, legal aspects of biomedical data processing, instrument interfacing.

Class 3, Credit 3 (W 1983-84)

**SCLC-820** Advanced Clinical Chemistry I**Registration #1023-820**

Toxicology, therapeutic drug monitoring, electrolytes acid-base, vitamins, oncology, hepatitis, coagulation, and various standard methods. (Permission of instructor)

2 hr. lecture, 2 hr. seminar, Credit 3 (S 1984; F 1985)

On a rotating basis Ad Clin. Chem. I, II, III will be offered two courses per year: one in the fall, another in the spring, and the third the following fall. They are independent courses that may be taken in any sequence.

**SCLC-810** Advanced Clinical Chemistry Laboratory I**Registration #1023-810**

Comparison of current methods for analysis of toxicology samples—gas-liquid chromatography, radioimmunoassay, enzyme multiplied immunoassay. (Permission of instructor, class size limited to 12)

Lab. 4, Credit 1 (offered concurrently with SCLC-820)

**SCLC-821** Advanced Clinical Chemistry II**Registration #1023-821**

Proteins, enzymes, hemoglobins, iron, renal functions, lipids, quality control, automation, and method selection. (Permission of instructor)

2 hr. lecture, 2 hr. seminar, Credit 3 (F 1986; S 1985)

**SCLC-811** Advanced Clinical Chemistry Laboratory II**Registration #1023-811**

Comparison of current methods for separation and determination of isoenzymes. (Permission of instructor, class size limited to 12)

Lab. 4, Credit 1 (concurrent with SCLC-821)

**SCLC-822** Advanced Clinical Chemistry III**Registration #1023-822**

Radioimmunoassay, hormones, fetal-placement unit, integration of laboratory data. (Permission of instructor)

2 hr. lecture, 2 hr. seminar, Credit 3 (F 1986; S 1985)

**SCLC-812** Advanced Clinical Chemistry Laboratory III**Registration #1023-812**

Methods for the development, improvement, and troubleshooting of radioimmunoassay analyses. (Permission of instructor, class size limited to 12)

Lab. 4, Credit 1 (concurrent with SCLC-822)

**SCLC-877** External Clinical Chemistry Research**Registration #1023-877**

Credit variable

**SCLC-879** Clinical Chemistry Research**Registration #1023-879**

Credit 1-16

**SCLC-899** Independent Study**Registration #1023-899**

Credit variable

**SCLC-870** Clinical Chemistry Seminar**Registration #1023-870**

Credit 1

**SCLC-872** Special Topics in Clinical Science**Registration #1023-872**

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.

Class variable, Credit variable

## Graduate Faculty College of Science

**John D. Paliouras**, Ph.D., University of Illinois—Professor and Dean

### Department of Biology

**Paul A. Haefner**, Ph.D., University of Delaware—Professor of Biology

**Douglas Merrill**, Ph.D., SUNY College of Environmental Science and Forestry, Syracuse University—Assistant Professor of Biology

**Robert H. Rothman**, Ph.D., University of California, Berkeley—Assistant Professor of Biology

**Franz K. Seischab**, Ph.D., SUNY College of Environmental Science and Forestry, Syracuse University—Professor of Biology

### Department of Chemistry

**Jerry M. Adduci**, Ph.D., University of Pennsylvania—Professor, organic chemistry: organic mechanisms, polymer synthesis, and characterizations.

**B. Edward Cain**, Ph.D., Syracuse University—Professor, inorganic chemistry: chemical education, methodologies and adaptation for the hand-capped student.

**Robert E. Gilman**, Ph.D., University of Michigan—Professor, organic chemistry: synthesis of novel hosts for cation complexation; cyclization via aryl-aryl coupling reactions.

**Joseph P. Hornak**, Ph.D., University of Notre Dame—Assistant Professor, physical chemistry: electron spin resonance, reaction kinetics of transient free radicals, solvated electrons, diffusion, and Heisenberg spin exchange.

**William B. Jensen**, Ph.D., University of Wisconsin—Assistant Professor, inorganic chemistry, chemical education, solid state inorganic chemistry.

**Earl Krakower**, Ph.D., University of British Columbia—Professor, physical chemistry: nuclear magnetic resonance, structure, and properties of molecules, chemical education.

**Terence C. Morrill**, Ph.D., University of Colorado—Department Head, Professor, organic chemistry: stereochemistry and mechanism of organic reactions, and organic structure effects upon lanthanide-induced shifts in NMR spectrometry; C-13 NMR, relaxation reagents.

**Eric Moskala**, Ph.D., The Penn State University—Assistant Professor, polymer chemistry, materials science, polymer blends.

**John P. Neenan**, Ph.D., University of California, Santa Barbara—Assistant Professor, Biochemistry: design of active-site-directed irreversible enzyme inhibitors.

**Christian G. Reinhardt**, Ph.D., University of Rochester—Chair, Graduate Committee; Assistant Professor, Biophysical chemistry: biological drug receptor recognition, binding and stereochemistry, mechanisms of interferon induction, nucleic acid structure.

**L. Paul Rosenberg**, Ph.D., University of New Hampshire—Assistant Professor, analytical chemistry: quantitative determination of metal and anion binding by computer-assisted EPR, HPLC, spectroscopy and fluorescence; computer interfacing.

**Gerald A. Takacs**, Ph.D., University of Wisconsin—Professor, physical chemistry: chemical kinetics, chemiluminescence, atmospheric chemistry, plasma chemistry and photochemistry.

**Laura Ellen Tubbs**, Ph.D., University of Rochester—Assistant Professor, physical chemistry: accelerator-based ultrasensitive mass spectroscopy, natural radioisotope dating.

**Kay G. Turner**, Ph.D., Ohio State University—Graduate Advisor; Assistant Professor, synthetic organic chemistry: synthesis of natural products including fluorescent estradiol analogs; study of estrogen receptor mechanisms.

**Vladimir Vukanovic**, Ph.D., University of Belgrade—Visiting Professor, physical chemistry: plasma physical, chemistry, atomic spectroscopy with an arc plasma source.

