

# GRADUATE STUDY

RIT Official Bulletin • Rochester Institute of Technology • 81/82



# Rochester Institute of Technology Calendar 1981-82

	Graduate Registration	No Classes	Non-Matriculated Student Registration	Classes Begin Day Colleges	Exam Week	Last Day of Quarter
Fall Quarter	Sept. 9	Nov. 24-29	Sept. 10	Sept. 10	Nov. 19-23	Nov. 23
Winter Quarter	Nov. 30	Dec. 20-Jan. 3 Feb. 2 (day) Feb. 28-Mar. 7	Dec. 1	Dec. 1	Feb. 24-27	Feb. 27
Spring Quarter	March 8	May 23-31	March 9	March 9	May 18-21	May 21

## Acknowledgements

**Dean**, Dr. Paul Bernstein

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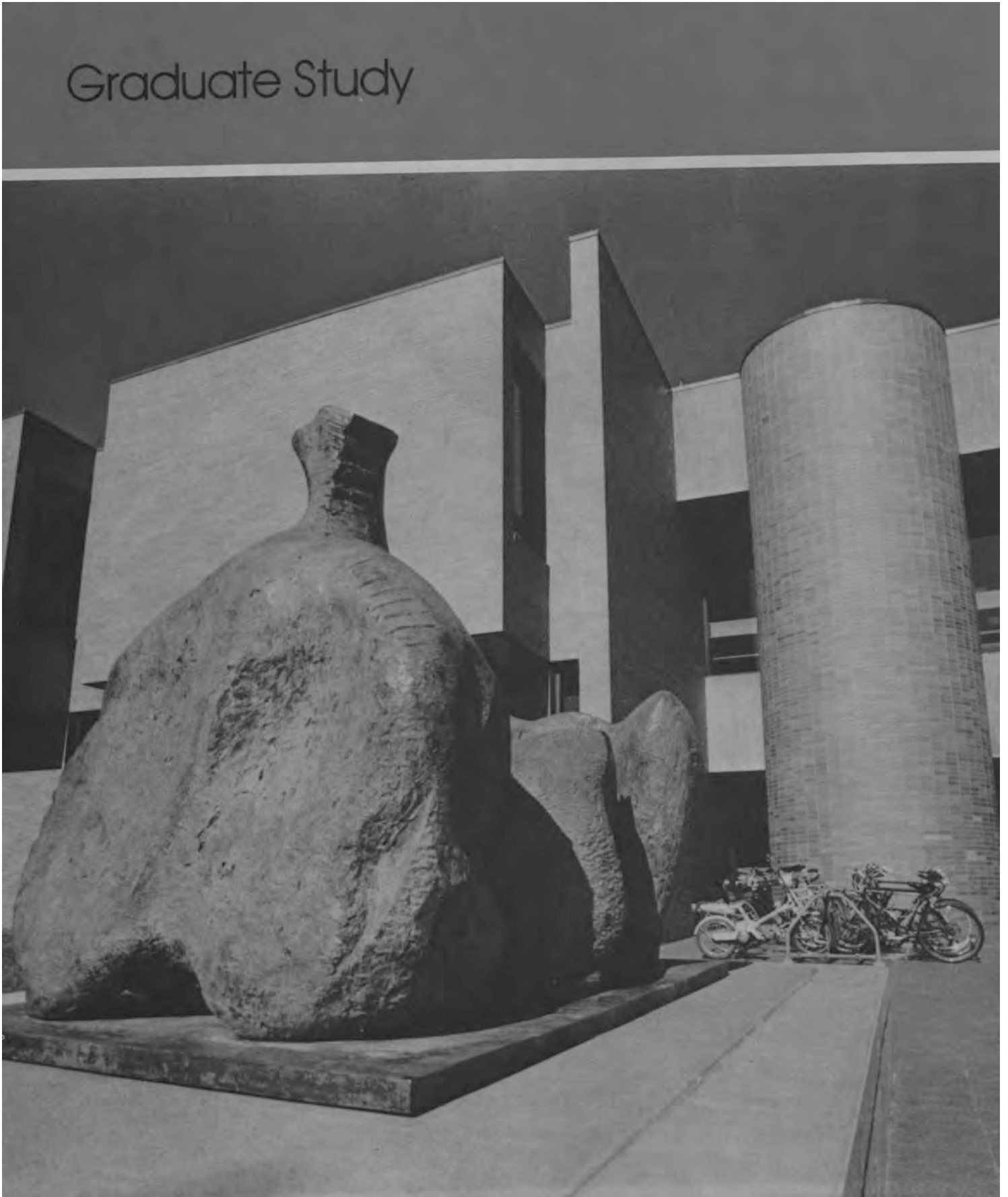
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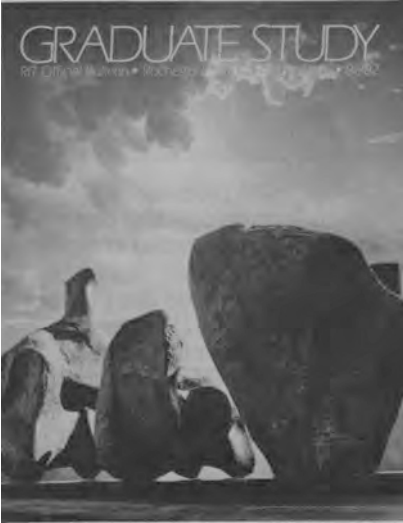
*The cover photo-composition features a three-piece reclining figure by renowned sculptor Henry Moore. The RIT bronze is one of seven cast from the same mold. The cover and photographs on this page and the next coincidentally illustrate the effects of perspective and light on the figure's*

*varying attitudes and relationships with its surroundings. Within the Max Lowenthal Memorial Building are the classrooms and offices of RIT's College of Continuing Education and the departments of criminal justice and social work in the College of General Studies.*

# Graduate Study







#### 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 1981-82**  
**Produced by RIT**  
**Communications and the**  
**Graduate Council**

Write or phone:

**Rochester Institute of Technology**  
**Admissions Office**  
**One Lomb Memorial Drive**  
**Rochester, NY 14623**  
**(Postmaster: Send address changes**  
**to above address)**  
**(716) 475-6631**

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 Institute of Technology

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#### Campus map (inside back cover)

## RIT Official Bulletin

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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 the modern 1,300-acre campus in Rochester, N.Y., the Eisenhower College campus in nearby Seneca Falls 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 10 colleges: Applied Science and Technology, Business, Continuing Education, Eisenhower, Engineering, Fine and Applied Arts, General Studies, Graphic Arts and Photography, Science, and the federally-funded National Technical Institute for the Deaf.

## Graduate Education at RIT

About 20 years ago, Rochester Institute of Technology expanded its educational responsibilities to include graduate curricula. Encouragement from a variety of professional sources plus student demand caused the Institute to produce programs in the arts and crafts leading to the master of fine arts degree. Shortly thereafter, RIT appointed a graduate council and petitioned for a charter to give the Institute authority to grant the master of science degree. The function of the Council on Graduate Studies was "to define the essential character of a graduate study at the Institute, to establish policies and procedures for the administration of graduate study, and to provide for a continuous coordination in review of graduate programs."



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

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

By 1965 national and local surveys suggested another area of responsibility that RIT might undertake. Considerable need was indicated for sophisticated

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

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

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

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



One of RIT's newer graduate programs has emanated from its School of Printing. The need for additional people with technological training in the graphic arts, as well as teachers who could apply new instructional methods and concepts that would encourage students to enter the printing profession, became apparent from the numerous requests RIT received for a graduate program in printing. As a result, the School of Printing introduced a graduate program with two majors, operational in January, 1969, leading to the MS degree.

Recent additions to the list of graduate degree programs now available include the MFA in photography, meeting the demand for higher level professional offerings by the School of Photographic Arts and Sciences, and a program leading to an MS degree in accountancy. Another new program was the graduate

internship leading to a master of engineering degree.

The Department of Instructional Technology has developed an MS degree program in instructional technologies for those engaged in teaching or directing multi-media communications. This combines and builds upon the several communication/graphics/visual disciplines long associated with RIT. In addition, the College of Applied Science and Technology now offers three programs through its School of Computer Science and Technology. These are the MS in computer science, the MS in computer systems management and the MS in information science. The college also offers an MS in career and human resource development, designed for school, business, and industrial personnel.

RIT has recently approved a new MS interdisciplinary program involving science and engineering in

the area of materials science. The projected start of this offering is Fall 1981. Our College of Fine and Applied Arts also projects an MS offering in medical illustration for 1981-82.

The Institute has a continuous concern for the emerging needs of the business, industrial and scholarly communities, and 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 are 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 and Technology	Master of Science	Career and Human Resource Development Computer Science Computer Systems Management Instructional Technology Information Science	0826 0701  0701 0699 0702	18
	Certificate	Information Science	0702	23
College of Business	Master of Business Administration	Business Options Listed on page 37	0506	32
	Master of Science	Accountancy Human Services Management	0502 2199	33 34
College of Continuing Education	Master of Science	Applied and Mathematical Statistics	1702	47
College of Engineering	Master of Science	Electrical Engineering Mechanical Engineering Materials Science and Engineering**	0909 0910  0915	57 58  98
	Master of Engineering	Engineering (EE, ME, IE)	0901	56
College of Fine and Applied Arts	Master of Fine Arts or Master of Science for Teachers	Ceramics and Ceramic Sculpture Communication Design Environmental Design Glass Metalcrafts and Jewelry Painting Printmaking Weaving and Textile Design Woodworking and Furniture Design	1009 1009 1009 1009  1009 1002 1002  1009 1009	70
	Master of Fine Arts Master of Science for Teachers	Medical Illustration Art Education	1299 0831	
College of Graphic Arts and Photography	Master of Science	Printing Technology Printing Education	0699 0806	78
	Master of Science for Teachers	Printing Education	0839	
	Master of Science	Photographic Science and Instrumentation	0999	84
	Master of Fine Arts	Photography	1011	86
College of Science	Master of Science	Chemistry Clinical Chemistry Materials Science and Engineering**	1905 1223  0915	92 94  98
National Technical Institute for the Deaf	None	Educational Specialists for the Deaf		102

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 40 graduate programs in such diverse areas as fine arts, business, engineering and career education. These offerings have drawn on the total resources of the Institute and have received wide acceptance.

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

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

Another fundamental objective of graduate education at RIT is that it be characterized both by effective teaching and quality scholarship. Out of these concerns have risen selective research projects that aid education of students and provide continuing opportunities for professional growth. At RIT many of our research projects—including projects in energy, graphic arts, information and communication—are under the umbrella of the RIT Research Corporation. These projects bring industry experts to campus to interact with faculty and graduate students, give graduate students the opportunity to assist with research projects and keep faculty members up to date on current industry practices. In

addition, through the Research Corporation, graduate students utilize special libraries and research facilities as they study in their fields.

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

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

## Admission Requirements

Decisions of graduate selection rest within the college offering the program to which the student is applying. 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, Rochester, New York 14623.
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.

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.

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

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

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

Graduate applicants who do not fully satisfy all admission criteria as to grades, test scores or other credentials, but do show sufficient promise to qualify for a trial period of graduate study may be admitted

on probation to the Institute. Such students must achieve a 3.0 ("B") program cumulative grade point average by the end of their first 12 quarter credit hours of graduate study. Those students who do not meet this criterion will be suspended. Responsibility for specific requirements and maintenance of the student's appropriate status rests with the department in consultation with the Admissions Office and the Registrar.

All applications are processed through the Office of Admissions. 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.

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



*RIT President  
M. Richard Rose*

### **RIT proud of link with Rochester, Dr. Rose asserts**

"RIT means different things to different people," says Dr. M. Richard Rose, the Institute's seventh president. "For those of us who work and study here, it's a progressive academic citadel that always has been willing to take those extra steps necessary to maintain relevant career-oriented programs.

"For its alumni, RIT continues to provide an opportunity to improve themselves and their families educationally, professionally, financially and socially.

"RIT also is something special to those in the greater Rochester community who may never have studied or worked at any of our facilities. It's a special pride in having the main campus of the Institute here.

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

"RIT is progressive and relevant. It always has been willing to take chances if chances were necessary to further its unique career and professional approach to higher education. Yet, in many ways it has grown hand-in-hand with greater Rochester itself. Its very roots are in the area's early industry.

"It is this link with greater Rochester's history and growth that makes RIT a special place for the entire community. It's a link of which we're very proud. We hope you will share in the pride."

## **Graduate programs specialized, and diverse.**



*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, and has been at RIT since 1966.

"Each of our graduate programs is built as a freestanding unit," he says. "Each is designed to fill a specific need in its respective field.

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

"A good example of that is the materials science and engineering program. We perceived a real need for people in this area from our discussions with business and industrial leaders, and then proceeded to develop this interdisciplinary offering 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)—  
 \$ 1550/quarter  
 Part-time (11 credit hours or less)—  
 \$ 132/credit hour  
 Master of Science (CCE)—  
 \$ 103/credit hour  
 Internship\*—\$48/credit hour

In addition, any graduate student carrying over 18 credit hours of study will be charged the full-time tuition rate plus \$ 132/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.

The graduate fee charge for those receiving a master's degree is \$20, which also includes rental of the master's hood.

