

R·I·T



*G R A D U A T E   S T U D Y / ' 8 6*



# Rochester Institute of Technology

## Calendar 1986-87

	Graduate Registration	No Classes	Non-Matriculated Student Registration	Classes Begin Day Colleges	Exam Week	Last Day of Quarter
Fall Quarter	Sept. 4,5	Nov. 22-29	Sept. 8	Sept. 8	Nov. 17-20	Nov. 21
Winter Quarter	Dec. 1	Dec. 21-Jan. 5 Feb. 24 (day) Mar. 1-8	Dec. 2	Dec. 2	Feb. 25-28	Feb. 28
Spring Quarter	March 9	May 24-28	March 10	March 10	May 19-22	May 23





*On the cover:* Computer pixelization by Rob Aronson, printing technology graduate student, on the Scitex Response 350 Imager. Original photography by RIT photographers James Cyostelein, John Danicic and Sue Weisler.

#### 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 1986-87**  
**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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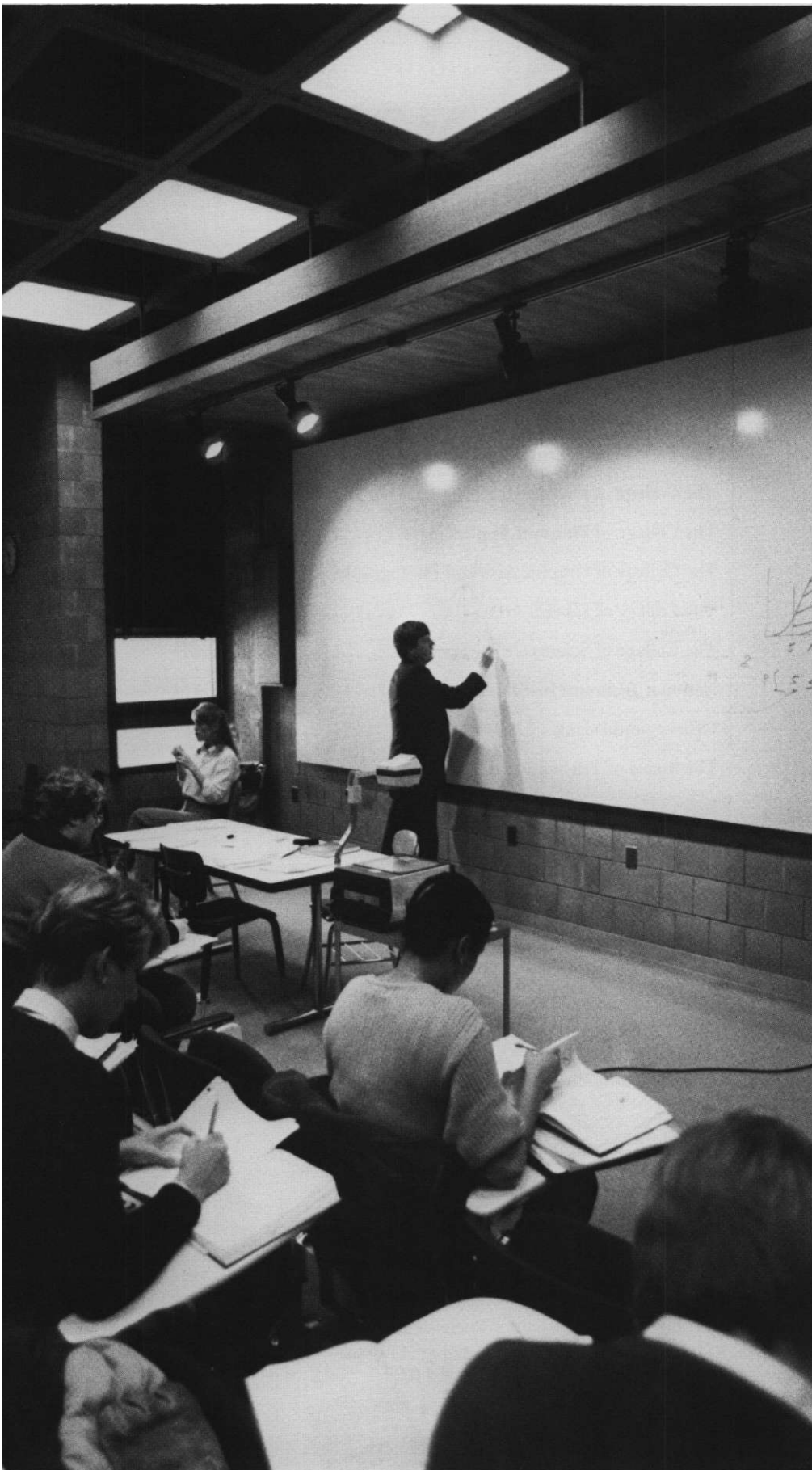
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# About RIT



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 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.

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 Management and Sciences introduced a graduate program in January 1969 leading to the MS degree.

Recent additions to the list of graduate degree programs now available include the MS in School Psychology, the MS in Color Science, Appearance, and Technology and the Advanced Certificate in Electronic and Optical Storage Applications.



The Department of Instructional Technology has developed an MS degree program 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 MS 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
College of Applied Science	Master of Science	Computer Science Instructional Technology Packaging Science	0701 0699 4999	18
College of Business	Master of Business Administration	Business Options Listed on page 36	0506	35
College of Continuing Education	Master of Science	Applied and Mathematical Statistics Cooperative Program Summer Program Career and Human Resource Development	1702  0826	46
College of Engineering	Master of Science  Master of Engineering	Electrical Engineering Mechanical Engineering Materials Science and Engineering**  Engineering (EC, EE, ME, IE)	0909 0910 0915  0901	52
College of Fine and Applied Arts	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	69
College of Graphic Arts and Photography	Master of Science  Master of Science  Master of Science  Advanced Certificate Master of Fine Arts	Printing Technology  Color Science, Appearance, and Technology  Imaging and Photographic Science  Electronic and Optical Storage Applications Photography	0699  1099  1011  0699 1011	80
College of Science	Master of Science	Chemistry Clinical Chemistry Materials Science and Engineering**	1905 1223 0195	103
National Technical Institute for the Deaf	None	Educational Specialists for the Deaf		114
College of Liberal Arts	Master of Science	School Psychology	0826.02	98

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.

\*Higher Education General Information Survey

\*\*Joint program of Colleges of Engineering and Science



# 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 imaging science and photography. 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 development 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.

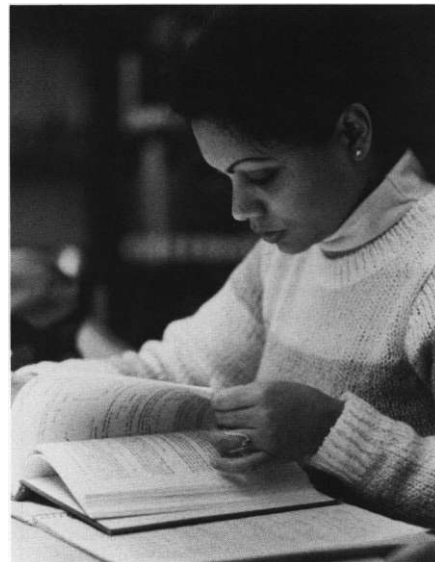
Graduate programs at RIT help students understand the conceptual structure and organization of knowledge of their chosen programs. Such an understanding is a necessity if our graduates are to cope with the accumulation of knowledge and technological change in the professions. These programs provide the 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 also 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, RO. Box 9887, Rochester, New York, 14623-0887.
2. The Admissions Office will acknowledge 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 informally 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. This policy took effect on September 1, 1984.

F. 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.

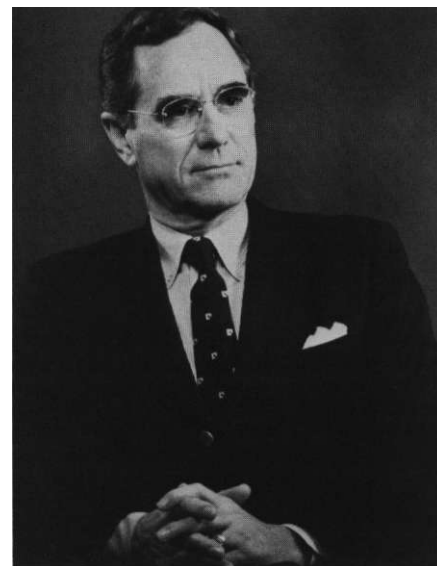
In certain cases graduate students may be admitted prior to, but conditional on completion of, the baccalaureate degree. Applicants will not be considered for admission prior to the start of their final year of undergraduate study. The student must present a final transcript within one quarter after 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. 11) 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.

G. 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 programs specialized and diverse



*RIT President M. Richard Rose*

"RIT means access to the future for thousands of young people and adults seeking a quality career education," 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 followed," 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)—  
\$2721/quarter

Part-time (11 credit hours or less)—  
\$231/credithour

Master of Science (CCE)—\$231/credit hour  
Internship\*—\$86/credit hour

In addition, any graduate student carrying over 18 credit hours of study will be charged the full-time tuition rate plus \$231/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 19, 1986;  
Winter Quarter, November 12, 1986;  
Spring Quarter, February 17, 1987;  
Summer Quarter, May 7, 1987.

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 1986-87 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 the first week of classes—90% tuition reduction

During the second week of classes—75% 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 Dian Miller in the graduate studies office (475-2337).

In addition, RIT Graduate Scholarships will be offered in 1986-87 in the colleges of Fine and Applied Arts, Continuing Education (applied statistics), Graphic Arts and Photography, College of Liberal Arts, Science, Applied Science and Technology, Engineering and Business. Additional funds are available for minority applicants. For information, write or call the graduate studies office (475-2337).

## 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.

## 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. 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 require-

ments 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 from the appropriate departmental officer or dean.

### **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 other 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 departmentally 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.

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:

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

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. 11 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.

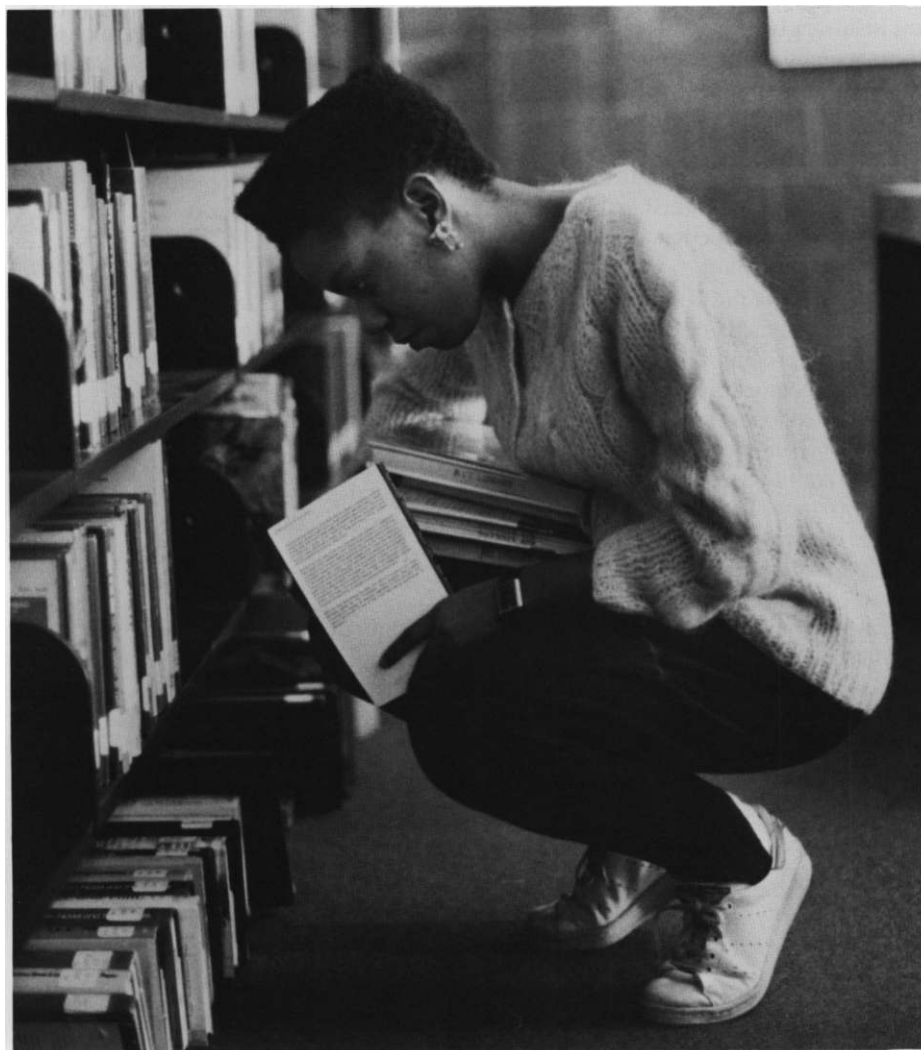
The Audiovisual Service Department houses a collection of nearly 400 films and provides materials, equipment, and assistance for classroom instruction. Approximately 3,500 films are shown in classrooms each year.

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 pre-school and kindergarten programs for the children of students, faculty, and staff. For complete information, call (716) 425-844.

### **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.

### **Office of Cooperative Education and Placement**

RIT's particular philosophy is called career education—and the Office of Cooperative Education and Placement 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 Placement Office helps the student gain an edge over the competition when graduation arrives.

Graduates, co-op students and alumni find the services of the Office of Cooperative Education and Placement 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 office provides these services to students at no fee. All students approaching graduation are encouraged to attend one of the many orientation sessions and register for use of all services during the important job-search period. Graduate students often seek their counselors early in the graduate program. Those students know that the employer seeking qualified graduates with an advanced degree contacts the office for job listings and interviews with graduate students. The Office of Cooperative Education and Placement is committed to linking RIT students to career experiences and to career entry upon graduation.

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.

### **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.

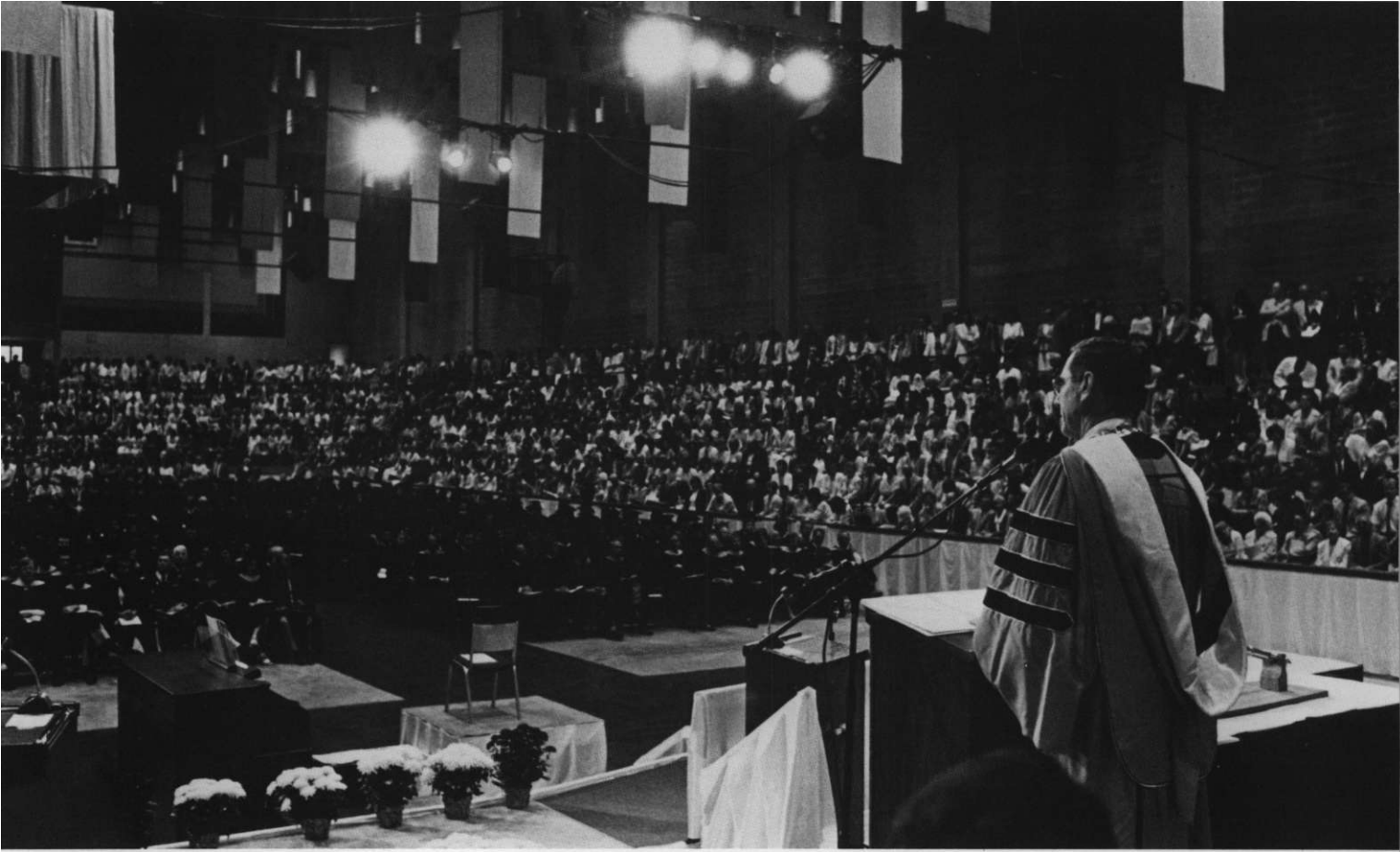
Questions about Student Health Service or health insurance should be directed to the office (475-2255).

**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

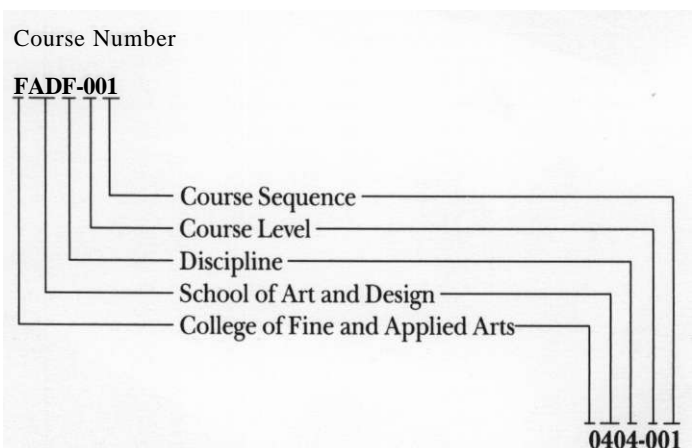
**Second and third letters:** School or department of that college

**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

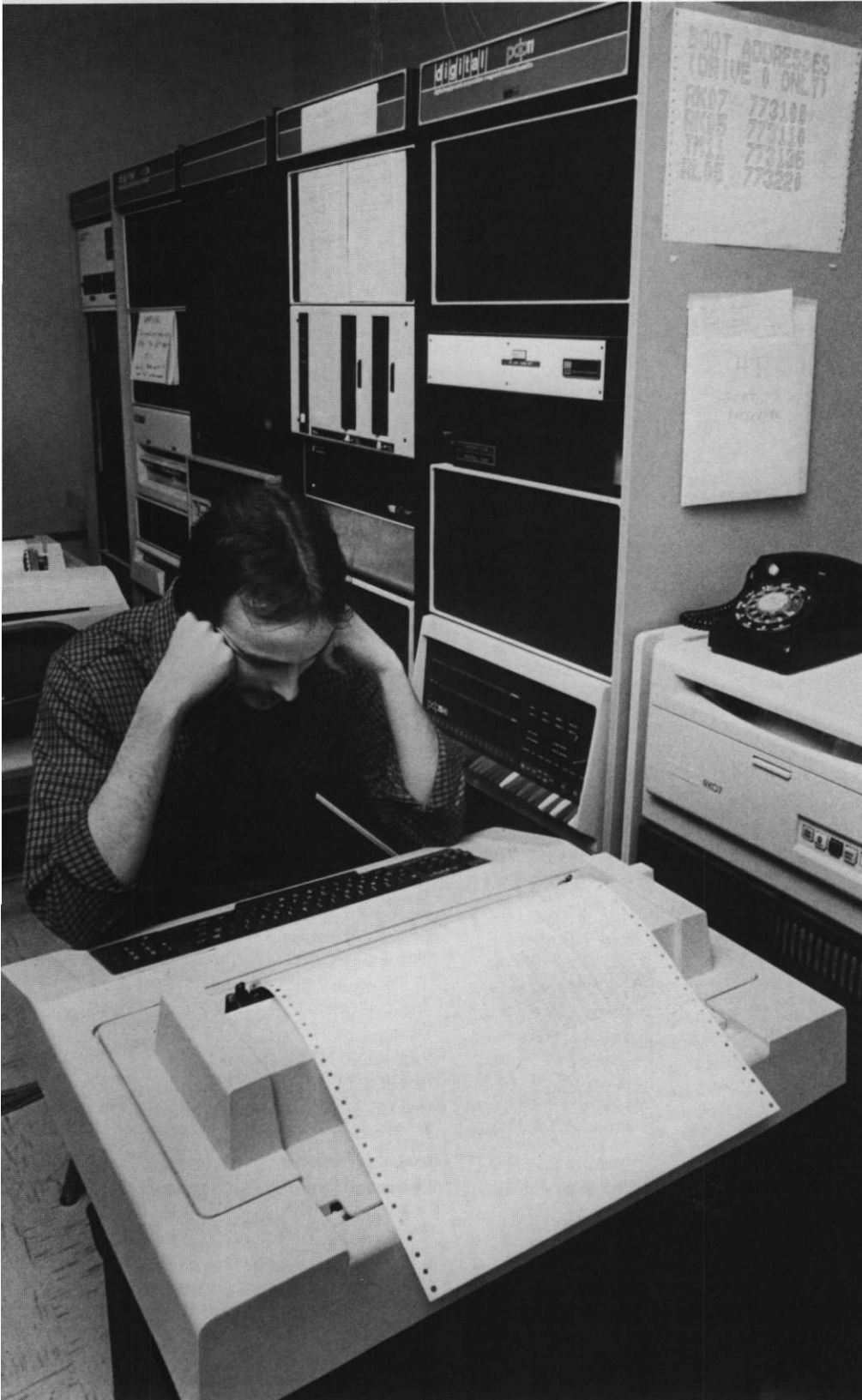
Directly below the alpha-numeric in the course description is the **registration number**. You must use this number with a section number (i.e., 01,02) when you register for a course, because the alpha-numeric cannot be read by the computer system. Course prerequisites are shown in parentheses after course descriptions.



Registration Number



# 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 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 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 and health sciences education. 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 taken as a full- or part-time student. 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 education 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 taken as a full- or part-time student. 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.

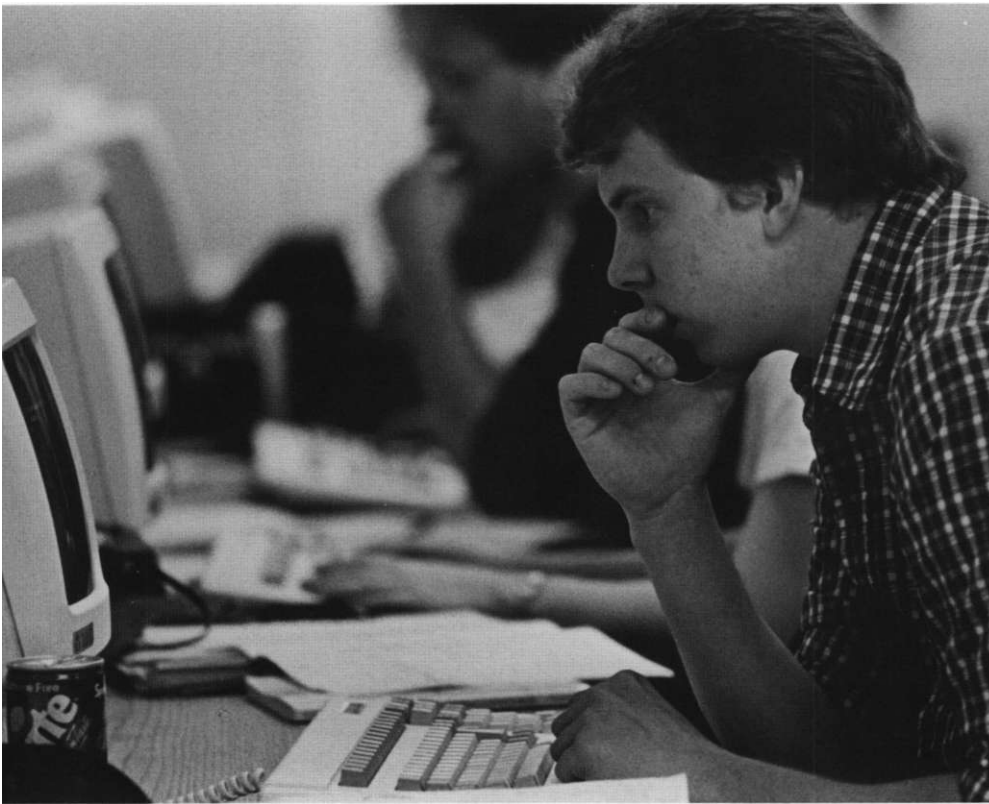
### **Computer Facilities**

RIT's main computing system is a network of six 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:

- four 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 64 ports and 12MB 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.