### Department of Clinical Sciences

**James C. Aumer**, MS, Michigan Technological University—Program Director, Medical Technology; Assistant Professor

**Alfred Bacharach**, Ph.D., UCLA—Professor and Department Head

**William A. Burns**, MS, Elmira—Associate Dean and Professor; medical technology

**J. Richard Granham**, BS, Purdue; M.S., Ohio State—Associate Professor and Program Director of Biomedical Computing

**Judy Newell**, BS, C.N.M.T., Assistant Professor and Director of Nuclear Medicine Technology

**Roger E. Warner**, BS, R.D.M.S., Seattle Pacific University—Assistant Professor and Program Director of Diagnostic Medical Sonography

### Adjunct Faculty

**Clark L. Anderson**, M.D., Chicago University—Strong Memorial Hospital, Rochester; Adjunct Clinical Professor

**Richard M. Bayer**, Ph.D., Rutgers University—Rochester General Hospital, Adjunct Clinical Professor

**Richard B. Coolen**, Ph.D., Michigan State University—Eastman Kodak Company, Rochester; Adjunct Clinical Associate Professor

**John P. D'Souza**, M.D., Mapere University—The Genesee Hospital, Rochester; Adjunct Clinical Associate Professor

**Nathan Hamblin**, BS, Rochester Institute of Technology—Rochester General Hospital, Adjunct Clinical Assistant Professor

**Howard Harrison**, Ph.D., Cornell University—Rochester General Hospital, Adjunct Clinical Associate Professor

**Robert Kringle**, MS, University of Wisconsin—Assistant Professor

**Norman P. Kubasik**, Ph.D., Syracuse University—Upstate Medical Center—The Genesee Hospital, Clinical Professor

**Tai C. Kwong**, Ph.D., University of Toronto—Strong Memorial Hospital, Rochester; Adjunct Associate Professor

**William Lachenauer**, BS, State University of New York—Rochester General Hospital, Adjunct Clinical Assistant Professor

**Fred Lasky**, Ph.D., SUNY at Buffalo—Eastman Kodak Company, Adjunct Clinical Associate Professor

**Frank R. Mirabella**, M.S., University of Rochester—Eastman Kodak Company, Rochester; Adjunct Assistant Professor

**Vivian A. Pallodoro**, M.S., University of Rochester—Strong Memorial Hospital, Rochester; Adjunct Clinical Assistant Professor

**Royden N. Rand**, Ph.D., University of Buffalo—Health, Safety and Human Factors Laboratory, Eastman Kodak Company, Adjunct Professor

**Harrison E. Sine, Jr.**, Ph.D., SUNY at Buffalo—The Genesee Hospital, Adjunct Clinical Professor

**Paul D. Woolf**, M.D., New York University—Strong Memorial Hospital, Rochester; Adjunct Clinical Associate Professor

## Department of Mathematics

**Peter Arzberger**, Ph.D., Purdue University—Assistant Professor of Mathematics

**Maurino Bautista**, Ph.D., Purdue University—Assistant Professor of Mathematics

**Patricia Clark**, Ph.D., University of Rochester—Associate Professor of Mathematics

**David Farnsworth**, Ph.D., University of Texas—Associate Professor of Mathematics

**Robert Fox**, Ph.D., Cornell University—Assistant Professor of Mathematics

**Lester B. Fuller**, Ph.D., Michigan State University—Professor of Mathematics

**George Georgantas**, Ph.D., SUNY at Buffalo—Professor of Mathematics

**James A. Glasenapp**, M.A., SUNY at Buffalo—Associate Professor of Mathematics

**Marvin Gruber**, Ph.D., University of Rochester—Associate Professor of Mathematics

**Laxmi Gupta**, Ph.D., SUNY at Buffalo—Assistant Professor of Mathematics

**Edwin T. Hofer**, Ph.D., SUNY at Buffalo—Associate Professor of Mathematics

**Wanda S.-Lojasiewicz**, Ph.D., University of Cracow, Poland—Assistant Professor of Mathematics

**David Mathiason**, Ph.D., University of Rochester—Assistant Professor of Mathematics

**Douglas Meadows**, Ph.D., Stanford University—Assistant Professor of Mathematics

**Edward A. Newburg**, Ph.D., University of Illinois—Professor of Mathematics

**Richard Orr**, M.S., SUNY at Buffalo—Assistant Professor of Mathematics

**Howard M. Proskin**, M.S., Rutgers University—Assistant Professor of Mathematics

**Pasquale Saeva**, M.S., Bowling Green—Associate Professor of Mathematics

**Harry M. Schey**, Ph.D., University of Illinois—Associate Professor of Mathematics

**Theodore Wilcox**, Ph.D., University of Washington—Assistant Professor of Mathematics

**Paul Wilson**, Ph.D., University of Illinois—Associate Professor of Mathematics

**James A. Wiseman**, Ph.D., Boston University—Assistant Professor of Mathematics

**Kenneth Yasuda**, Ph.D., University of Rochester—Assistant Professor of Mathematics

**Elmer Young**, Ph.D., Ohio State University—Assistant Professor of Mathematics

**Joseph Zacharski**, M.S., Rensselaer Polytechnic Institute—Assistant Professor of Mathematics

## Department of Physics

**Hrishikesh Banerjee**, Ph.D., Institute of Nuclear Physics, Calcutta—Professor of Physics

**Peter A. Cardegnà**, Ph.D., Clemson University—Assistant Professor of Physics

**Christopher A. Ciarcia**, Ph.D., University of Lowell—Assistant Professor of Physics

**Tracy A. Davis**, Ph.D., Clemson University—Assistant Professor of Physics

**F. Kingsley Elder, Jr.**, Ph.D., Yale University—Professor of Physics

**Alan B. Entenberg**, Ph.D., University of Rochester—Assistant Professor of Physics

**Charles A. Hewett**, Ph.D., University of Missouri—Professor of Physics

**Ronald E. Jodoin**, Ph.D., University of Rochester—Associate Professor of Physics

**Arthur Z. Kovacs**, Ph.D., Duke University—Professor of Physics

**Vern Lindberg**, Ph.D., Case Western Reserve University—Assistant Professor of Physics

**Varadaraja V. Raman**, Ph.D., University of Paris—Professor of Physics

**Earl H. Sexton**, Ph.D., SUNY at Albany—Associate Professor of Physics

**John S. Shaw**, Ph.D., SUNY at Albany—Associate Professor of Physics

**Jerome Wagner**, Ph.D., University of Wisconsin—Associate Professor of Physics

**Anne Young**, Ph.D., Cornell University—Assistant Professor of Physics

# Materials Science and Engineering

**Richard A. Kenyon**, Dean, College of Engineering

**John D. Paliouras**, Dean, College of Science

**Hrishikesh Banerjee**, Director, Materials Science and Engineering program

For information call 475-2536  
(Dr. Banerjee)

The program, under the joint auspices of the colleges of Engineering and Science, offers graduate studies leading to the master of science degree in materials science and engineering with a variety of options designed to satisfy individual and industry needs in the rapidly growing field of materials.