Tuition and fee payments are due on the following dates: Fall Quarter, August 10, 1981; Winter Quarter, November 2, 1981; Spring Quarter, February 8, 1982; Summer Quarter, May 3, 1982. 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.) The Institute reserves the right to change its prices without prior notice.

## Deferred payment plan

For those students who are not able to pay the amount due by the designated due date, RIT has made arrangements for deferred payment through a local bank. With this plan you may defer no more than 50 percent of your quarterly balance. For further information regarding this plan call the RIT Bursar's Office at (716) 475-6186.

## Refund policy

Advance deposits are not refundable.

The date of a Drop Form or Withdrawal Form shall be the date of official dropping of course(s) or official withdrawal from the Institute and shall be used to determine the applicable tuition charge.

The acceptable reasons for any refund during the quarter are:"

### Full refund:

1. Active military service: Students called to active military service during the term may receive full tuition refund. If called after the eighth week, they may elect to complete the course by making special arrangements with both their instructor and department advisor.
2. Academic reasons: Students sometimes register before grades from the previous quarter are available. If such students later find that they are subject to academic suspension or have failed a prerequisite course, they will be given a full refund upon dropping the prerequisite course. It remains the student's responsibility to contact their department to assure that the Drop Form and refund are properly processed.
3. If part-time students drop course(s) during the Official Drop Period (first 10 days of classes during that specific quarter), they may contact the Bursar's Office for a 100 percent refund for that course dropped. Courses dropped after the Official Drop Period will not result in any tuition refund.

### Full- to part-time status

If students drop their course load from full-time (12 or more credits) to part-time (less than 12 credits) status during the Official Drop Period (first 10 days of classes for that specific quarter), they may contact the Bursar for a refund based on the differential between the full-time tuition payment and the total per-credit-hour charge for the part-time load. Courses dropped after the Official Drop Period will not result in any tuition refund.

### Partial refund

A partial refund will be made during a quarter if *total withdrawal* from the Institute 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 (suspension)
3. Transfer by employer, making class attendance impossible
4. Total withdrawal from the Institute for academic or personal reasons at the request of the student; approved by the student's advisor or department representative and the Bursar

Partial refund of tuition in totally withdrawing from the Institute for the above reasons will be according to the following schedule:

90 percent during the first week of classes

75 percent during the second week of classes

60 percent during the third week of classes

50 percent during the fourth week of classes

No refund during the fifth and subsequent weeks of classes

In order for a refund to be processed the student must contact the Bursar's Office directly and provide it with a copy of the official Withdrawal Form.

### 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 pro-rated from the date of official withdrawal from the Institute.

90 percent of unused room charge during the first week of classes

75 percent of unused room charge during the second week of classes

60 percent of unused room charge during the third week of classes

50 percent of unused room charge during the fourth week of classes

Board charges will be refunded according to the following schedule:

75 percent of unused board charge during the first four weeks

50 percent of the unused board charge after the first four weeks

A specific rate schedule is available in the Housing Office.

### Fees

Fees are not refundable.

### Financial aid

Fellowships and graduate assistantships are often available. Please write to the appropriate department chairperson or dean shown in the Correspondence Directory or contact the Financial Aid Office (475-2187).

*\*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 MS degrees in business technology and career information 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.*



In addition, RIT Graduate Scholarships will be offered in 1981-82 in the colleges of Graphic Arts and Photography, Science, Applied Science and Technology, and Business. Additional funds are available for minority applicants. For information, write to the Dean of Graduate Studies.

### **Tuition Assistance Program**

(New York State Residents)  
New York State residents who show ability to pursue a full-time program may receive awards from \$100 to \$600 as a graduate student. The following table indicates the minimum standards of satisfactory academic progress for TAP purposes. These standards have been approved by the State Education Department.

### **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 Mr. Richard B. Schonblom, bursar. Matters which cannot be resolved will be referred for further action to Mr. William J. Welch, controller.

### **Other**

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

## **The steps toward earning your degree**



### **Graduate degree program**

A master's degree at RIT may be obtained in programs ranging from accountancy 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, winter and spring graduates are mailed during the Summer Quarter. Degrees for summer graduates are mailed during the Fall Quarter.

### **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 with the department's approval and with the knowledge that the course work completed while a non-matriculated student may not apply to any given baccalaureate or masters 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. Careful and well-informed advisement should be employed to assure a quality program. In the majority of cases, most, if not all, course work will be at the graduate (700-800) level.



### Credit requirements

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

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

### Transfer credit

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

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

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

### Thesis requirements

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

For the purpose of verifying credit, an end-of-quarter grade of R should be submitted for each registration of Research and Thesis Guidance by the student's faculty advisor. Before the degree can be awarded, the

acceptance of the thesis must be recorded on the student's permanent record.

### Candidacy for an advanced degree

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

The basic 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 degree 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 normally be met within seven years of the time of initial registration for graduate study. Extensions of this rule may be granted through petition to the Graduate Council.
2. Complete a minimum of 45 credit hours for the master's degree. At least 36 quarter credit hours of graduate level course work and research (courses numbered 700-800) must be earned in residence at the Institute.
3. Achieve a program cumulative grade point average of 3.0 (B) or better. (See p. 13 for further details.)
4. Complete a thesis or other appropriate research or comparable professional achievement, at the discretion of the degree granting program.
5. Pay in full, or satisfactorily adjust, all financial obligation 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 graduation 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:

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

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, typed upon 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 of classes or if a student withdraws from all courses in a given quarter. A student can change from credit to audit or from audit to credit status for a course only during the first 10 days of classes.

**Audit (Z)** - indicates a student has audited the course. The student need not take exams and full tuition will be charged. Audited courses do not count toward the residency requirement.

**Transfer (T)** (credit) - assigned through the admission process and, possibly, through later review (see p. 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 or subsequently 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 upon demonstration of adequate reason for readmission.

# Student Services



## **The Wallace Memorial Library**

Information comes in many forms other than printed pages bound between two covers. When a student wants to research a topic at Wallace Memorial Library, he or she will find not only a variety of print and non-print forms in which to locate information but also an on-line computer catalog where the search for references can be made.

Particularly adapted to an institution of technology and the arts and sciences, the Wallace Memorial Library contains, in addition to material in the usual form of books, magazines, newspapers, and pamphlets, material in the form of microfilm, microfiche, films and slides. To assist students in the use of all of these resources, reference librarians are on duty during the week and on weekends. Located throughout the three floors of the library are over 900 student study stations, including individual study carrels and group study rooms.

During the year student work in art and photography is exhibited in the second floor display gallery. Outstanding student art work is permanently displayed throughout the building. Two music listening rooms are located on the third floor, and there are several lounge areas within the building.

The library contains a special collection of materials on the deaf to serve the National Technical Institute for the Deaf and to support research by anyone wishing to pursue studies in the problems of deafness. Supplementing the main library is the Graduate Chemistry Library.

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 one of the finest slide collections in the country with more than 70,000 slides. Preview facilities and study carrels are also provided.

The Audiovisual Services 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.

## **Counseling Center**

The counseling and testing services of the Counseling Center are available to graduate students. Any student may see a counselor promptly for assistance in dealing with a personal problem or in clarifying career plans. When appropriate, tests may be used to

obtain more evidence about interests, abilities, aptitudes, and personality characteristics. In its offices in the residence halls the Counseling Center maintains a library of educational and occupational information.

In addition to providing counseling services for RIT students, the Counseling Center offers career counseling for individuals. Brochures describing the types of service and fees may be obtained by telephoning or writing the Counseling Center.

## **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 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.





Gary MacMillan

## Wallace Library 'is more than books' says director

"We're a pretty advanced library, technologically speaking," Wallace Memorial Library Director Gary MacMillan says.

"Books are losing some of their importance and other media are taking over...there's growing awareness here that there are other ways to get information than from the printed word," he says.

Many technological advances are evident throughout the three-story air-conditioned Wallace Library. The Media Resource Center on the first floor offers a wide range of instructional audiovisual materials such as videotapes and motion pictures for student use in the building.

MacMillan came to RIT in December, 1970, fresh from a job at the University of Liberia in West Africa, where he was working in a joint United States government—Cornell University program. He's a graduate of Kalamazoo College (psychology/sociology) and University of Michigan (library science).

"A library doesn't mean just books any more," he says. "It's a collection of information kept in the way that's easiest to retrieve."



### **Housing**

RIT has three campus apartment complexes on the campus for both married and single students. You should apply through the Campus Apartment Housing Office, 113 Kimball Drive, Rochester, NY 14623. Do this at your earliest convenience, as there is a waiting list.

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 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**

In case of an emergency (fire, injury) the Institute 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.

### **Central Placement Services**

This office provides career counseling and aids students in making appropriate contacts with part-time, co-op and full-time employers. The centralized activities of Central Placement Services make it easier for potential employees and employers to meet and to become aware of the full spectrum of opportunities and personnel available at any given time. The staff and facilities of Central Placement Services are located on the second floor of the George Eastman Memorial Building and are available to students Monday through Friday, 8:30 a.m. to 4:30 p.m.

### **Medical service**

Primary care medical services are provided on campus by Student Health Services, located on the second floor of the George Eastman Memorial Building. The staff, including physicians, nurse practitioners, and registered nurses, are on duty Monday through Friday during the daytime hours posted at the Health Center. A registered nurse is on duty in Nathaniel Rochester Hall, Monday through Friday evenings. Services are provided to graduate students on a prepaid, quarterly fee basis (\$20 per quarter) or on a fee-for-service basis.

Emergency medical services are provided by the Emergency Medical Unit, a New York State registered ambulance service. This student group provides on-site care and emergency transportation to Student Health Services or an area hospital.

RIT requires all students to be protected by health insurance to cover costs incurred off campus. If you do not have insurance, student health insurance is available through the Institute.

### **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 Descriptions



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

## Course Numbering

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. This number will appear on grade reports, transcripts, and other official correspondence. This is what the alpha-numeric means:

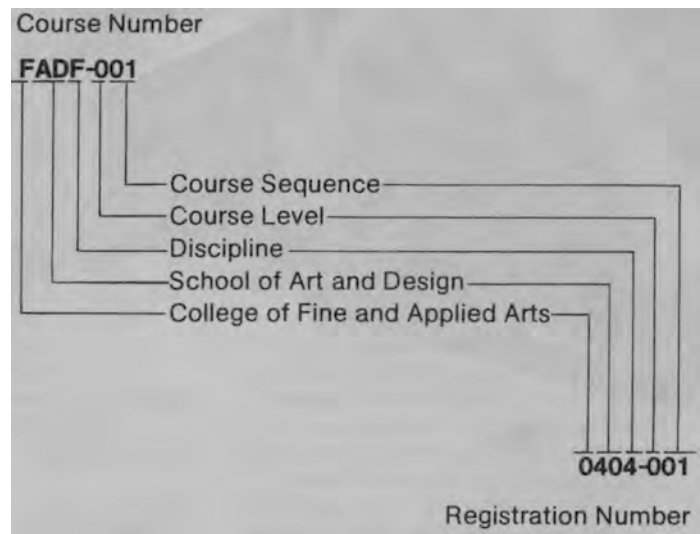
**First letter:** College offering the course