A 1985 Xerox Corporation grant added the following equipment to the department: five advanced 8014 Xerox Dandelion work stations; a print server; and a file server. This equipment and the Pyramid are connected by Ethernet to other campus computing facilities.

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 con-

sidered 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  
Probability and 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 ICSA-705 or SMAM-265

#### *Computing*

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

#### *Alternative intensive courses*

Programming ICSA-701  
(combined ICSA-700 and 703)  
Programming H ICSA-702  
(combined ICSA-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 Com-

puter Science as electives (e.g. Science, Engineering, or Business). The following courses are typical computer science electives:

ICSS-610 EDP Auditing  
 ICSS-721 Microcomputers & Micro-processors  
 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

Scholarships and 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 14623-0887

## Department of Instructional Technology

**Clint Wallington, Director**

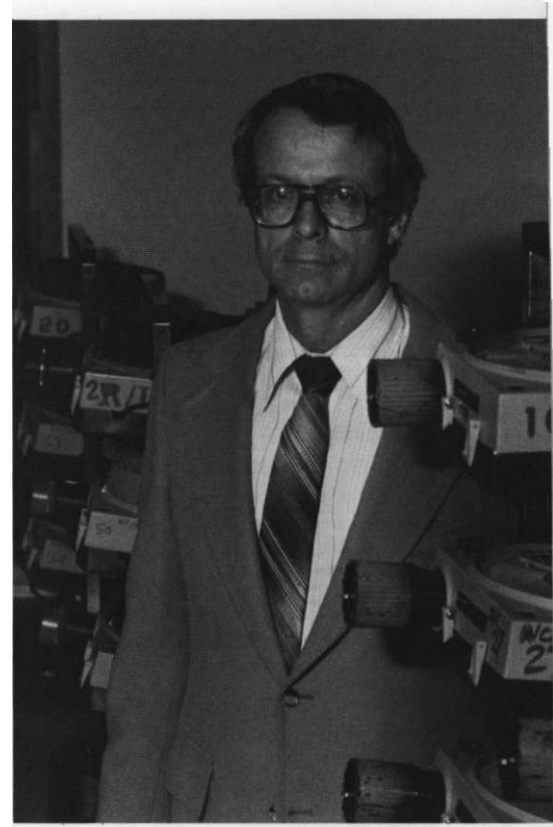
Instructional Technology... a name still not completely understood by many who use it. Instructional Technology... a name with different meanings in different circles. Instructional Technology... only an idea 20 years ago, but a reality now.

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 audiovisual 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. Qualified students may also elect to take one of two options—or not to take an option. The two options currently available are Training and Development and Health Science.

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 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.

### 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, 29 are in 9 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 19 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.

Required Core Courses	Credits
ICIT 700 Introduction to Instructional Technology	2
ICIT 735 Psychology of Learning and Teaching	4
ICIT 750 Instructional Development I	4
ICIT 751 Instructional Development II	4
IJCC 753 Group Dynamics for Career Development	4
ICIT 755 Criterion Referenced Instruction and Technical Training I	3
ICIT 756 Criterion Referenced Instruction and Technical Training II	3
ICIT 770 Interpersonal Communications	2
IJCC 749 Manpower Forecasting Fundamentals	3
OR	
ICIT-780 Selected Topics _____	3
Total Required Core	29

### Training and Development Option (10 Hours)

ICIT 721 Evaluation of Training and Instruction	4
ICIT 736 Interviewing, Counseling, and Coaching in Training	3
OR	
ICIT 757 Techniques of Work Analysis	3
ICIT 758 Developing Instructional Modules	3
<b>Health Sciences Option (14 hours)</b>	
ICIT 721 Evaluating Training and Instruction	4
ICIT 736 Interviewing, Counseling, and Coaching in Training	3
ICIT 758 Developing Instructional Modules	3
ICIT 765 Individual Learning Styles Analysis	4



## Department of Career and Human Resource Development\*

*\*The program is scheduled for transfer to the College of Continuing Education.*

**Dorothy Paynter**, 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 28- to 29-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 man-

power 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 formal 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.

Students are relatively free to choose the electives they feel best meet 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 (IJCC-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 Courses</b>	<b>Credits</b>
IJCC 742 Career Decision Making Concepts	4
IJCC 744 Career Concepts: Work Fields	4
IJCC 748 Information Use in Career Planning	4
IJCC 749 Strategy, Technology, and Futuring in Human Resource Development	3
IJCC 760 Career Counseling Skills	4
BBUB 740 Organizational Behavior	4
CQAS 712 Fundamentals of Statistics II	3-4
OR	
BBUQ 782 Applied Statistical Analysis	4
IJCC 777 Career Development Project (minimum 2 hrs.)	2
<b>Total Required Core</b>	<b>28-29</b>

### Concentrations

A Student *must* choose one of the two concentrations (HRD or Career Education) and meet the requirements for that concentration.

### Human Resource Development

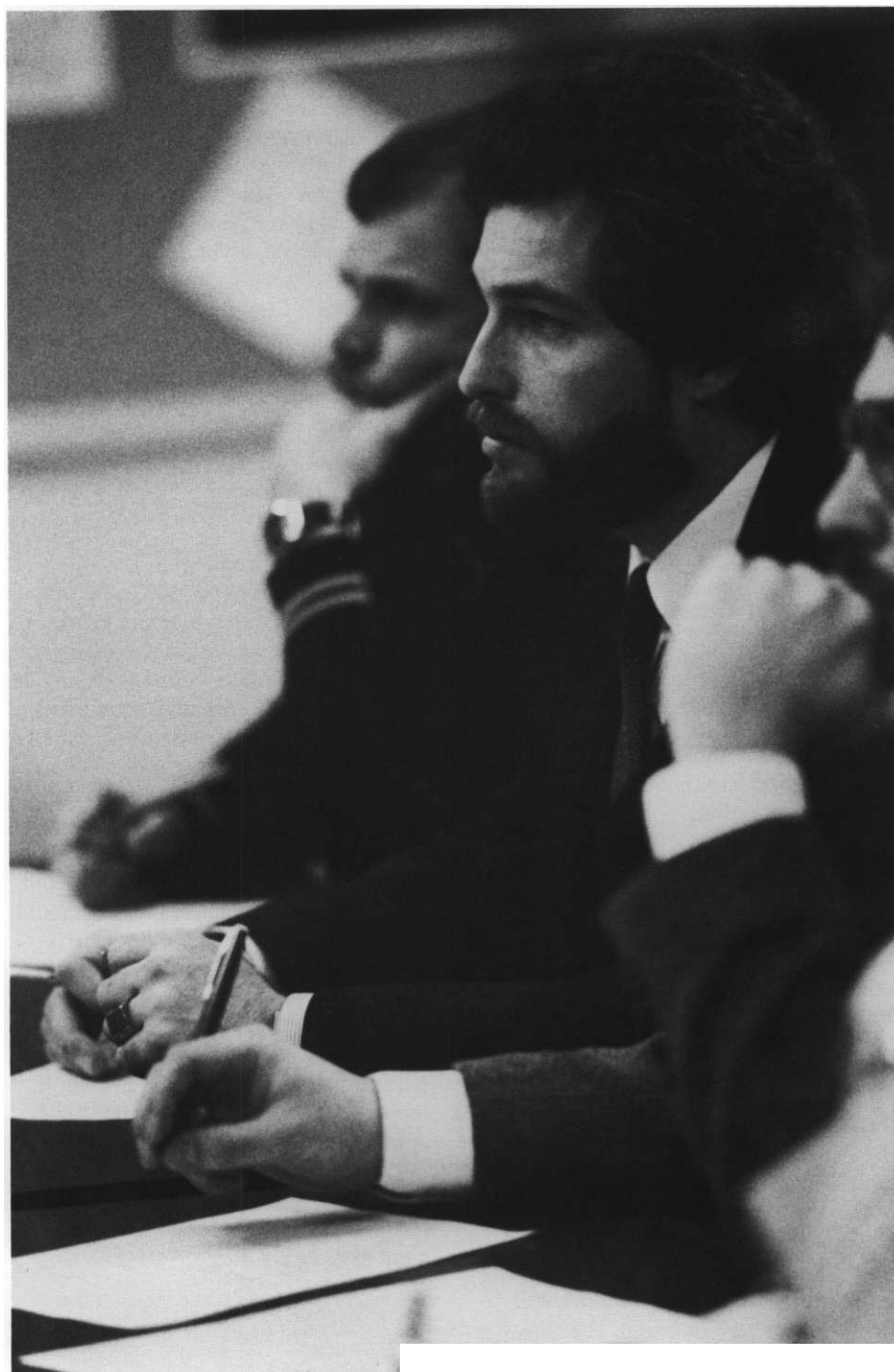
<b>Concentration (16 hours)</b>	<b>Credits</b>
BBUB 741 Organization and Management	4
BBUB 748 Employee and Labor Relations	4
BBUB 750 Personnel Systems	4
BBUB 755 Compensation and Reward Systems	4
OR	
BBUB 756 Conflict Management and Negotiation Skills for Managers	4
OR	
BBUB 746 Management and Career Development	4

### Career Education Concentration

<b>(12-13 hours)</b>	<b>Credits</b>
IJCC 743 Education/Business/ Industry Interrelationships	3
IJCC 753 Group Dynamics for Career Development	4
ICIT 770 Interpersonal Communications	2
ICIT 757 Techniques of Work Analysis OR	3
ICIT 765 Individual Learning Styles Analysis	4

### Other Suggested Electives

BBUB 742 Technology, Business and Society	4
ICIT 721 Evaluation of Training and Instruction	4
Additional courses, especially those from the College of Business or the Department of Instructional 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, Rigid Containers, Flexible Containers, 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 Advanced 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.

## 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 Computer Science and Technology, 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, Professor

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

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

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

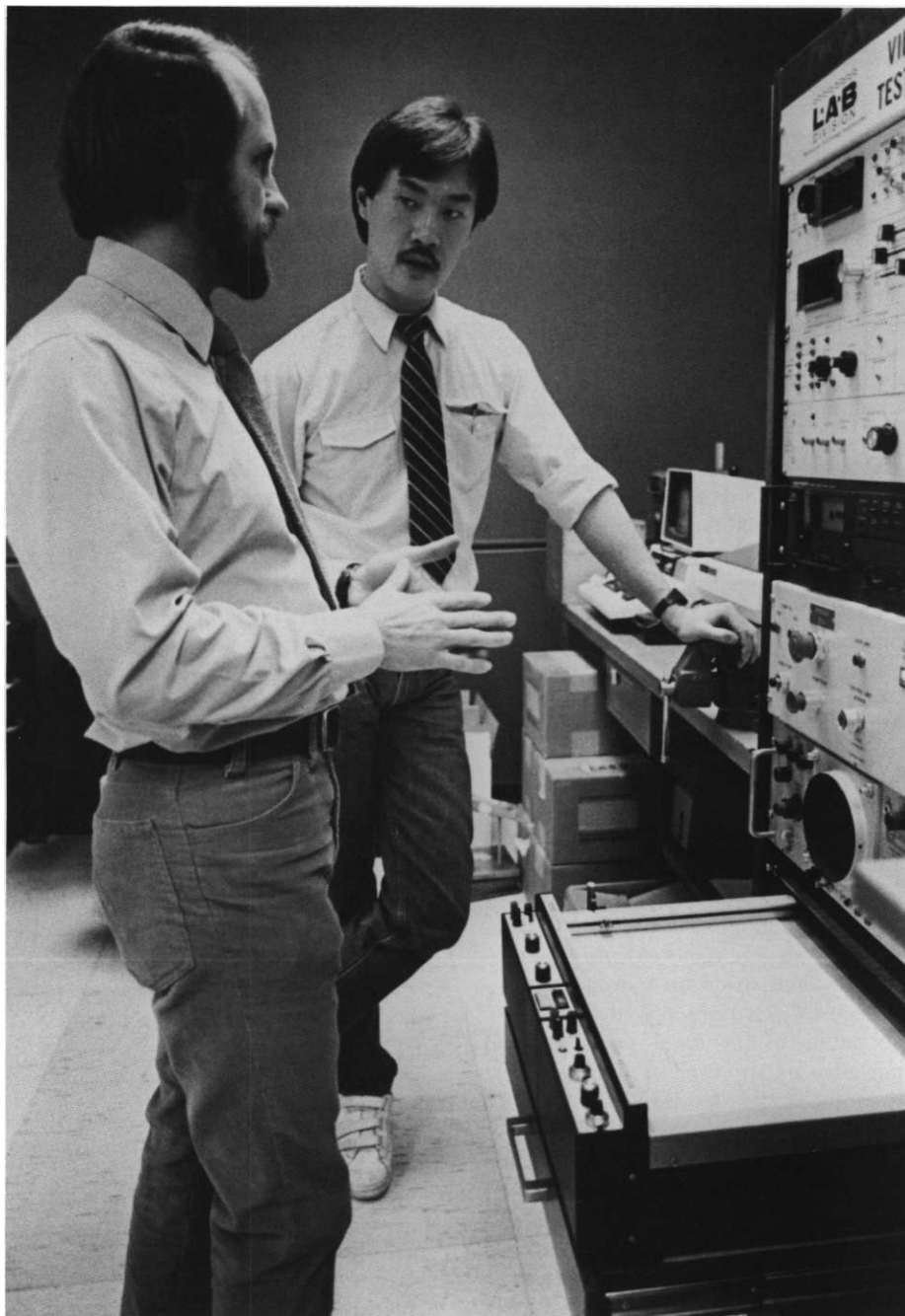
**Roy Czernikowski, Ph.D.**, Rensselaer Polytechnic Institute—Chairman, Computer Engineering Department, Professor

**H. Kevin Donaghy, Ph.D.**, University of Toronto—Visiting Assistant Professor

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

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

**Gordon Goodman, MS**, Rochester Institute of Technology—Assistant Professor



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

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

**Daryl Johnson, MS**, Rochester Institute of Technology—Instructor

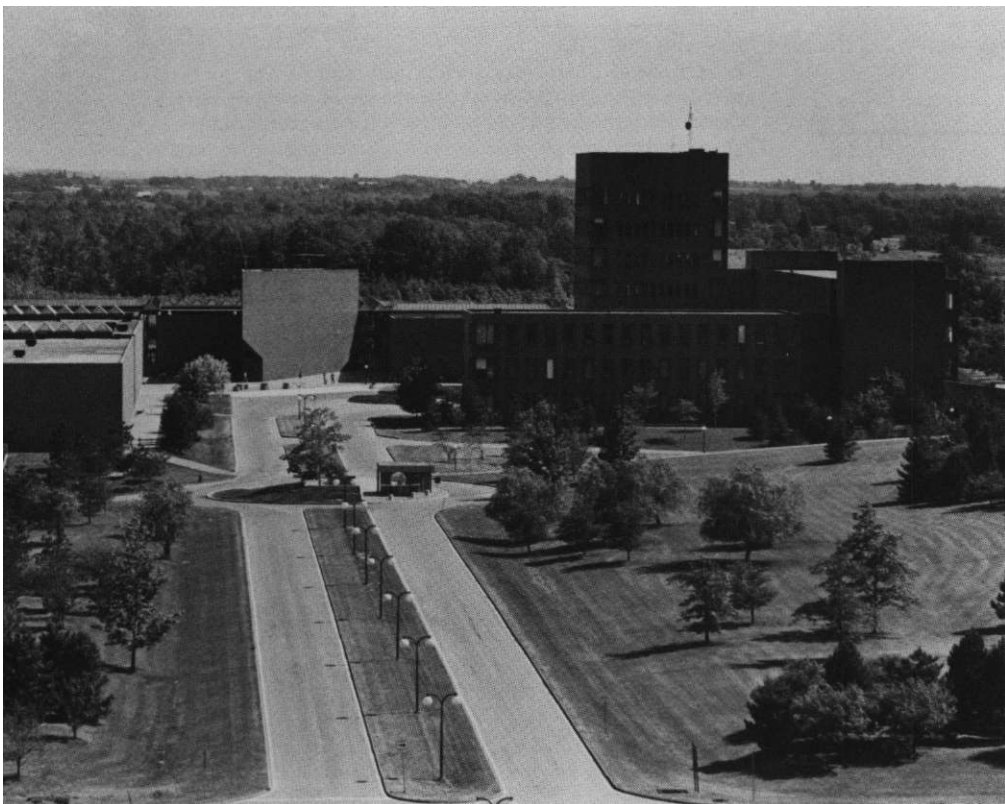
**Guy Johnson, MS**, Syracuse University—Chairman, Department of Applied Computer Studies, Professor

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

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

**Steve Kurtz, MFA**, Rochester Institute of Technology—Instructor

**Jeffrey Lasky, MBA**, City University of New York—Associate Professor



**Michael J. Lutz**, MS, SUNY at Buffalo—Associate Professor

**Peter Lutz**, Ph.D, SUNY at Buffalo—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—Chairman, Undergraduate Computer Science, 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—Assistant Professor

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

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

**Teiji Furugori**, Ph.D., University of Buffalo

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

**Alan R. Kaminsky**, MS, University of Michigan

**Mary Kilmer**, MS, Rochester Institute of Technology

**Narayan Kulkarni**, MS, Rochester Institute of Technology

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

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

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

**Jacqueline Vandellon**, MS, Rochester Institute of Technology

### **Department of Instructional Technology**

**Clinton J. Wallington**, Ph.D., University of Southern California—Professor

**Sandra L. Modlin**, MS, Rochester Institute of Technology—Instructor

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

### **Adjunct Faculty**

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

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

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

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

### **Department of Career and Human Resource Development**

**Clinton J. Wallington**, Ph.D., University of Southern California—Professor

**Donald D. Baker**, Ed.D., University of Rochester—Associate Professor

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

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

### **Adjunct Faculty**

**Gladys Abraham**, MS, SUC Brockport

**Gaillard Ashley**, Ph.D., Syracuse University

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

**Mahlon Gebhardt**, M.Ed., Lehigh University

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

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

### **Department of Packaging Science**

**David L. Olsson**, Ph.D., Michigan State University—Director, Professor

**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

# School of Computer Science and Technology

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.

## Applied Computer Studies

### ICSA-700 Computer Programming and Problem Solving

#### Registration #0602-700

An introductory course in the use of computers, interactive environments, file systems, editor. Programming in a modern software development with a structured programming language such as Pascal or Ada, covering: control structures, procedures and functions, recursion, arrays, pointers, file I/O, records. Application areas cover: numerical methods, sorting and searching, graphics, text processing. Programming projects will be required. (Pre-calculus)  
Credit 4

### ICSA-701 Programming I

#### Registration #0602-701

Fundamentals of computer programming and problem solving using a modern software development environment and a structured programming language (Pascal or Ada). Introduction to and use of an interactive editor and file system. Applications in business, science, mathematics, engineering, education, systems programming, and graphics will be covered. Techniques will be introduced for data representation and structuring, sorting, and searching. Programming projects will be required. (Computer literacy, pre-calculus; discrete math, is a corequisite.)  
Credit 8

### ICSA-702 Programming II

#### Registration #0602-702

The concept of computer programming at various levels of application. At a lower level is a macro assembly language. At a higher level, a new language—APL, Snobol, etc. Combining program segments in a known high-level language. Modern programming practices, tools and techniques from the point of view of the software life-cycle: specification, design and prototyping, coding and verification, integration, and maintenance. A study of a programming language (e.g., ADA) and a software engineering environment (e.g., Unix) that supports these programming practices. Programming projects will be required. (ICSA-701 or equivalent)  
Credit 8

### ICSA-703 Algorithms and Data Structures

#### Registration #0602-703

Topics include data abstraction, data representation, data structures, such as linked lists, trees, stacks, queues, hash tables, sparse matrix techniques, searching and sorting techniques, file structure and maintenance. Programming projects will be required. (Programming proficiency in some high-level structured programming language, discrete mathematics)  
Credit 4

### ICSA-704 Assembly Language Programming

#### Registration #0602-704

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. (ICSA-700, 701 or a programming proficiency in some high-level language.)  
Credit 4

### ICSA-705

### Discrete Computational Structures

#### Registration #0602-705

The fundamental concepts of discrete mathematics which are necessary for understanding the mathematical foundations of computer science. Topics include: structures defined on countable sets elementary symbolic logic, patterns of mathematical proof, vectors and matrices, graphs and networks, combinatorics, formal languages, abstract mathematical systems. The relevance of the chosen topics to Computer Science and the applications of computers to these topics are stressed. (College algebra, computer literacy)  
Credit 4

### ICSA-707

### Advanced Programming

#### Registration #0602-707

An introductory course in the life-cycle issues of large and single/multi-programmer programs. Structured and modular programming, data abstraction and information hiding. The Chief programmer concept. Specific focus on modern programming practices (specification, design and prototyping, coding and verification, integration and maintenance) and tools (software engineering environments such as Unix and software engineering languages such as ADA). Programming projects will be required. (ICSA-703)  
Credit 4

### ICSA-708

### Computer Organization and Programming

#### Registration #0602-708

An introduction to the basic concepts and terminology of hardware and software systems. Basic hardware is elementary circuit design—gates, Boolean algebra, simple combinational circuits (adders, decoders, multiplexers) and simple sequential circuits (various flip-flops, registers, serial adders, counters). The Operating System as the major software providing a "virtual" interface—virtual memory (paging, segmentation, etc.), file systems, multiprogramming, traps and interrupts, etc. The intent of this course is to prepare the student for future courses in computer architecture and operating systems. Programming projects will be required. (ICSA-704, ICSA-703, ICSA-707)  
Credit 4

### ICSA-890

### Graduate Seminar in Applied Computer Studies

#### Registration #0602-890

Current topics and advances in applications of computer technology for graduate students. (Permission of instructor)  
Credit 2-4

### ICSA-899

### Independent Study

#### Registration #0602-899

Faculty directed study of appropriate topics to a tutorial basis. This course may be used by a graduate student to study particular applications of computers that are not covered in depth in other courses. (Permission of instructor)  
Credit 24

## Graduate Computer Science

### 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 compatibility and algorithmic complexity. (ICSA-705, ICSA-703)  
Credit 4

### ICSS-709

### Programming Language Theory

#### 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 elected will include examples of string processing, applicative, systems programming, and concurrent languages. Programming projects will be required. (ICSA-702 or equivalent)  
Credit 4





**ICSS-802****Software Engineering Laboratory****Registration #0603-802**

A projects course in applied software engineering with emphasis on the use of software based engineering tools. Available tools include Higher Order Software's specification and code generation system and Stanford University's WEB, an integrated programming and documentation system. Students work in small teams on software development projects. Programming projects will be required. (ICSS-801)

Credit 4

**ICSS-809****Operating Systems I****Registration #0603-809**

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

Credit 4

**ICSS-810****Operating Systems II****Registration #0603-810**

A laboratory practice course, Operating Systems II is designed to provide the student with practical experience in implementing many of the motions discussed in Operating Systems I. The class, with the instructor serving primarily as a technical advisor, designs the kernel of a small operating system in class in the first 2-3 weeks. This kernel is module tested and downloaded to a standalone processor and test run until it is debugged. Then students form into groups of 3-5 persons each and choose a project to pursue, which involves implementing additional features of the operating system. Typical projects are: file systems, memory management, scheduling, and interprocess communications. Programming projects will be required.

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****Text Storage and Retrieval Systems****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 while-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 variable 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 variable 4-8

**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 1-8

## 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.

**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 package 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 Advanced 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 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)

## Department of Instructional Technology

**ICIT-700 Introduction to Instructional Technology****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. 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 reports and conference proceedings, catalogues and commercial information, and automated information systems. Interpreting recent copyright changes is also covered. Actual search problems are given and an information search project is required.