The objectives of the program are threefold:

- With the advent of whole new classes of materials and instruments in recent times, the traditional practice of empiricism in the search for and selection of materials is rapidly becoming obsolete. The program will offer, therefore, a serious interdisciplinary learning experience in materials studies, crossing over the traditional boundaries of such classical disciplines as chemistry, physics, electrical and mechanical engineering.
- The program will provide extensive experimental courses in diverse areas of materials-related studies.
- The program will explore avenues for introducing greater harmony between industrial expansion and academic training.

## Special features of the program

A special feature of the program is the offering of five required core courses. The core courses are specially designed a) to establish a common base of materials-oriented knowledge for students with baccalaureate degrees in chemistry, chemical engineering, electrical engineering, mechanical engineering, and physics; and consequently, b) to provide a new intellectual identity to those involved in the study of materials.

Second, there is an emphasis on experimental techniques in the program. It offers one required experimental course and makes available additional optional experimental courses. These are organized into

appropriate units covering many aspects of analysis of materials. This aspect of the program should enhance student confidence when dealing with materials-related problems.

Finally, a large number of highly qualified scientists and engineers in the Rochester area are engaged in the research and development of materials. This reservoir of talent is utilized to ensure the breadth and quality of the program. The program offers an "industrial option" that allows participants to continue their studies in their work environment and thus enhance their job satisfaction.

The overall thrust of the program is to establish a positive relationship between academia and industry by building a sound academic base in the field of materials.

## Governance of the program

A Program Council, consisting of 12 members, eight from the Institute and four from Rochester industries, is responsible for decisions on all academic aspects of the program. The program director serves as chairman of the council.

## Admission

The program is open to individuals with a bachelor's degree in chemistry, physics, and chemical, electrical or mechanical engineering from an accredited college or university. Any student who wishes to study at the graduate level must first be admitted to the program. An applicant is permitted to take graduate courses as a non-matriculated student, however, if he or she meets the general requirements mentioned above.

A person not meeting the general requirements may petition for admission to the program. In such cases, the Program Council would decide on the necessary background courses to be taken at the undergraduate level. However, undergraduate credits that make up deficiencies may not be counted toward the master's degree.

To be considered for admission, it is necessary to file an application for admission to graduate study, accompanied by the appropriate transcripts of previous study and two letters of recommendation.

## Degree requirements

A minimum of 45 quarter credit hours is required for the completion of the program.

A course unit will normally carry four quarter credit hours, with the exception of the seminar which will carry one quarter credit hour.

The five core courses and the seminar course are required for the completion of the program. Together, they carry a total of 21 quarter credit hours.

The remaining 24 quarter credit hours may be taken in a combination of advanced courses including "special topics," electives in courses currently available in other master's programs in the Institute, and the "research thesis" option, subject to prior approval. Also, the Program Council may award transfer credits based on academic background above and beyond the baccalaureate degree or credit by examination based on experience.

## Part-time study

Because practicing scientists and engineers are encouraged to pursue the program on a part-time basis, most of the courses are scheduled in the late afternoon. (This may not apply to courses offered off campus at several industrial locations.)

Students employed full-time in industry are normally limited to a maximum of two courses, or eight credit hours, each quarter. A student who wishes to register for more than eight credit hours while employed full-time must obtain the permission of the Program Council.

## Thesis option and the industrial internship option

The inclusion of a research thesis as a formal part of the master of science degree program in materials science and engineering is optional. The research thesis option would carry a minimum of eight and a maximum of 16 quarter credit hours, subject to review and approval of the project.

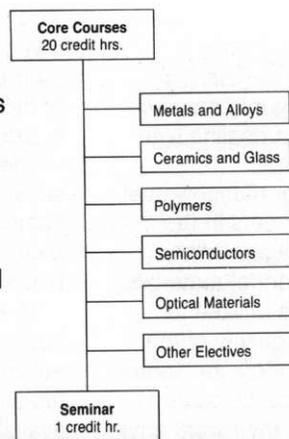
It is also recognized that in-plant work experience in the materials-related areas may include independent study and creative research. This industrial internship option may be applied, for a minimum of four and a maximum of 16 quarter credit hours, toward the completion of the master of science degree.

## Curriculum

The core courses will be offered on the basis of a one-year cycle and the advanced courses will be scheduled on the basis of a two-year cycle.

**Course number and title****core courses:**

SESM-701 Introduction to Materials Science  
 SESM-702 Introduction to Polymer Science  
 SESM-703 Introduction to Solid State Science  
 SESM-704 Introductory Theoretical Methods  
 SESM-705 Introductory Experimental Techniques or, any one of SESM-706, 707, and 708 courses



## Materials Science and Engineering

**SESM-701 Introduction to Materials Science****Registration #1028-701**

Crystal structure and defects, strength of materials, metals, alloy principles, ferrous alloys.

Credit 4 (offered every year)

**SESM-702 Introduction to Polymer Science****Registration #1028-702**

Introduction to the physical chemistry and organic chemistry of polymers, structure, preparation and properties of polymers.

Credit 4 (offered every year)

**SESM-703 Solid State Science****Registration #1028-703**

Crystal structure and x-ray diffraction; lattice vibrations and thermal properties; electron band theory of insulators, metals, and semiconductors, junction diodes and transistors.

Credit 4 (offered every year)

**SESM-704 Introductory Theoretical Methods****Registration #1028-704**

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.

Credit 4 (offered every year)

**SESM-705 Introductory Experimental Techniques****Registration #1028-705**

The list of laboratory projects includes the areas of:

- Microanalysis of materials; x-ray diffraction, scanning electron microscopy metallography, microelectronics, fluorescence, phosphorescence, etc.;
- Thermal systems: thermomechanical and thermogravimetric systems and differential scanning calorimetry;
- Thin films; thermal evaporation system, sputter coating system, phase contact microscopy, chemical vapor deposition system;
- Sonics and ultrasonics;
- Dielectrics: time domain reflectometry

Credit 4 (offered every year)

## Elective Courses

**SESM-706, 707, 708 Experimental Techniques****Registration #1028-706, 707, 708**

The study of more topics listed in Introductory Experimental Techniques.

Credit 4 (offered every year)

**SESM-710, 711 Material Properties and Selection I and II****Registration #1028-710,711**

Mechanical properties of metallic polymeric materials; application and selection of such materials based on strength, fatigue, impact, creep, processing, and economy.

Credit 4

**SESM-714 Ceramics and Glass****Registration #1028-714**

Nature of ceramics, nature of glass, processing of ceramics and glass materials, properties and application of ceramics and glass.

Credit 4

**SESM-717 Materials Degradation Corrosion****Registration #1028-717**

Electrochemical nature of corrosion, high-temperature corrosion, anticorrosion techniques, materials selection for corrosion services.

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.

Credit 4

**SESM-721 Physical Chemistry of Polymers****Registration #1028-721**

This course is designed to meet the needs of students of materials science in the area of theoretical and experimental physical chemistry macromolecules.