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

**Fourth letter:** Discipline

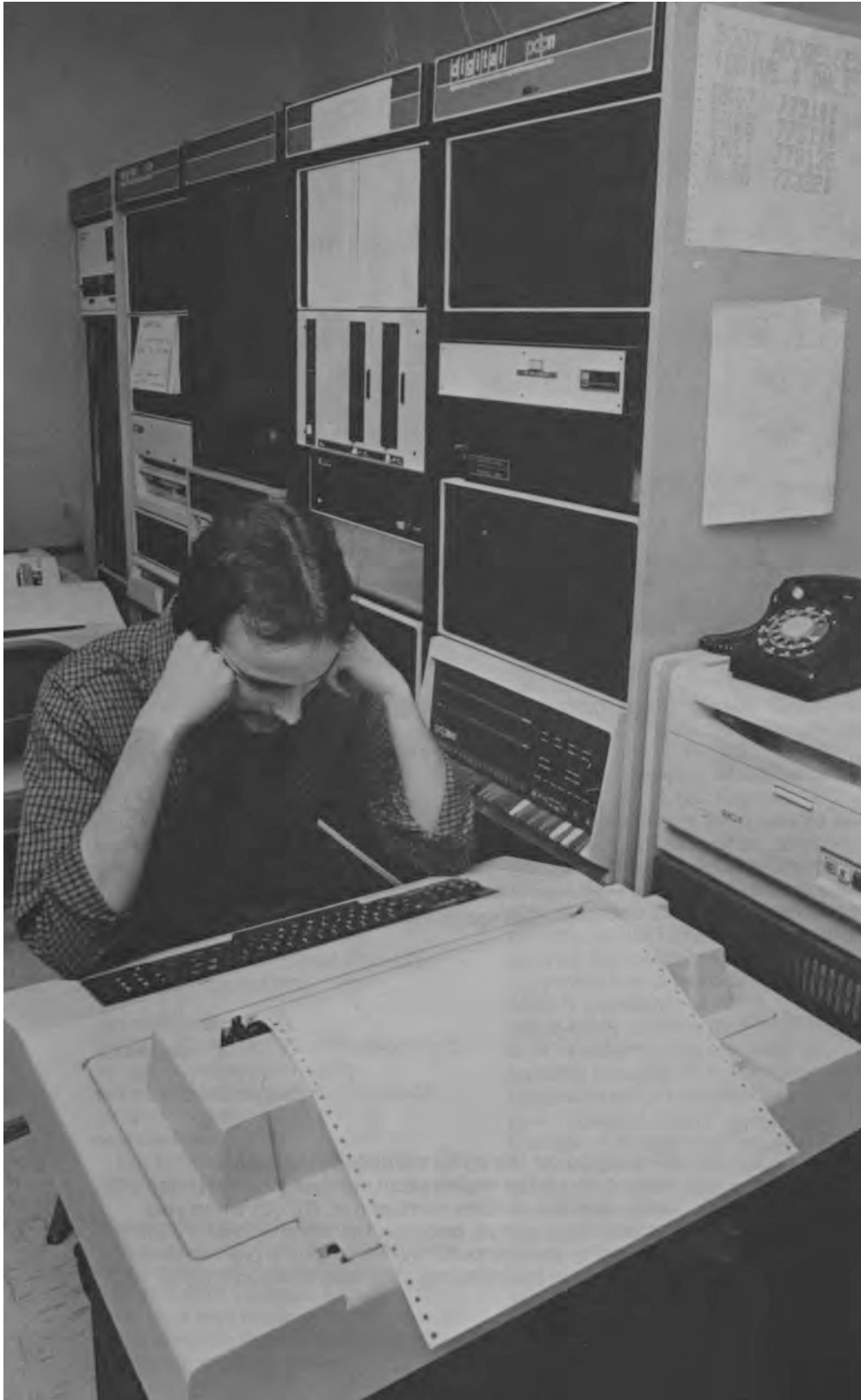
**First number:** Course level: 0 = Non-credit; 1 = Diploma; 2 or 3 = Lower level degree courses; 4, 5 or 6 = Upper level undergraduate degree courses; 7, or 8 = Courses for graduate credit.

**Second and Third numbers:** Course differentiation and sequencing



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

# College of Applied Science and Technology



## **Dennis C. Nystrom, Dean**

Imaginative, innovative, flexible and rigorous describe the graduate and undergraduate programs of RIT's College of Applied Science and Technology. The College of Applied Science and Technology is composed of five units: School of Computer Science and Technology, Department of Instructional Technology, Department of Packaging Science, School of Engineering Technology, and Department of Career and Human Resource Development.

Many College of Applied Science and Technology programs are unusual 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 field. Programs in instructional technology answer the demand for skilled and professional systems oriented training and educational technologists.

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

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

This program provides the necessary courses and internship experiences to enable the graduate to serve in a variety of positions related to career education and human resource development. Extensive use is made of persons from personnel and training, as well as other employment areas in business, industry and education. Serving as faculty members and internship supervisors, they bring to the courses the practical as well as the theoretical sides of their professions. Upon completion of the program, the graduate has a well-rounded knowledge of the goals, procedures and fundamentals of the various career fields. Full- or part-time study is available.

### **Master of Science degree in Computer System Management**

This curriculum, the first of its kind in the United States, is designed to prepare competent personnel for the management of computer installations. Graduate management courses and computer courses are combined in such a way that the student concentrates in areas where he or she has the least experience,





and is strengthened in those areas of knowledge already acquired. Both full-time and part-time students are enrolled in this curriculum.

#### **Master of Science degree in Computer Science**

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

#### **Master of Science degree in Information Science**

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

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

Instructional technology is a relatively new field. RIT graduates are employed in business, industry, educational institutions/community colleges, and the allied health fields. The RIT program currently consists of three options: one for the course developers and trainers in business and industry, the second for the preparation of instructional developers in higher education, and the third for developers in health sciences. Each program may be pursued on a full- or part-time schedule. Courses are offered in the evening hours to enable those already employed to pursue a degree.

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

**Donald D. Baker**, Chairperson

This new integrative program has been designed to provide graduates with the background that is necessary to help organizations better utilize human resources, to plan and implement career education programs, and to help individuals make career choices.

The program combines elements of business, guidance, instructional technology, statistics, and automated systems to meet the demands of this emerging field.

Two concentrations are offered to provide the student with the knowledge that is needed for a career in either the private business and industrial sector or in community based organizations and educational institutions.

Students who choose the human resource development concentration will be prepared to function in broad-based human resource development activities in the business and industrial sector. Skills in human resource forecasting, differential statistics, management development, labor relations, and automated information systems are coupled with core competencies regarding the nature of work, career decision making and group dynamics. A knowledge of the basic functions of business also is provided. Emphasis is placed on the development of qualified career development experts who possess basic personnel administration competencies. Through careful design of electives, many graduates

can develop special talents in one of several other functional business or technology areas.

The students who choose the career education concentration will learn to help clients investigate career options, identify the skills and interests that are needed for various jobs, and translate career trends and opportunities into valid and reliable information. The student also will understand group dynamics and basic counseling skills. In addition, the program will provide useful skills in conducting new program feasibility studies, planning curriculum and teaching or facilitating career education programs. Potential employers include: community and junior colleges, four-year colleges and universities, K-12 school systems, social service agencies, and career information centers.

The master's program is not a classroom-only project. Students spend up to 200 hours working on a major project relating to their career goals. Many have found exciting internships in major corporations. Examples of research projects include: a nationwide search to determine why engineers reject certain job offers, the organization and development of career resource centers, and career advisement for adults in continuing education programs.

#### Summer option

The summer option has been designed to permit students to complete the core requirements during three successive summers. Through summer full-time study (12 credit hours), a student can earn 36 credits during the three-year period toward the degree requirements. The additional 12 credits necessary for graduation may be completed through a special project and the transfer of other graduate studies appropriate to the degree goals. Students pursuing the human resource development concentration may need to take more time.

#### Admission

Admission decisions for this program are based on the review of the baccalaureate degree, undergraduate grades, interviews, a personal goal statement and work experience. It is expected that applicants will have at least three years of full-time work experience or the equivalent of part-time work. At least two years of full-time

experience outside of education is desired. Interviews and the personal goals statement are evaluated as they relate program goals to the individual's personality and aptitudes for functioning as a career development specialist.

#### Graduate assistantships

A limited number of research and graduate assistantships are available. These assistantships involve 10 to 15 hours of work a week.

#### Graduate Scholarship

A limited amount of money is available in the form of tuition remissions for students on the basis of past performance and future potential.

#### Degree requirements

A minimum of 48 quarter hour credits of combined required and elective courses is required for the degree. A maximum of nine quarter hour credits may be transferred from other graduate institutions.

#### Curriculum foundation studies

Specific educational competencies that are expected of individuals in the program may be satisfied by prior documentable mastery in non-credit courses, approved experience, and competency examinations, and/or by graduate or undergraduate courses.

- A. Basic Statistics
- B. Basic Sociology
- C. Basic Psychology
- D. Basic Economics

#### Required Core

	Credits
0615-741 Nature of Work	3
0615-742 Career Decision Making Concepts	4
0615-745 Career Concepts:	
0615-746 Production, Commerce,	
0615-747 Services	3
(one course required)	
0615-748 Information Retrieval Systems in Career Planning	3
0615-749 Manpower Forecasting Fundamentals	4
0615-769 Career Counseling Skills	3
0615-755 Career Information Project	2
0604-703 Management of Learning	2
0240-712 Fundamentals of Statistics II	3
Total	27

#### Concentrations:

Students choose one concentration and follow the requirements indicated below.

#### Career Education Concentration

	Credits
0615-743 Education/Business/ Industry Interrelationships	2
0615-745 Career Concepts:	
0615-746 Services (one course in 0615-747 addition to the one taken as part of the required core)	3
0615-753 Group Dynamics for Career Development	3
Electives	13
Total	21

#### Human Resource Development Concentration

0102-741 Organization and Management	4
0102-746 Management Development	4
0102-748 Labor/Management Problems	4
0102-750 Personnel Systems	4
Electives	5
Total	21
Credits from Required Core	27
Credits from Concentration	21 <sup>A</sup>
	48

#### Electives

0615-752 Career Education in Colleges and Special Settings	3
0615-754 Occupational Environments and Human Resources Topics	1-5
0615-762 Career Education Seminar	3
0615-777 Career Internship	1-5
0613-757 Techniques of Work Analysis	2-3

Courses listed as required for one concentration may be taken as electives for the other concentration.

Certain courses listed as required offer variable credit beyond what is required and can be used as electives:

0604-703 Management of Learning	1-4
0615-755 Career Information Project	1-5
0615-745, 746, 747 Career Concepts	
Additional courses may be used as electives if approved by the Chairperson.	

# School of Computer Science and Technology

**Jack Hollingsworth**, Director

The School of Computer Science and Technology offers three distinct master of science degree programs—MS degree in computer science, MS degree in information sciences and MS degree in computer systems management.

The spectrum of the computer science program ranges from practical to theoretical aspects of computers, computing, and information systems.

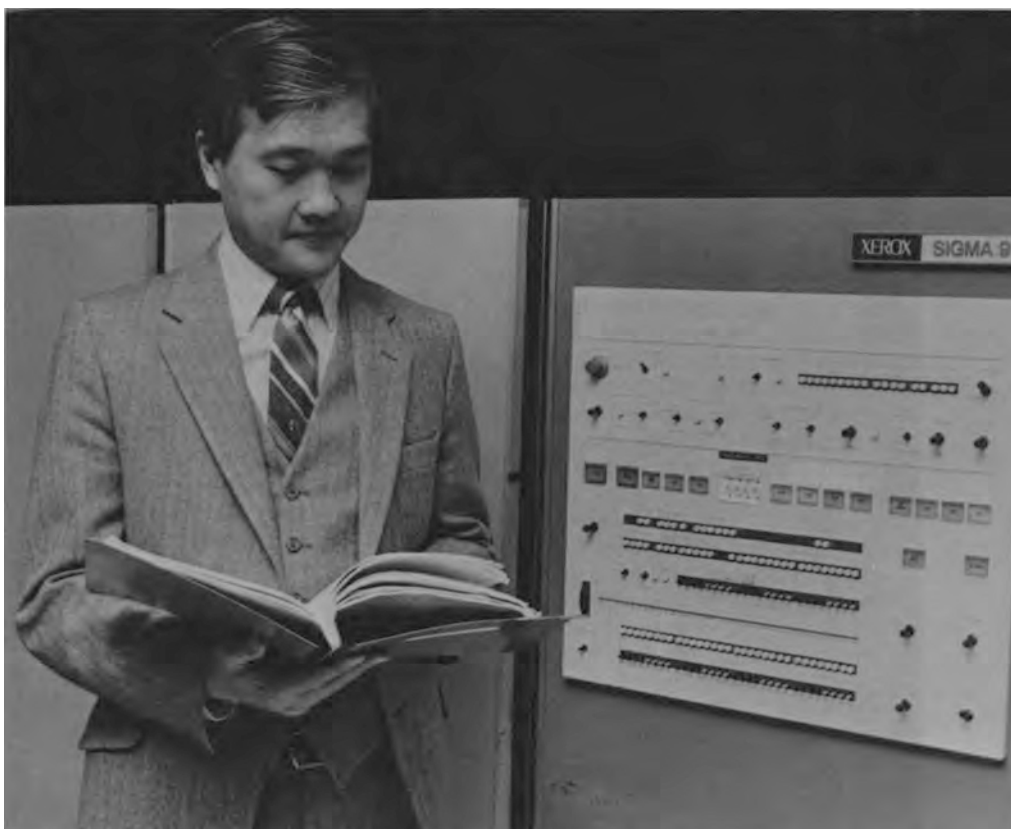
The master of science degree in computer system management is designed to prepare students as computer center managers. The MS degree in computer science offers students opportunities to be specialized in areas such as system analysis, automata theory, data base systems, computer graphics, system software, computer architecture, and programming languages.

The master of science degree in information sciences is designed to provide students with graduate training in computerized information science. Graduates will be prepared to enter employment on the staff of information science centers such as public, private, and university libraries, medical information centers, lawyer's libraries and law enforcement data centers. Their job functions will be analyzing, designing, and programming the informations storage, retrieval, and display systems.

In addition to the MS degree, a sixth year certificate program in information sciences is offered. This program is intended for persons with an MS degree in library science or the equivalent who need training in computer automated information processing.

Since we plan extensive changes in all our graduate computer science programs, students must have their planned program of study approved by their graduate advisor. This should be done in the student's first quarter in graduate school.

The School of Computer Science and Technology is staffed with competent faculty members with excellent academic preparation and Professional experience. The main computer system at RIT is a



Honeywell Sigma-9 system with one megabyte main storage, supports batch processing, and over one hundred time sharing terminals. The School of Computer Science and Technology is equipped with a PDP 11/45 time sharing system, a PDP 11/34 connected to three LSI/11 microcomputers, two IBM 360/30 systems, IBM 1500 CAI system, Interdata 7/16 system, Microdata 1600D, Cromeco Z2, Intel MCS80 and other minicomputers and microcomputers.

All of the computer equipment is available to computer science and information science students.