Credit 3

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

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

Credit 4

**ICIT-712 Computer Assisted 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 preparing all technical and user documentation. The course incorporates the principles of ICIT-712 (CAI-1) and ICIT-713 (CAI-2). Major project required. (ICIT-712, 713, 750, 755, 756, media design skills)

Credit 4

**ICIT-715                      Instructional Television****Registration #0613-715**

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

Credit 4 (offered on demand)

**ICIT-720                      Research in Instructional 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 interest 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

**ICIT-736                      Interviewing, Counseling, and Coaching in Training****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 or job counseling. Includes methods of interaction to maintain communications and to shape behavior. (ICIT-735, 770 or concurrently)

Credit 3

**ICIT-745                      Instructional Facility Design****Registration #0613-745**

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

Credit 4

**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 in****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 of 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**

A two-course sequence which applies the principles of instructional development specifically to those areas of training in which performance criteria can be precisely stated and accurately measured. Such training usually tends to be in technical skill areas where procedures or product are predetermined or can be clearly specified. The course is largely self-paced and self-instructional and the student must complete a project in the technical training area. Required for graduation.

Credit 3

**ICIT-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. Required for graduation.

Credit 3

**ICIT-757****Techniques of Work Analysis****Registration #0613-757**

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

Credit 3

**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-759****Technical Writing for Instructional Developers****Registration #0613-759**

This course introduces instructional developers to the process of writing technical manuals and reports. Includes an overview of the production process, content and audience analysis, information layout. Two major writing projects and other exercises required. (Writing skills, ICIT-700, 755, 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 Styles 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, 751, 757, 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. This course or IJCC 749, Manpower Forecasting Fundamentals, required for graduation. (30 hours course work)

Credit 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-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 3

**IJCC-744****Career Concepts: Work Fields****Registration #0615-744**

This course provides the human resource specialist and the career educator with an overview of three major areas of work: production, commerce, and services. The course is organized to compare the kinds of employment and employees needed in each area along with the area's career possibilities. The course includes sources of information about various career fields and career paths.

Credit 4

**IJCC-748****Information Use in Career Planning****Registration #0615-748**

This course is designed to evaluate and use the different information sources available for career advising and career planning. This includes the role of assessment instruments, career and job data bases, and the different formats in which the information is stored and can be retrieved. (CTAM 712, IJCC 742, IJCC 760, and 20 hours of course work)

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. (20 hours of course work)

Credit 3

**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-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 (14 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 course work)

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 course work)

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 specialized value. Proposals approved by director required prior to enrollment. (IJCC-742, IJCC-760, 20 additional hours of course work)

Credit variable (1-3 credits)



# College of Business

**Dr. Walter F. McCanna**, Dean  
**Dr. William Mihal**, 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. Cooperative education is a tradition at RIT, and the MBA program provides opportunities for students to alternate quarters spent in class and quarters spent at full-time work.

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 80 quarter credit hours (20 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 course work in business may reduce the number of courses required by successful completion of waiver examinations.

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 course work 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, NJ., 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, 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. Scholarships are administered through the dean of graduate studies, Paul Bernstein, who should be contacted by interested prospective students.

Other forms of financial aid such as fellowships, loans, and grants should be investigated through the Graduate Business 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 with 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, 80 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. Students have the responsibility of applying for transfer credit and waiver credit.



#### **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.

#### **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. Students are urged to pay careful attention to that policy.

#### **Program Scheduling**

Classes are scheduled weekday mornings and afternoons, Saturday mornings, and weekday evenings. Classes meet once a week, eleven times during the quarter, for sessions of 3 1/2 hours. Full-time students typically will take two regular day classes, and a third class from among the evening or Saturday offerings. 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. 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. All required courses are offered every quarter during the evening or on Saturday to facilitate scheduling by part-time students.

### Program completion

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

### Internship and co-op 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.

Co-op is another opportunity to alternate work and school experience. Formal recording of the co-op experience is made on the student's transcript. Faculty members approve co-op positions and evaluate student reports at the completion of each co-op. Co-op jobs are full-time, paid, and relate to the student's educational objectives.

### 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.

#### Quarter 1

BBUA-703 Accounting Concepts for Managers  
BBUB-740 Organizational Behavior  
BBUQ-780 Management Science  
BBUQ-781 Introduction to Statistics

#### Quarter 3

BBUF-721 Financial Management I  
BBUM-761 Marketing Concepts  
BBUQ-743 Operations Management

#### Quarter 5

Elective  
BBUQ-790 Information Systems  
BBUB-745 Business and Public Policy

#### Quarter 2

BBUQ-782 Applied Statistical Analysis  
BBUE-711 Microeconomics  
BBUB-741 Organization & Management

#### Quarter 4

Elective  
Elective  
BBUF-722 Financial Management  
BBUE-712 Macroeconomics

#### Quarter 6

Elective  
Elective  
BBUB-759 Integrated Business Analysis

### 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-781 Introduction to Statistics	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
	60

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

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

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**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 prior approval is obtained from the graduate office.

Free Electives 8

Total Hours 80

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 prerequisite requirements.*

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

### **CORPORATE ACCOUNTING OPTION**

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

Suggested electives:

BBUF-723 Theory of Finance

BBUF-724 Problems in Finance

Approved computer science courses

### **PUBLIC ACCOUNTING OPTION**

<b>Course Number and Title</b>	<b>Credit Hours</b>
*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
BBUA-810 Advanced Taxation Accounting	4
BBUB-730 Business Law I	4
BBUB-731 Business Law II	4
	36

\*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).

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

### **FINANCE OPTION**

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

#### **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**

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

#### **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**

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

#### **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**

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

#### **Group A**

BBUB-746 Management &

Career Development

BBUB-755 Compensation &

Reward Systems

BBUB-758 Seminar in

Management

## 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

**William L. Mihal**, Ph.D., University of Rochester; MS, Clarkson—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**, Ph.D., University of California at Irvine: MPA, Syracuse University—Assistant Professor, Management

**William A. Nowlin**, Ph.D., SUNY Buffalo; MPA SUNY Brockport—Assistant Professor, Management

**Karen Paul**, PhD., Emory University—Associate Professor, Management

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

**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

**Philip R. Tyler**, DBA, MBA, Michigan State—Associate 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

**Bruce Oliver**, Ph.D., University of Washington; MBA, University of Cincinnati—Professor, and Chairman

### Accounting Faculty

**Francis E. Kearns**, Ph.D., MBA, SUNY Buffalo, CPA—Assistant Professor, Accounting

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

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

**Daniel D. Tesson**, 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

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

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

**Ralph W. Sanders, Jr.**, Ph.D. SUNY at Buffalo; MS, University of Rochester—Assistant Professor, Finance



# 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 is 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 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-730

### Business Law I

#### Registration #0102-730

An introduction to law and ethical considerations in the areas of contracts, creditors rights, agency, partnership, corporations, bailments, and international law in a global economy.

Credit 4

## BBUB-731

### Business Law II

#### Registration #0102-731

Topics of business law with ethical considerations intended to help prepare students for the CPA exam. Topics from the Uniform Commercial Code include: sales, commercial paper and secured transactions, and personal and real property. Wills, trusts, and estates, liability of accountants, and international law are also discussed.

Credit 4

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

The importance of human behavior in reaching organizational goals. Course emphasis: managing individual and interpersonal relations; group and 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.

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, BBUE-710)

Credit 4

**BBUB-750****Human Resource Management****Registration #0102-750**

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

Credit 4

**BBUB-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, BBUB-721, BBUM-761)

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 aspect 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, comparative management, and small business information systems. The course topic for a specific quarter will be announced prior to the course offering. Although a seminar, the course may include some lectures and examinations. (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 and computer simulation are used extensively. Since this is a capstone course, the workload is considerably above average. (All other required courses)

Credit 4

**BBUB-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 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.

Credit 4

**BBUE-712****Macroeconomics****Registration #0103-712**

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

Credit 4

**BBUE-713****Advanced Microeconomic 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. (BBUA-703, BBUE-711, either BBUQ-782 or prior knowledge of calculus)

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.

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

Credit 4

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

A study of 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 interrelationships with other elements of the marketing mix. (BBUM-761)

Credit 4

**BBUM-769****Seminar in Marketing****Registration #0105-769**

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

Credit 4

## Decision Sciences

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

Study of the production of goods and services. Topics include quality assurance, resource planning, scheduling, materials and capacity control, inventory management, project management, 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 decision analysis. 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-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 1986-87)

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) (Not offered in 1986-87)

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, BBUF-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) (Not offered in 1986-87)

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 1986-87)

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

# 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 master of science degree in applied and mathematical statistics is offered by the College of Continuing Education at RIT through the Center for Quality and Applied Statistics. Several options, including thesis and non-thesis options, are available. Students electing a plan of study that includes a thesis must successfully complete 36 quarter hours of course work in addition to an acceptable thesis. Non-thesis options require the candidate for the MS to successfully complete 45 quarter hours of course work.

The faculty and staff of the Center for Quality and Applied Statistics is a distinguished group that includes three members who are fellows of both the American Statistical Association and the American Society for Quality Control. A fourth member of the faculty is a fellow of the American Society for Quality Control. The center's faculty includes two past presi-

dents of the American Society for Quality Control and the only person ever to win the prestigious ASQC Brumbaugh Award four times. Extensive industrial experience characterizes the center's faculty, and the graduate program prepares each student for a productive career in the fields of statistics and quality control.

### Cooperative Education Program—Earn a Degree While You Acquire Industrial Experience

A unique feature of the graduate statistics program at RIT is the cooperative education program. This program allows the qualified graduate student to attend school on a full-time basis one quarter, and to earn a substantial salary the next quarter as an employee of one of the Rochester area major industries. This pattern can be repeated until the student completes the MS degree.

### The Summer Program

The summer program allows interested individuals to pursue a graduate degree in statistics during the summer. If normal progress is made, this program leads to completion of the MS degree at the end of three summers. The program features faculty of national and international reputation teaching courses in their areas of specialization.

### The Full-Time Program

Students who wish to study on a full-time basis can complete the MS degree in one year if normal progress is made.

### The Evening Program

The Center for Quality and Applied Statistics offers courses to full-time employees of industry and other interested individuals in the evenings. The master's degree can normally be completed in two years of evening study.

### The Mason E. Wescott Statistics Laboratory

The Center for Quality and Applied Statistics houses the Mason E. Wescott Statistics Laboratory, which provides computer access, assistance with problem solving, and interpretation of results for students enrolled in courses offered by the center. In addition, RIT maintains an extensive



computer center with VAX/VMS and IBM equipment available for instruction and research. Additional resource facilities include the Wallace Memorial Library and Media Resource Center that provide access to all technical references vital to the professional growth in the areas of applied statistics and quality control.

#### **Financial Assistance**

A variety of financial assistance possibilities exist and are available on a competitive basis to qualified applicants. These possibilities include graduate assistantships, tuition scholarships, grants, and cooperative education opportunities.

#### **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 in 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 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

##### **Six core courses:**

CQAS-801 and 802 Design of Experiments I & II  
CQAS-821 and 822 Theory of Statistics I & II  
CQAS-841 Regression Analysis I  
CQAS-742 Statistical Computing

##### **Four required career options courses:**

A new feature of the MS program is a logical grouping of core requirements, existing and new courses, which will allow the student to specialize within his or her career endeavors. The five specialized career options are:

##### **Quality Control in Industry**

##### **Industrial Statistics**

##### **Administrative Applications of Quality Control**

##### **Statistical Theory and Methods**

##### **Quality Control in the Health Sciences**

Each career option has four required courses. A department advisor will work with each student in identifying the appropriate career option and in developing a total program structured to achieve individual professional objectives.

##### **Five 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, a written 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 is required. 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 have 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 undergraduate 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, the candidate 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 when the student is enrolled in the last quarter of his or her program, 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**

Four full-time and 22 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.

## Graduate Faculty College of Continuing Education

**Donald D. Baker**, BA, 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**, BA, MBA, University of Buffalo, MS, Ph.D., Rutgers University—Paul Miller Professor, Chairman, Graduate Statistics.

**Anne M. Barker**, BA, Nazareth College; MS, Rochester Institute of Technology—Assistant Professor

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

**Daniel L. Lawrence**, BA, BS, University of Akron; MA, Ball State University; MS, Rochester Institute of Technology; Ph.D., University of Toronto—Assistant Professor

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

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

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

**F. Rebecca Burr**, BA, Mount Holyoke; MS, University of Minnesota

**John T Burr**, BA, Grinnell College, Iowa; Ph.D., Purdue University

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

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

**J. Edward Jackson**, BA, University of Rochester; MA, University of North Carolina; Ph.D., Virginia Polytechnic Institute

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

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

**James Mason**, BA, SUNY at Buffalo; MA, University of Rochester

**Sterling A. Mason**, BS, MS, Brigham Young University

**Robert M. Meisel**, BS, ME, Rensselaer Polytechnic Institute; 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, University of Pennsylvania; MA, University of Rochester

## Statistics

### CQAS-701

### Statistical Concepts

#### Registration #0280-701

A service course designed for non-concentrators which emphasizes statistical thinking instead of mathematical manipulations. This is an intuition-based introduction to the subject. Topics include: exploratory data analysis, methods for collecting data, statistical inference, regression analysis, and analysis of variance. This course does not count as credit for the MS degree in statistics. (None)

Credit 4

### CQAS-711

### Fundamentals of Statistics I

#### Registration #0280-711

For those taking statistics for the first time. Covers the statistical methods used most in industry, business, and research. Essential for all scientists, engineers, and administrators. Topics: organizing observed data for analysis and insight; learning to understand probability as the science of uncertain events; concepts of random variables and their associated probability models; meaning and practical use of the Central Limit Theorem. (Consent of the Department)

Credit 3 or 4

### CQAS-712

### Fundamentals of Statistics II

#### Registration #0280-712

Continuation of CQAS-711. Topics: concepts and strategies of statistical inference for making decisions about populations on the basis of sample evidence; tests for independence and for adequacy of a proposed probability model; learning how to separate total variability of a system into identifiable com-

ponents through analysis of variance; regression and correlation models for studying the relationship of a response variable to one or more predictor variables. (Fund. of Statistics ICQAS-711 or Consent of the Department)

Credit 3 or 4

### CQAS-721

### Statistical Quality Control I

#### Registration #0280-721

A practical course designed to give depth to practicing quality control personnel. Topics: statistical measures; theory, construction, and application of control charts for variables and attributes; computerization procedures for control charts; tolerances, specifications, and process capability studies; basic concepts of total quality control, and the management of the quality control function. (Consent of the Department)

Credit 3

### CQAS-731

### Statistical Quality Control II

#### Registration #0280-731

Investigation of modern acceptance sampling techniques with emphasis on industrial applications. Topics: single, double multiple, and sequential techniques for attributes sampling; variables sampling, techniques for sampling continuous production. The course highlights Dodge-Romig plans, Military Standard plans, and recent contributions from the literature. (Consent of the Department)

Credit 3

### CQAS-742

### Statistical Computing

#### Registration #0280-742

An advanced course in statistical computing using SAS statistical software. The course will cover basic SAS procedures; the creation, manipulation, and analysis of data bases; graphical display techniques; and the development and writing of custom numerical analysis procedures. (Design of Experiments II CQAS-802 and Regression Analysis ICQAS-841)

Credit 3

**CQAS-761****Reliability****Registration #0280-761**

A methods course in reliability practices: What a reliability engineer must know about reliability predictions, estimation, analysis, demonstration, and other reliability activities. Covers most methods 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. (Fund. of Statistics II CQAS-712)

Credit 3

**CQAS-781****Quality Management****Registration #0280-781**

A course designed to cover concepts and methods of quality management. Topics include: basic concepts, history of quality control, quality policy, economics of quality, quality costs, organization for quality, design for system effectiveness, manufacturing planning for quality, and quality data systems. (Consent of the Department)

Credit 3

**CQAS-782****Quality Engineering****Registration #0280-782**

A course designed to cover important elements of quality engineering. Topics include: specifications, statistical tolerancing, measurement, vendor relations, process control, motivation, customer relations, diagnostic techniques, process improvement studies, and quality planning. (Consent of the Department)

Credit 3

**CQAS-783****Quality Engineering by Design****Registration #0280-783**

The Taguchi Method of off-line control including parameter design and tolerance design leading to improved products and processes at lower costs. (Design of Experiments ICQAS-801 and Design of Experiments IICQAS-802)

Credit 3

**CQAS-791****Statistical Methods in Health Sciences****Registration #0280-791**

A course designed as an introduction to statistical methods for those involved in the health sciences. Topics include: types of biological data, descriptive statistics, tests of significance, experimental design, tests of association, relative risk, diagnostic tests. (Fund. of Statistics II CQAS-712)

Credit 3

**CQAS-792****Biological Assays****Registration #0280-792**

An advanced course in biostatistics which deals with the important research concerns of identifying and verifying drug-dose response. Topics include: parallel-line assays, slope-ratio assays, quantal response assays. (Design of Experiments I CQAS-801 and Design of Experiments II CQAS-802)

Credit 3

**CQAS-801****Design of Experiments I****Registration #0280-801**

How you design and analyze experiments in any subject matter area; what you do and why. Topics: basic statistical concepts, scientific experimentation, completely randomized design, randomized complete block design, nested and split plot design. Practical applications to civil engineering, pharmacy, aircraft, agronomy, photo-science, genetics, psychology, and advertising. (Fund. of Statistics II CQAS-712)

Credit 3

**CQAS-802****Design of Experiments H****Registration #0280-802**

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

Credit 3

**CQAS-821****Theory of Statistics I****Registration #0280-821**

Provides a sound theoretical basis for continuing study and reading in statistics. Topics: constructs and applications of mathematical probability, discrete and continuous distribution functions for a single variable and for the multivariate case; expected value and moment generating functions; special continuous distributions. (Fund. of Statistics II CQAS-712 or Consent of the Department)

Credit 3

**CQAS-822****Theory of Statistics H****Registration #0280-822**

Continuation of CQAS-821. Topics: supporting theory for and derivation of sampling distribution models; applications and related material; point estimation theory and applications; the multivariate normal probability model, its properties and applications; interval estimation theory and applications. (Theory of Statistics I CQAS-821)

Credit 3

**CQAS-824****Probability Models****Registration #0280-824**

An introduction to probability theory and stochastic processes. Topics include: random variables, conditional probability and expectation, Markov chains, renewal theory, queuing theory, and reliability. (Theory of Statistics I CQAS-821)

Credit 3

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

This course deals with the summarization, representation, and interpretation of data sampled from populations where more than one characteristic is measured on each sample element. Usually the several measurements made on each individual experimental item are correlated and certainly one should not apply univariate analysis to each measurement separately. This course covers the use of the basic multivariate techniques. Computer problem solving will be emphasized. Topics will include: multivariate t-tests, ANOVA, MANOVA, regression analysis, repeated measures, quality control, and profile analysis. (Design of Experiments I CQAS-801 and Design of Experiments II CQAS-802)

Credit 3

**CQAS-831****Multivariate Analysis H****Registration #0280-831**

A continuation of CQAS-830, this course covers the use of advanced multivariate techniques. Topics include: principal component analysis, cluster analysis, multi-dimensional contingency tables, discrete discriminant analysis, multi-dimensional scaling, and regression with errors in the independent variable. Practical applications will be emphasized. (Multivariate Analysis I CQAS-830)

Credit 3

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

A methods course dealing with the general relationship problem. Topics include: the matrix approach to simple and multiple linear regression; analysis of residuals; dummy variables; orthogonal models; and computational techniques. (Design of Experiments II CQAS-802)

Credit 3

**CQAS-842****Regression Analysis II****Registration #0280-842**

A continuation of CQAS-841. Topics: selection of best linear models; regression applied to analysis of variance problems; nonlinear estimation; and model building. (Regression Analysis I CQAS-841)

Credit 3

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

Distribution-free testing and estimation techniques with emphasis on applications. Topics: sign tests; Kolmogorov-Smirnov statistics; runs tests; Wilcoxon-Mann-Whitney test; chi-square tests; rank correlation; rank order tests; quick tests. (Fund, of Statistics II CQAS-712)

Credit 3

**CQAS-853****Managerial Decision Making****Registration #0280-853**

Statistical decision analysis for management. Topics: utilities; how to make the best decision (but not necessarily the right one); normal and beta distributions; Bayesian theory; many action problems; optimal sample size; decision diagrams. Applications to marketing, oil exploration; portfolio selection; quality control; production; and research programs. (Bayesian Statistics CQAS-881)

Credit 3

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

Advanced topics related to use of statistics in investigational analysis, including, narrow limit gauging, practical design of experiments, analysis of small sample data, analysis of means, identifying assignable causes, and other methods for troubleshooting with statistical methods. (Design of Experiments I CQAS-801)

Credit 3

**CQAS-864****Advanced Acceptance Sampling****Registration #0280-864**

An advanced course in acceptance control techniques including: basis of acceptance sampling, attributes plans; variables plans for process parameters; variables plans for proportion nonconforming, sampling schemes including MIL-STD-105D and MIL-STD-414; plans for special applications; rectification and continuous procedures; cumulative results plans; compliance sampling; reliability sampling, and administration of sampling plan. (Statistical Quality Control II, CQAS-731)

Credit 3

**CQAS-871****Sampling Theory and 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. (Fund, of Statistics II, CQAS-712)

Credit 3

**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, Boxjenkins models, transfer function models, case studies. (Regression Analysis I CQAS-841)

Credit 3

**CQAS-875****Empirical Modeling****Registration #0280-875**

A course in model building based on the application of empirical data gathered through appropriate experimental design and analyzed through regression techniques. Topics: response variable construction, experimental design methods, and related analysis techniques. (Design of Experiments II CQAS-802 and Regression Analysis ICQAS-841)

Credit 3

**CQAS-881****Bayesian Statistics****Registration #0280-881**

An introduction to Bayesian statistics and decision making which explores Bayes' Theorem in its relation to classical and Bayesian methodology. Topics: probability, Bayes' Theorem, assessment of prior probabilities and likelihoods, hypothesis testing, and the multivariable case. (Fund, of Statistics II CQAS-712)

Credit 3

**CQAS-886****Sample Size Determination****Registration #0280-886**

The question most often asked of an industrial statistician is "What size sample should I take?" This course answers that question for a wide variety of practical investigational projects. Techniques for the full use of the optimal sample evidence are also offered. (Fund, of Statistics II CQAS-712 and Design of Experiments I CQAS-801)

Credit 3

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

These courses provide for the presentation of subject matter of important specialized value in the field of applied and mathematical statistics not offered as a regular part of the statistics program. (Consent of the Department)

Credit 3 each course

**CQAS-895****Statistics Seminar****Registration #0280-895**

This course or sequence of courses provides for one or more quarters of independent study and research activity. This course may be used by other departments or other colleges at RIT to provide special training in statistics for students who desire an independent study program in partial fulfillment of graduate degree requirements. (Consent of all departments involved)

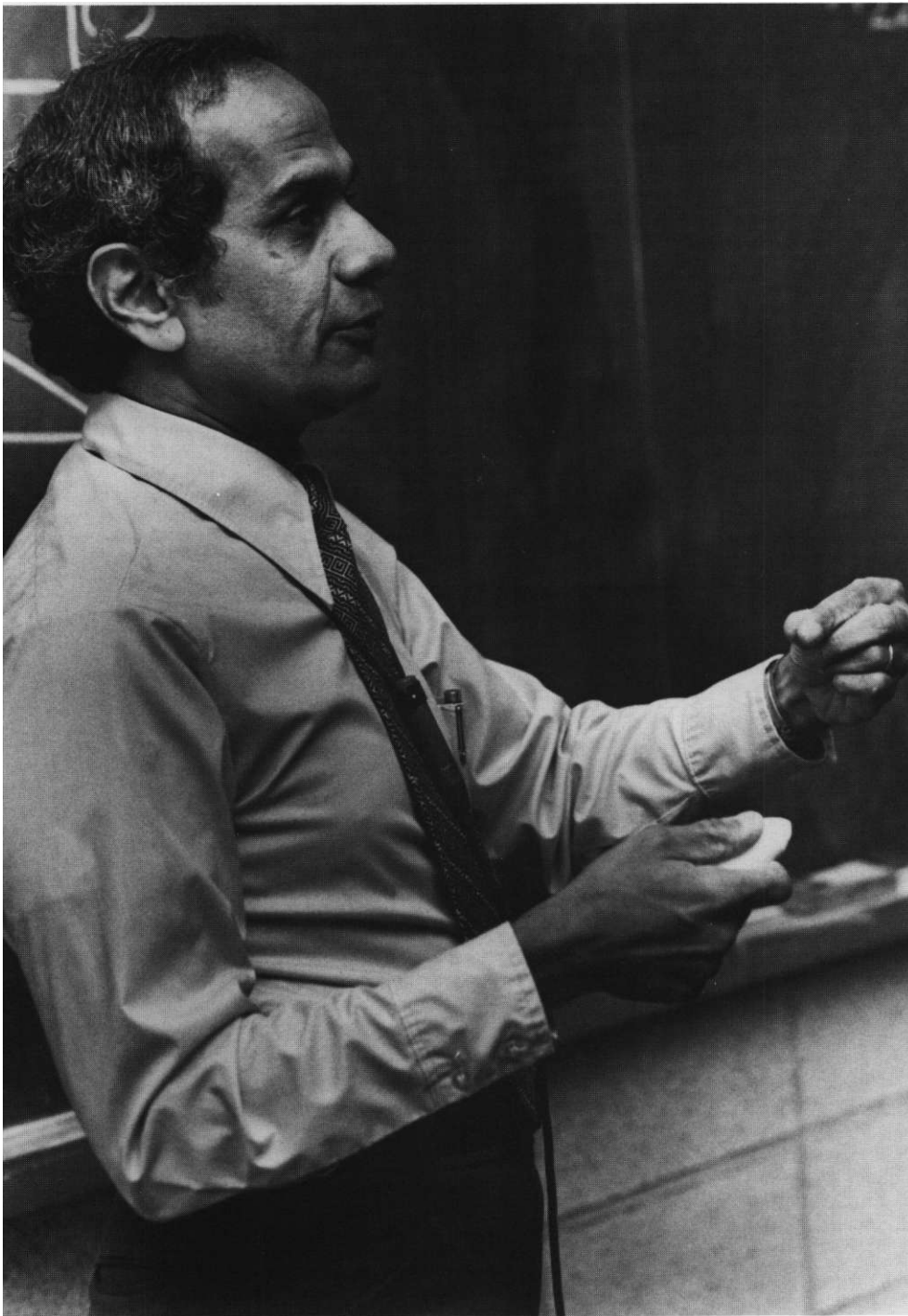
Credit 3

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

For students working for 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)