Credit 4

**SESM-722 Polymer Processing****Registration #1028-722**

A study of the basic principles and methods involved in the technology of polymeric materials, including treatment of heat transfer, mass flow, mixing, shaping and moulding of polymeric materials.

Credit 4

**SESM-730 Optical Properties of Materials****Registration #1028-730**

Fundamentals of geometrical and physical optics; interaction of radiation with atoms, molecules, and matter; dielectrics; phenomenological considerations of electro-optics, acousto-optics, and lasers.

Credit 4

**SESM-733 Electrical and Magnetic Properties of Materials****Registration #1028-733**

Band structures of pure and doped solids and solid compounds, transport phenomena, semiconduction, optical properties, galvanomagnetic and magneto-optic effects.

Credit 4

**SESM-734 Advanced Optics****Registration #1028-734**

Lasers: theory, types and construction; optical properties of various metals and alloys; thin films: multilayer dielectric coating; principles and applications of electro-optical and acousto-optical materials; shutters and modulators.

Credit 4

**SESM-736 Amorphous and Semicrystalline Materials****Registration #1028-736**

Electrical, thermal, and optical properties of amorphous materials; models of conduction.

Credit 4

**SESM-740 Nuclear Science and Engineering****Registration #1028-740**

Systematics of the atom nuclei; radioactivity; neutron induced reactions; fission; nuclear reactor principles, designs and materials.

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, emission spectroscopy and atmospheric science.

Credit 4

**SESM-770 Physics and Chemistry of I.C. Processing****Registration #1028-770**

Topics include diffusion, oxide growth, chemical vapor deposition, epitaxy, ion implantation, plasma processing, photolithography, and mask making as they apply to fabrication of integrated circuits.

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.

Credit 4

**SESM-879****Research and Thesis Guidance****Registration #1028-879**

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 variable

**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.

Credit 1

**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 to register required.

Credit variable

## Graduate Faculty

### Materials Science and Engineering

#### College of Engineering and College of Science

**Richard A. Kenyon**, Ph.D., P.E., Syracuse University—Dean, College of Engineering, Professor: Mechanical Engineering, Thermodynamics and Fluid Mechanics

**John D. Paliouras**, Ph.D., University of Illinois—Dean, College of Science, Professor: Mathematics, Analysis

**Hrishikesh Banerjee**, Ph.D., University of Calcutta—Director of Materials Science and Engineering: Professor: Physics, Nuclear Physics, Solid State and Semiconductor Physics

**Swaminathan Madhu**, Ph.D., University of Washington—Professor and Department Head, Electrical Engineering: Communications Theory, Logic Design

**Lynn Fuller**, Ph.D., University of Buffalo—Associate Professor and Department Head: Microelectronic Engineering, Solid State Devices and Microelectronics

**Bhalchandra V. Karlekar**, Ph.D., P.E., University of Illinois—Professor and Department Head, Mechanical Engineering: Heat Transfer, Applied Mathematics

**Arthur Z. Kovacs**, Ph.D., Duke University—Professor and Department Head: Physics, High Energy Physics, Systems Engineering and Management Science

**Terence C. Morrill**, Ph.D., University of Colorado—Professor and Department Head: Chemistry, Organic Chemistry, Stereochemistry, NMR Spectrometry

**Jerry M. Adduci**, Ph.D., University of Pennsylvania—Professor: Chemistry, Organic Mechanisms, Polymer Synthesis and Characterization

**Robert A. Clark**, Ph.D., University of Maryland—Professor: College of Graphic Arts and Photography, Physical and Organic Chemistry, Polymers

**Alan B. Entenberg**, Ph.D., University of Rochester—Assistant Professor: Physics, Laser Fusion and Thin Films Adhesion

**G. Thomas Frederick**, Ph.D., Ohio State University—Associate Professor and Department Head: Biology, Scanning Electron Microscopy, Energy Dispersive X-Ray Analysis

**William G. Frizelle**, MS, P.E., University of Rochester—Associate Director: School of Engineering Technology, Polymer Engineering

**Surendra K. Gupta**, MS, University of Notre Dame—Lecturer: Mechanical Engineering, X-ray Diffraction, Powder Metallurgy

**Roger E. Heintz**, Ph.D., Syracuse University—Associate Professor: Electrical Engineering, Solid State Devices

**Charles A. Hewett**, Ph.D., University of Missouri—Professor: Physics, Solid State Physics, Fluorescence

**Ronald E. Jodoin**, Ph.D., University of Rochester—Associate Professor: Physics, Optics, Lasers and Digital Image Processing

**Raj Khanwalkar**, Ph.D., The Johns Hopkins University—Visiting Assistant Professor: Mechanical Engineering, Wave Propagation, Elasticity

**Vern Lindberg**, Ph.D., Case Western Reserve University—Assistant Professor: Physics, Thin Film Deposition and Analysis

**Eric J. Moskala**, Ph.D., The Penn State University—Assistant Professor: Chemistry, Polymer Chemistry, Polymer Blends and Infrared Spectroscopy

**Chris Nilsen**, Ph.D., P.E., Michigan State—Associate Professor: Mechanical Engineering, Metallurgy and Materials Science

**Alan H. Nye**, Ph.D., University of Rochester—Associate Professor: Mechanical Engineering, Solid Mechanics and Heat Transfer

**Harvey E. Rhody**, Ph.D., Syracuse University—Professor: Electrical Engineering, Communication Theory

**Tapan K. Sarkar**, Ph.D., Syracuse University—Associate Professor: Electrical Engineering, E.M., Fields, Time Domain Studies

**Robert L. Snyder**, Ph.D., P.E., Iowa State—Professor: Mechanical Engineering, Materials Science, Chemistry

**David A. Sumberg**, Ph.D., Michigan State University—Associate Professor: Electrical Engineering, Lasers and Optoelectronics

**Gerald A. Takacs**, Ph.D., University of Wisconsin—Professor: Chemistry, Plasma Physical Chemistry and Atmospheric Science

**Renan Turkman**, Ph.D., University of Paris—Visiting Assistant Professor: Electrical Engineering, Solid State Devices

**Vladimir Vukanovic**, Ph.D., University of Belgrade—Visiting Professor: Chemistry, Plasma Physical Chemistry, Atomic Spectroscopy with Arc Plasma Source

**Jerome Wagner**, Ph.D., University of Wisconsin—Associate Professor: Physics, Defect Properties in Solids, Medical Physics and Radiation Dosimetry