Graduate courses may be taken during the day or evening hours through course offerings by the School of Computer Science and Technology.

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

**Peter G. Anderson**, Coordinator

This program provides students with professional competence in technical and theoretical areas of computer science. Graduates will be prepared to enter employment in industrial, educational and governmental institutions. Their job titles would be senior programmer, systems programmer, data base

administrator, computer specialist and instructor. Graduates will also be prepared to enter doctoral degree programs in computer science.

## **Entrance requirements**

A baccalaureate degree earned from an accredited institution with a major in computer science, mathematics, physical sciences, business, engineering or the equivalent is required. Applicants must have a solid background in one or more high level programming languages, one or more assembly languages, and data structure analysis. Students without adequate background must take additional courses to make up for the deficiencies.

## **Graduation requirements**

The master of science degree in computer science requires the successful completion of a minimum of 44 quarter credits of course work and four credits of thesis research. The thesis requirement may be substituted by taking two additional graduate computer science courses followed by a comprehensive examination. A graduate student must maintain a grade point average of 3.0 or higher.

### Curriculum

Curricula for entering students differ, depending on their undergraduate programs. However, in each case 24 credits must be graduate computer science courses and 20 credits may be electives in either mathematics, science, business, engineering or computer science. If a student enters with prerequisite deficiencies, the undergraduate credits which make up the deficiencies will not be counted toward the MS degree. A student may take courses and complete the MS degree through day or evening offerings. Sample programs are available in the graduate computer science handbook.

Each student is required to select an area of concentration, such as operating systems, data bases, programming languages, systems analysis, systems program, etc. Students with undergraduate preparation in other than computer science will typically be required to take additional undergraduate computer science courses to satisfy the prerequisites of the specific concentration.

### Master of Science in Computer System Management

**Jack Hollingsworth**, Coordinator

This program provides students with additional background and many of the tools needed to manage a computer installation or a computing project.

### Entrance requirements

A baccalaureate degree earned from an accredited institution with a record of acceptable academic achievement is required. Also required is a background in at least one level programming language and an assembly language. Students with deficiencies in either will be expected to make up such deficiencies without credit toward the degree. Work experience in some computer area is strongly recommended before entering this program.

### Graduation requirements

The master of science degree requires the successful completion of 48 quarter credits, specified in the curriculum below. A graduate student must maintain an average of 3.0 or higher to graduate.

### Curriculum

Required courses:

ICSM-703 Data Management Concepts  
 ICSM-710 Computer Systems Software  
 ICSM-715 Computer Systems Hardware  
 ICSM-720 Data Processing Administration  
 ICSM-765 Advanced Computer Utilization Techniques  
 BBUA-701 Financial Accounting  
 BBUF-721 Financial Management  
 BBUF-745 Economic Environment of American Business  
 BBUQ-781 Statistical Analysis I  
 BBUQ-782 Statistical Analysis II

The remaining two courses are electives, generally chosen from graduate courses in business or computer science, subject to the advisor's approval. Entering students, who have one (or more) of the required courses, may seek to have the course requirement(s) waived and would then take a more advanced business or computer science course in its place.

### Master of Science in Information Sciences

**Peter G. Anderson**,  
 Acting Coordinator

This program provides students with sufficient background in computer automated information systems. Graduates will be proficient in areas of data base systems, data management, information storage, information retrieval, library management, information media and displays. Potential employers include public libraries, university and college libraries, medical information centers, law libraries, law enforcement data centers and more.

This program is scheduled to begin with the Fall Quarter of 1982.

### Entrance requirements:

A baccalaureate degree earned from an accredited institution with a major in library science, information sciences or the equivalent is required. In addition, a student must have three courses in library science from a previously attended institution.

### Graduation requirements ,

The master of science degree in information sciences requires the successful completion of 48 quarter credits of course work. A graduate student must maintain a grade point average of 3.0 or higher.

### Curriculum:

A minimum of 48 quarter credit hours is required for the master of science degree in information science. Of the 48 credits, 36 must be taken in the computer science and information science field. The remaining 12 credits may be taken from a related discipline. Statistics is highly recommended as an elective area. Curriculum for each individual student differs depending on undergraduate preparation.

### Curriculum MS Degree in Information Science

#### A. Core Requirement (24 Credits)

##### Course Title and Number Credit

ICSS-485 Data Base Concepts	4
ICSS-736 Data Base System Implementation	4
ICSS-836 Data Base Systems	4
ICSS-846 Information Storage & Retrieval	4
ICSI-722 Library Automation & Management	4
ICSI-733 Information Media and Design	4

#### B. Recommended Electives (12-24 Credits)

##### Course Title and Number Credit

ICSS-320 Data Structure Analysis	4
ICSS-325 Data Organization and Management	4
ICSS-420 Data Communication Systems	4
ICSS-440 Operating Systems	4
ICSS-721 Microprocessor and Microcomputers	4
ICSS-730 Discrete Simulation	4
ICSS-735 On-Line Information Systems Design	4
ICSS-740 Computer Communication Networks	4
ICSS-825 Assemblers, Interpreters, & Compilers	4
ICSS-875 Minicomputer Systems & Applications	4
ICSS-895 MS Thesis	4-8



### Sixth Year Certificate Program Information Sciences

This program is designed for students who hold a master's degree in library science or the equivalent. It is highly recommended for librarians and data managers who wish to enhance their knowledge in computer automated information systems.

This program is scheduled to begin with the Fall Quarter of 1982.

#### Entrance requirement:

A master's degree in library science or equivalent earned from an accredited institution is required. RIT MS graduates in computer science or information science are not accepted.

#### Curriculum

Curricula differ among entering students depending on their preparation. The faculty advisor will work together with each student on the one year certificate program. The certificate program requires 36 quarter credit hours of course work. Among the 36 credits, 24 credits must be in graduate computer science or information science. The remaining 12 credits are electives in a related area (statistics courses are highly recommended) or in computer science undergraduate courses.

#### A. Core Requirement (16 credits)

##### Course Title and Number Credit

ICSS-485 Data Base Concepts	4
ICSS-846 Information Storage & Retrieval	4
ICSI-722 Library Automation & Management	4
ICSI-733 Information Media and Design	4

#### B. Recommended Electives (20 Credits)

##### Course Title and Number Credit

ICSS-320 Data Structure Analysis	4
ICSS-325 Data Organization and Management	4
ICSS-735 On-Line Information Systems Design	4
ICSS-736 Data Base System Implementation	4
ICSS-740 Computer Communication Networks 4	
ICSS-825 Assemblers, Interpreters, & Comp.	4
ICSS-875 Minicomputer Systems & Applications	4

## Instructional Technology



#### Clint Wallington, Chairperson

Instructional Technology is a relatively new field concerned with the development of instructional programs and related instructional and training materials. People in this field work in a variety of settings—education, business, industry, government. All incorporate a systematic approach to training and instruction. Instructional technology includes such areas as: needs assessment, learner behavior; instructional techniques and systems; media and communications; and the evaluation of materials, programs and learners. Instructional technology covers instruction ranging from individualized instruction through large group presentations.

The RIT program is concerned with instructional development, particularly as it applies to the training in the private sector. The program also focuses on instructional development in postsecondary education, particularly in community colleges and in allied health training. RIT's program also covers the selection, evaluation, and distribution of

instructional materials. Students interested in these areas are individually advised and a program of studies is developed to suit individual needs and career goals.

The program is practically oriented without sacrificing adequate coverage of the new information and theories of instructional technology. Students must complete an actual instructional development project and there is ample opportunity for developing instructional modules. The projects are intended to demonstrate competence in the student's selected career area—for example, health sciences or industry. The department encourages each student to produce a portfolio of work which will represent the skills acquired during his or her study for the MS degree. The portfolio will contain items such as the instructional development or training projects, needs analysis studies, evaluation studies, programmed materials, and mediated instructional materials.

### Training and development option

The training and development option is designed primarily for trainers and developers in business, industry, and government. Organizations today are discovering an increasing need for effective and efficient training. Companies are developing not only technical skills training but are looking toward other training activities to increase workers' job satisfaction, motivation, and productivity. The training and development professional becomes a key figure in the development of instruction in these areas. The developer must be proficient in analyzing training needs, designing effective and cost-efficient courses and training packages, setting up evaluation procedures, and maintaining information systems about the organization's training efforts. RIT's training and development option is designed to help students learn not only the instructional design and management skills but the interpersonal communication skills so vital to working on a training team.

As much as possible, experiential learning through work-related projects and internships is integrated into the program of study.

### Higher education option

Community colleges, four-year colleges and universities are beginning to recognize the merits of instructional technology and instructional development, particularly in instances where the institution must increase productivity. Developed in conjunction with RIT's Center for Community and Junior College Relations, the higher education option emphasizes instructional development in the context of postsecondary education. The option gives instructional developers added preparation in the areas of learning resource centers and the design of instructional facilities. As with the training and development option, students are required to complete a major project, either in their work outside the Institute or working with RIT's own instructional development and media services or one of its colleges.

### Health science option

Instruction in the field of health science education is undergoing major changes. Health science

training institutions are re-examining their goals, their students, and their instructional methods. Many are turning to instructional technology, particularly instructional development, as a way of improving their instruction. The instructional developer plays a key role in the development process. The Instructional Technology Department is concerned with training individuals to successfully apply the principles and processes of instructional technology in health science training—from nursing and medical technology to medicine and dentistry. Because of the nature of health science training, students interested in this option should have earned an academic degree in health science or a directly related field or have significant work experience in the health sciences.

### Requirements

Persons interested in being admitted to the program must have a baccalaureate degree or equivalent. Because it is not uncommon for a person to make a career change by pursuing the MS degree, the content area of the baccalaureate degree is not specified. A person should have a strong interest in instructional technology and, if needed, should contact the department for personal guidance.

As can be seen from the course listing, the department does not emphasize media production skills. Students entering the program are assumed to have some skills in such areas as photography, filmmaking, graphics, audio, and television production. Students without these basic skills are encouraged to acquire them through course work or personal projects.

The degree requires completion of a minimum of 48 quarter credit hours, of which 21 -28 (depending on the option chosen) are required. The program is quite flexible, allowing the student a maximum of 18 hours from the following:

RIT courses outside of the Instructional Technology Department (10 hours maximum);  
Graduate courses outside of RIT (9 hours maximum);  
Special project courses—ICIT-722, 840, 850 (8 hours total maximum);  
ICIT-736, 755, 756, 758 (12 hours maximum).

Applicants must take and report scores on the Graduate Record Exam; however, no minimum score is required for entry.

A full-time student entering in the fall or summer quarter should be able to complete the MS degree in one year, i.e. usually four quarters, but sometimes three. Part-time students are welcome and will be able to complete their degree during the evenings.

Application materials may be obtained from the department or from the Office of Admissions.

For further information, contact Dr. Clint Wallington, chairperson.

Required Courses	Credit Hours
Introduction to Instructional Technology I—ICIT-700 required	Variable credit, 2
Psychology of Learning and Teaching—ICIT-735	4
Instructional Development I—ICIT-750	4
Instructional Development II—ICIT-751	4
Interpersonal Communications—ICIT-770	2
Selected Topics in Instructional Technology—ICIT-780	2

### Training and Development Option

Core Courses (minimum 8 hours required)	
Applications of Behavioral Psychology to Training and Adult Learning—ICIT-736	4
Criterion Referenced Instruction and Technical Training I and II—ICIT-755 and-756	each 3
Techniques of Work Analysis—ICIT-757	2-3
Developing Instructional Modules—ICIT-758	3

### Higher Education Option Core Courses

(6 hours required)	
Sources of Information in Instructional Technology—ICIT-705	3-4
Evaluation of Training and Instruction—ICIT-721	4
Management and Budgeting in Instructional Technology—ICIT-762	4
The Two-Year Colleges—IJCG-701	1-3
Education/Business/Industry Interrelationships—IJCG-743	2

### Health Science Option Core Courses

(6 hours required)	
Training Health Professionals—ICIT-703	2
Evaluation of Training and Instruction—ICIT-721	4
Applications of Behavioral Psychology to Training and Adult Learning—ICIT-736	4



# College of Applied Science and Technology

## Career and Human Resource Development

### IJCC-701 The Two-Year Colleges Registration #0615-701

The study of the philosophies, organizations, developments, finance, goals, curricula, and spirit of the two-year college.

Credit variable (1-3 credits)

### IJCC-702 Teaching, Learning, Content, Registration #0615-702 & Environment

Advising/counseling relationships, learning styles, student activities, motivations, developmental education, and the implications of the "open door" policy are investigated.

Credit variable (1-3 credits)

### 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 variable (1-6 credits)

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

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

Credit variable (1-4 credits)

### IJCC-741 The Nature of Work Registration #0615-741

Analysis of the changed meaning of work throughout history with emphasis on the 20th century. Different theoretical and practical approaches to job satisfaction and work motivation will be studied as well as recent efforts to redesign work and/or apply alternative time patterns. New work trends and the changed work-leisure relationship also will be explored.

Credit 3

### 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, friends 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 Registration #0615-743 Interrelationships

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 post-secondary education, differing size business organizations and industrial groups that involve differing levels of technical specialization are studied.