Credit 3,6, or 9

# College of Engineering



**Richard A. Kenyon, Dean**

## **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

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 pro-

gram 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 Col-

leges 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

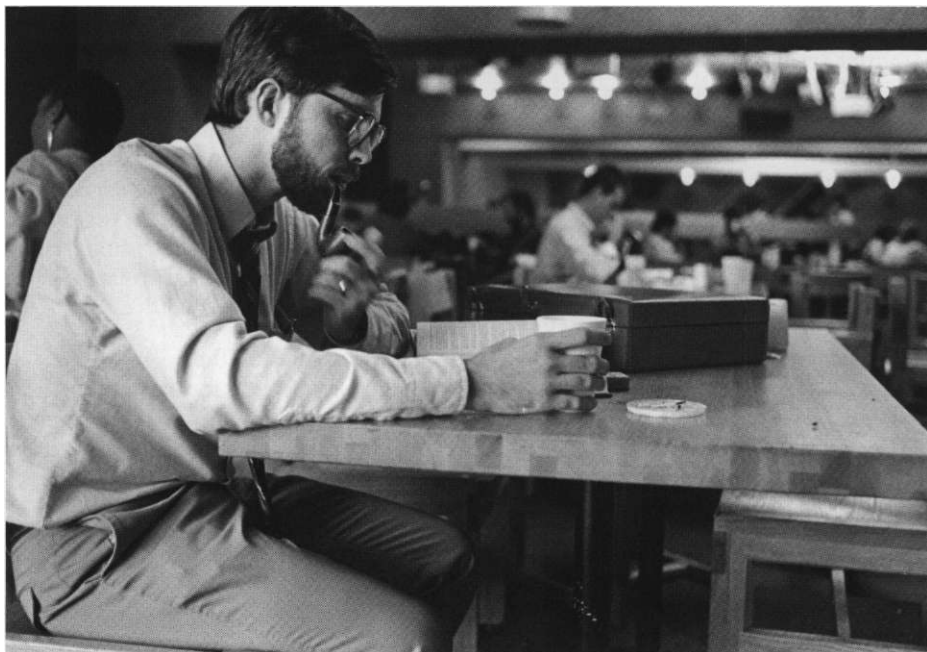
Industrial Engineering 475-2598

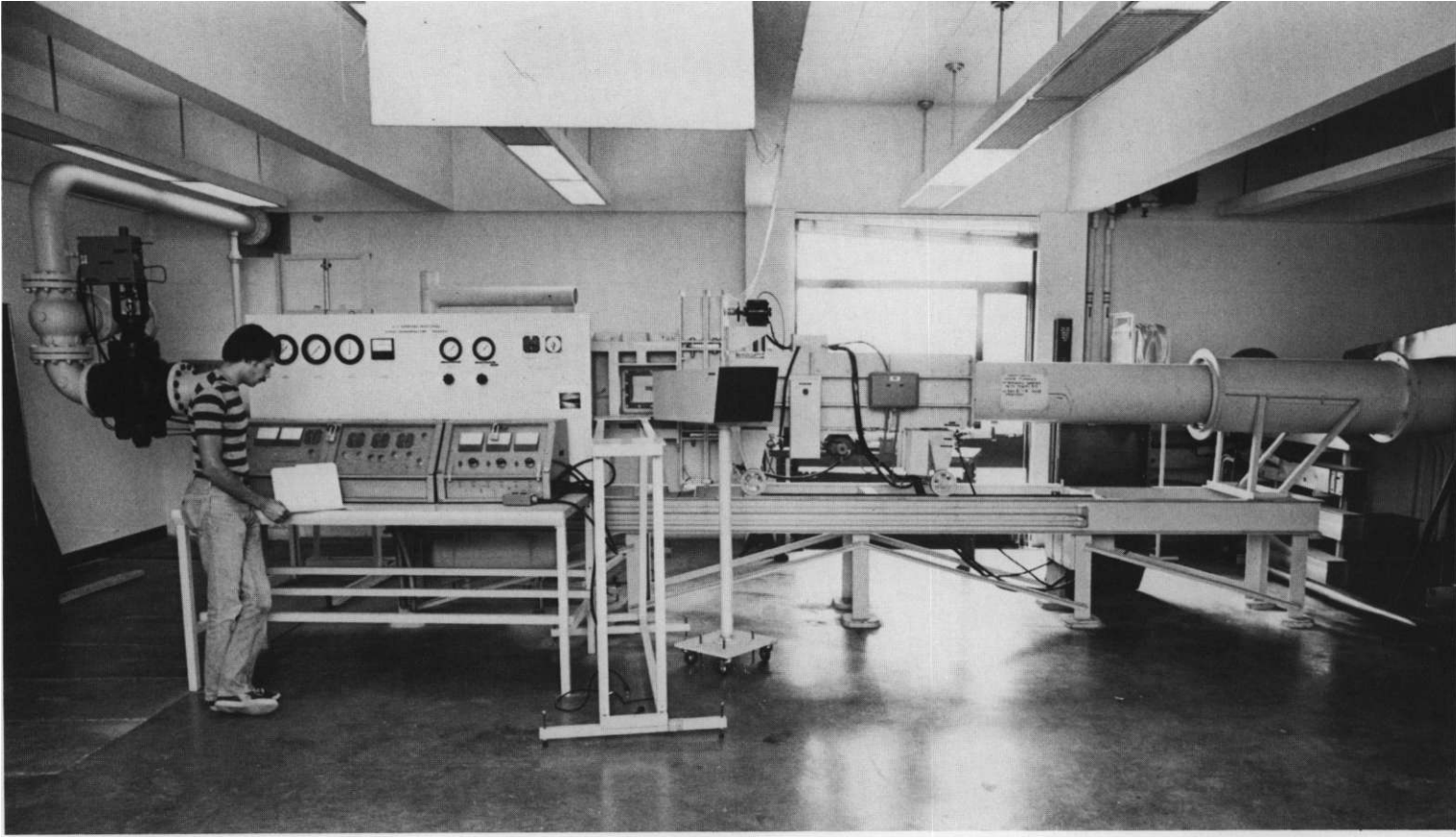
Mechanical Engineering 475-2163

## 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 stu-





dent'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 (Fall)

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 and/or graduate electives (20 quarter credits)

8 credits in graduate internship project

48 quarter credits total

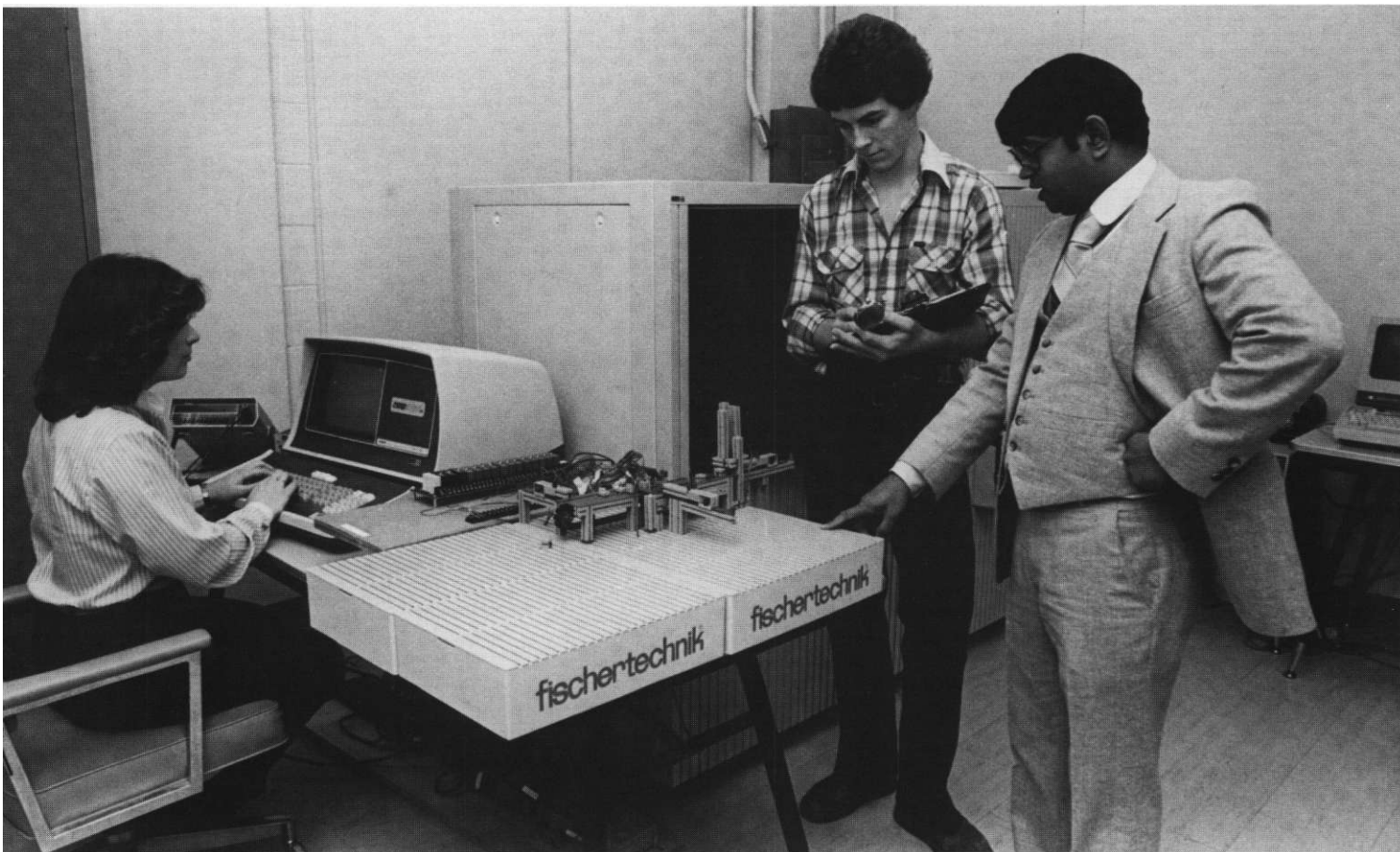
The area of concentration builds some expertise in preparation for conducting a successful graduate project in an area within the discipline of computer engineering. The graduate internship project is generally expected to be an appropriate industrial project that is supervised and approved by the graduate 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 stu-

dent 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 59.

## 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; and manufacturing engineering. Close cooperation with the College of Business 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

The graduate faculty of the Mechanical Engineering Department is dynamic and committed to professional growth. Some of the current research interests of the faculty in the Mechanical Engineering Department include finite elements, robotics, programmable automation, and

computer-aided design and manufacturing. Research also is conducted in areas such as thermal stresses, response of structures to laser heating, analysis and optimization of vehicular systems subject to impulsive and random excitations, and mechanism of fracture in materials. Also, there is interest in software design and development for engineering applications; analysis of satellite data to derive information on the physical oceanography of the southern ocean using time series techniques; minimax optimal control and the problem of space glider re-entry using a multiple sub-arc approach; developing techniques of airfoil optimization to solve the inverse problem; flow in time-varying boundaries; three-dimensional reconstruction of two-dimensional echocardiographic images; and two-phase heat transfer.

The department has access to modern computing facilities, such as VAX 8600, VAX 11-785, VAX 11-782 and IBM 3083 computers, which provide many different types of software: NASTRAN, ANSYS, PADL, PATRAN-G, GIFTS, ADS and ACSL. These can be used for research and development work on finite elements, CAD/CAM, modal analysis, vibrations, and heat transfer. The departmental laboratories include a low-velocity wind tunnel, a supersonic wind tunnel, PUMA robots, spectrum analyzers, and a TEKTRONIX CAD/CAM facility.

### 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 of 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.

### Admission Requirements

1. A Bachelor of Science degree in engineering or science is required.
2. If an applicant has a BS degree, but not in mechanical engineering, the department head will recommend which undergraduate courses must be taken in order to acquire an acceptable background.
3. If an applicant has a BS degree, but not in mechanical engineering, he must receive at least a 3.0 grade point average in the recommended undergraduate courses before admission is granted to the graduate program in mechanical engineering.

### Core Courses

All graduate students in the MS program are required to complete the following core courses:

EMEM-870 Mathematics for Engineers I  
EMEM-871 Mathematics for Engineers II  
EMEM-872 Mechanics  
EMEM-874 Numerical Analysis  
EMEM-877 Fluid Dynamics

In cases where students have had the equivalent in graduate level courses of 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.

### Elective Courses

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

EMEM-810 Introduction to Continuum Mechanics  
EMEM-811 Theory of Elasticity  
EMEM-812 Theory of Plates and Shells  
EMEM-813 Theory of Plasticity  
EMEM-815 Experimental Stress Analysis  
EMEM-816 Finite Elements  
EMEM-820 Advanced Optimal Design  
EMEM-821 Vibration Theory and Applications  
EMEM-827 Computer Graphics in Design  
EMEM-833 Heat Exchanger Design  
EMEM-838 Idea Flow  
EMEM-864 Production Tool Design  
EMEM-865 Applications of the Finite Element Method Using NASTRAN  
EMEM-875 Instrumentation and Experimental Analysis  
EENG-801 Design for Manufacture  
SESM-701 Introduction to Materials Science  
SESM-710 Materials Properties I

Students with a background deficient in engineering materials are strongly advised to take SESM-701 as an elective.

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 those upper-level undergraduate electives in mechanical engineering specified in the course description catalog as EMEM-6XX.

Some examples are:

EMEM-605 Applications in Fluid Mechanics

EMEM-615 Robotics

EMEM-618 Computer-Aided Engineering

EMEM-635 Heat Transfer n

EMEM-652 Fluid Mechanics of Turbomachinery

EMEM-658 Engineering Vibrations

EMEM-660 Refrigeration and Air Conditioning

EMEM-672 Dynamics of Machinery

EMEM-685 Advanced Strength of Materials

EMEM-694 Stress Analysis

A maximum of two such courses is allowed for graduate credit. A student also may earn a limited number of credits by doing an independent study with guidance from a member of the graduate faculty. Some of the areas for independent study are selected topics in applied mathematics, energy methods in mechanics, analytical mechanics, lubrication, convective and radiative heat transfer, fluid mechanics, thermodynamics, wind and solar energy, and control systems.

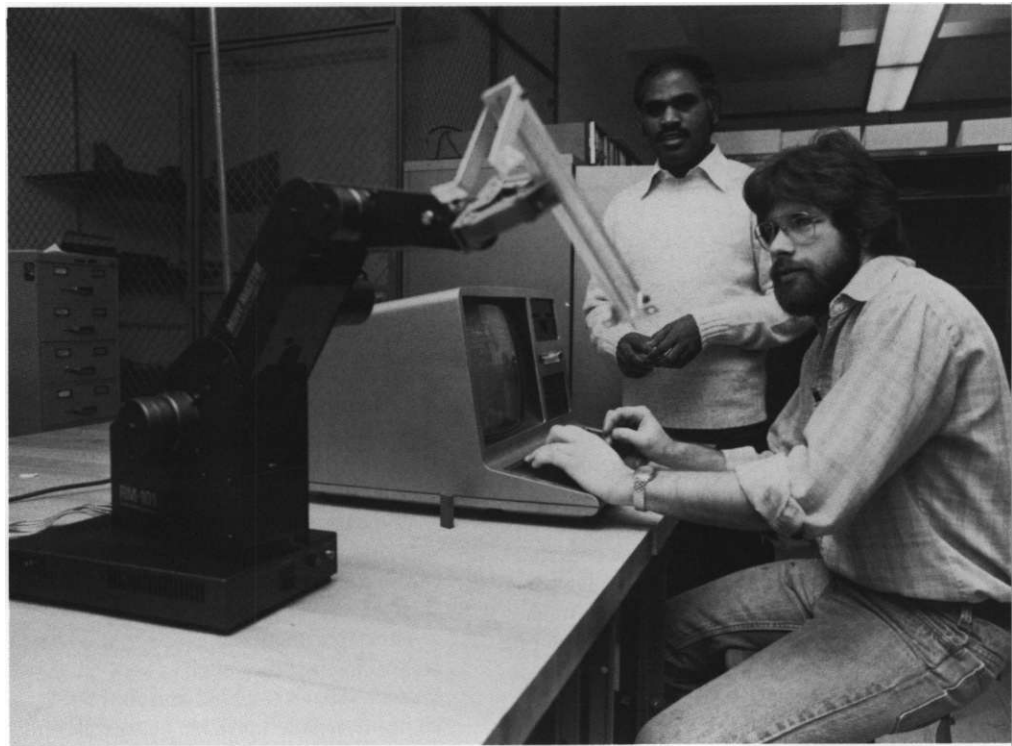
### **Thesis and Other Options**

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 research thesis, a literature search, a design project, or additional course work with a comprehensive examination that is usually given in the Spring Quarter. A student selecting one of the first three options has to earn a minimum of five credits in the option chosen, and has to make a successful oral presentation of the work.

### **Admission Requirements for the Master of Engineering Degrees**

The admission requirements, general standards and selection procedures for admission to the engineering program are similar to those for the MS degree program.

A student seeking admission to the master of engineering degree in manufacturing engineering is expected to have undergraduate background in FORTRAN programming, engineering materials, manufacturing processes, and probability and statistics.



### **The Mechanical Engineering Option for the Master of Engineering Degree**

A student in the ME degree program with the mechanical engineering option is required to take all the core courses in the MS program. Depending on the student's professional interest, he can then choose from the graduate courses offered in the engineering departments, College of Business, or computer science to fulfill the total requirements for the course work.

### **The Manufacturing Engineering Option for the Master of Engineering Degree**

This option is offered jointly by the departments of mechanical engineering and industrial engineering. In this option, the student is required to take one course each from four different groups: computer-aided design, manufacturing systems, computer-aided manufacturing, and probability and statistics. In addition, the student is required to take a core course: Design for Manufacture. The balance of the course work can be completed by selecting appropriate courses from the course offerings in industrial and mechanical engineering.

### **Course descriptions**

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

### **Assistantships and scholarships**

Some assistantships and scholarships 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 for 8 credits per quarter. Appointment as a research assistant usually permits taking 8 credits per quarter while the remaining time is devoted to the research effort, which often serves as a thesis subject. Information on tuition scholarships may be obtained from Dr. Paul Bernstein, dean of Graduate Studies (716-475-6523).

### **Course calendar**

The core courses are offered every quarter, which enables a student to fulfill the core requirements in one academic year. 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).

### Tentative Schedule of Graduate Courses in Electrical Engineering

	1986-87			1987-88		
	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. I	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 COURSE OFFERINGS DEPARTMENT OF INDUSTRIAL ENGINEERING

Even Years (e.g., 86/87, 88/89 etc.)

Odd Years (e.g., 85/86, 87/88, etc.)

FALL	WINTER	SPRING	FALL	WINTER	SPRING
EIEI 715- Statistical Analysis	EIEI 716- Registration	EIEI 630- Comp. Aided Mfg II	EIEI 715 Statistical Analysis	EIEI 716 Regression	EIEI 630 Comp. Aided Mfg. II
•EIEI 625 Comp. Aided Mfg. I	EIEI 730 Human Factors I	EIEI 734 Safety Engrg.	*EIEI 625 Comp. Aided Mfg. I	EIEI 620 Engrg. Economy	EIEI 734 Safety Engrg.
EIEI7XX Special Topics/ Reliability	EIEI 7XX Special Topics/ SLAM	EIEI 720 Production Control	EIEI 701 Linear Programming	EIEI 731 Human Factors II	EIEI 702 Non Linear Prog
EIEI7XX Special Topics/ Decision Analysis	EIEI 7XX Special Topics/ Multiobjective Analysis	EIEI7XX Special Topics/ Case Studies	EIEI 7XX Special Topics/ Design of Experiments	EIEI 710 Simulation (GPSS)	EIEI 601 Value Analysis
		EIEI 725 Technological Forecasting			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.)



## 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—Associate Professor, Microcomputers and Control Systems

**Pratapa Reddy**, Ph.D., Indian Institute of Technology—Associate Professor, Digital Systems

### Electrical Engineering Department

**Swaminathan Madhu**, Ph.D., University of Washington—Professor, Communication Theory, Logic Design, Department Head

**Ercument Arvas**, Ph.D., Syracuse University—Senior Research Associate, electromagnetics, antennas & radiation

**Lance Breger**, Ph.D., University of Illinois—Assistant Professor, crystal physics, electromagnetic fields

**Joseph D. DeLorenzo**, Ph.D., Boston University—Associate Professor, electromagnetic scattering, image analysis, communication systems

**Soheil A. Dianat**, Ph.D., George Washington University—Associate Professor, Control Systems

**Lynn Fuller**, Ph.D., Buffalo—Professor, Solid State Devices and Microelectronics



**Roger Heintz**, Ph.D., Syracuse—Professor, Solid State Devices

**Michael A. Jackson**, M.S., SUNY Buffalo—Assistant Professor, semi-conductor processing

**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

**Sannesi Ramanan**, Ph.D., I.I.T.-India—Visiting Assistant Professor, semi-conductor devices

**Alton Riethmeier**, M.S., Rochester—Associate Professor, Digital Systems

**Edward R. Salem**, Ph.D., Buffalo—Professor, Digital Processing, Microcomputers

**David Sumberg**, Ph.D., Michigan State—Associate Professor, Optics

**Fung-I Tseng**, Ph.D., Syracuse—Professor, Electromagnetic Theory

**Renan Turkman**, Ph.D., Paris—Assistant Professor, Solid state devices

**Raman M. Unnikrishnan**, Ph.D., Missouri—Associate Department Head; 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

**Isaac Ajewole**, Ph.D., University of Rochester—image processing

**Robert Hopkins**, MS, RIT—control systems

**K. H. Gurubhasavaraj**, Ph.D., Nebraska—control systems

**Majid Rabbani**, Ph.D., Wisconsin—image processing, pattern recognition

**James Schueckler**, MS, RIT—microcomputers

**James Wiseman**, Ph.D., Boston University—coding theory

### Industrial Engineering Department

**Richard Reeve**, Ph.D., Buffalo—Professor, Applied Operations Research; Department Head

**Kwang-Soo Kim**, Ph.D., Univ. Central Florida—Assistant Professor, manufacturing systems, robotics, CNC

**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

**Paul H. Stiebitz**, ME, RIT—Assistant Professor, simulation and operations research

**Brian K. Thorn**, MS, Georgia Tech—Assistant Professor, applied statistics, behavior science



## 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

**Jon E. Freckleton**, BS, University of Rochester—Lecturer, manufacturing engineering

**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—Assistant Professor, 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—Associate 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—Associate Professor, Geophysical Fluid Dynamics and Environmental Control

**Robert L. Snyder**, Ph.D., P.E., Iowa State—Professor, Materials Science, Chemistry

**Joseph S. Torok**, Ph.D., Ohio State University—Assistant Professor, theoretical and applied mechanics, applied mathematics

**Panchapakesan Venkataraman**, Ph.D., Rice University—Visiting Assistant Professor, optimal control, fluid mechanics

**Wayne W. Walter**, Ph.D., P.E., Rensselaer Polytechnic Institute—Professor, Applied Mechanics

## 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 720)

Class 4, Credit 4 (F,W)

### EECC-694

### Data and Computer Communications

#### Registration #0306-694

This course provides a unified view of the broad field of data and computer communications. Emphasis will be on the basic principles underlying the technology of data and computer communications. These critical design issues in data communication networks as well as the current and evolving standards in computer communication architecture will be discussed. Alternative approaches to meeting user requirements will be explored. (Fifth-year standing in Computer Engineering or with permission of instructor)

Credit 4, Class 4 (S)

### 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-730

### VLSI Design

#### Registration #0306-730

An introduction to the design and implementation of Very Large Scale (VLSI) systems. Basic NMOS devices and circuits are described. From this base, a variety of methods for designing both combinational logic and state machines is developed, with emphasis on the use of regular structures such as programmed logic arrays. System architecture and use of Computer Aided Design (CAD) tools will be stressed. Extensive laboratory projects will be required.