**Paul H. Wojciechowski**, Ph.D., University of Rochester—Associate Professor: Mechanical Engineering, Thin Film Studies

**Adjunct Faculty:**

**John F. Carson**, MS, Massachusetts Institute of Technology—Eastman Kodak Company, Rochester, NY

**J. Raymond Hensler**, Ph.D., Pennsylvania State University—Director of Manufacturing Technology, Bausch and Lomb, Inc., Rochester, NY

**Merle N. Hirsh**, Ph.D., The Johns Hopkins University—Director of R&D, Beta Physics, Division of Eastman Technologies, Rochester, NY

**Robert Lord**, MS, Syracuse University—Manager, IBM-Endicott, Endicott, NY

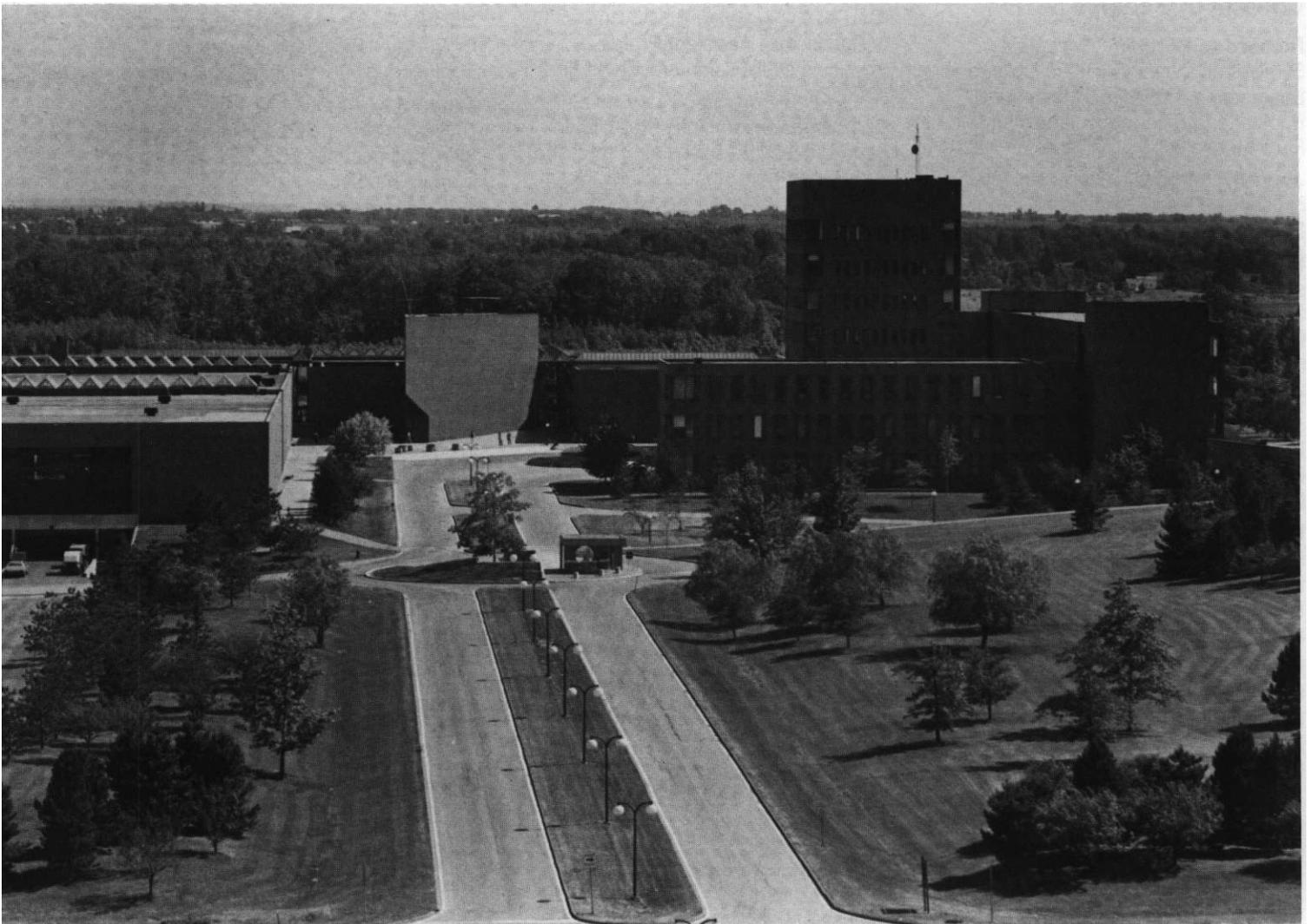
**Gerald F. Meyers**, BS, University of Pittsburgh—Plant Metallurgist, Delco Products, General Motors Corporation, Rochester, NY

**Richard W. Reynolds**, B.M.E., Cornell University—Manager, Xerox Corporation, Rochester, NY

**J. William Sexton**, BS, University of Rochester—Coordinator of Optics Contracts and New Opportunities Development, Eastman Kodak Company, Rochester, NY

**Tien-Kuei Su**, Ph.D., University of Massachusetts—Supervisor, Mobil Chemical Corporation, Macedon, NY

**E. Wayne Turnblom**, Ph.D., Columbia University—Market Intelligence Associate, Eastman Kodak Company, Rochester, NY



# The National Technical Institute for the Deaf

**William E. Castle, Director**

The National Technical Institute for the Deaf (NTID) was created in 1965 to offer deaf students technical and professional education that can lead to meaningful employment in business, industry, government, and education. Rochester Institute of Technology (RIT) was chosen as NTID's sponsoring institution in late 1966 by the Department of Health, Education and Welfare. In the fall of 1968, the first group of deaf students began their studies at NTID. For more than 16 years, NTID at RIT has provided postsecondary education to deaf students from every state in the nation.

While it is a national institution, it also is one of the nine colleges of RIT. NTID is the world's only technological college serving deaf students in comprehensive career-oriented postsecondary programs.

## **Graduate programs for deaf students**

NTID encourages qualified deaf students to pursue master's degree programs at RIT. Students who request them will receive appropriate support services, through NTID, including sign language interpreting, tutoring, note-taking, career counseling, personal/social counseling, and job placement assistance.

Many NTID faculty members teach in the RIT graduate programs and share a wide range of technical expertise as well as knowledge of both deafness and education of deaf people.

For more information, contact the RIT Office of Admissions or the NTID Office of Career Outreach and Admissions, One Lomb Memorial Drive, Post Office Box 9887, Rochester, New York 14623.



Co-Sponsors: University of Rochester through the Graduate School of Education and Human Development  
**Guilbert Hentschke**, Acting Dean and  
 Rochester Institute of Technology through the National Technical Institute for the Deaf  
**William E. Castle**, Director

### A new type of professional

The University of Rochester's Graduate School of Education and Human Development and Rochester Institute of Technology through the National Technical Institute for the Deaf have jointly developed a graduate program designed to improve the quality of education and services for deaf people.