Credit 2

### IJCC-745 Registration #0615-745 Credit 3

Career Concepts: Production

### IJCC-746 Registration #0615-746 Credit 3

Career Concepts: Commerce

### IJCC-747 Registration #0615-747 Credit 3

Career Concepts: Services

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

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

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

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

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

Additional goals are an awareness of other systems based upon media and print materials, and the ability to evaluate various systems.

Credit 3

### 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) to assist 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. (Satisfaction of all foundation studies.)

Credit 4

### IJCC-750 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.

Credit 2

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

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

Credit 3

**IJCC-753****Registration #0615-753**

**Group Dynamics for Career Development**  
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 3

**IJCC-754****Registration #0615-754****Occupational Environments & Human Resources Topics**

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.

Credit variable (1-6)

**IJCC-755****Registration #0615-755****Career Development Project**

This is a variable credit (1 to 5) course that is required of all students unless they have had sufficient approvable experience as a Career Information Specialist. It would be an opportunity to practice one or more of the defined functions of a Career Information Specialist under RIT supervision.

Credit variable (1-5 credits)

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

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 3

**IJCC-762****Registration #0615-762****Career Education Seminar—Women**

An elective course for students in Career Information concentrating on the ability to provide effective counseling for women who wish to enter non-traditional career fields. Case studies, first person presentations, readings, media and discussions are used to develop the knowledge and skills needed. A project related to the elimination of bias and stereotyping in career counseling materials will be required.

Credit 3

**IJCC-763****Registration #0615-763****Career Education Seminar—Handicapped**

An elective course for students in Career Information concentrating on the ability to provide effective counseling for handicapped persons who wish to plan and succeed in desired careers.

Credit 3

**IJCC-777****Registration #0615-777****Career Internship**

This is a variable (1 to 5) credit course, and is an elective that is available only when satisfactory arrangements can be made to function as a specialist in business/industry. It is possible this would only be available for full-time students.

Credit variable (1-5 credits)

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

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.

Credit variable (3-6 credits)

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

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 require approval by the director.

Credit variable (1-6)

## School of Computer Science and Technology

All School of Computer Science and Technology courses are offered at least once annually, except as noted.

Undergraduate students may not take ICSS-700 or 800 level courses, ICSM courses, or ICSI courses.

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.

**ICSS-710****Registration #0603-710****EDP Auditing**

A study of the techniques and approaches used to audit computer data centers and systems. Topics include the methodology and tools of EDP auditing, internal departmental controls, program controls, input/output controls, data security, physical security, computer hardware controls and data communication control.

Credit 4

**ICSS-720****Registration #0603-720****Computer Architecture**

Brief review of a classical computer architecture. Analysis of internal and external bus structures. Architectural features required to support virtual storage and various replacement policies are discussed. Various types of parallel computers are presented along with analyses of the problems preventing them from achieving an ideal n-fold speedup. (ICSS-305 or equivalent)

Credit 4

**ICSS-721****Registration #0603-721****Microprocessors and Microcomputers**

A study of microprocessors, microcomputers, and their applications. Topics include microprocessor hardware, microcomputer organization, software, microcomputer programming, interface techniques and development trends. Case studies will be provided. (ICSS-720)

Credit 4

**ICSS-730****Registration #0603-730****Discrete Simulation**

Computer simulation techniques are examined. Topics include abstract properties of simulations modeling, analysis of a simulation run, and statistics. One or more general-purpose simulation languages will be taught. Programming projects will be required. (Statistics; programming language)

Credit 4

**I CSS-735 On-Line Information Systems Design  
Registration #0603-735**

Topics include basic on-line system characteristics, design guidelines, hardware requirements, comparison of systems and languages, file organization concepts, the simultaneous access problem, file security and recovery, error recovery, system evaluation, and case studies. (Background in systems analysis is recommended)

Credit 4

**I CSS-736 Data Base System Implementation  
Registration #0603-736**

Requirements and characterization of generalized data-base systems, the role of the data-base administrator, creation of a general data-base, elements of data-base management systems, data-base management in a multi-access environment, survey of data-base management systems, selecting a data-base management system. Projects in data-base systems implementation will be emphasized. (ICSS-485 or ICSS-806)

Credit 4

**I CSS-740 Computer Communications Networks  
Registration #0603-740**

A study of hardware and software principles of computer communication networks. Topics include network configuration and vocabulary, network hardware components, network software components, network technologies, examples of existing networks, network utilization, measurement and evaluation. (ICSS-420)

Credit 4

**ICSS-755 Real-Time Computation  
Registration #0603-755**

Principles and applied problems in real-time computation using microprocessors as laboratory equipment. Topics include interrupt handlers, multi-tasking concepts, process synchronization, response time considerations for interrupt-driven and polled I/O and elements of computer communications. (ICSS-440 is required, I CSS-720 is recommended)

Credit 4

**ICSS-770 Computer Graphics  
Registration #0603-770**

Topics include basic concepts, 2-D transformations, windowing, clipping, interactive and raster graphics, 3-D transformations and perspective, hidden line and hidden surface techniques, graphical software packages and graphics systems. Programming projects will be required. (A scientific high-level programming language)

Credit 4

**ICSS-805 Fundamentals of Computing  
Registration #0603-805**

Computer systems, number representations, arithmetic operations and error analysis, structured programming, recursive programming, program correctness, systems software and computer architecture.

Credit 4

**ICSS-806 Foundations of Computing Theory  
Registration #0603-806**

Principles of computing theory; mathematical logic, set theory, relations, functions, algebraic structures; grammars and languages, lattices and Boolean algebra and graph theory. (SMAM-265 or equivalent)

Credit 4

**ICSS-825 Assemblers, Interpreters, and Compilers  
Registration #0603-825**

A survey of the three basic programming language processors. Topics include design and construction of language processors, formal syntactic definition methods, parsing techniques and code generation techniques. Laboratory work includes actual construction of language processors. (ICSS-320)

Credit 4

**ICSS-826 Deterministic and Probabilistic Models  
Registration #0603-826 of Operating Systems**

Concurrent process control, processor scheduling models, computer sequencing problems, auxiliary and buffer storage models, storage allocation in paging systems, memory management of multiprogramming computers. (ICSS-440 or SMAM-352)

Credit 4

**I CSS-836 Data Base Concepts  
Registration #0603-836**

Topics include data organization and structure; relational, hierarchical, and network approach; data security and recovery. Comparison of the data-base approach with traditional file organization and access methods, performance and management issues. Existing data-base systems will be studied. (ICSS-320)

Credit 4

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

Topics include an overview of history, development and traditional approaches of information storage and retrieval, automatic text analysis, automatic classification, file structures, search strategies, probabilistic retrieval and system evaluation. (ICSS-320)

Credit 4

**I CSS-850 Computability  
Registration #0603-850**

The theory of computation as it relates to computable functions is examined. Topics include finite state machines, Turing machines, recursive function theory, Post's symbol manipulation systems and the limitations of the concept of effective computability. (ICSS-806)

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-complete problems, and lower bounds on algorithms involving arithmetic operations. (ICSS-850 or equivalent)

Credit 4

**I CSS-852 Coding Theory  
Registration #0603-852**

Study of error correcting codes and their applications. Topics include algebraic structure of group codes, linear switching circuits, cyclic codes and the decoding problem. (ICSS-806)

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-320; ICSS-806)

Credit 4

**I CSS-860 Compiler Construction  
Registration #0603-860**

Language definition, lexical analysis, syntactic analysis, storage allocation and management, code generation, code optimization, diagnostic generation and bootstrapping. (ICSS-806, ICSS-825)

Credit 4

**ICSS-875 Minicomputer Systems and Applications  
Registration #0603-875**

A study of minicomputer hardware architectures; software organization, operation systems; input/output programming, interrupt handling; debugging techniques, device interfacing and custom applications. Hands-on experimentation with a minicomputer is emphasized. (ICSS-720)

Credit 4

**ICSS-880** **Systems Programming**  
**Registration #0603-880**  
 A study of systems program organization and systems programming techniques. Topics include systems programming languages, assemblers, macroprocessors, linkage editors and loaders, compilers, text processors. Programming projects will be required. (ICSS-320)  
 Credit 4

**ICSS-885** **Systems Programming Laboratory**  
**Registration #0603-885**  
 Systems programming techniques applied to the design and implementation of a large systems program or module. Past projects have included floating point simulators, a small database system, system utilities and a command language interpreter. (ICSS-880)  
 Credit 4

**ICSS-890** **Seminar**  
**Registration #0603-890**  
 Current advances in computer science.  
 Credit 2-4

**ICSS-895** **MS Thesis**  
**Registration #0603-895**  
 Credit 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 is required prior to registration.)  
 Credit 2-4

## Computer Systems Management

ICSM-700 or equivalent is a prerequisite for all other ICSM courses.

**ICSM-700** **Review of Programming**  
**Registration #0611-700**  
 This course is intended for the incoming student with programming deficiencies. Topics include assembly language programming; high-level languages in general and one high-level language in particular; design, construction, and testing of programs; programming technique and style. Programming projects will be required.  
 Credit 4

**ICSM-703** **Data Management Concepts**  
**Registration #0611-703**  
 A study of computer data management concepts. Topics include data representation, data structures, searching and storage techniques, file structure and maintenance, data communication and generalized data management systems.  
 Credit 4

**ICSM-710** **Computer Systems Software**  
**Registration #0611-710**  
 A broad survey of existing and developing systems software. Topics include assemblers, macro processors, linkage editors, loaders, compilers, file and data management systems, and monoprogramming, multiprogramming, batch processing, time-sharing, and virtual storage operating systems. The survey is conceptual in nature dealing with the purpose, organization, and functional characteristics of systems software modules and their interaction.  
 Credit 4

**ICSM-715** **Computer Systems Hardware**  
**Registration #0611-715**  
 A study of the characteristics of computer system hardware. The topics discussed include speed, memory size, architecture, expandability, maintenance problems and software backup. Case studies and comparative studies will be made of large, medium, and small scale computers.  
 Credit 4

**ICSM-720** **Data Processing and Administration**  
**Registration #0611-720**  
 A study of management topics as related to data processing, management planning, computers and profits, security and privacy, data processing planning, and managerial development. Other selected topics will be discussed based upon specific interests of class participants.  
 Credit 4

**ICSM-725** **Systems Development, Computer Operations Technology for the Manager**  
**Registration #0611-725**  
 A study of technically oriented data processing management, operations, cost control, and standards and documentation. Other selected topics will be discussed based upon specific interests of class participants. (ICSM-720)  
 Credit 4

**ICSM-765** **Advanced Computer Utilization Techniques**  
**Registration #0611-765**  
 A study of advanced computer utilization techniques. Topics include resource allocation of available software in business, mathematical and engineering applications. Information storage and retrieval techniques as well as characteristics of some more frequently used programs are studied.  
 Credit 4

**ICSM-790** **Seminar**  
**Registration #0611-790**  
 Current advances in computer science.  
 Credit 2-4

**ICSM-799** **Independent Study**  
**Registration #0611-799**  
 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 is required prior to registration.)  
 Credit 2-4

## Information Science

**ICSI-722** **Library Automation and Management**  
**Registration #0616-722**  
 This course summarizes the computer techniques applied to library automation and the study of management techniques and problems in a modern automated library. Case studies in current library systems will be included. Management models in selected libraries will be discussed.  
 Credit 4 (offered upon sufficient demand)

**ICSI-733** **Information Media and Design**  
**Registration #0616-733**  
 A study of current information media and their design. Topics include microfilm systems, video systems, computer input and output devices, computer interface with media devices, and system design concepts and techniques for applications in libraries and information centers.  
 Credit 4 (offered upon sufficient demand)

## Instructional Technology

All courses in the department of Instructional Technology are taught at least once every three years and/or upon sufficient demand.

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

An overview of the basic elements of instructional technology including: technology and its application to instruction; instructional development; past, present, and future trends in instructional technology; and, instructional objectives. The course is a mix of self-instructional modules and seminars. Completion of modules and seminars on topics above are required (2 cr.). Additional modules cover specialized areas of instructional technology such as health sciences and community college applications, television and instruction, training and development. Course credit varies with the number of modules completed. Course required for graduation.

Credit variable (2-4)

**ICIT-701**                      **Introduction to Instructional  
Registration #0613-701**                      **Technology II**

A continuation of ICIT-700 offering the student an opportunity to complete additional modules as described in ICIT-700 course description. (ICIT-700)

Credit variable (1-3)

**ICIT-703**  
**Registration #0613-703**

Examines the various methods used to train physicians, nurses, dentists, and other allied health personnel. Particular emphasis is placed on the role of instructional technology in current training programs. Maximum use is made of field trips to various local training programs.

## Credit 2

**ICIT-705**  
**Registration #0613-705**

**Sources of Information in  
Instructional Technology**

Students develop general search techniques and strategies for finding information, evaluating it, and establishing a reference file. Sources of print material include journals and periodicals related to instructional technology, books, research reports and conference proceedings, catalogues and commercial information, and automated information systems. Interpreting recent copyright changes is also covered. Actual search problems are given and an information search project is required. To receive 4 credits, the student applies the general search techniques to sources of visual materials and completes a search for primary and secondary sources of prepared visual material relating to training and instruction.