Class 4, Credit 4 (S, SR)

### EECC-731

### VLSI Design Projects

#### Registration #0306-731

A second course in the design and implementation of Very Large Scale (VLSI) systems. CMOS devices will be studied. System architecture and the use of Computer Aided Design (CAD) tools will be stressed. A major laboratory design project will be required. In addition the students will test chips fabricated in the first course. (EECC-730 or EECC-630)

Class 4, Credit 4 (F,W)

### EECC-756

### Small Systems Workshop

#### Registration #0306-756

This course will cover the general guidelines, methodology, and approaches for the design, development, and use of single and multi, micro or minicomputer systems. The 16-bit microprocessors have vast address spaces and virtual memory capability, incorporate complex I/O facilities, and permit rapid execution of cost-saving, high-level languages. The hardware and software support available for 16-bit microprocessors also makes them a cost-effective alternative to minicomputers. Distributed systems based on microcomputer technology will be investigated with emphasis on interconnect structures, intercommunications, software and hardware. The course will include a laboratory workshop in which each student will be required to design, implement, and test one or more parts of a practical system. Emphasis will be placed on engineering ability and management skill to meet proposed technical goals on time and within budget. (Graduate standing in Computer Engineering with at least three core courses completed or permission of instructor)

Class 3, Lab 3, Credit 4 (S)

**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, EECC-550 or ICSS-720)  
Class 4, Credit 4 (S)

**EECC-759****Digital Interface Circuits****Registration #0306-759**

Standard bus interface-parallel and serial. LSI interface devices. Interface design-peripherals and memory. Data acquisition-A/D & D/A converters, multiplexing. Remote control. Error detection and correction. (EECC-560 or permission of instructor)  
Class 4, Credit 4 (S)

## Electrical Engineering

**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 gap 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 in-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)

Credit 4

**EEEE-742****Advanced Microprocessor Software Design****Registration #0301-742**

An introduction to the theory and application of top-down design, structure, abstraction, segmentation, high-level languages, and operating systems to real-time programs for microprocessors. The students will become proficient in a structured high level language. Topics include: Structure diagrams, separate module compilation, data types, data structures, self documenting code, procedures, meaningful variable names, linkage with other languages, object code libraries, operating system calls, multitasking, concurrent and re-entrant programs, and symbolic debugging. (EEEE-665 or a high-level programming language)

Credit 4

**EEEE-744****Advanced Microprocessor Systems Design****Registration #0301-744**

The effective application of microprocessors in the design of digital systems requires a knowledge of both hardware and software. This course will develop an understanding of assembly language programming and hardware design techniques. The role of macro-assemblers, editors, linking loaders, and other system software aids used in microcomputer development systems to produce efficient modular code will be covered. Several aspects of hardware/software organization of input/output programs will be considered including interrupts and direct memory access. The use of special LSI interface devices to allow a microcomputer to operate with peripheral devices such as A/D and D/A converters, CRT terminals, floppy disks, etc. will be studied. Laboratory sessions will be used to provide experience in the use of software development systems, and logic analyzers in developing and testing a microcomputer system design. (EEEE-665)

Credit 4

**EEEE-745****Topics in Digital Systems****Registration #0301-745**

Topics will be selected on different aspects of digital systems design. Some of the proposed topics are signature analysis, bit slice processors, timing problems, reliable systems design, and designing for maintainability. (EEEE-650)

Credit 4

**EEEE-747****Topics in Switching Theory****Registration #0301-747**

A selection of topics on various theoretical aspects of switching circuits will be presented. Topics such as decomposition of combinational switching functions, experiments on sequential circuits, and regular expressions will be covered. (EEEE-650)

Credit 4



**EEEE-779****Digital Image Processing****Registration #0301-779**

This is an introductory course in digital image processing. The course begins with a study of two dimensional signal processing and transform methods with applications to images. Image sampling is discussed followed by gray level description of images and methods of contrast manipulation including linear/nonlinear transformations and histogram equalization and specification. Image smoothing methods are considered including spatial and frequency domain low pass filtering. ADHOC methods of noise removal and median filtering. Following this, methods of image sharpening are studied including derivative methods and high pass filtering. Edge and line detection methods are discussed using masks and hough transforms and methods of image segmentation are degradation and methods of image restoration including deblurring. Several extensive computer assignments are required. (EEEE-754, 554 or permission of instructor)

**EEEE-780****Independent Study****Registration #0301-780**

This course number should be used by students who plan to study a topic on an independent study basis. The student must obtain the permission of the appropriate faculty member before registering for the course.

Credit 4

**EEEE-781****Electromagnetic Fields****Registration #0301-781**

Development of electromagnetic theory from basic postulated leading to Maxwell's equations for the plane waves, transmission lines, wavelengths, and antennas.

Credit 4

**EEEE-782****Boundary Value Problems****Registration #0301-782**

Techniques for solving boundary value problems. Numerical methods, analog and relaxations methods. Green's function, special methods making use of symmetries, images, inversion, and conformal mapping; introduction to integral equations. Wiener-Hopf and Watson transformations Saddlepoint integration. Variational techniques. (EEEE-754,755,756)

Credit 4

**EEEE-783****Antennas and Antenna Systems****Registration #0301-783**

Theoretical and practical characteristics of electromagnetic radiators. Equivalent circuits and radiating properties of antenna elements. Dipoles, slots, small loops, helical and dielectric radiators. Pattern analysis, primary and secondary patterns. Theory of phased antenna arrays, reflectors, and horns. (EEEE-781)

Credit 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 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-793****Error Detecting and Error Correction****Registration #0301-793**

This course covers linear block codes and convolutional codes. The major linear block codes to be covered are Hamming, BCH, Golay, and Reed-Solomon codes. The fundamentals structure of linear block codes will be developed and applied to performance calculations. The structure of cyclic codes will be developed and applied to encoders and decoders. The major error correction methods, including error trapping, majority logic decoding and the BCH algorithm will be developed and the Viterbi and sequential decoding algorithms will be studied. Questions of system performance, speed, and complexity will be examined. (EEEE-756)

Credit 4

**EEEE-794****Information Theory****Registration #0301-794**

An introduction to the fundamental concepts of information theory; entropy, equivocation, transinformation, and redundancy; coding for binary channels; measurement of signal parameters in the presence of noise; bandwidth vs. accuracy. (EEEE-756)

Credit 4

**EEEE-795****Optical Engineering II****Registration #0301-795**

A continuation of EEEEE-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 holophy, 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****Thesis****Registration #0301-890**

An independent engineering project or research problem to demonstrate professional maturity. A formal written thesis and an oral defense are required. The student must obtain the approval of an appropriate faculty member to guide the thesis before registering for the thesis. A thesis may be used to earn a minimum of 6 credits and a maximum of 12 credits. The usual is 9 credits.

Credit variable

## Industrial Engineering and Engineering Management

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 Engineering 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



**EMEM-812****Theory of Plates and Shells****Registration #0304-812**

Theory of thin plates for small deflections. Rectangular and circular plates with various boundary conditions, elliptic and triangular plates. Navier and Levy solutions. Thermal stress in plates. Membrane theory of shells. Cylindrical shells and shells of revolution. (EMEM-685 or equivalent)

Class 4, Credit 4 (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)

Class 4, 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. Different methods will be demonstrated. (EMEM-694 or equivalent)

Class 4, Credit 4 (TBA)

**EMEM-816****Finite Elements****Registration #0304-816**

Boundary value problems in mechanical engineering are discussed and presented through the development of the governing field equations of a continuum in structural mechanics, heat transfer and fluid mechanics. The process of discretization of a continuum by the finite element method is presented using energy principles, and applied to the field equations outlined above. In the course of application, various line, surface, and solid elements are defined and developed. Numerical considerations presented include topics such as solution time, optimization, condensation methods, computer characteristics, etc. Commercial codes such as NASTRAN, ANSYS, GIFTS, and SAP will be discussed. However, the students will solve problems using fundamental approaches that will involve hand calculations and writing some individual computer programs. (EMEM-870, EMEM-871, EMEM-440 or equivalent)

Class 4, Credit 4(F)

**EMEM-820****Advanced Optimal Design****Registration #0304-820**

Topics from nonlinear programming as applied to automated optimal design. Use of penalty functions for the transformation of constrained nonlinear optimization problems. Multivariate pattern and gradient based algorithms, such as the method of steepest descent, Newton's method, quasi-Newton methods, and generalized conjugate gradient techniques. Algorithms for the univariate subproblem of the line search. Applications to the solution of practical nonlinear optimization problems using the digital computer. (EMEM-871 and EMEM-874)

Class 4, Credit 4 (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)

Class 4, Credit 4 (TBA)

**EMEM-827****Computer Graphics in Design****Registration #0304-827-01**

The course emphasizes the current role of computer graphics in computer-assisted design and design analysis. Subjects include; components of CAD systems, methods of geometric modeling, visualization methods, techniques of interactive communication, and design applications utilizing available software packages for multi-dimensional graphic display, pre- and post-processing modellers for finite element analyses, and three-dimensional solids modeling. (Graduate standing)

Class 4, 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 topics for special courses is found at the end.

Credit variable (maximum of 4 credits/quarter) (TBA)

**EMEM-833****Heat Exchanger Design****Registration #0304-833**

This course covers analytical models for forced convection through tubes and over surfaces, experimental correlations for the Nusselt number and pressure drop, design of single and multiple pass shell and tube heat exchangers; compact baffled, direct contact, plate, and fluidized bed heat exchangers; radiators, recuperators, and regenerators. (EMEM-514)

Class 4, 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; the theory of complex variables', airfoil and wing theories. (EMEM-871, EMEM-516 or equivalent)

Class 4, 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 topics for 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 manufacture of modern parts is covered in detail. The student must do research in current publications, and complete and present a project. Project selection can usually be arranged to incorporate an assembly of parts from the student's normal work. There will be field trips to local specialty firms. (Graduate standing)

Class 4, Credit 4 (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 use 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 analysis such as acoustics, illumination, etc. (EMEM-816)

Class 4, Credit 4 (W)

**EMEM-870 Mathematics for Engineers I****Registration #0304-870**

A concise introduction to the concepts of matrix and linear algebra, including determinants, eigenvalues, systems of linear equations, vector spaces, linear transformations, diagonalization, orthogonal subspaces and the Gram-Schmidt orthonormalizing procedure. (Graduate standing)

Class 4, Credit 4 (TBA)

**EMEM-871 Mathematics for Engineers II****Registration #0304-871**

Topics covered are orthogonal functions including Fourier Series, Fourier Integrals, Bessel functions, Legendre Polynomials, Sturm-Liouville problems and eigenfunction expansions; an introduction to calculus of variations, including problems with constraints; vector analysis including the directional derivative, the gradient, Green's Theorem, the Divergence Theorem and Stokes' Theorem. (Graduate standing)

Class 4, Credit 4 (TBA)

**EMEM-872 Mechanics****Registration #0304-872**

Variational principles are developed and applied to the area of solid mechanics. Exact and approximate solution techniques are applied to the solutions of static and dynamic structural problems. Although static analysis is emphasized, dynamic problems will be introduced. Topics presented include: Calculus of Variations, Virtual Work, minimum potential energy, Castigliano's method, the Rayleigh-Ritz method, Galerkin's method. Hamilton's principle, and Lagrange's equations. (EMEM-871 and EMEM-543 or equivalent)

Class 4, Credit 4 (TBA)

**EMEM-873 Heat Transfer****Registration #0304-873**

This course deals with mechanisms and applications of forced convection heat transfer. Governing equations are analyzed and applied to practical situations such as single phase heat transfer during flow inside tubes, cooling of electronic components, flow boiling, and augmentation of single phase and two phase heat transfer. (EMEM-877)

Class 4, Credit 4(F)

**EMEM-874 Numerical Analysis****Registration #0304-874**

The course emphasizes both the development of the current numerical methods that are available to solve engineering problems and the use of the digital computer to implement these techniques. The methods are developed for: Algebraic and transcendental equations in single variable; system of linear algebraic equations by both direct and iterative techniques; system of nonlinear equations, interpolation and approximation theory; numerical differentiation and integration, initial value problems for ordinary differential equations; boundary value problems for ordinary linear and nonlinear differential equations; and partial differential equations; discussion on convergence and stability of methods, effect of truncation and round off errors. Extensive use of the computer will be required. (Graduate standing, knowledge of FORTRAN, experience in the use of digital computers)

Class 4, Credit 4 (W)

**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)

Class 4, Credit 4 (TBA)

**EMEM-877 Fluid Dynamics****Registration #0304-877**

This is an introductory course at the graduate level in fluid dynamics intended to give the students a broad exposure to incompressible flows. This course lays the foundation, and is a prerequisite for a study of advanced topics in heat transfer, advanced aerodynamics, computational fluid dynamics, wave mechanics, and geophysical fluid dynamics. This course includes conservation laws and boundary conditions, potential flows, highly viscous flows, boundary layer theory, flow stability and transition to turbulence. (EMEM-871, Graduate standing)

Class 4, Credit 4 (W)

**EMEM-880 Independent Study****Registration #0304-880**

An opportunity for the advanced student to undertake an independent investigation in a special area under the guidance of a faculty member. A written proposal is to be forwarded to the sponsoring faculty member and approved by the department head prior to the commencement of work.

Credit variable (maximum of 4 credits/quarter) (TBA)

**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, S, SR)

**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 deals with effective material selection which requires that a designer be familiar with many material systems and be acquainted with a nominal number of specific materials in these systems. The course contains theory not found in handbooks and practical information not covered in materials science or metallurgy courses. Emphasis is placed upon the application of materials according to the properties and principles of material behavior. Ferrous, nonferrous and nonmetallic materials are covered. (SESM-701 or equivalent)

Class 4, Credit 4 (TBA)

Special topic courses will be offered in the following areas if there is a sufficient demand:

Energy Methods in Mechanics	Thermal Stresses
Advanced Vibration Theory	Aerodynamics
Lubrication	Wave Mechanics
Advanced Heat Transfer	Computational Fluid Dynamics
Advanced Thermodynamics	Geophysical Fluid Dynamics
Control Systems	

# 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 addition, in art education. The art education concentration leads toward permanent artN-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 woodworking 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 "IV 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 require-

ments. 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.

#### **Studio Residence Program**

The School for American Craftsmen offers a craft residence program. Residence will be accepted in ceramics and ceramic sculpture, weaving and textile design, metalcrafts and jewelry design, woodworking and furniture design and the glass studios. This is an opportunity for the development of craft skills and aesthetic concepts.

Residence positions are limited and will be awarded by portfolio, transcript, references and a statement of purpose. An interview is required. Accepted candidates are required to enroll for at least six credits of audit per quarter, be present in the studio during class hours and contribute up to six hours of work in the studio area. In exchange, the school will provide work space, excellent equipment and supportive tutorial instruction. The resident is invited

to participate in visiting artists sessions, lectures and all other studio activities.

Participants may be graduates continuing preparation for graduate study, early career professionals developing techniques and designs for production in their own future studios, or teachers on leave who wish to work again in an academic environment.

Inquiries should be made to Residence Program, College of Fine and Applied Arts, Rochester Institute of Technology, One Lomb Memorial Drive, Rochester, N.Y. 14623.

#### **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, or who holds provisional 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 18 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 electives 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.

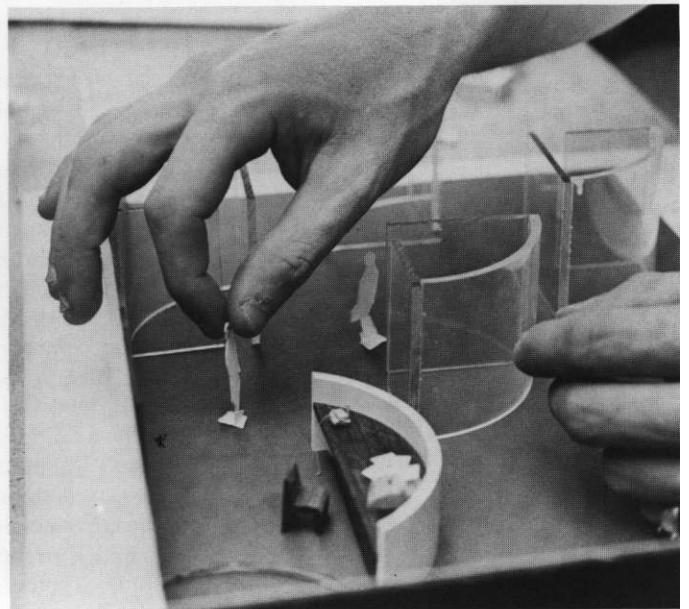
	MFA	MST STUDIO	MST ART EDUCATION
Major	30 credits	24 credits	22 credits
Minor	15	9	
Humanities	10	10	20 Social Sciences
Graduate Forum	3		
Electives	18	5	6
Thesis	14		
	90 credits	*48 credits	**48 credits

\*One year or summers

\*\*September start only

\*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.







## 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 8 1/2" 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.

## Graduate Faculty College of Fine and Applied Arts

**Robert H. Johnston**, Ph.D., Pennsylvania State University—Professor, Dean

**Peter Giopulos**, Ph.D., Pennsylvania State University—Professor, Associate Dean

**PhUp 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—Associate 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

**Craig McArt**, MFA, Rochester Institute of Technology—Professor, Industrial and Interior Design, 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

**James H. Sias**, MA, Michigan State University—Associate Professor, Industrial and Interior Design, School of Art and Design

**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—Associate Professor, Glass, School for American Craftsmen

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.

**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

# School of Art and Design

Beginning September 1982, the Communication Design program name has been changed to Graphic Design, and Environmental Design has been changed to industrial and Interior Design.

Courses for the education concentration of the MST program are offered through the College of Liberal Arts, and course descriptions are given under that heading with a Liberal Arts call number.

## Art Education

### FADA-701, -702 (MST) Methods and Materials in Art 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 (F, W) (offered every year)

### 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)

### FADA-860 (MST) Practice Teaching in Art

#### Registration #0401-860 (Major)

A seven-week full-time practice teaching experience in secondary school, including professional duties of the art teacher in humanities courses, publication advising, audiovisual work, and supervision. Supplements the studio-theoretical education. Meets the state education requirements.

Credit 9 (offered every year—Spring)

## Graphic Design

### FADC-750 Graphic Design

#### Registration #0402-750 (Major, Elective)

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)

## Computer Graphics Design

### FADG-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. 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)

## Industrial and Interior Design

### FADD-750 Industrial and Interior Design

#### Registration #0403-750 (Minor, Elective)

The reasoned application of theoretical and practical background to advanced projects in industrial and interior design.

Lab 6, Credit 3 (offered every quarter)

### FADD-780 Industrial and Interior Design

#### Registration #0403-780 (Major)

Selected projects in industrial or interior design which allow individual application of design methodology and technical skills toward professional goals. Selection of the projects is directed at providing an adequate background for development of the master's thesis.

Lab 9-27, Credit 3-9 (offered every quarter)

## Painting

### FADP-750

#### Painting

#### Registration #0405-750

(Minor, Elective)

Study of present techniques and concepts in painting and their relation to the tradition of painting. Development of painting skills in a chosen medium.

Lab 6, Credit 3 (offered every quarter)

### FADP-750

#### Illustration

#### Registration #0405-750

(Painting Minor, Elective)

An elective exploring the art of illustrators, their relation to audience, publishers, and media. Studio problems will develop and expand basic concepts of illustration.

Class 3, Lab 3, Credit 3 (offered each year)

### FADP-750

#### Drawing Problems

#### Registration #0405-751

(Painting Minor, Elective)

Individual drawing projects related to graduate students' major area of study. Opportunity to refine drawing skills on the graduate level.

Lab 6, Credit 3 (offered each year)

### FADP-780

#### Painting

#### Registration #0405-780

(Major)

Development of mastery of a permanent painting medium and related preparatory study. Examination of ideas and relationships in the field of painting with emphasis upon individual creative solutions.

Lab 9-27, Credit 3-9 (offered every quarter)

## Printmaking

### FADR-750

#### Printmaking

#### Registration #0406-750

(Minor, Elective)

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 I

#### Registration #0408-781

(MFA Major)

This is an introductory course, designed to acquaint the illustration student with art techniques commonly used in medical illustration, and with the medical library and audio-visual television supporting milieu in which the medical illustrator works.

Lab 6, Credit 3 (offered each year)

### FADM-782

#### Medical Illustration Graphics and Exhibits

#### Registration #0408-782

(MFA Majors)

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 while constructing three dimensional illustrations for in-house presentation or for traveling displays. In addition, students will learn to plan and cost analyse their illustrative exhibits.

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 Topics H

#### Registration #0408-784

(MFA Major)

A course emphasizing photographic techniques as employed in medical illustration. Students will learn to use the copystand and various films to reproduce continuous tone, black and white, and color artwork. The copystand and other lighting techniques will be introduced for photographing anatomical specimens, models, and surgical instruments. Combining photographic images and processes with illustrative techniques also will be explored.

Lab 6, Credit 3 (offered each year)

### FADM-785

#### Medical Illustration Operative Procedures I

#### Registration #0408-785

(MFA Major)

The application of illustrating and photographing in the operating room. The student will become familiar with the organization of operations and with his or her role as a medical illustrator. Sketches are to be drawn directly from the observation of surgery, consulting with the surgeon for accuracy of detail and development. The final preparation of the art work will be submitted for publication or portfolio.

Lab 6, Credit 3 (offered each year)

### FADM-786

#### Medical Illustration Operative Procedures II

#### Registration #0408-786

(MFA Majors)

A continuation of the concepts begun in 785; specifically, combining anatomical knowledge with surgical observation to construct a concise and accurate surgical series. Students will concentrate on communicating essential surgical concepts to a specific audience, as well as ensuring that their artwork will meet the demands of reproduction.

Lab 6, Credit 3 (offered each year)

## Thesis

### FAD (C, D, P, R, M or G)-890

#### Research and Thesis Guidance

#### Registration #040 (2,3,5,6,8, or 32)-890

(MFA Major)

The development of a thesis project initiated by the student and approved by a faculty committee and the Special Assistant to the Dean for Graduate Affairs. Primary creative production, the thesis must also include a written report and participation in a graduate thesis show.

Lab 27, Credit 3-14 (offered every quarter)

**FASA-785****Forms of Inquiry****Registration #0420-785****(Required for MFA)**

The exploration and organization of forms of inquiry in the fields of art, craft and design.

Class 2, Credit 2 (offered each year)

**FASA-790****Graduate Forum****Registration #0420-790****(Required for MFA)**

The presentation and discussion of issues in aesthetics, criticism, creativity and perception as they relate to art, design and craft will be undertaken. Points of view will be clarified through critical writing. Required for MFA; to be taken prior to Thesis.

Class 2, Credit 3

## School for American Craftsmen

### Ceramics and Ceramic Sculpture

**FSCC-750****Ceramics and Ceramic Sculpture****Registration #0409-750****(Minor, Elective)**

Basic instruction and experience in ceramic design, fabrication and production of ceramic forms is undertaken. This study provides ceramic technology and terminology and gives experience with clays along with fundamental forming techniques. The development of design awareness is encouraged through lectures and critiques.

Lab 6, Credit 3 (offered every quarter)

**FSCC-780****Ceramics and Ceramic 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, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

### Glass

**FSCG-720****Stained Glass****Registration #0411-720****(Minor, Elective)**

An elective providing exploration of personal approaches to visual expression and techniques in flat glass. Technical processes may incorporate all hot and cold processes used in glass.

Lab 6, Credit 3 (offered each year)

**FSCG-750****Glass****Registration #0411-750****(Minor, Elective)**

Collaborative work with the student's major area of study and glass fabrication is encouraged. Various techniques, both hot and cold will be considered: casting, slumping, fusing, blowing, cutting, electroplating, lamp working and sculptural construction. Course emphasis on personal, independent development encouraging contemporary thought and concept.

Lab 6, Credit 3 (offered every quarter)

**FSCG-780****Glass****Registration #0411-780****(Major)**

A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. All technical processes and techniques are to be considered relevant. The course is structured to provide a foundation for professional activity and to encourage exploration of personal concepts relating to the presentation of a body of visual work. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

### Metalcrafts and Jewelry

**FSCM-750****Metalcrafts and Jewelry****Registration #0412-750****(Minor, Elective)**

This is the study and manipulation of metals for hollowware/jewelry. Design sensitivity and concepts are approached through the raising, forming and planishing or casting, forging, and fabricating techniques.