Graduates of the master's degree program will be qualified to work as professionals with deaf people at the secondary level in:

- teaching deaf and normally hearing secondary students in such areas as English, mathematics, science, and social studies;
- managing special educational support service systems such as tutoring, notetaking, and interpreting;
- serving as resources on deafness to schools involved in mainstreaming deaf students into regular school systems.

Graduates will work in secondary schools serving deaf students, or function as instructional leaders, working with colleagues to enrich and upgrade the quality of education for deaf people nationally.

### Certification

Graduates of this program will be eligible for:

- provisional certification from New York State as an academic teacher of the normally hearing, for grades 7-12, in one or more of these areas: English, social studies, mathematics, biology, chemistry, physics, earth science, and general science;
- provisional certification from New York State as a teacher of deaf and hearing-impaired students, nursery school through grade 12;

- a master of science in education degree from the University of Rochester co-sponsored by Rochester Institute of Technology through the National Technical Institute for the Deaf. The program is approved by the Council on the Education of the Deaf (CED). Graduates can be certified by CED.

To be certified to teach one or more of the broad fields listed below at the secondary level in New York State, applicants must satisfy the following minimum course work (undergraduate or graduate level) requirements in one of these areas:

English—36 semester hours including work in linguistics, literature, and writing;

Mathematics—36 semester hours including a calculus sequence;

Science—44 semester hours in the natural sciences including a calculus sequence;

Social Studies—36 semester hours in history, geography, and the social sciences, with American studies and at least one course in the methods of inquiry in history, geography, or one of the social sciences.

### The University of Rochester and the National Technical Institute for the Deaf: uniquely qualified to jointly prepare educational specialists

The University of Rochester, one of the smallest of the nation's distinguished universities, enrolls about 8,000 students, upwards of 3,000 of them at the graduate level. One of its eight colleges and schools, the Graduate School of Education and Human Development, offers doctor's and master's degrees in a variety of educational specialties. The school maintains long-established programs of teacher preparation for students in the university's departments of English, mathematics, social sciences, and natural sciences in the College of Arts and Science. Individuals and groups from the school's faculty have engaged in a number of joint activities with NTID personnel over the past 11 years. Members of the university's School of Medicine and Dentistry and Center for Visual Science have joined in similar collaborations.

NTID, an integral part of Rochester Institute of Technology, is the world's only technological college for deaf students. It is renowned, both nationally and internationally, for its efforts to integrate deaf students onto a college campus planned primarily for hearing

students. Today nearly 1,300 hearing-impaired students from 50 states, Puerto Rico, and the District of Columbia study and reside on the RIT campus with 15,000 hearing students.

RIT's students are enrolled in the colleges of Applied Science and Technology, Business, Continuing Education, Engineering, Fine and Applied Arts, Graphic Arts and Photography, Liberal Arts, Science and, of course, NTID.

RIT offers more than 200 individual career study areas leading to master's, bachelor's, and associate degrees.

### About the program

This full-time master's degree program normally requires three to five semesters to complete, depending upon the applicant's entry-level qualifications. The program is designed for people who seek academic certification to teach both hearing and deaf students. It also serves those who are already certified to teach academic subjects to hearing students at the secondary level and who seek additional certification to teach deaf students.

Applicants must have at least an undergraduate major in an academic area normally taught at the secondary school level, such as English, literature, mathematics, chemistry, or history. Some applicants also may need more advanced work in their area of academic expertise, or may need to develop a broader perspective in several academic areas. For example, persons with an undergraduate degree in mathematics may need additional mathematics preparation to meet the University of Rochester's program requirements, or to attain an appropriate breadth of knowledge in that subject.

### Sign language

Participants will be required to demonstrate basic skills in expressive and receptive sign language before their student teaching begins. Those without sign language skills will be encouraged to participate in sign language courses at NTID in the summer that precedes their first semester of graduate study.

### Admission requirements

To gain admittance to this graduate program, applicants must:

- complete the equivalent of an undergraduate major in at least one academic area directly related to subjects normally taught at the secondary level.

- demonstrate an interest in serving the needs of deaf people.
- satisfy the University of Rochester admission requirements: solid undergraduate background in an academic area, good recommendations, and a successful on-campus interview.
- take the aptitude section of the Graduate Record Examination (GRE) prior to admission. Those who have not done so before admission will be required to take the GRE subsequent to admission.

Participants will determine their individual programs of study with the assistance of a faculty advisor. Among the major areas of study available to participants will be specialized courses that relate deafness to the communication sciences and disorders, instructional theories and techniques, educational goals and processes, and psycho-social-cultural development. Student teaching will provide exposure to the full range of educational environments available to deaf adolescents in the region.

#### How to apply

Enrollment will be limited to 15. Some financial aid may be available. For an application, please write to:

Associate Dean for Graduate Studies  
Graduate School of Education and Human Development  
304 Lattimore Hall  
University of Rochester  
Rochester, New York 14627

For additional information, please contact:

Dr. Kenneth R. Nash  
Director, Joint Program to Prepare Educational Specialists for the Deaf at the Secondary Level  
422 Lattimore Hall  
University of Rochester  
Rochester, New York 14627  
Phone (716) 275-4009  
(Voice or TDD)

*Note: Course descriptions can be found in the University of Rochester Graduate Bulletin.*



### NTID/RIT Graduate Internships

The purpose of the NTID Internship program is to provide opportunities for students at the master's or doctoral level to gain practical experience in the application of their discipline. Interns are usually graduate students or professionals who wish to gain advanced in-service training in their career areas and in education and services for deaf persons. The duration of the internship depends on individual needs and the calendar of the sponsoring institution.

NTID offers graduate internships in:

Audiology  
Career and Personal Counseling  
Curriculum Planning and Evaluation  
Educational Administration  
Educational Research  
Media Development  
Speech Pathology  
Teaching  
Theatre

In 1984, 85 interns from the United States and several foreign countries worked with NTID in their career areas.