Credit variable (3-4)

**ICIT-710**  
**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**  
**Registration #0613-712**

Students review the use of the computer for instruction (computer-assisted instruction) and then produce their own teaching programs actually using a computer. Examines research about computer assisted instruction, various hardware and software configurations, programming languages and sources of already developed computer-assisted courses, also discusses various methods of course and lesson development. (ICIT-710 or permission of department.)

## 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

**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**  
**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  
Registration #0613-722

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

Credit variable 1-4

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

The basic two credit course relates the major principles of learning (from ICIT-735) to training situations in business, industry, and government. The emphasis is upon the cognitive and psychomotor skills for adult learners. The module for the additional credit is an overview of the relationship of work, learning, and leisure in the stages of adult development and explores methods of interrelating these areas in the continuing development of the learner. (ICIT-735)

Credit variable (2-3)

**ICIT-745**  
**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.)

Credit 4

**ICIT-751** **Instructional Development II**  
**Registration #0613-751**  
 A continuation of Instructional Development I (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. (Prerequisite: ICIT-750)

Credit 4

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

Credit 4

**ICIT-755** **Criterion Referenced Instruction and Technical Training I**  
**Registration #0613-755**  
 Credit 3

**ICIT-756** **Criterion Referenced Instruction and Technical Training II**  
**Registration #0613-756**  
 Credit 3

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.

**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 variable 2-3

**ICIT-758** **Developing Instructional Modules**  
**Registration #0613-758**  
 The course is designed to follow either ICIT-756 and/or ICIT-751 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-750 & 751 or ICIT-755 & 756)

Credit 3

**ICIT-762** **Management & Budgeting in Instructional Technology**  
**Registration #0613-762**  
 Applies basic theories of management to areas of instructional technology (such as production, audiovisual services) and to management of personnel of those areas. Examines the organizational structure of media centers and units within the center. Covers budgeting and actual financing for services and projects dealing with the use of media in training and instruction.

Credit 4

**ICIT-765** **Individual Learning Style Analysis**  
**Registration #0613-765**  
 Examines the ways different individuals learn and relates instructional strategies to learning styles. Covers cognitive style mapping, aptitude treatment interaction, application of norm and criterion referenced tests as they relate to individual learning styles. (Prerequisite: 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. (ICIT-750, 751, 757, 770)

Credit 3

**ICIT-780** **Selected Topics in Instructional Technology**  
**Registration #0613-780**  
 This seminar provides a forum for a small group of students to examine various areas of interest to them. Students select topics, examine them thoroughly, and present the findings for group consideration. Required for graduation. (30 hours course work)

Credit 2

**ICIT-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, 751 and 20 hours of course work)

Credit variable 1-4

**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, 751 and 20 hours of course work)

Credit variable 1-4



## Graduate Faculty College of Applied Science and Technology

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

**Wiley R. McKinzie**, MS, SUNY at Buffalo—Associate Dean, Associate Professor

**Donna McDonough**, MS, Rochester Institute of Technology—Assistant to the Dean

**Donald D. Baker**, Ed.D., University of Rochester—Chairperson, Department of Career and Human Resource Development, Associate Professor

**Jack Hollingsworth**, Ph.D., University of Wisconsin—Director, School of Computer Science and Technology, Professor

**Richard L. Rinehart**, Ed.D., Michigan State—Director, Center for Community/Junior College Relations, Professor

**Clinton James Wallington**, Ph.D., Southern California—Chairperson, Department of Instructional Technology, Professor

### Department of Career and Human Resource Development

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

### Adjunct Faculty

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

**Lawrence W. Belle**, Ph.D., University of Rochester

**Paul Bernstein**, Ph.D., University of Pennsylvania

**Terry L. Dennis**, Ph.D., MSIA, Purdue

**Joan Green**, M.Ed., Trenton State; MS, Rochester Institute of Technology

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

**Richard Marchand**, Ph.D., Florida State University

**Nancy Neville**, MA, Fordham University

### Center for Community/Junior College Relations

**Richard L. Rinehart**, Ed.D., Michigan State University—Director, Center for Community/Junior College Relations, Professor

### School of Computer Science and Technology

**Jack Hollingsworth**, Ph.D., University of Wisconsin—Director, School of Computer Science and Technology, Professor

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

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

**Mehmet Baray**, Ph.D., University of California, Berkeley—Associate Professor

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

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

**William Carithers**, MS, University of Kansas—Instructor

**James A. Chmura**, MS, Rutgers University—Assistant Professor

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

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

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

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

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

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

**Peter Lutz**, Ph.D., SUNY at Buffalo—Assistant Professor

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

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

**Margaret Reek**, MS, Rochester Institute of Technology—Instructor

**Stewart Shen**, Ph.D., Northwestern University—Associate Professor

**William Stratton**, MS, SUNY at Buffalo—Assistant Professor

**Daniel S. Yeung**, Ph.D., Case Western Reserve—Assistant Professor

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

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

**Michael J. Ciaraldi**, MS, Rochester Institute of Technology

**Teiji Furugori**, Ph.D., SUNY at Buffalo

**James Hammerton**, MBA, New York University

**Kenneth Kelsen**, BS, Syracuse University

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

**Patrick Moyer**, MS, Pennsylvania State University

**Michael Mino**, MBA, Rochester Institute of Technology

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

**T. C. Soong**, Ph.D., Stanford University

**William Thiel**, MS, Rochester Institute of Technology

### Department of Instructional Technology

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

**Lawrence W. Belle**, Ph.D., University of Rochester—Associate Professor

**Russell Kraus**, Ed.D., University of Massachusetts—Associate Professor

**Anne L. Wiley**, Ph.D., Syracuse University—Visiting Assistant Professor

# College of Business



**Dr. Walter F. McCanna**, Dean  
**Dr. Thomas E. Comte**, Assistant  
 Dean, Graduate Programs  
 (475-2256)

RIT's graduate programs in management include the master of business administration, the master of science in accountancy, and the master of science in human services management. Each program is designed for full- and part-time students.

Through a flexible, decision-oriented curriculum, graduate students focus on key aspects of modern management relevant to profit and non-profit organizations, with the opportunity to concentrate in selected areas.

Tomorrow's manager must be able to handle highly complex problems set in an ever-changing environment. Recognizing this need, RIT blends its graduate management and accounting programs with education in management theory and analytical techniques. Programs are based on extensive applications and problem solving considerations. Because an effective manager also must have an appreciation for the behavioral facets of his or her position, faculty members arrange courses and experiences that offer the knowledge necessary for a leadership role in business, non-profit organizations, and government.

The College of Business is housed in the George Eastman Memorial Building on RIT's Rochester campus. Facilities include a Learning Support Center, time-sharing computer terminals on-line with RIT's Sigma 9 computer and extensive software support, and an up-to-date business collection of texts, periodicals and reference services in the Wallace Memorial Library.

The overall goal of RIT's graduate management programs is to provide education for men and women preparing themselves for continuing executive positions in management. Preparation for managerial responsibilities and opportunities, together with the development of the individual, are integral parts of the program. While progressing toward a graduate degree in management, the student should be able to develop: a systematic approach to problem solving; maturity of character and the ability to make intelligent decisions; the ability to communicate and work with people in organization management and a base from which he or she can continue to grow professionally in a changing environment.

## Master of Business Administration

The master of business administration program is professional in nature. Management is the element common to all successful organizations. The professional manager must be able to work with and through others. He or she must have organizational skills, be able to identify and solve problems, and carry out decisions by motivating others to accomplish goals.

The MBA program presents a body of knowledge that provides a foundation and then allows the student to explore concentrations suited to his or her particular desires. In its early stages, the program prepares the student with courses in basic management skills. At the intermediate level, the student deals with the forces influencing decisions. Advanced courses allow for continued intellectual growth in a specialty and the application of previously acquired skills to specialized areas as well as the integration of the various management functions.

To accomplish program objectives, the curriculum provides:

- education in the basic tools needed for management decision making;
- a background in the functional areas of marketing, finance, accounting, management, and operations;
- an understanding of the environment in which business operates;
- an opportunity to develop a specialty by offering concentrations in accounting, finance, marketing, management, and decision sciences;
- an opportunity to develop a tailored program directed toward an emerging professional specialty or the enhancement of particular skills through use of free electives in the general option;
- an opportunity to practice management problem-solving through the use of cases, computers, simulation, gaming, and other dynamic management techniques;
- an opportunity to integrate fundamental and advanced knowledge through course work and job experience.

### Curriculum

The master of business administration curriculum is designed so that a student will progress through the program in a logical sequence and will also be allowed some program flexibility. Initially, students must demonstrate their ability in foundation courses, either by taking graduate coursework or by waiving up to 24 quarter credit hours of foundation courses, based on having taken appropriate undergraduate courses or having successfully challenged them by examination.

In the second phase the professional level is reached and students are exposed to the various functional areas of business through a series of required core courses. Coincident with or following the core courses, students may pursue electives concentrating in accounting, decision science, finance, management, marketing or general business. Except for the registered accounting programs, these options are not indicated by title on the transcript or degree itself.



A general program requirement is that foundation courses must be completed before a student attempts core courses or option electives. However, as a student approaches completion of the foundation courses, he or she may combine the last foundation courses with appropriate core courses in order to maintain a full schedule in the specified quarter. Students must also adhere to the prerequisite sequencing. Any proposed exceptions to the above must be approved by the assistant dean for Graduate Business Programs.

## Graduate programs in Accountancy

Increasing demands on the professional accountant have produced a need for broad educational preparation. In recognition of this need, the College of Business offers graduate programs leading to the master of business administration with accounting option, and the master of science with an emphasis in accountancy.

Graduates of these programs meet the educational requirements for the Uniform Certified Public Accounting Examination and may sit

for the exam immediately upon completion of the master's degree. The specific requirements are described in detail in a later section.

Proper selection of electives within an accounting program will prepare a student for a number of possible accounting careers other than public accounting. The curriculum allows a student to prepare for the Certificate in Management Accounting examination as administered by the Institute of Management Accounting of the National Association of Accountants. Students desiring to pursue an accounting major should consult the Graduate Office to ensure that their programs are designed to meet licensing requirements.

#### **MBA with accounting option**

The MBA with accounting option enables the student to obtain a broad education encompassing those behavioral and quantitative aspects of management common to middle and upper management, in addition to meeting the previously mentioned educational requirements for either the Certified Public Accounting Certificate or the Certificate in Management Accounting.

Specifically, the MBA with accounting option is designed for students without an extensive background in accounting or business at the undergraduate level. The program requires a sequence of accounting courses to be integrated as approved electives in the MBA program.



#### **MS with an emphasis in accountancy**

The master of science in accountancy is an intensive 48 quarter credit hour program and is specifically designed for students who desire to continue their accounting studies at an advanced level. Those students lacking the prerequisite undergraduate hours in accounting may be able to pursue the MS degree by making up those courses, at the graduate level, in which they are deficient. This program prepares students for the Uniform Certified Public Accounting examination and meets New York State requirements. The admission standards and procedures are the same as those for the MBA program.

#### **Master of Science in Human Services Management**

The master of science in human services management program is designed to prepare students for managerial responsibilities in a human service setting. The curriculum is designed for persons whose professional focus is in the public or private not-for-profit organization. The program utilizes the diverse capabilities of the College of Business, the departments of Social Work and Criminal Justice and the faculties of the allied health programs.

The curriculum is organized in four basic phases from which 72 quarter credit hours (18 courses) are required. In the first two phases, foundation and core, 11 courses provide the basic information and techniques necessary to effective management. The third phase, the interdisciplinary core, requires four courses that cover the Interventive, interpersonal and communication skills essential for effective interaction with the community, other organizations, and colleagues. The fourth phase provides three electives, which may be taken in management, social work, criminal justice or related areas.

The MS in human services management is available to persons holding a variety of undergraduate degrees.

#### **Programs prepare students to 'go out and manage'**



*Dr. Thomas E. Comte*

"We want students to go through one of our management programs and then be able to go out and manage. We know that they can apply what they've learned directly to their jobs. They also have the knowledge to continue their management growth," says Dr. Thomas E. Comte, assistant dean of Graduate Business Programs at RIT.

"We're a managerially oriented program as opposed to a highly theoretical or research oriented one. We are interested in the ability of students to apply their knowledge to business problems. I believe that theory is necessary to provide direction to the solution of a management problem. The professional application of theory and knowledge is mandatory for continued business success," he says.

Since RIT graduated its first class of graduate business students in 1970, classes have grown consistently. During the past academic year, more than 700 students were enrolled. "And," Comte says, "full-time enrollment in the program is steadily increasing."

"The majority of our students are people who've done undergraduate work in other areas—like social work, graphic arts, liberal arts, or engineering—and see the need to enroll for a graduate program in management. They not only want to be able to do what they do well, but also to be able to manage others in the same or other fields."

"One important thing about a graduate business program at RIT is that you do not have to have had any undergraduate work in business to be admitted to, or successful in, the program. A well-developed undergraduate experience is important, however."

The faculty in the College of Business brings to the classroom a blend of quality academic preparation and strong business relationships. Most of the professors have previous and continuing business experience, are active consultants, and maintain memberships on numerous boards of directors.