Lab 6, Credit 3 (offered every quarter)

**FSCM-780****Metalcrafts and Jewelry****Registration #0412-780****(Major)**

A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. Both hollowware and jewelry areas will be explored. It is designed to give the student a broad exposure to metalworking techniques, expand the student's knowledge of applied design, strengthen perceptual and philosophical concepts and develop an individual mode of expression. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

### Weaving and Textile Design

**FSCT-750****Weaving and Textile Design****Registration #0413-750****(Minor, Elective)**

This is the study and appreciation of weaving and textile techniques, soft sculpture, off loom weaving and printing. Design approaches are stressed.

Lab 6, Credit 3 (offered every quarter)

**FSCT-750****Business Practices for the Craftsperson****Registration #0413-750, -85, -86****(Elective)**

Fundamental craft business practices, including setting up a business basic record keeping, banking, pricing, government regulations, insurance, marketing, and studying operations.

Class 3, Credit 3 (offered every other year)

**FSCT-780****Weaving and Textile Design****Registration #0413-780****(Major)**

A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. Techniques offered are combination weaves and pattern design, double weave, embroidery and stitchery, finn-weave, Ikat, multiple layer, dyeing, non-loom, pile rug, printed surface, silk-screen, tapestry, and soft sculpture. Design concepts are complements to the techniques. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)



## Woodworking and Furniture Design

**FSCW-750**

**Woodworking and Furniture Design**

**Registration #0414-750**

**(Minor, Elective)**

This is a course in woodworking techniques and procedures. It enables the student to gain design competency through wood and an individual solution to wood projects based on suggested needs.

Lab 6, Credit 3 (offered every quarter)

**FSCW-780**

**Woodworking and Furniture Design**

**Registration #0414-780**

**(Major)**

A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. This provides an opportunity for technical, aesthetic and design competency to grow through the exploration of hand and machine tools; solid wood theory, joinery and practice; veneer theory, and practice; production theory; chair, table, cabinet design and construction. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab 9-27, Credit 3-9 (offered every quarter)

## Thesis

**FSC (C, G, M, T or W)-890**

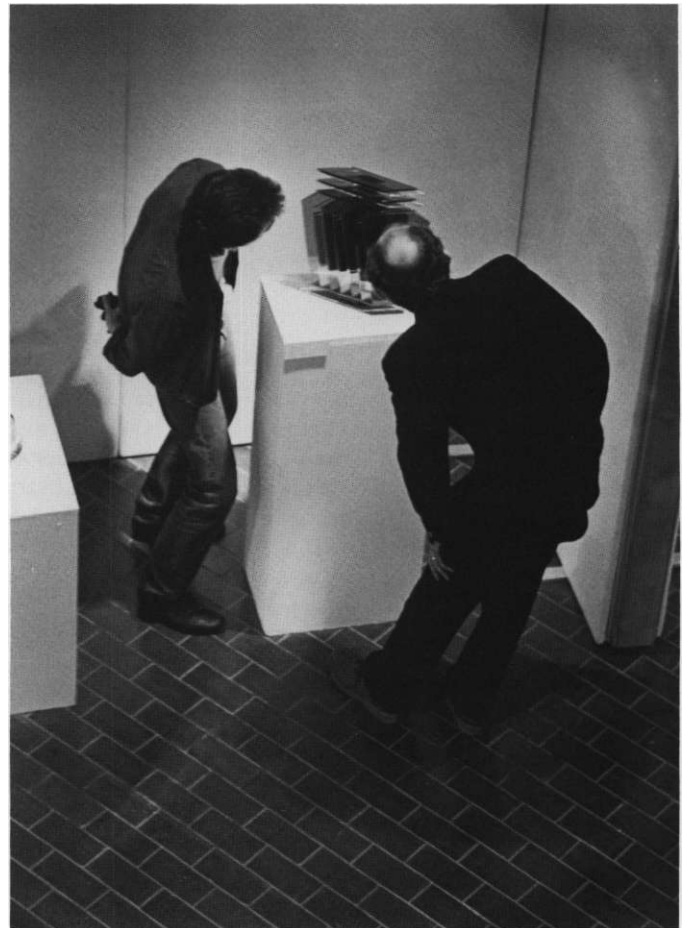
**Research and Thesis Guidance**

**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)



# College of Graphic Arts and Photography



## Dr. Robert M. Desmond, Dean

The college of Graphic Arts and Photography represents what RIT is all about—an interdisciplinary institution. A broad range of disciplines are available to students including design, science, technology, engineering, and management, as well as world-class faculty, who are at the forefront of their disciplines.

Four graduate programs are offered in the field of imaging arts and sciences: **master of science degree in printing technology** from the School of Printing Management and Sciences; **master of science degree in imag-**

**ing science** from the Center for Imaging Science; **master of fine arts degree in photography** from the School of Photographic Arts and Sciences; and a **master of science degree in color science, appearance and technology**. In addition, the School of Photographic Arts and Sciences offers an advanced certificate in electronic and optical storage.

With over \$70 million in state-of-the-art and advanced equipment supporting course work and research, students have the opportunity to excel in their chosen areas of emphasis.

The advancement of our graduates upon employment is excellent; their successes are what our programs are all about—excellence through learning.

## Master of Science Degree in Printing Technology

**Joseph L. Noga**, Coordinator  
MS Program, (716) 475-2849

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 Management and Sciences 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 addi-

tional 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 Management and Sciences 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 of Printing Management and Sciences 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'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 (Five Courses)

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  
 PPRT-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 Management and Sciences 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 Management and Sciences 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 Management and Sciences 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 Management and Sciences 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.

# Printing Technology

## 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-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

### **PPRT-890**

### **Research and Thesis Guidance**

#### **Registration #0911-890**

An experimental survey of a problem area in the graphic arts.

Credit 8

## 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 Management and Sciences

**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, Photolithography Technology

**Mark F. Guldin**, Ph.D., University of Iowa—Distinguished Professor of Graphic Arts Communication

**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

**Joseph L. Noga**, MS, University of Bridgeport—Professor, Reproduction Photography, 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

**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

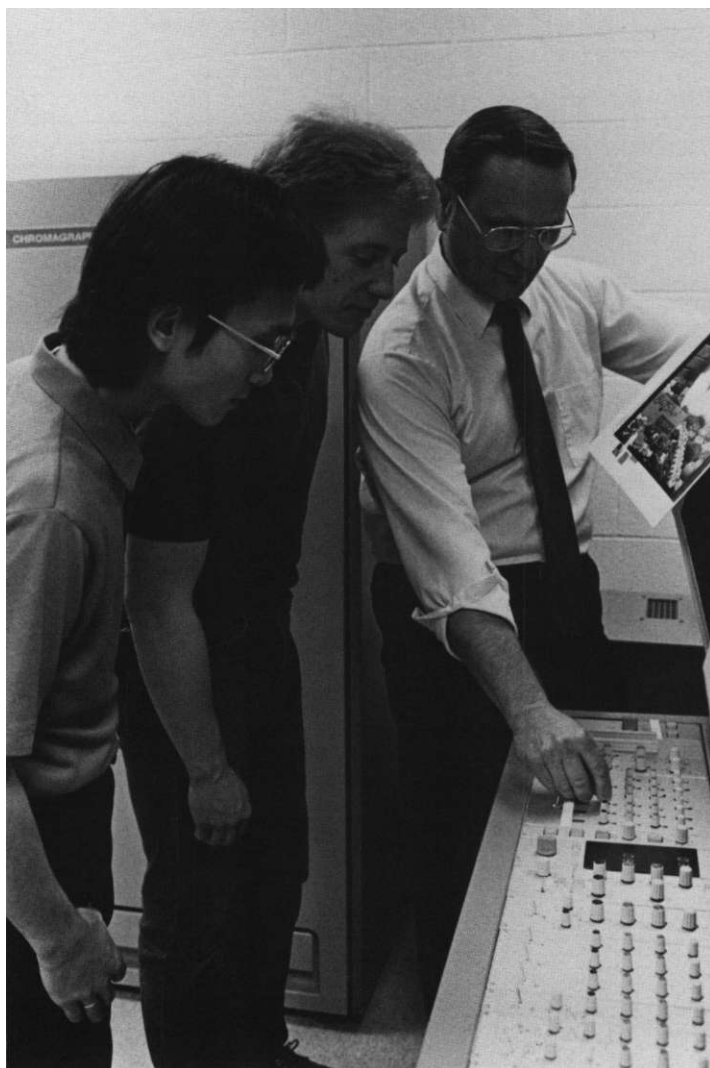
**Alfred F. Horton**, AAS, Rochester Institute of Technology—Melbert B. Cary, Jr., Professor in Graphic Arts, Layout and Design

**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—Professor, Planning and Finishing

**Robert S. Tompkins**—Assistant Professor, Composition Specialist



## Master of Science Degree in Imaging Science

**Dr. Rodney Shaw**, Coordinator  
MS Program, (716) 475-2774

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 science 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 science. A thesis is required.

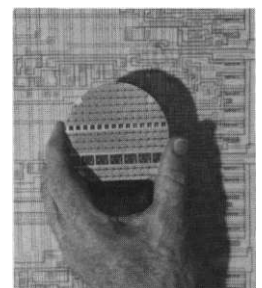
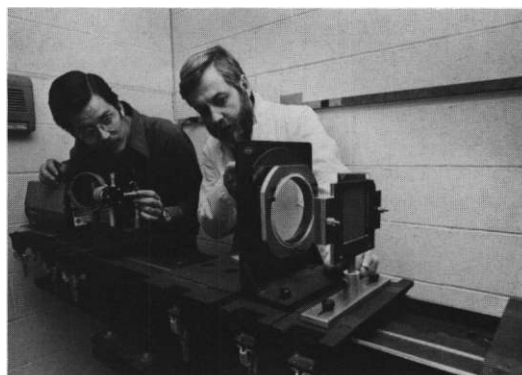
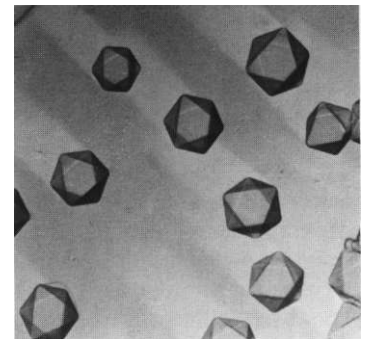
Faculty members within the department supervise research in areas of the chemistry and physics of radiation-sensitive materials and processes, color science, digital image processing, remote sensing, photci-optical instrumentation, and objective and subjective image evaluation. Other interdisciplinary 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 science:

### 1. Bachelor of Science and Master of Science in Imaging 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 halting thousands of circuit elements; optical instrumentation lab*

## 2. Master of Science in Imaging Science (Full-time)

This program is designed for persons holding a bachelor's degree in science or engineering.

Before admission to candidacy and before beginning graduate level courses, the student must have an adequate foundation in the principles of imaging science. This knowledge may be acquired by enrolling in the full-time summer course, Principles of Imaging Science, PIMG-600. This course begins in June and runs for 10 weeks, and is waived for students with undergraduate degrees in imaging science. The curriculum is built around four core areas: optics, image evaluation, theory of the photographic process and mathematics. Each student is required to select at least three of these areas of study. To fulfill the core requirements, a three-quarter series in two of these areas and a two-quarter series in a third area must be completed. The student must also complete nine credit hours of research with three credit hours assigned to the graduate research course and six credit hours assigned to the thesis research and defense. The student will elect graduate courses to bring the total credit count to 51. Up to six credit hours applicable as graduate technical electives may be from graduate courses outside the Center for Imaging Science. All non-imaging science courses must be approved by the CIS graduate faculty as acceptable for CIS credit.

## 3. Master of Science in Imaging 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 science may be obtained by taking Principles of Imaging Science, PIMG-601, 602, 603 which is equivalent to PIMG-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 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 of the Center for Imaging Science 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.

## 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 fol-

lowing 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 Imaging Science, our summer transfer course. It presents an enormous amount of very basic information and provides access to an astonishing number of fields that use imaging science in some way, such as microelectronics, photographic chemistry, color science, radiometry, optics, 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.

COURSE OF STUDY					
Quarter Credit Hours					
Course Title and Number	Summer	Fall	Winter	Spring	Summer
Principles of Imaging Science PIMG-600,601 or 602 and 603		No Graduate Credit <sup>(1)</sup>			
Three-Quarter Core Sequence		3/4*	3/4*	3/4*	
Three-Quarter Core Sequence		3/4*	3/4*	3/4*	
Two-Quarter Core Sequence		3/4**	3/4**		
Research—PIMG-890		1	1	1	6
Technical Electives		3/4†	3/4†	3/4†	
Technical Electives				3/4†	

(1) Consent of the graduate coordinator is necessary for registration. Each quarter of PIMG-601,602,603 carries 5 undergraduate quarter credits. PIMG-600 carries 15 quarter credits.  
 \*\*Fulfills two-quarter core sequence requirement.  
 †To bring graduate credit count to 51, up to 6 credit hours may be non-CIS graduate courses approved by CIS Graduate Faculty.  
 \*Fulfills three-quarter core sequence requirement.

**Technical Electives****Imaging Science Core Sequences\***

PIMG 711, 712, 713	Theory of the Photographic Process
PIMG 721, 722	Statistics and Computer Techniques
PIMG 731, 732, 733	Instrumental and Photographic Optics
PIMG 741, 742, 743	Analysis and Evaluation of Imaging Systems

**CIS Technical Electives**

PIMG 761, 762, 763	Principles of Remote Sensing & Image Analysis
PIMG 751, 752, 753	Special Topics—varies each year, typical offerings include Electro-Optics, Digital Image Processing, Photo Microlithography

**Recommended Non-CIS Electives\*\***

FFEF 778	Fiber Optics
FFFF 723	Semiconductor Physics
EEEE779	Digital Image Processing
FFFF 794	Information Theory
CTAM 821, 822	Theory of Statistics
CTAM 841, 842	Regression Analysis
CTAM 830, 831	Multivariate Analysis
SCHA711	Instrumental Analysis
SCHO 737	Advanced Organic Chemistry
SCHP 744	Quantum Mechanics
SCHO 835	Organic Chemistry of Polymers

\*CIS core courses also can be taken as technical electives.

\*\*This is not a comprehensive listing. Other courses at the Institute or other universities can be taken with the approval of CIS graduate faculty.

## Imaging Science

**PIMG-600****Principles of Imaging Science****Registration #0925-600**

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 imaging science or who desire a working knowledge of imaging 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 imaging science and instrumentation graduate program)

**PIMG-601,602,603****Principles of Imaging Science****Registration #0925-601,602,603**

Equivalent to PIMG-600, but offered in the evening and Saturdays during the regular Fall, Winter, and Spring Quarters. (Preliminary admission to the MS program in Imaging Science or consent of graduate coordinator. Not offered every year. Consult coordinator of imaging science graduate program.)

Credit 5/Qtr.

(Not applicable to 45 required graduate credits)

**PIMG-711,712,713****Theory of the Photographic Process****Registration #0925-711,712,713**

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.

**Statistics & Computer Techniques  
for Photographic Systems****PIMG-721,722****Registration #0925-721,722**

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.

**Instrumental and  
Photographic Optics****PIMG-731,732,733****Registration #0925-731,732,733**

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.

**PIMG-741,742,743****Analysis and Evaluation of Imaging Systems****Registration #0925-741,742,743**

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)

**PIMG-751,752,753****Special Topics in Photographic Science****Registration #0925-751,752,753**

Advanced topics of current or special interest, varying from quarter to quarter, selected from the field of imaging science. Specific topics announced in advance. (Not offered every quarter. Consult coordinator of the graduate program.)

Credit varies

**PIMG-761,762,763****Principles of Remote Sensing & Image Analysis****Registration #0925-761,762,763**

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

**PIMG-890****Research and Thesis Guidance****Registration #0925-890**

Thesis based on experimental evidence obtained by the candidate in an appropriate field as arranged between the candidate and his or her advisor.

Credit 9, minimum for MS

## Graduate Faculty Center for Imaging Science

**Robert A. Clark**, Ph.D., University of Maryland—Professor, Imaging Science

**Ronald Francis**, Ph.D., Massachusetts Institute of Technology—Professor, Imaging Science

**Pantazis, Mouroulis**, BSc, University of Athens; Ph.D., University of Reading

**John R. Schott**, Ph.D., Syracuse University—Associate Professor, Imaging Science

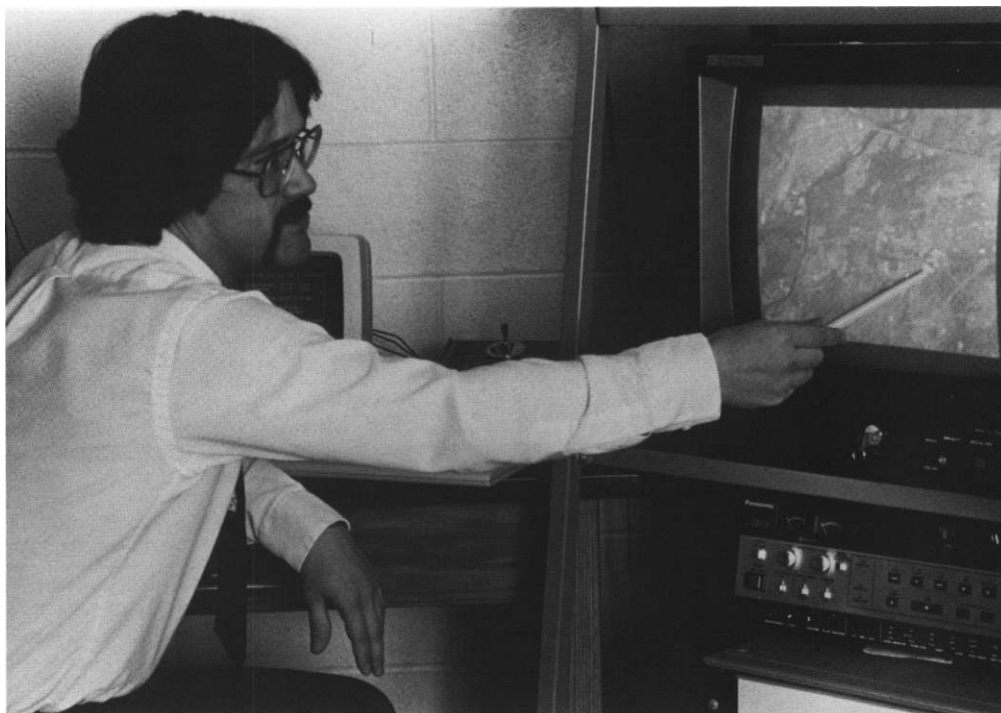
**Rodney Shaw**, BS, Leeds University; Ph.D. Cambridge University—Professor, Imaging Science

### Associates of the Graduate Faculty

**Willem Brouwer**, Ph.D., Technical University, Delft, Holland—Visiting Professor, Imaging Science

**Robert Daly**, Ph.D., University of Arizona

**Harry Roberts**, BS, University of Rochester



## Master of Fine Arts Degree in Photography

**Dr. Richard D. Zakia**, Coordinator  
MFA Program, (716) 475-2616

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 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.





### 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. 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.

To apply for admissions to graduate study, a student must submit evidence of his or her graduate degree, an acceptable portfolio, a statement of purpose, and references. All correspondence concerning applications, catalogs and portfolios should be addressed to the Director of Admissions at RIT.

### 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, computer-generated images, 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.



Photograph by Willie Osterman



Dr. Richard P. Zakia

Photograph by John Retallack

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 are accepted beginning in September of each year. Portfolios should be submitted in time to arrive the first week in March.

### 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.

### Major

Designed to give depth of experience to photography 36

### Electives

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

**Humanities** 8

**Research and Thesis** 12

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.

### Quarter Credit Hours

### 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.

### 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.

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.

# 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

## 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

## 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

## 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

## 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

## 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

## 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.

## PPHG733

### Animation and Graphic Film Production

#### Registration #0903-733

An introduction to the techniques and practice of graphic and animated film production. This course provides training and practical experience in a wide variety of approaches to single frame motion picture production. Students produce a number of short film exercises utilizing both existing and original artwork. Some techniques covered in the course are: direct modification of the film surface, eel, ink and paint animation, and kinestasis. Screenings of professionally made films will illustrate each technique. Proficiency in drawing is not required. No prerequisites.

Class 2, Discussion 1, Lab 2; Credit 4 (F, W)

## PPHG-734

### Animation and Graphic Film Production

#### Registration #0903-734

A continued introduction to the techniques and practice of graphic and animated film production. This course provides training and practical experience in a number of approaches to single-frame film making in addition to those covered in PPHG-733. Some techniques covered in the course are: Three-dimensional animation; optical printing; computer animation; and hand-drawn sound. Screenings of professionally made films will illustrate each technique. Proficiency in drawing is not required. (PPHG-733)

Class 2, Discussion 1, Lab 2; Credit 4 (W, S)

## PPHG-735

### Animation and Graphic Film Production

#### Registration #0903-735

This course provides practice in all phases of single-frame film production. Students produce a 16mm 90-second graphic film with sound utilizing one or more techniques learned in the preceding two quarters. (PPHG-734)

Class 2, Discussion 2, Lab 2; Credit 4 (S, F)

## PPHG-740,741,742

### Photographic Museum 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

## 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

## PPHG-753

### Teaching Photography

#### 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-754

### Photographic Workshop for Teachers

#### Registration #0903-754

A graduate course in the principles and practices of photography designed especially for the high school or community college teacher, counselor or advisor, who may be involved in instruction or career guidance in photography.

Both black and white and color photography are presented and applied in actual picture-making experiences. Both the aesthetic and the technical aspects of photography are stressed. Teaching methods, course development, and ideas in visual communications are examined. Teaching technique relevant to the instruction of photography will be stressed. Career opportunities in photography will be explored.

Credit 6

## PPHG755

### 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

## 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

**PPHG-767,768,769****Contemporary Issues****Registration #0903-767,768,769**

A study of current issues relevant to fine art photography, how they relate to broader historical/cultural issues, and how they might suggest future directions.

(Graduate Status)

Credit 2

**PPHG-799****Independent Project****Registration #0903-799**

The student proposes an advanced project to an individual instructor. The student and the instructor are jointly responsible that the material to be covered is appropriate to the student's program and that the number of credits proposed are justified. Both will sign the proposal which must also be approved by the graduate coordinator and the director of the school.

Credit 1-10

**PPHG-877****Museum Internship****Registration #0903-877**

Experiential learning is provided in collection management, cataloguing and classification, exhibition preparation and exhibitions, research and critical writing.

Credit 1-8

**PPHG-887,888,889****Research Seminar****Registration #0903-889**

The seminar serves as a basis for exchanging ideas for research work and for a general orientation of the procedures and requirements for the completion of a successful thesis.

Credit 2

**PPHG-890****Research and Thesis****Registration #0903-890**

The thesis is designed and proposed by the candidate. It is considered his culminating experience in the program, involving research, a creative body of work, an exhibition or suitable presentation, and a written illustrated report.

Credit 1-12

## Master of Science Degree in Color Science, Appearance, and Technology

**Dr. Roy S. Berns, Coordinator**

MS Program, (716) 475-2784

or (716) 475-6013

Color science is broadly interdisciplinary, encompassing physics, chemistry, physiology, and psychology. The curriculum leading to a master of science degree in color science, appearance, and technology is a program developed to educate students using a broad interdisciplinary approach. This is a unique opportunity for students as this is the only graduate program in the country devoted to this discipline. The program is designed for students whose undergraduate majors are in imaging science, photography, printing, textiles, physics, chemistry, psychology, physiology, graphic or fine arts, or any discipline pertaining to the quantitative description of

color. Candidates who do not have adequate undergraduate work in related sciences must make up foundation courses before matriculating into the program.

The color science, appearance, and technology major provides graduate level study in both color science theory and its practical application. The program will give students a broad exposure to the field of color and will afford students the unique opportunity of specializing in a particular area appropriate for their background and interest. This objective will be accomplished through the program's core courses, selection of electives, and completion of the thesis.

The degree program in color science, appearance, and technology revolves around the activities of the Munsell Color Science Laboratory. The Munsell Laboratory is already the pre-eminent academic laboratory in the country devoted to color science. Since its inauguration in 1984, two industrial conferences have been held, both drawing participants from around the world. Industrial seminars devoted to the quantitative specification of color are offered on a continuing basis. Students have received co-op and full-time positions through contacts made with the assistance of the Munsell Laboratory.