For more information, contact:

Rochester Institute of Technology  
National Technical Institute for the Deaf  
Office of Professional Development  
Coordinator of Internships  
One Lomb Memorial Drive  
Post Office Box 9887  
Rochester, New York 14623

## Graduate Faculty

**William E. Castle**, Ph.D., Stanford University—Professor, Director and Vice President, NTID/RIT

**Jack R. Clarcq**, Ed.D., Syracuse University—Associate Professor, Associate Vice President, Technical Assistance Programs, NTID/RIT

**Kenneth R. Nash**, Ed.D., Columbia University—Associate Professor, Director, Joint Educational Specialist Program; Adjunct Associate Professor, Graduate School of Education and Human Development, University of Rochester

**Frank C. Caccamise**, Ph.D., University of Washington—Professor

**Kathleen E. Crandall**, Ph.D., Northwestern University—Associate Professor

**Greg Emerton**, Ph.D., Western Michigan University—Associate Professor

**T. Alan Hurwitz**, Ed.D., University of Rochester—Associate Professor

**Donald D. Johnson**, Ph.D., University of Illinois—Professor

**Harry G. Lang**, Ed.D., University of Rochester—Associate Professor

**Charles A. Layne**, Ph.D., Ohio State University—Associate Professor

**Bonnie Meath-Lang**, Ed.D., University of Rochester—Associate Professor

**Robert F. Panara**, MS, New York University—Professor

**Donald G. Sims**, Ph.D., University of Pittsburgh—Associate Professor

**Joan B. Stone**, Ed.D., University of Rochester—Assistant Professor

**Ross E. Stuckless**, Ph.D., University of Pittsburgh—Professor

**Joanne D. Subtelny**, Ph.D., Northwestern University—Professor

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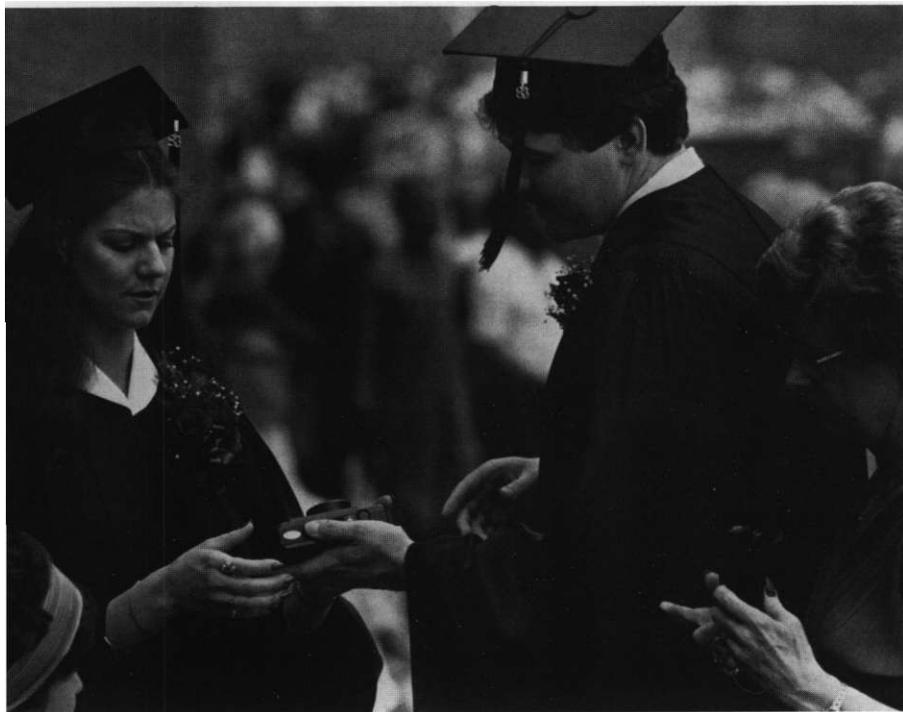
**Donald D. Baker**, BA, M. Ed., MBA, Ed. D., College of Continuing Education  
**Paul Bernstein**, BS, MA, Ph.D., Graduate Studies  
**James J. DeCaro**, BS, MS, Ph.D., National Technical Institute for the Deaf  
**Mark F. Guldin**, BS, MS, Ph.D., College of Graphic Arts and Photography  
**Robert H. Johnston**, BS, MA, Ph.D., College of Fine and Applied Arts  
**Richard A. Kenyon**, BME, MS, Ph.D., College of Engineering  
**Waite F. McCanna**, BS, Ph.D., College of Business  
**Dennis C. Nystrom**, BS, Ed.D., College of Applied Science and Technology  
**John D. Pallouras**, BA, MA, Ph.D., College of Science  
**Mary Sullivan**, BA, MA, Ph.D., College of Liberal Arts

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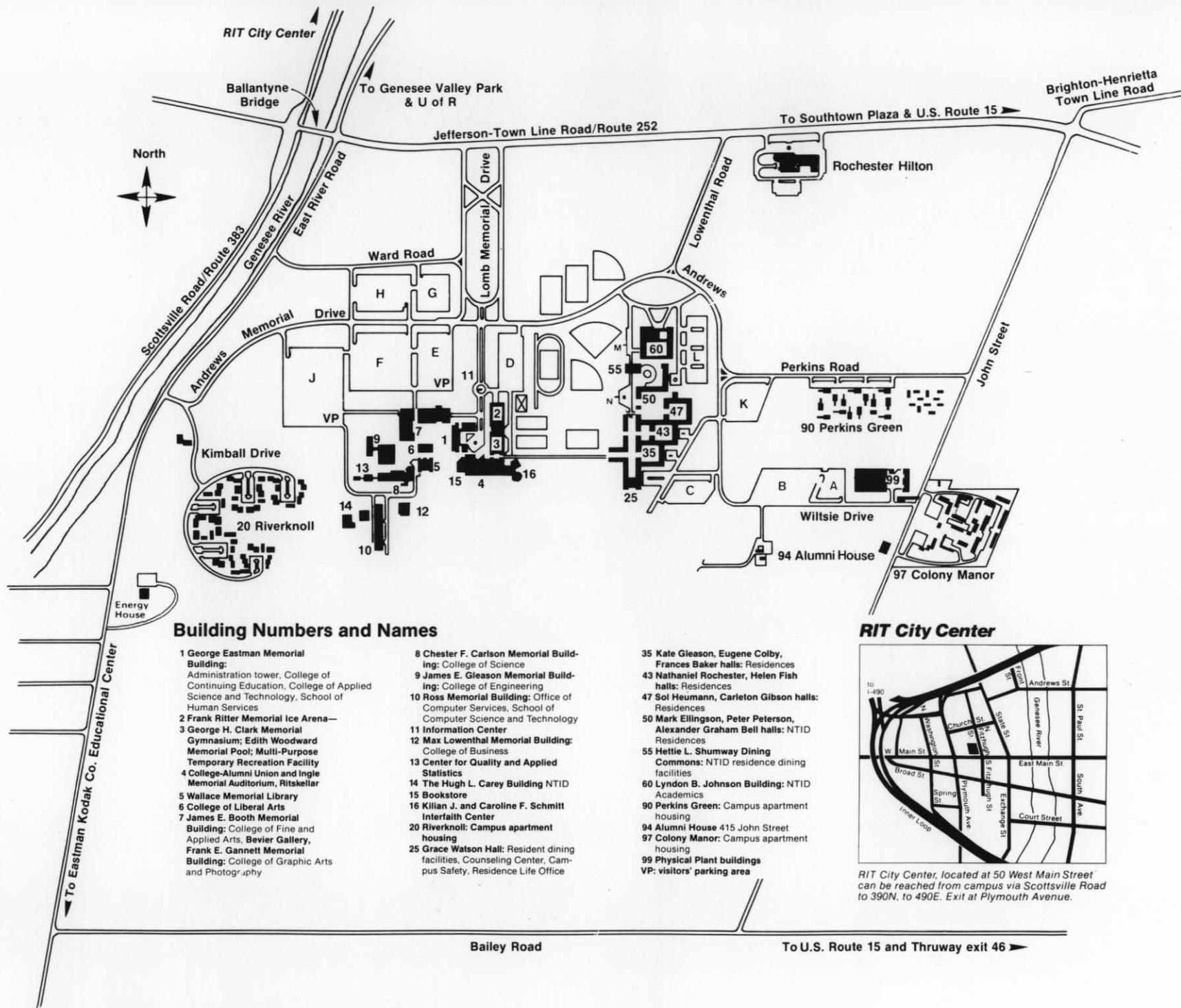
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**'Lucius R. Gordon**, Retired Chairman of the Board, Mixing Equipment Co., Inc. (a unit of General Signal Corporation)  
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**John D. Hostutler**, President, Industrial Management Council  
**Frank M. Hutchins**, Chairman of the Board, Hutchins/Young & Rubicam; Past Chairman, Board of Trustees, Rochester Institute of Technology