Professors teach both undergraduate and graduate programs in both day and evening classes.

Comte is a graduate of the University of California at Davis (BS, chemistry), Columbia University (MBA, production systems) and the University of Missouri (Ph.D., management). He has been at RIT since 1978. He has experience in the pharmaceutical industry and began his academic career in 1972.

### Admission

Any individual who wishes to study in the graduate business programs must first be admitted. Admission will be granted to graduates of accredited baccalaureate degree programs, who, in the opinion of the Graduate Admission Committee of the College of Business, have demonstrated their potential to successfully complete graduate business studies through their achievements in their undergraduate program, through the results of the Graduate Management Admission Test, or, in the case of the MS in human services management, either the Graduate Management Admission Test or Graduate Record Exam, and applicable professional experience.

Applicants whose past performance does not satisfy all conditions of admission but who appear to merit a trial period may be admitted and their performance reviewed after the completion of 12 credit hours of graduate level work. Additional preparatory work may be required prior to applicant acceptance.

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.

Applicants from foreign countries where a degree or diploma is granted by an institution not holding accreditation may be admitted provided that 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 should 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, two letters of recommendation, and results of the Graduate Management Admission Test or, for the MS in human services management, the Graduate Record Examination or the Graduate Management Admissions Test. Information may be obtained from the College of Business or by writing the Graduate Management Admission Test, Educational Testing Service, Box 966, Princeton, N.J., 08540, or Graduate Record Examination, Educational Testing Service, Box 955, Princeton, N.J., 08541. The test is usually given four times a year in convenient locations.

### Non-matriculated students

Individuals already holding master's or doctor's degrees in business may enroll in graduate business courses as non-matriculated students. Evidence of previous degree must be presented to the College of Business before registering as a non-matriculated student.

### 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 the Assistant Dean, 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 MS in human services management student, scholarship aid is available in the form of a tuition remission.



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

### Placement Service

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

### Credit hour requirement

Credit hour requirements vary depending on the particular program and a student's prior academic achievements. Normally, 72 quarter credit hours are required in the master of business administration program and the master of science in human services management. The master of science in accountancy program requires a minimum of 48 quarter credit hours. 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. Some accounting majors may require more than the normal maximum hours depending on background.

An admitted student with appropriate undergraduate business courses taken prior to entry in the MBA or MS in human services management program, carrying a grade of "B" or better, may waive some or all of the foundation courses and thus reduce the total required hours accordingly. Certain courses may be exempted in the MS in accountancy program; however, they must be replaced by approved electives to maintain the 48 quarter credit total.

#### **Transfer credit**

A maximum of 12 quarter credit hours may be accepted 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 assistant dean, Graduate Business Programs.

#### **Academic standards**

The average of all course grades earned at RIT while in a graduate business program must be at least a "B" in order to satisfy requirements for master's degree certification. Transfer credits, waiver credits, or credits from undergraduate courses taken while in the graduate program are not counted in the grade point computation.

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

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

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

Full-time students desiring work experience while in the master's program may include a management internship in their curriculum. Students may arrange internships with local and national business and non-profit organizations. Each academic quarter of internship will add one quarter of time to the program's duration. RIT offers no guarantee to provide internships but does work with students to obtain positions. Students should contact the director of experiential learning programs for the College of Business in the Career Education Office for more information. To gain academic credit for a management internship, a research paper is required and the internship must be

approved before it is begun by the assistant dean of graduate business programs.

Full-time students will find that, while certain courses may be scheduled during the day, they will take most courses during the evening hours and that each evening course meets once a week.

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

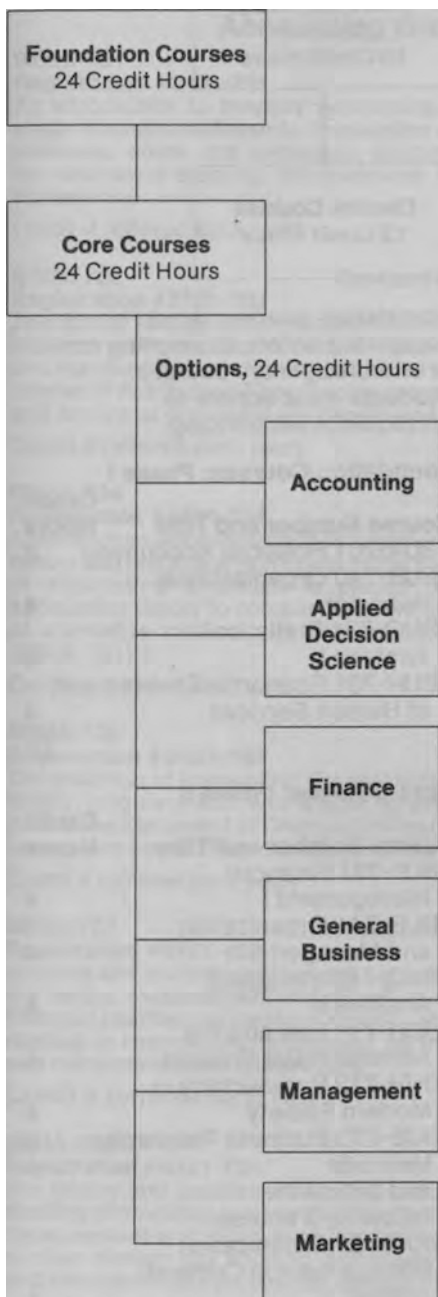
In addition to full-time study, all graduate programs are available on a part-time basis. Course requirements, faculty, and admission procedures correspond to the full-time program. The part-time MBA allows individuals from the greater Rochester area to prepare themselves for advancement in management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





### Course offerings

Information concerning courses to be offered in a given quarter will be available through the Graduate Business 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 courses meet twice a week, and evening or Saturday 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

### Foundation Course: Phase I

Course Number and Title	Credit Hours
BBUA-701 Financial Accounting	4
BBUA-702 Cost & Managerial Accounting	4
BBUB-740 Organizational Behavior	4
BBUQ-781 Statistical Analysis I	4
BBUQ-780 Quantitative Analysis	4
BBUF-745 Economic Environment of American Business	4
<b>Total</b>	<b>24</b>

### Core Courses: Phase II

Course Number and Title	Credit Hours
BBUQ-782 Statistical Analysis II	4
BBUF-721 Financial Management I	4
BBUB-741 Organization & Management	4
BBUB-743 Operations Management	4
BBUM-761 Marketing Concepts	4
BBUB-759 Integrated Business Analysis	4
<b>Total</b>	<b>24</b>

### Option Courses: Phase III

Approved options are illustrated in the following material. Free electives may be selected from graduate level courses offered by the College of Business or by other colleges of the Institute subject to the approval of the assistant dean of Graduate Business Programs. In addition to elective courses, students may earn up to eight hours of research option credit in fulfilling elective requirements.	
Total hours	72

Note that the required foundation courses must be completed before a student attempts core or option courses. However, as a student approaches completion of the foundation courses, the last foundation courses may be combined with appropriate core courses to maintain a full schedule. Students must adhere to the pre-requisite sequencing that appears in the course descriptions.

### Accounting Option

Course Number and Title	Credit Hours
*BBUA-704 Accounting Theory I	4
*BBUA-705 Accounting Theory II	4
BBUA-707 Advanced Accounting	4
BBUA-708 Auditing	4
*BBUA-709 Basic Taxation Accounting	4
BBUB-751 Legal Environment of Business	4
BBUF-722 Financial Management II	4
<b>Total</b>	<b>28</b>

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

Note: In addition to the above option courses, CPA candidates must also take the following courses to comply with the program registered by the New York State Education Department:

- BBUA-810 Advanced Taxation Accounting
- BBUA-811 Auditing Theory
- BBUA-813 Financial Accounting Theory

If BBUF-745 is exempted it must be replaced with another graduate economics course.

### Decision Science Option

Course Number and Title	Credit Hours
BBUB-770 Business Research Methods	4
BBUQ-785 Applied Regression Analysis	4
Three courses from Group A or other quantitative related electives approved by graduate program assistant dean	12
One graduate elective from College of Business or approved by graduate program assistant dean	4
<b>Total</b>	<b>24</b>

### Group A

- BBUQ-784 Decision Analysis
- BBUQ-786 Mathematical Programming
- BBUQ-788 Survey Design and Sampling
- BBUQ-789 Simulation
- BBUQ-793 Business Forecasting
- BBUQ-794 Multivariate Methods in Business
- BBUQ-795 Seminar in Decision Sciences

**Finance Option**

<b>Course Number and Title</b>	<b>Credit Hours</b>
BBUF-722 Financial Management II	4
BBUF-723 Theory of Finance and Research	4
BBUF-767 Advanced Microeconomic Theory	4
BBUF-768 Advanced Macroeconomic Theory	4
Two electives from Group A	<u>8</u>
	24

BBUF-724 Problems in Financial Management  
 BBUF-725 Securities and Investment Analysis  
 BBUF-729 Seminar in Finance

**General Business Option**

<b>Course Number and Title</b>	<b>Credit Hours</b>
BBUB-770 Business Research Methods	4
Five graduate electives from the College of Business or approved by graduate programs assistant dean	<u>20</u>
	24

**Management Option**

<b>Course Number and Title</b>	<b>Credit Hours</b>
BBUB-750 Personnel Systems 4	
BBUB-770 Business Research Methods 4	
Three courses in Group A 12	
One graduate elective from the College of Business or approved by graduate programs assistant dean	<u>4</u>
	24

**Group A**

BBUB-742 Business and Society  
 BBUB-746 Management Development  
 BBUB-748 Labor/Management Problems  
 BBUB-751 Legal Environment of Business  
 BBUB-758 Seminar in Management  
 BBUF-765 Managerial Economics

**Marketing Option**

<b>Course Number and Title</b>	<b>Credit Hours</b>
BBUM-762 Advanced Marketing Management 4	
BBUB-770 Business Research Methods 4	
BBUM-763 Consumer Behavior or 4	
BBUM-765 Sales Management	
Two courses from Group A 8	
One graduate elective from the College of Business or approved by graduate program assistant dean	<u>4</u>
	~24

**Group A**

BBUF-767 Advanced Microeconomic Theory  
 BBUM-763 Consumer Behavior Seminar  
 BBUM-764 Marketing Logistics  
 BBUM-765 Sales Management  
 BBUM-766 International Marketing  
 BBUM-767 Marketing Communications  
 BBUQ-785 Applied Regression Analysis  
 BBUQ-788 Survey Design and Sampling  
 BBUQ-793 Business Forecasting Methods

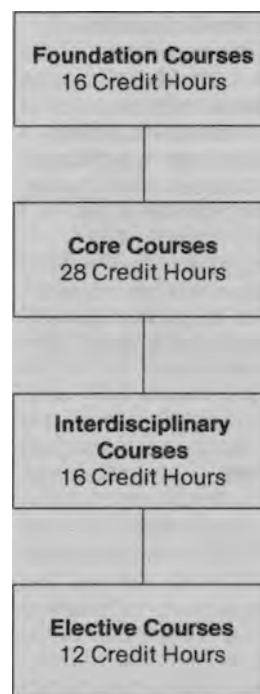
**Master of Science in Accountancy Curriculum****Prerequisites: (undergraduate hours or equivalent)**

Accounting (21 Sem. Hrs.)  
 Business Law (6 Sem. Hrs.)  
 Finance (6 Sem. Hrs.)  
 Statistics (6 Sem. Hrs.)  
 Economics (9 Sem. Hrs.)

**Advanced Courses**

<b>Course Number and Title</b>	<b>Credit Hours</b>
BBUQ-782 Statistical Analysis II	4
BBUB-740 Organizational Behavior	4
BBUB-741 Organization and Management	4
BBUF-721 Financial Management I	4
BBUF-722 Financial Management II	4
BBUF-765 Managerial Economics (or BBUF-767 Advanced Microeconomic Theory)	4
BBUA-810 Advanced Taxation Accounting	4
BBUA-811 Auditing Theory	4
BBUA-813 Financial Accounting Theory	4
Approved Electives	<u>12</u>
	48

BBUB-740, Organizational Behavior, may be exempted with appropriate undergraduate background. However, if exempted, it must be replaced with an approved course to maintain the 48 quarter credit hours minimum. Deficiencies of more than two courses will extend the degree requirements beyond the 48 quarter credit hour minimum.

**Master of Science Human Services Management**

Foundation courses should be completed before attempting core or interdisciplinary courses. Students must adhere to prerequisite sequencing.