### The Program

The color science, appearance, and technology major is a full-time or part-time master's degree program. The length of time required to earn a degree varies according to the student's undergraduate preparation in mathematics, computer science, general science, and the number of courses taken per quarter. All students must earn 45 credits as a graduate student, 36 of which must be taken at RIT, to earn the master of science degree. For full-time students, the program requires a minimum of 4 quarters of study at the graduate level. Part-time students generally require 7 quarters of study at the graduate level. The curriculum is a combination of required courses in color science, appearance, and technology, elective courses appropriate for the candidate's background, and a research thesis. Candidates who wish to enter the program, but lack adequate preparation may have to take as many as 22 credits of foundation courses in mathematics, computer science, and general science prior to matriculation with graduate status. Foundation courses can be completed in two quarters.

### The Foundation Program

The color science, appearance, and technology major is designed for the candidate with an undergraduate degree in a scientific or non-scientific discipline. Candidates with adequate undergraduate work in related sciences will start the program as a matriculated graduate student.

Candidates without adequate undergraduate work in related sciences must take foundation courses prior to matriculation into the graduate program. These students will enter the program as "Special Students." This will help identify the candidate in foundation courses, and allow for guidance from the director of the program.

Course work in mathematics, computer science, and general science is expected if these courses are not indicated on the candidate's transcript. Students who require foundation courses may be required to take as many as 22 credits in these subjects. A written agreement between the candidate and the director of the program will be developed to identify the courses required to complete the foundation course requirements.

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 accepted. A maximum of 9 credit hours at the graduate level may be taken prior to matriculation into the graduate program.

### Foundation Courses

The courses listed below represent the courses required to meet the foundation course requirements:

SMAM 214,215 Introduction to Calculus I, II—3 cr/qr

SPSP 211,212 College Physics I, II—3 cr/qr

SPSP 271,272 College Physics Lab I, II—1 cr/qr

ICSP 220 FORTRAN Programming for Engineers—4 cr

GSSP 509 Psychology of Perception—4 cr

It should be noted that these foundation courses prepare the student only for required course work in color science, appearance, and technology. Additional undergraduate course work may be necessary in order to have the appropriate requirements for graduate electives offered in other areas.



*Professor Bems aligning goniospectrophotometer to measure the color and surface attributes of a chromatic sample. The instrument was designed by the first Richard S. Hunter Professor, Dr. Franc Grum.*

### Program Requirements

The master of science degree program in color science, appearance, and technology requires the completion of 45 quarter credit hours of study including 9 hours for the thesis. If foundation courses are not required, the program can be completed in 4 quarters at full-time status and in 7 quarters at part-time status. Students who are qualified in one or more of the required courses may substitute other course work with the permission of the director of the program. The program curriculum is a combination of required courses in color science, appearance, and technology and elective courses which will satisfy the student's individual needs. The student may choose elective courses with the approval of the director of the program. This flexibility enables the program to be broadly interdisciplinary.

### Required Graduate Courses

(PPHC 701) Colorimetry I—4 cr

(PPHC702) Colorimetry II—4 cr

(PPHC 751) Special Topics: Color Perception—3 cr

(PPHC 801) Advanced Colorimetry—3 cr

(PPHC 802) Colorimetric Instrumentation and Standardization—4 cr

(PPHC 803) Computer Colorant Formulation—3 cr

(PPHC 890) Research Thesis—9 cr

(CQAS 711) Fundamentals of Statistics I—3 cr

(CQAS 712) Fundamentals of Statistics II—3 cr

### Electives

Appropriate electives should be selected to bring total course work to 45 credit hours. The following is a partial list of possible recommended electives:

(CQAS 801,802) Design of Experiments I, II—3 cr/qr

(CQAS 821,822) Theory of Statistics I, II—3 cr/qr

(CQAS 830, 831) Multivariate Analysis I, II—3 cr/qr

(PIMG 741,742,743) Analysis and Evaluation of Imaging Systems—3 cr/qr

(PPRT 702) Graphic Reproduction Theory—4 cr

(PPRT 722) Ink, Color and Substrates—4 cr

(SCHO 736) Spectrometric Chemical Identification of Organic Compounds—3 cr

(SCHA 711) Instrumental Analysis—3 cr

(ICSA 770) Fundamentals of Computer Graphics—4 cr

(ICSA 771) Advanced Topics in Computer Graphics—4 cr

### Thesis

Nine credit hours are required. Topics should be chosen that complement the candidate's undergraduate training. The technical advisory board to the Munsell Color Science Laboratory, in addition to the director of the program, can aid the candidate in selecting a thesis topic which has current industrial relevance.

### Admission Requirements

Prior to being admitted to the master of science degree program, applicants must satisfy the director of the program in that their previous training, ability, practical experience, and education indicate a reasonable chance of success. Applicants may be admitted who hold a baccalaureate degree from an accredited institution. Applicants must have undergraduate records of 3.0 or higher. They will be required to take the Graduate Record Examination (GRE) as an aid in academic counseling during the development of the individual's program of studies.

Requirements are:

Graduate application

Earned baccalaureate degree

Graduate record examination (GRE)

Official undergraduate transcript

Two professional recommendations

An on-campus interview when possible

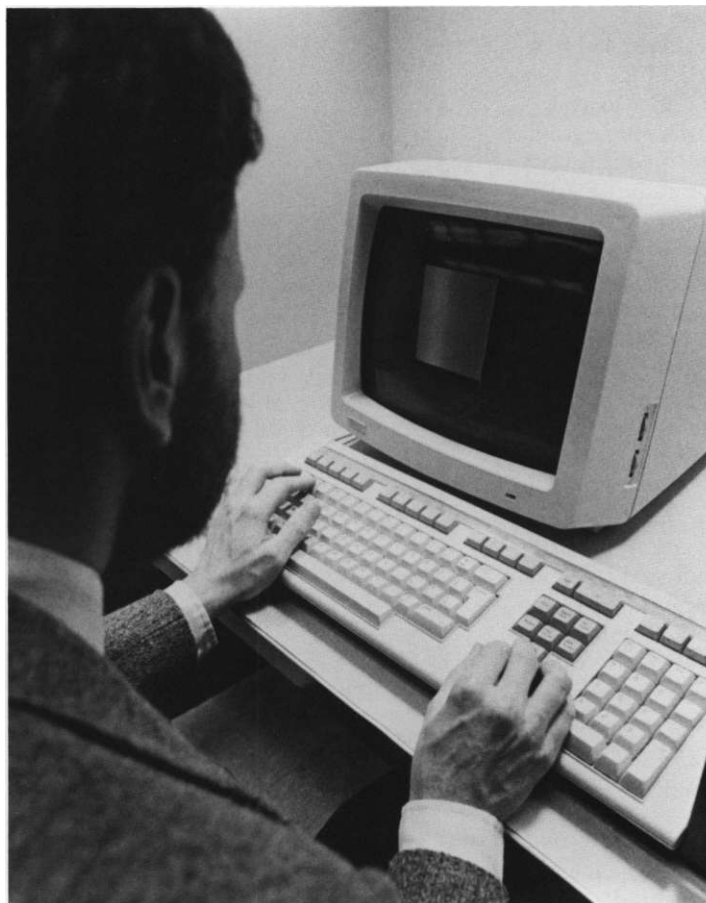
Undergraduate GPA of 3.0 or higher

Foundation course work 3.0 or higher, if required

TOEFL score of at least 550 (international students)

### Munsell Advisory Board

In order to insure that the research activities surrounding the degree program are relevant to current industrial needs, the Munsell Color Science Laboratory Advisory Board was established. The board members have expertise in color vision, color measuring instrumentation, psychophysics, computer colorant formulation, lighting, art, and applied color technology. The Advisory Board provides an excellent resource for students in both the selection of a thesis topic and future placement.



#### A Typical Part-Time Schedule of Courses

		Credits
Fall		
PPHC	701 Colorimetry I	4
CQAS	711 Fundamentals of Statistics I	3
Winter		
PPHC	702 Colorimetry II	4
CQAS	712 Fundamentals of Statistics II	3
Spring		
PPHC	801 Advanced Colorimetry	3
	Graduate Electives	4
Summer		
	Graduate Electives	6
Fall		
PPHC	751 Color Perception	3
PPHC	802 Color Instrumentation and Standardization	4
Winter		
PPHC	890 Thesis	6
Spring		
PPHC	803 Computer Colorant Formulation	3
PPHC	890 Thesis	3
Total		46

#### A Typical Full-Time Schedule of Courses

		Credits
Fall		
PPHC	701 Colorimetry I	4
CQAS	711 Fundamentals of Statistics I	3
	Graduate Electives	5
Winter		
PPHC	702 Colorimetry II	4
CQAS	712 Fundamentals of Statistics II	3
	Graduate Electives	5
Spring		
PPHC	801 Advanced Colorimetry	3
PPHC	804 Computer Colorant Formulation	3
PPHC	890 Thesis	4
	Graduate Electives	2
Fall		
PPHC	751 Color Perception	3
PPHC	802 Colorimetric Instrumentation and Standardization	4
PPHC	890 Thesis	5
Total		48

## Advanced Certificate in Electronic & Optical Storage Applications

**Dr. John Ciampa**, Chair  
American Video Institute at RIT  
(716)475-6625

The interdisciplinary expertise required by the modern systems architect will be addressed by offering a sequence of three storage applications courses (Fall, Winter and Spring Quarters) which mix electronics, computer science, communication theory, system design, production and project management skills. Along with these three specialized courses, a second course is required each quarter that will add background and specialized knowledge in related fields.

In the fall, Video Materials and Processes, an existing undergraduate course, will provide background to those who have little or no experience in video systems.

During the Winter Quarter, a micro-computer course will teach some programming as it relates to video disc control.

In the Spring, the selection of one of three courses will allow the student to add an additional emphasis in one of the three related fields, depending on his or her special interests: Advanced Video, an existing undergraduate course, for those in production careers; Image Bank Management for those in computer science careers; and Communication Theory for those in careers in design and/or education.

In order to complete the requirements for the certificate, satisfactory course work must be completed in the three storage application courses: Video Materials and Processes, Microcomputer Controls and one of the three Spring Quarter electives. In addition, a project must be finished that represents an original application design with sufficient steps toward implementation.

Students will have at their disposal the American Video Institute (AVI) Videodisc and Optical Publishing Laboratory, which contains over \$1 million in computer hardware and software.

Fall	Credits
PPHV-0922 731	4
Storage Applications Design I	
PPHF-310 Video Materials and Processes	2
<b>Winter</b>	
PPHV-0922 732	4
Storage Applications Design II	
PPHV-0922 736	
Microcomputer Control	4
<b>Spring</b>	
PPHV-0922 733	4
Storage Applications Design HI	
One of the following three electives:	
PPHF-434 Advanced Video	3
PPHV 0922 734	4
Imagebank Management	
PPHV-0922 735	4
Communication Theory	





# Color Science, Appearance and Technology

## PPHC-701

## Colorimetry I

### Registration #0923-701

For those taking colorimetry for the first time. Covers colorimetric procedures commonly used in industrial quality control and research and development. The emphasis is on the spectral and colorimetric characterization of chromatic stimuli using modern instrumental methods, and deriving the relationships between appearance attributes and instrumental data. Accompanying laboratory stresses instrumental measurements.

Credit 4

## PPHC-702

## Colorimetry II

### Registration #0923-702

(A continuation of Colorimetry I) The emphasis is on visual methods to determine color tolerances, characterizing surface properties of objects, visual scaling techniques using color order systems, and the effects of viewing and illuminating conditions on color appearance. Accompanying laboratory stresses visual measurements.

Credit 4

## PPHC-751

## Special Topics: Color Perception

### Registration #0923-751

This course describes how we see color and what measurements of color mean. It includes information about the anatomy and physiology of the mechanism of vision and relates activities in that mechanism to the appearances of perceived colors. Methods for measuring and specifying color appearances are discussed. The implications and limitations of various kinds of color measurement are emphasized. Laboratory work includes measuring certain visual functions and using the data to make colorimetric specifications.

Credit 3

## PPHC 801

## Advanced Colorimetry

### Registration #0923-801

A detailed treatment and evaluation of current research and development in color science. Topics include current developments in CIE technical committees, luminescent colorimetry, color rendering of light sources, observer metamerism, color differences, self-luminous displays, and color appearance specification.

Credit 3

## PPHC-802

## Colorimetric Instrumentation and Standardization

### Registration #0923-802

This course covers current methods of precisely measuring the spectral properties of object colors and of radiation sources. Proper procedures in calibration, standardization, data analyses, instrument maintenance, and standards selection are discussed. The use of standard reference materials in optical metrology are explored. Various measurement assurance programs are introduced for the diagnostic evaluation of current colorimetric instrumentation.

Credit 4

## PPHC 803

## Computer Colorant Formulation

### Registration #0923-803

his course explores modern methods of colorant formulation prediction for the coloring of polymers, textiles, paper (impact and non-impact), and coatings. Emphasis is placed on Kubelka-Munk turbid media theory for opaque and translucent materials. Students have ample opportunity to familiarize themselves with several commercial computer colorant formulation systems.

Credit 3

## PPHC-890

## Thesis

### Registration #0923-890

Thesis based on experimental evidence obtained by the candidate in an appropriate topic as arranged between the candidate and the director of the program.

Credit 9

(minimum for MS)

## PPHC-899

## Independent Study

### Registration #0923-899

A student-proposed advanced project sponsored by a graduate faculty member. Approval required by the director of the program.

Credit variable

# Storage Applications Design

## PPHV-731

## Storage Applications Design I

### Registration #0922-731

An exploration of the technology, psychology, and aesthetics of modern storage applications with their massive image/information/delivery capacities, including an analysis of the hardware and software of videodiscs and optical discs as image banks with attendant databases and the effects of interactivity on system design. (Completion of undergraduate degree or equivalent; some background in computers or communication arts or science)

Class 4, Credit 4

## PPHV-732

## Storage Applications Design II

### Registration #0922-732

An experiential laboratory working with existing interactive software, authoring systems, original image retrieval programs, for existing image banks primarily on videodisc and optical disk; also involving experience with interactive input devices such as keyboard and touch-screen. (PPHV-731)

Class 4, Credit 4

## PPHV-733

## Storage Applications Design in

### Registration #0922-733

Having already acquired an understanding of the theory and practice of modern storage applications, primarily in the area of videodisc and optical disc, students will be assigned to project teams in such a way that a balanced blend of artistic and scientific backgrounds is achieved where possible. The project team will be assigned an application which will be taken from the assessment of the end user's need right through final production; and software design which will include, in some shared projects, actual production on "Draw" disc or videodisc, so that an up-and-running system is the product of the project team rather than a paper design. (PPHV-732)

Class 4, Credit 4

## PPHV-734

## Image Bank Management

### Registration #0922-734

An adaptation of database concepts to the special problems of the massive, randomly accessible signal stores now possible with optical storage. (PPHV-736)

Class 4, Credit 4

## PPHV-735

## Communication Theory

### Registration #0922-735

Analysis of all communication forms in terms of a taxonomy which divides communication forms into immediate and mediate, and then further subdivides in terms of channel capacity and characteristics such as one-way systems, two-way interactive systems, etc. Within the mediate class, the course shall consider, among other things, the comparative effects on expression and impression processes of the television medium, computer storage, interactive video, and so forth. (Permission of instructor)

Class 4, Credit 4

## PPHV-736

## Microcomputer Control

### Registration #0922-736

A survey of current computer-driven videodisc playback systems, involving both microcomputers and supermicrocomputers. Topics covered include hardware configurations, videodisc instruction sets, software interfaces, and system utilization. The course requires computer and video literacy.

Class 4, Credit 4



## Graduate Faculty School of Photographic Arts and Sciences

**Charles Arnold, Jr.**, MFA, Rochester Institute of Technology—Professor, Applied Photography

**Roy S. Berns**, Ph.D., Rensselaer Polytechnic Institute—Associate Professor, Color Science

**John Ciampa**, BA, Boston University; MA, University of Michigan; JD, Cornell University—Associate Professor, American Video Institute

**Andrew Davidhazy**, MFA, Rochester Institute of Technology—Professor, Imaging and Photographic Technology

**Lothar K. Engelmann**, Ph.D., J. W. Goethe University, Germany—Professor, Imaging and Photographic Technology

**Russell Kraus**, Ed. D., Massachusetts—Associate Professor, Imaging and Photographic Technology

**James E. McMillion, Jr.**, MFA, Ohio University—Professor, Imaging and Photographic Technology

**Elliott Rubenstein**, MFA SUNY, Buffalo; MA, St. John's University—Associate Professor, Fine Art Photography

**Leslie D. Stroebe**, BS, Ed. D., University of Rochester—Professor, Chairman, Imaging and Photographic Technology

**Richard D. Zakia**, BS, Rochester Institute of Technology; Ed. D., University of Rochester—Professor; Chairman, Fine Art Photography

### Associates of Graduate Faculty

**Owen Butler**, BFA, Rochester Institute of Technology—Associate Professor, Applied 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**, BFA, Alfred—Director, Visual Studies Workshop; Lecturer, Photography

**Roger Merton**, BFA, Rochester Institute of Technology, MFA, SUNY Buffalo, Associate Professor, University of Rochester

**John Pfahl**, MA, Syracuse University—Lecturer, Photography

**James M. Reilly**, BA, Franklin and Marshall, MA SUNY Buffalo, Director, Imaging Permanence Institute, Rochester Institute of Technology, Lecturer, Photography

**David J. Robertson**, MS, Columbia—Professor, Applied Photography

**Grant B. Romer**, BFA, Pratt Institute, MFA, Rochester Institute of Technology, Conservator, International Museum of Photography, George Eastman House; Lecturer, Photography

**Robert A. Sobieszak**, MA, Stanford—Director, Photographic Collections, International Museum of Photography, George Eastman House; Lecturer, Photography

**Charles C. Werberig**, BFA, MS, Syracuse University—Associate Professor, Film/Video

**Ken White**, BA, Princeton University; MA, MFA, University of New Mexico—Assistant Professor, Fine Art Photography

**Tom Muir Wilson**, BFA, Cranbrook Academy of Art; MFA, Rochester Institute of Technology—Associate Professor, Fine Art Photography

# College of Liberal Arts

**Mary C. 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 broader human and social knowledge and 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.

## Master of Science Degree in School Psychology

**Dr. Margery Reading-Brown**, chairperson, School Psychology

The College of Liberal Arts offers a graduate program leading to the master of science degree in school psychology. The program prepares students for provisional certification as school psychologists in New York State. It is designed to provide students with a strong background in psychological theory, and to develop their skills and competencies in evaluation and consultation.

School psychologists work with elementary and high school students, teachers and administrators, parents and professionals. They provide services which lead to the amelioration of existing student-related educational difficulties, and attempt to prevent potential school problems. Through diagnostic testing and intervention, they help students deal with their learning difficulties, and to improve their adjustment to school.

The school psychology program is rich in resources. RIT-affiliated facilities such as the Learning Development Center, Horton Child Care Center, and the



National Technical Institute for the Deaf are available for training experiences. Nearby urban, suburban, and rural public schools offer prospective placements for practicum and internship experiences under the supervision of certified school psychologists.

### Requirements for Admission

Admission to the program is based on the following criteria:

- Successful completion of the Baccalaureate degree at an accredited college or university
- A cumulative grade point average of 3.0 or above
- Completion of at least 27 quarter hours in behavioral sciences with a B grade or above

Prerequisite courses include:

General Psychology  
Elementary Statistics  
Child or Developmental Psychology  
Abnormal Psychology

- Minimum Graduate Record Examination (GRE) scores:

Verbal 550  
Quantitative 500  
Psychology 500

- Evidence of professional commitment and potential for developing effective relationships with children, youth, and adults:

- Letters of reference
- Student statement about goals, prior related experience, and future plans

- An individual interview

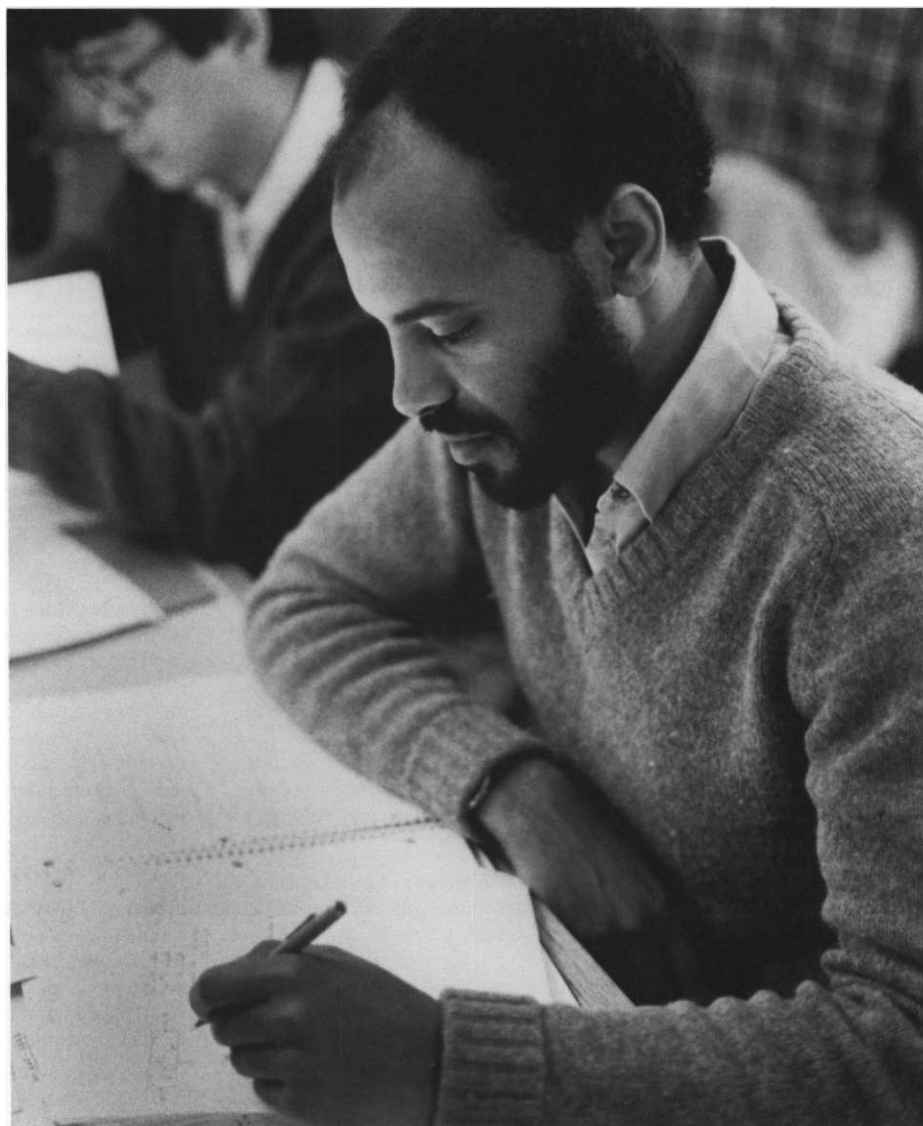
All credentials must be submitted and reviewed by the staff prior to the completion of 12 quarter hours of graduate work in the program.

Course Number and Title	Credits	Proposed Plan of Study	
Required Psychological Foundations and Professional Courses	32	1st Quarter Psychology of Learning Tests and Measurements Theories of Personality Counseling Theory	5th Quarter Master's Project—Begun in the 5th Quarter Behavioral Management Techniques and Assessment
GSSP-701 Developmental Psychology	4	2nd Quarter Research for the School Psychologist	Practicum in School Psychology II
GSSP-720 Theories of Personality	4	Counseling Practicum	Elective (Educational Psychology, Community Psychology)
GSSP-722 Psychology of Learning	4	Developmental Psychology	6th Quarter Internship I
GSSP-723 Emotional Adjustment	4	Intellectual Assessment	Elective (Social Psychology of Deafness)
GSSP-724 Counseling Theory	4	3rd Quarter Seminar for the School Psychologist	7th Quarter Internship II
GSSP-725 Counseling Practicum	4	Personality Assessment	Elective (Educational Sociology)
GSSP-726 Tests and Measurements	4	Emotional Adjustment	
GSSP-727 Cognitive Psychology	4	Learning Disabilities: Identification and Intervention	
Required Statistics and Research Methodology	8	4th Quarter Computer Technology for the School Psychologist	
GSSP-728 Research for the School Psychologist	4	Cognitive Psychology Practicum in School	
GSSP-729 Computer Technology for the School Psychologist	4	Psychology I Analysis of Exceptional Individuals	
Required Specialized Courses	24		
GSSP-730 Seminar for the School Psychologist	4		
GSSP-731 Intellectual Assessment	4		
GSSP-732 Personality Assessment	4		
GSSP-733 Behavioral Management Techniques and Assessment	4		
GSSP-734 Analysis of Exceptional Individuals	4		
GSSP-742 Learning Disabilities: Identification and Intervention	4		
Required Field Experience	16		
GSSP-735 Practicum in School Psychology I	3		
GSSP-736 Practicum in School Psychology II	3		
GSSP-737 Internship in School Psychology I	5		
GSSP-738 Internship in School Psychology II	5		
Electives*	12		
Master's Project	4		
Total	96		

### Degree Requirements

A minimum of 96 quarter credit hours is required for completion of the program. Students must pass a comprehensive examination and complete a satisfactory master's project. A cumulative grade point average of 3.0 or above is required.