**'Stanley R. Jacobs**, Former Member, New York Stock Exchange  
**Herbert W. Jarvis**, President and Chief Executive Officer, Sybron Corporation  
**Paul C. Jenks, M.D.**, Physician  
**Byron Johnson**, Senior Partner, Johnson, Mullan, Brundage & Keigher, P.C.  
**'John Wiley Jones**, Chairman of the Board, Jones Chemicals, Inc.  
**Thomas F. Judson, Jr.**, President and Chief Executive Officer, John B. Pike & Son, Inc.  
**'Thomas F. Judson, Sr.**, Chairman of the Board, John B. Pike & Son, Inc.  
**'Arthur M. Lowenthal**  
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**'Russell C. McCarthy**, Retired Manager, Industrial Management Council  
**\*J. Warren McClure**, President, McClure Media Marketing Motivation Co.  
**\*C. Peter McColough**, Chairman of the Board, Xerox Corporation  
**'Paul Miller**, Former Chairman of the Board, Gannett Co., Inc.  
**Mrs. Edward T. Mulligan**  
**'Raymond E. Olson**, Retired Vice Chairman of the Board, Sybron Corporation  
**Frederick G. Ray**, Retired Chairman of the Board, Rochester Community Savings Bank  
**Ernest I. Reveal**  
**Jorge A. G. Rivas**, Presidente, Grupo RIMA, S.A. de C.V.  
**M. Richard Rose**, President, Rochester Institute of Technology  
**Harris H. Rusitzky**, Treasurer, Board of Trustees, Rochester Institute of Technology; President, Serv-Rite Food Service & Consulting Corporation  
**'Killian J. Schmitt**  
**'John E. Schubert**, Former President, Chairman and Chief Executive Officer, The Community Savings Bank  
**James E. Shapiro**, Vice President, Xerox Corporation  
**'F. Ritter Shumway**, Honorary Vice Chairman, Board of Trustees, Rochester Institute of Technology; Honorary Member of the Board, Sybron Corporation  
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**Ronald A. White**, President, Graphic Systems Division, Rockwell International Corporation  
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**Kenneth W. Woodward, M.D.**, Manager, Clinical Services, Xerox Corporation  
**'Member of Honorary Board**  
**\*Ex Officio Member; Chairman, National Alumni Council**



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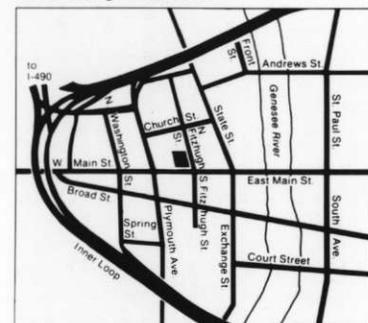
### Building Numbers and Names

- 1 **George Eastman Memorial Building:** Administration tower, College of Continuing Education, College of Applied Science and Technology, School of Human Services
- 2 **Frank Ritter Memorial Ice Arena—**
- 3 **George H. Clark Memorial Gymnasium; Edith Woodward Memorial Pool; Multi-Purpose Temporary Recreation Facility**
- 4 **College-Alumni Union and Ingle Memorial Auditorium, Ritskeller**
- 5 **Wallace Memorial Library**
- 6 **College of Liberal Arts**
- 7 **James E. Booth Memorial Building:** College of Fine and Applied Arts, **Bevier Gallery, Frank E. Gannett Memorial Building:** College of Graphic Arts and Photography

- 8 **Chester F. Carlson Memorial Building:** College of Science
- 9 **James E. Gleason Memorial Building:** College of Engineering
- 10 **Ross Memorial Building:** Office of Computer Services, School of Computer Science and Technology
- 11 **Information Center**
- 12 **Max Lowenthal Memorial Building:** College of Business
- 13 **Center for Quality and Applied Statistics**
- 14 **The Hugh L. Carey Building** NTID
- 15 **Bookstore**
- 16 **Kilian J. and Caroline F. Schmitt Interfaith Center**
- 20 **Riverknoll:** Campus apartment housing
- 25 **Grace Watson Hall:** Resident dining facilities, Counseling Center, Campus Safety, Residence Life Office

- 35 **Kate Gleason, Eugene Colby, Frances Baker halls:** Residences
- 43 **Nathaniel Rochester, Helen Fish halls:** Residences
- 47 **Sol Heumann, Carleton Gibson halls:** Residences
- 50 **Mark Ellingson, Peter Peterson, Alexander Graham Bell halls:** NTID Residences
- 55 **Hettie L. Shumway Dining Commons:** NTID residence dining facilities
- 60 **Lyndon B. Johnson Building:** NTID Academics
- 90 **Perkins Green:** Campus apartment housing
- 94 **Alumni House** 415 John Street
- 97 **Colony Manor:** Campus apartment housing
- 99 **Physical Plant buildings**
- VP: **visitors' parking area**

### RIT City Center



RIT City Center, located at 50 West Main Street can be reached from campus via Scottsville Road to 390N, to 490E. Exit at Plymouth Avenue.



**Rochester Institute of Technology**

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