\*Educational Psychology, Educational Sociology, Social Psychology (GSSP-739), Community Psychology (GSSP-741), and Psychology of Deafness (GSSP-740). Electives from the graduate level courses offered by the College of Business and the College of Applied Science and Technology, with permission.



# Liberal Arts 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 of the art-oriented graduate student centering on the student's search for a supportable and reliable basis for making value judgments about works of art as well as introducing the student to major concepts in aesthetics.

Class 3, Credit 4 (offered occasionally)

## GSHF-707

## Cubism to the Present

### Registration #0505-707

Cubism as a way of seeing and as an expression of 20th century thinking. Differences and similarities with art forms of earlier eras and other cultures will be discussed.

Class 3, Credit 4 (offered on sufficient demand)

## GSHF-708

## Oriental Art

### Registration #0505-708

A seminar exploring the philosophical and cultural perspectives underlying traditional Far Eastern art as a prelude to examining selected topics in Indian, Chinese and Japanese art. Emphasis will be placed on the application of research techniques and critical methods of an individually selected area of interest which may serve as a foundation for continuing study.

Class 3, Credit 4 (offered occasionally)

## GSHF-711

## 20th Century American Art

### Registration #0505-711

An investigation of American art from the Civil War to the present. Emphasis will be placed on the visual arts but many references will be made to music and architecture.

Class 3, Credit 4 (offered occasionally)

## GSHF-712

## Arts and Crafts in Tribal 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. Some background in the history of art is helpful but not necessary.

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 artist's relationship to their society and to the character of the Baroque outlook.

Class 3, Credit 4 (offered occasionally)

## GSHF-717

## Topics in Music History

### Registration #0505-717

This course is a study of various aspects of music in different historical environments with emphasis on analogies between music and the other fine arts.

Class 3, Credit 4 (offered occasionally)

## 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 experience. 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 experiences in non-mentalistic terms? Can computers think? It will be the business of this course to explore these and other related questions and to see what progress has been made in attempting to answer them.

Class 3, Credit 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)

**GSSP-702 Educational Psychology****Registration #0514-702**

This course is designed to furnish students with an understanding of the basic psychological processes underlying the educational process, and to apply them to concrete situations that may arise for persons who teach.

Class 3, Credit 5 (offered annually)

**GSSP-720 Theories of Personality****Registration #0514-720**

This course will cover the major theoretical approaches to understand human personality, including, but not limited to, psychodynamic, behavioral, cognitive and humanistic approaches.

Class 3, Credit 4 (offered annually)

**GSSP-722 Psychology of Learning****Registration #0514-722**

History and principles of psychological learning theories. Comparative study of behaviorism, cognitive approaches and social learning theory. Basic factors affecting learning, forgetting and transfer of various tasks relevant to learning and instruction. Discussion of theories of memory, neuro-physiological processes and computer models of human learning.

Class 3, Credit 4 (offered annually)

**GSSP-723 Emotional Adjustment****Registration #0514-723**

Normal and deviant adaptation in relationship to human growth and development with emphasis on children and youth. Models of deviant childhood behavior with attention to physical, learned and social bases of deviant behavior. Rehabilitation facilities and treatment are discussed.

Class 3, Credit 4

**GSSP-724 Counseling Theory****Registration #0514-724**

Analytic, phenomenological and behavioral approaches to counseling. Implications for each theoretical system and particularly the practice of counseling that might be derived from each of these sources.

Class 3, Credit 4

**GSSP-725 Counseling Practicum****Registration #0514-725**

Opportunity, under close faculty supervision, to interview clients, administer tests and provide other services related to the counseling session. Prerequisite: Counseling Theory

Class 3, Credit 4

**GSSP-726 Tests and Measurements****Registration #0514-726**

This introductory course, in a series of assessment courses, will study assessment, types of tests and their uses, strengths and weaknesses, basic measurement, principles of reliability, validity, scales and norms. Students will acquire an understanding of quantitative and qualitative principles of measurement. There will be extensive laboratory experiences on a variety of instruments, the clinical method, and the uses of tests in schools and other settings.

Laboratory experiences involve administration, scoring and interpretation of tests. Sample tests include Kaufman Assessment Battery for Children (KABC), Stanford-Binet-Riverside edition, Wide Range Achievement Test, the Detroit Test of Learning Aptitude, the Bracken Basic Concept Scale, Wisc-R, Colored Progressive Matrices, Bender Visual Motor Gestalt Test, Kinetic Family Drawing, Draw-A-Person, TAT, CAT, Incomplete Sentences, Child Behavior Checklist, Rokeach Value Survey, Taylor-Johnson Temperament Analysis, etc.

Class 3, Credit 4

**GSSP-727 Cognitive Psychology****Registration #0514-727**

This introduction to the theories, issues and related research in concept learning, problem-solving, information processing, perception, attention, cognitive development and creativity will be applicable to the practicing school psychologist in analysis of school learning behaviors.

Class 3, Credit 4

**GSSP-728 Research for the School Psychologist****Registration #0514-728**

The student will learn many of the statistical procedures commonly involved in research utilizing statistics in the planning, analysis and presentation of the data.

Class 3, Credit 4

**GSSP-729 Computer Technology for the School Psychologist****Registration #0514-729**

The student will acquire competence in applying computer technology in education and training, and in support of a professional role. Skills will be acquired in the use of a word processor, a database, and an electronic spreadsheet. In addition to developing skills in using the computer, students will become aware of ethical and social issues surrounding its use in education, and will learn skills in evaluating and selecting instructional software appropriate for achieving learning objectives. Computer-based instructional simulation and gaming will be explored. Students will apply computer skills in a specialized project responsive to their interests. Computer packages, MINITAB or SPSSX, will be used to analyze data.

Class 3, Credit 4

**GSSP-730 Seminar for the School Psychologist****Registration #0514-730**

Critical issues, theories and practices; role of the school psychologist as defined by competencies and responsibilities in the settings in which school psychology is practiced.

Class 3, Credit 4

**GSSP-731 Intellectual Assessment****Registration #0514-731**

This course concentrates on development of intellectual assessment skills. Students learn to select and administer individual intelligence tests, to interpret results, and to provide written and oral reports.

Class 3, Credit 4

**GSSP-732 Personality Assessment****Registration #0514-732**

This course uses interview, behavior observation and personality tests for clinical evaluation. Students gain experience in administering, interpreting and reporting results of personality tests currently used in the practice of school psychology.

Class 3, Credit 4

**GSSP-733 Behavioral Management Techniques and Assessment****Registration #0514-733**

Advanced training in the applications of behavioral assessment and modification techniques in educational settings. Supervised study and experiences will include individuals within the wide range of disabilities.

Class 3, Credit 4

**GSSP-734 Analysis of Exceptional Individuals****Registration #0514-734**

An applied course in the diagnostic evaluation of exceptional individuals in order to provide psychoeducational and psychoneurological information to multidisciplinary evaluation teams. Students select, administer and integrate test data, and report results and recommendations for treatment. An overview of relevant information on theory of exceptionality and current status of diagnosis and treatment of exceptional children is provided.

Class 3, Credit 4

**GSSP-735,736****Practicum in School Psychology I & II****Registration #0514-735,736**

The practicum serves as a bridge from theory and research to the professional practice of school psychology. Completion of at least 48 hours of sequential courses will serve as a basis for this course. A weekly classroom seminar will be provided in addition to a three to six hour/week placement in a school setting. The practicum experience is a major part of preparation for the field placement/internship.

Class 3, Credit 3

**GSSP-737,738****Internship in School Psychology I & II****Registration #0514-737,738**

Through direct, supervised experience the student will practice the various professional roles of a school psychologist in a real setting. Competency in carrying out these tasks in an ethical and professional manner will be developed as preparation for employment.

Class 3, Credit 5

**GSSP-739****Social Psychology****Registration #0514-739**

This course examines the way human behavior is affected by the social and physical environment. It analyzes the situational variables which promote or inhibit various behaviors and suggests ways in which individuals can recognize and resist social influence or fashion an environment conducive to attainment of their goals.

Class 3, Credit 4

**GSSP-740****Psychology of Deafness****Registration #0514-740**

This course is an introduction to the cognitive, linguistic and emotional processes of hearing-impaired persons. Emphasis is placed on understanding the functional integrity and the dynamics of hearing-impaired persons' psychological systems.

Class 3, Credit 4

**GSSP-741****Community Psychology Seminar****Registration #0514-741**

Overview of the main concepts and issues in community psychology as they relate to the school psychologist. Explores functions of mental health education, consultation, crisis intervention, research and evaluation.

Class 3, Credit 4

**GSSP-742****Learning Disabilities: Identification and Intervention****Registration #0514-742**

This course provides the student with an overview of the issues and research on learning disabilities. Because the topic of learning disabilities is diverse, the course emphasizes criteria and content that have an established empirical base. Attention is directed to the issues of definition with a focus on identification (definition and diagnosis) and intervention (instruction and service delivery). Issues related to etiology and theoretical constructs of learning disabilities are presented in readings and by lecture content. A neuropsychological approach is emphasized.

Class 3, Credit 4

**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 and dean of the College of Liberal Arts. Because of the length of the approval process, students who desire to take independent study should make arrangements several weeks before the quarter begins. An independent study project enables the interested student and his or her faculty sponsor to coordinate their efforts on subjects and topics that range beyond the normal sequence of the graduate course selection.

Credit variable (offered annually)

## 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

**Brian Barry**, Ph.D., Syracuse University—Associate Professor

**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

**Janet E. Farnum**, Ph.D., University of Rochester—Assistant Professor

**Robert Golden**, Ph.D., Rochester—Associate Professor, Language and Literature

**Roger Harnish**, Ph.D., Oklahoma State University—Assistant Professor

**Warren Hickman**, Ph.D., University of Geneva, Switzerland—Professor, History

**Morton Isaacs**, Ph.D., Yeshiva—Professor, Psychology

**Paul Kazmierski**, Ph.D., Syracuse University—Adjunct Professor

**Tina Lent**, MA, University of California, Los Angeles—Instructor, Fine Arts

**Salvatore Mondello**, Ph.D., New York University—Professor, History

**Margery S. Reading-Brown**, Ph.D., State University of New York, Albany—Assistant Professor

**Murli M. Sinha**, Ph.D., Cornell University—Associate Professor

**David B. Suits**, Ph.D., University of Waterloo—Associate Professor

**Houghton Wetherald**, MA, Oberlin—Professor, Fine Arts

**I. Louis Young**, Ph.D., University of Massachusetts—Adjunct Professor

**Hans Zandvoort**, MFA, Royal Academy of Fine Arts, The Hague—Professor, Fine Arts



Instructional Technology, Department of .....	21	Master's Thesis (Electrical Engineering) .....	64	Portfolio Guidelines for Fine Arts. .	75	Seminar in Finance .....	44
Instructional Technology, Introduction .....	31	Materials Science and Engineering	108	Power Semiconductor Circuits .....	63	Seminar in Management .....	42
Instructional Technology, Research in .....	32	Materials Science, Introduction to ..	68	Practice Teaching in Art .....	76	Seminar in Marketing .....	44
Instructional Technology Research Project .....	32	Mathematical Programming .....	65	Principles of Imaging Science .....	87	Seminar in Statistics .....	51
Instructional Technology Selected Topics .....	33	Mathematics for Engineers .....	68	Principles of Operations Research ..	65	Signal Analysis and Processing .....	64
Instructional Technology, Sources of Information .....	31	Mechanical Engineering .....	57	Printing Technology courses .....	83	Simulation .....	45
Instructional Television .....	32	Mechanical Engineering courses...	66	Printing Technology (MS) .....	83	Simulation and Modeling .....	29
Instrumental Analysis .....	110	Mechanical Engineering, MS .....	52	Printmaking courses .....	77	Small Business Administration .....	42
Instrumentation & Experimental Analysis .....	68	Mechanics .....	68	Probability Models .....	50	Small Systems Workshop .....	61
Integrated Business Analysis .....	42	Mechanisms of Disease .....	112	Problems in Finance .....	43	Social Psychology .....	102
Interactive Instructional Systems, CAI-3 .....	32	Medical Illustration courses .....	77	Production Control .....	65	Software Engineering .....	29
International Marketing .....	44	Metalcrafts and Jewelry .....	78	Production Tool Design .....	67	Software Engineering Laboratory...	30
Interpersonal Communications .....	33	Microcomputers in Control, Instrumentation .....	63	Programmed Instruction .....	31	Solid State Science .....	112
Interpersonal Skills for Managers..	42	Microeconomic Theory, Advanced ..	43	Programming I, II .....	28	Sources of Information in Instructional Technology .....	31
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Interviewing, Counseling & Coaching .....	32	Microprocessor Applications .....	66	Psychology, Cognitive .....	101	Special Topics in Applied Statistics .....	51
Introduction to Artificial Intelligence .....	29	Microprocessors and Microcomputers .....	29	Psychology, Educational .....	101	Special Topics in Applied Mechanics .....	67
Introduction to Continuum Mechanics .....	66	Microwave Devices .....	64	Psychology of Deafness .....	102	Special Topics in Clinical Science ..	112
Introduction to Instructional Technology .....	31	Modeling and Simulation I, II .....	29	Psychology of Learning and Teaching .....	32	Special Topics in Electrical Engineering .....	63
Introduction to Materials Science..	68	Monthly Payment Plan .....	10	Psychology of Learning .....	101	Special Topics in Electromagnetic Theory .....	64
Introduction to Statistics .....	44	Multivariate Analysis I, II .....	50	Quality Engineering .....	50	Special Topics in Industrial Engineering .....	66
Inventory Design .....	65	Multivariate Methods in Business ..	45	Quality Engineering by Design .....	50	Special Topics in Thermo Fluid Systems .....	67
<b>J</b> Joint Program for Education Specialists .....	115	Music History, Topics in .....	100	Quality Management .....	50	Stained Glass .....	78
<b>L</b> Learning Development Center ....	15	<b>N</b> National Technical Institute for the Deaf .....	114	Quality points .....	12	Statistical Analysis, Applied .....	45
Legal Environment of Business....	42	Negotiating Skills for Managers. ....	42	Quantum Mechanics .....	111	Statistical Analysis for Engineers I, II .....	65
Legal Environment, the .....	31	Nonlinear Control Systems .....	63	<b>R</b> Radar Engineering .....	64	Statistical Computing .....	49
Liberal Arts, College of .....	98	Nonparametric Statistics .....	51	Random Signals and Noise .....	64	Statistical Concepts .....	49
Liberal Arts courses .....	100	NTID Faculty .....	116	Readmission .....	9	Statistical Inference .....	83
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Library, Wallace Memorial .....	14	Nuclear Science and Engineering ..	113	Regression Analysis, Applied .....	45	Statistical Quality Control I, II .....	49
<b>M</b> MBA Curriculum .....	38	Numerical Analysis .....	68	Regression Analysis I .....	50	Statistics and Quality Control....	112
MFA Degree in Photography .....	88	Numerical Control and Manufacturing .....	66	Regression Analysis II .....	51	Statistics, Applied (Special Topics in) .....	51
MS in Applied & Mathematical Statistics .....	46	<b>O</b> Occupational/Industrial Environments .....	34	Reliability .....	50	Statistics, Bayesian .....	51
MS in Career & Human Resource Development .....	19	Office of Cooperative Education & Placement .....	16	Rembrandt .....	100	Statistics courses .....	49
MS in Clinical Chemistry .....	105	Officers .....	117	Research for the School Psychologist .....	101	Statistics, Fundamentals of .....	49
MS in Color Science, Appearance, Technology .....	92	On-Line Information Systems Design .....	29	Research in Instructional Technology .....	32	Statistics, Introduction to .....	44
MS in Computer Science .....	18	Operating Systems I, II, III .....	30	Research Methods .....	43	Statistics, Nonparametric .....	51
MS in Electrical Engineering .....	52	Operations Management .....	44	Research Methods in Graphic Arts ..	83	Statistics Seminar .....	51
MS in Imaging Science .....	85	Operations Research, Principles of ..	65	Research Methods in Packaging .....	30	Statistics, Theory of .....	50
MS in Instructional Technology .....	19	Operations Research, Survey of .....	65	Research Option .....	43	Stereochemistry .....	111
MS in Mechanical Engineering .....	52	Optical Engineering I .....	63	Research Project (Instructional Technology) .....	32	Stochastic Estimation and Control ..	63
MS in Packaging Science .....	19	Optical Engineering II .....	64	Room and board .....	11	Storage Applications Design Courses .....	96
MS in Printing Technology .....	80	Optical Properties of Materials....	113	Rose, Dr. M. Richard .....	9	Student Health Service .....	16
MS in School Psychology .....	98	Optimal Control .....	63	<b>S</b> Sales Management .....	44	Student Services .....	14
MS Thesis (Computer Science)....	30	Optimal Design, Advanced .....	67	Sample Size Determination .....	51	Summary experience .....	12
Macroeconomic Theory, Advanced..	43	Organic Chemistry of Polymers. ....	111	Sampling Theory and Applications ..	51	Survey Design & Sampling .....	45
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Management and Budgeting, Instructional Technology .....	33	Organization and Management. ....	42	School Psychologist, Research for ..	101	Systems Safety Engineering .....	66
Management and Career Development .....	42	Organizational Behavior .....	42	School Psychology (MS) .....	98	Systems Simulation .....	65
Management courses .....	41	Oriental Art .....	100	School for American Craftsmen .....	78	<b>T</b> Taxation Accounting (basic and advanced) .....	41
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Management Science .....	44	Packaging Administration .....	31	School of Computer Science & Technology .....	19	Technical Writing (Instructional Development) .....	33
Management Seminar .....	42	Packaging Dynamics .....	31	School of Computer Science courses .....	28	Techniques of Work Analysis .....	33
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Managerial Economics .....	43	Packaging for End Use .....	31	School of Printing Management and Sciences Faculty .....	84	Technology, Business and Society ..	42
Manpower Forecasting Fundamentals .....	34	Packaging Independent Study .....	31	Science, College of .....	103	Tests and Measurements .....	101
Marketing Communications .....	44	Packaging Sciences courses .....	30	Sculpture .....	77	Text Storage and Retrieval Systems ..	30
Marketing Concepts .....	44	Packaging Science, Department of ..	25	Securities and Investment Analysis ..	44	Theory of Elasticity .....	66
Marketing courses .....	44	Painting Courses .....	77	Selected Instructional Technology Topics .....	33	Theory of Finance .....	43
Marketing, International .....	44	Parsing, Theory of .....	30	Semiconductor Physics .....	62	Theory of Parsing .....	30
Marketing Logistics .....	44	Perception & Photography .....	92	Seminar for the School Psychologist .....	101	Theory of Plasticity .....	67
Marketing Management, Advanced..	44	Personality, Theories of .....	101	Seminar in Aesthetics .....	100	Theory of Plates and Shells .....	67
Marketing Seminar .....	44	Philosophy of Graduate Education at RIT .....	8	Seminar in Art Education .....	76	Theory of Statistics I, II .....	50
Master of Business Administration ..	35	Philosophy of Mind, the .....	100	Seminar in Decision Sciences .....	45	Thesis (Applied Statistics) .....	51
Master of Engineering Degree .....	52	Photo Typography Procedures .....	83	Seminar in Economics .....	43	Thesis (Art and Design) .....	77
Master of Fine Arts .....	69	Photographic Museum Practice....	91	<b>Q</b> Quality Engineering .....	50	Thesis (MFA) .....	79
Master of Science for Teachers .....	69	Photographic Workshop .....	91	Quality points .....	12	Thesis requirements .....	12
Master of Science in Chemistry...	103	Photography Core .....	91	Quantum Mechanics .....	111		

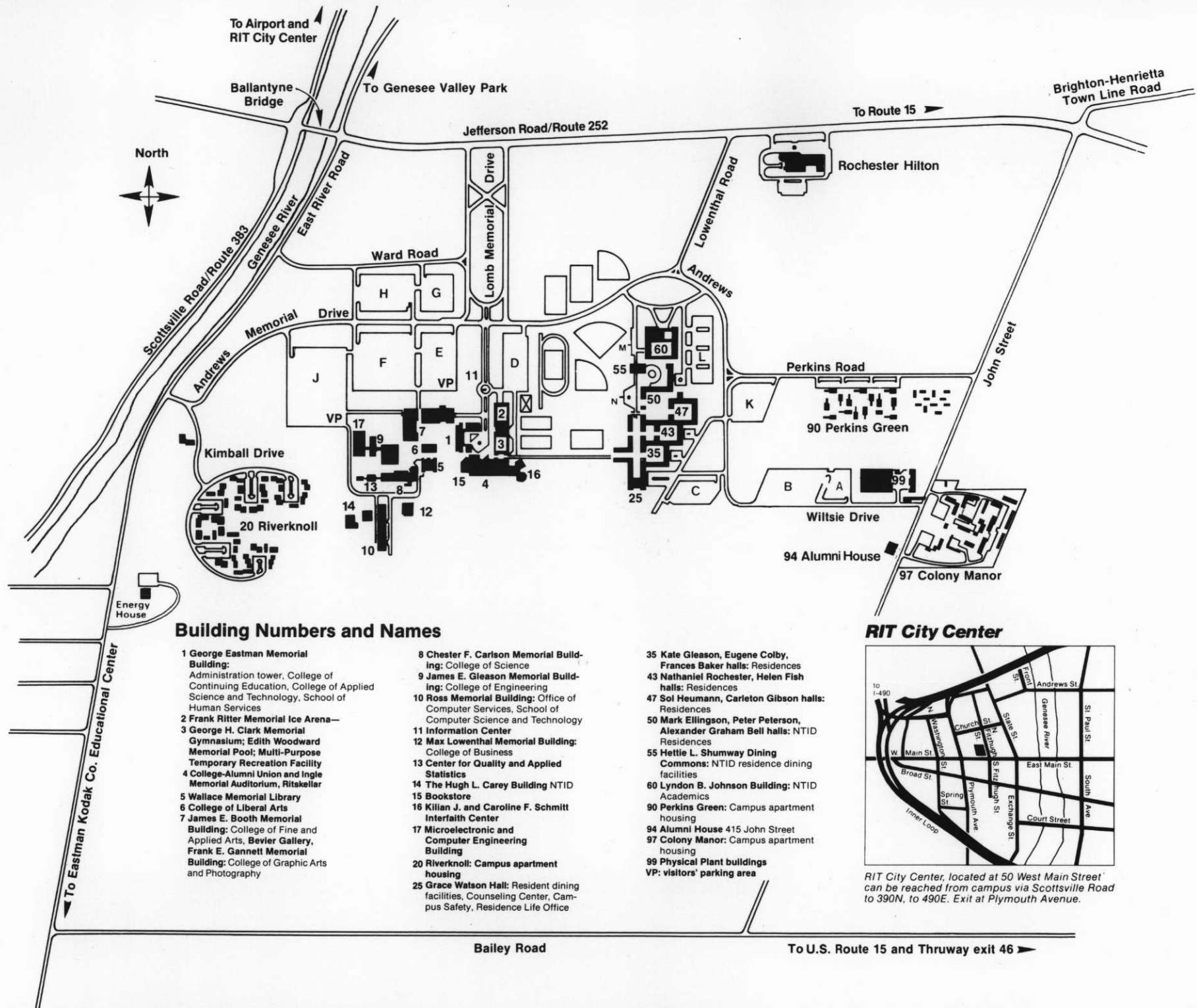
Time Series Analysis . . . . .	51
Topics in Digital Systems	
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Topics in Signal Analysis and	
Processing . . . . .	64
Topics in Switching Theory . . . . .	62
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Evaluation of . . . . .	32
Transfer credit . . . . .	11
Trends in Printing Technology . . . . .	83
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Tuition Assistance Program (TAP)..	11

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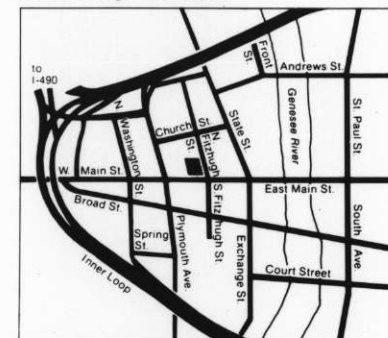
VLSI Design (Computer	
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Engineering) . . . . .	62
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and Applications . . . . .	67

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Design . . . . .	79
Work Analysis, Techniques of . . . . .	33



### 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**

Office of Admissions  
One Lomb Memorial Drive  
Post Office Box 9887  
Rochester, NY 14623