**Foundation Courses: Phase I**

<b>Course Number and Title</b>	<b>Credit Hours</b>
BBUA-701 Financial Accounting 4	
BBUB-740 Organizational Behavior 4	
BBUQ-781 Statistical Analysis I 4	
BBUH-701 Economic Environment of Human Services	<u>4</u>
	16

**Core Courses: Phase II**

<b>Course Number and Title</b>	<b>Credit Hours</b>
BBUF-721 Financial Management I	4
BBUB-741 Organization and Management	4
BBUQ-782 Statistical Analysis II	4
BBUH-711 Law and the Administrative Process	4
BBUH-712 Bureaucracy in Modern Society	4
BBUB-770 Business Research Methods and one of the following 3 courses	4
BBUH-721 Organization Management in Criminal Justice	4
BBUH-722 Administration in the Social Work Setting	
BBUB-750 Personnel Systems	

**Interdisciplinary Courses: Phase III  
(Choose 4 of 5)**

<b>Course Number and Title</b>	<b>Credit Hours</b>
BBUH-731 Intervention in the Community	4
BBUH-732 Cooperation and Conflict	4
BBUH-733 Interpersonal Skills 4	
BBUH-734 Deviance, Conformity and Criminal Behavior	4
BBUH-735 Special Populations _____	4
	16

**Electives: Phase IV**

Students may select electives from courses in management, social work or criminal justice or other RIT graduate offerings. Electives, offered on demand, will include such topics as grant writing, evaluation, current issues in the legal system, etc.

12

Total hours 72

## Business Administration courses

### Accounting Group

**BBUA-701**
**Financial Accounting**
**Registration #0101-701**

An introduction to financial accounting. Topics covered will include: financial statements; transaction analysis; accounting for revenues, costs, and expenses; accounting for assets, liabilities and owner's equity; measurement; and the use of financial statements.

Credit 4 (offered each year)

**BBUA-702**
**Cost and Managerial Accounting**
**Registration #0101-702**

The uses of cost data and reports for managerial decision making. Includes problems and procedures relating to job order, process, and standard cost systems with special attention to problems of overhead distribution. The planning process, the control process, and analytical processes are considered in detail. (BBUA-701)

Credit 4 (offered each year)

**BBUA-704**
**Accounting Theory I**
**Registration #0101-704**

A comprehensive exposure at an intermediate level to accounting theory and practice which exists within the present days structure of accounting. Emphasis is placed on applying underlying accounting theory to complex accounting problems. The effects of alternative methods are considered throughout the course. (BBUA-701)

Credit 4 (offered each year)

**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 (offered each year)

**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; attention to special areas relating to consolidated statement, partnerships, consignments and installment sales. (BBUA-705)

Credit 4 (offered each year)

**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 day auditing techniques by statistical sampling and electronic data processing applications. (BBUA-705).

Credit 4 (offered each year)

**BBUA-709**
**Basic Taxation Accounting**
**Registration #0101-709**

Study of federal income taxation of individuals. 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 and deductions. (BBUA-701)

Credit 4 (offered each year)

**BBUA-712**
**Seminar in Accounting**
**Registration #0101-712**

Course content will differ by instructor and quarter. Topics covered: taxation, international accounting and accounting for non-profit organizations (Permission of instructor)

Credit 4 (offered upon sufficient demand)

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

A study of federal income taxation as it relates to corporate tax planning; reorganization, merger, and liquidation; partnership, estates, trusts, and gifts. Problems of the special corporation—Subchapter S, Personal Holding company—are examined. Tax planning for the individual, tax shelters, estate and gift taxes are studied and discussed. Emphasis will be placed upon the need for tax planning in the complex business or personal situation. (BBUA-709 or admission to MS in accountancy).

Credit 4 (offered each year)

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

Advance 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 admission to MS in accountancy)

Credit 4 (offered each year)

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

A variety of advanced accounting topics covered, depending on the instructor. Topics included would be: CPA problems, SEC accounting, small business accounting, internal auditing. (BBUA-705 or admission to the MS in accountancy)

Credit 4 (offered each year)

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

An advanced course in financial accounting theory which 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 admission to the MS in accountancy)

Credit 4 (offered each year)

## Business Group

### BBUB-740

### Organizational Behavior

#### Registration #0102-740

Organization Analysis through the study of individual and group behaviors within organizations. The implications of studies from psychology and social psychology are stressed. Topics include motivation, leadership, group dynamics, conflict, communication, stress, and individual and group development.

Credit 4 (offered each year)

### BBUB-741

### Organization and Management

#### Registration #0102-741

Develops the analyses of organizations by studying the systems and subsystems which make up the organization. These systems include the technological, structural and managerial subsystems as well as the environmental suprsystem. Included are topics such as organization effectiveness and organization development. (BBUB-740)

Credit 4 (offered each year)

### BBUB-742

### Business and Society

#### Registration #0102-742

A study of the impact on the manager of the needs, demands and restrictions posed by employees, government, the consumer and other environmental forces. The course examines possible managerial responses within the framework of several definitions of "social responsibility." (Foundation courses)

Credit 4 (Offered upon sufficient demand)

### BBUB-743

### Operations Management

#### Registration #0102-743

An analytical approach to the theory and application of operations management. Combines quantitative models and qualitative considerations relating to forecasting, inventory management, quality control, and queuing analysis. Statistical reasoning and computer utilization are basic tools in problem solution. (BBUQ-780, BBUQ-782)

Credit 4 (offered each year)

### BBUB-746

### Management Development

#### Registration #0102-746

Concepts of career development; overview of present individual and group procedures; implications of current technological development for training, replacement, and advancement. (BBUB-741)

Credit 4 (offered each year)

### BBUB-747

### Systems Administration

#### Registration #0102-747

General systems theory applied to the management of business systems. Topics covered include philosophy of systems, design, analysis and control of systems, cybernetics, project management, reliability, and human factors. (Foundation courses)

Credit 4 (offered upon sufficient demand)

### BBUB-748

### Labor/Management Problems

#### Registration #0102-748

Problems in labor/management relations as they influence managerial decision making. Topics may include collective bargaining, conflicts and agreements between labor and management, and contemporary issues. From the perspective of labor/management structure, concepts are developed concerning market forces, unionism and labor laws as they influence wage levels and wage structure. (BBUB-740, BBUQ-745)

Credit 4 (offered each year)

### BBUB-750

### Personnel Systems

#### Registration #0102-750

This course introduces the concept of personnel systems and allows a detailed examination of the systems' different elements. The student will become acquainted with current theory and research in behavioral sciences. The course also allows the student to integrate theory with practical application through exercises and class projects dealing with problems in personnel selection, placement, training and evaluation (BBUB-740, BBUQ-782)

Credit 4 (offered each year)

### BBUB-751

### Legal Environment of Business

#### Registration #0102-751

An introduction to legal principles and their relationship to business practices including the background and sources of law, law enforcement agencies and procedures. Topical cases and examples are used as a guide to the observation of legal requirements and the legal forces which influence business and accounted decisions. (Foundation courses)

Credit 4 (Offered each year)

### BBUB-752

### Comparative Organizations

#### Registration #0102-752

A course providing a critical evaluation of a wide range of current management theory and research concerned with organizations of all types; public and private, profit and non-profit. Appropriateness of the body of knowledge for managing different types of organizations is a primary concern. A focus on comparative analysis of a variety of organizations is made to understand differences and similarities and to determine whether research and theory is generalizable across organizations. Particular emphasis is placed on non-profit organizations. (BBUB-741)

Credit 4 (offered on sufficient demand)

### BBUB-753

### Small Business Administration

#### Registration #0102-753

A course providing students with the opportunity to act in a consulting capacity with a given business firm. Under an arrangement with the Small Business Administration and working with faculty, teams of students provide management consulting to small businesses. (BBUA-702, BBUQ-721, BBUM-761).

Credit 4 (offered each year)

### BBUB-758

### Seminar in Management

#### Registration #0102-758

This course will take on different content depending on the instructor and quarter when offered. Topics which may be covered include management thought, systems theory and application, and behavioral aspects of management. Specific content for a particular quarter will be announced prior to the course offering. (Permission of instructor)

Credit 4 (offered each year)

### BBUB-759

### Integrated Business Analysis

#### Registration #0102-759

A course intended to give 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 several functional areas of marketing, production, finance and personnel. This course is aimed at the formulating and implementation of business policy as viewed by top management. The case method is used extensively. (All other core courses plus two electives preferred)

Credit 4 (offered each year.)

### BBUB-770

### Business Research Methods

#### Registration #0102-770

Research as a basis for policy building, planning, control and operation of the business enterprise. Concepts, tools, sources, methods, and applications are covered. Procurement and evaluation of data for business use from government and private sources. Introduces the use of multivariate techniques as a means for data reduction and the analysis of complex data bases. (Foundation courses, BBUQ-782; BBUM-761 preferred)

Credit 4 (offered each year)

### BBUB-771,772

### Research Option

#### Registration #0102-771, -772

A Practicum or thesis alternative permitting the student to confront a real management problem. Requirements include steps from design to completed management report. (Core courses and one of the following: BBUB-770, BBUQ-723, BBUQ-784)

Credit 4 or 8 (Option to be developed with selected faculty).

**BUB 799****Information Systems**

Registration #0102-799  
 This course is designed to give the student greater depth in the basic concepts of financial management and greater facility in using the analytical techniques. Extensive use will be made of case material. Problem types to be considered include liquid asset management, capital budgeting, security valuation, methods of financing and dividend policy. (BBUF-723)  
 Credit 4 (offered upon sufficient demand)

**BBUF-799****Independent Study**

Registration #0102-799

This course is designed to give the student greater depth in the basic concepts of financial management and greater facility in using the analytical techniques. Extensive use will be made of case material. Problem types to be considered include liquid asset management, capital budgeting, security valuation, methods of financing and dividend policy. (BBUF-723)  
 Credit 4 (offered upon sufficient demand)

Credit 1-4 (variable) (offered subject to review)

**Finance and Economics****BBUF-721****Financial Management I**

Registration #0104-721

Critical examination of the financial elements and systems of the firm. The emphasis is on asset management to include valuation theory and analysis, cost of capital, current asset management, and capital budgeting. Portfolio approaches to security and project selection and management. (Foundation courses, BBUB-782)  
 Credit 4 (offered each year)

**BBUF-722****Financial Management II**

Registration #0104-722

Liability and equity management receive primary emphasis to include short and intermediate term financing, long term financing leases, capital structure, dividend policy, and bankruptcy and reorganization. Theory and application approaches are shared. (BBUF-721)  
 Credit 4 (offered each year)

**BBUF-723****Theory of Finance and Research**

Registration #0104-723

This course involves a study of the current literature and most recent developments relating to the theories of investment and valuation, cost of capital, risk and dividend policy. Also considered are specific areas of application and the policy implications of the theories studied. (BBUF-722, BBUF-767)  
 Credit 4 (offered each year)

**BBUF-724****Problems in Financial Management**

Registration #0104-724

This course is designed to give the student greater depth in the basic concepts of financial management and greater facility in using the analytical techniques. Extensive use will be made of case material. Problem types to be considered include liquid asset management, capital budgeting, security valuation, methods of financing and dividend policy. (BBUF-723)  
 Credit 4 (offered each year)

**BBUF-725****Securities and Investment Analysis**

Registration #0104-725

Study of securities and various investment media and their markets. Analysis of investment values based on financial and other data. Considers factors such as return, growth, and risk. (BBUF-722)  
 Credit 4 (offered each year)

**BBUF-729****Seminar in Finance**

Registration #0104-729

This course will take on different content depending on the instructor and quarter when offered. Topics which 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 (offered upon sufficient demand)

**BBUF-745****Economic Environment of**

Registration #0104-745

American Business

Nature of the business firm; theory of demand, costs and prices; competition and monopoly; production function and the marginal productivity theory of distribution; saving and investment; the determination of the level of income; Federal Reserve operations; fiscal and monetary policies. (BBUQ-780)  
 Credit 4 (offered each year)

**BBUF-757****Seminar in Economics**

Registration #0104-757

Content will differ depending on the quarter and instructor. Topics which may be covered include international finance, monetary theory, labor economics and market structure. (Permission of instructor)  
 Credit 4 (offered upon sufficient demand)

**BBUF-765****Managerial Economics**

Registration #0104-765

Analysis of the economic conditions facing the firm. Topics include: demand and cost analyses, resource utilization, pricing, market structure, and other selected topics. (BBUF-745, BBUA-702, BBUB-743 recommended)  
 Credit 4 (offered each year)

**BBUF-767****Advanced Microeconomic Theory**

Registration #0104-767

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. (Foundation courses)  
 Credit 4 (offered each year)

**BBUF-768****Advanced Macroeconomic Theory**

Registration #0104-768

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 policies in promoting and maintaining economic stability and growth; reality and macroeconomic disequilibrium; and wage-price policies. (Foundation courses)  
 Credit 4 (offered each year)

**Marketing group****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. (Foundation courses)  
 Credit 4 (offered each year)

**BBUM-762****Advanced Marketing Management**

Registration #0105-762

Advanced study of selected problems which 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 (offered each year)

**BBUM-763****Consumer Behavior****Registration #0105-763**

A study of the market in terms of the psychological and socio-economic determinants of buying behaviors, including current trends in purchasing power and population movements. (BBUM-761)

Credit 4 (offered each year)

**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 (offered upon sufficient demand)

**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 relate to building and managing an effective sales force and to selling philosophy and techniques creating managerial "win-win" situations with both superiors and subordinates. (BBUM-761)

Credit 4 (offered each year)

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

Credit 4 (offered upon sufficient demand)

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

A study of inter-relationships of three communications mix functions; public relations, advertising, and sales promotion. Topics covered will center on the use of these functions in the development of models for persuasive communications and their inter-relationships with other elements of the marketing mix. (BBUM-761)

Credit 4 (offered each year)

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

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

Credit 4 (offered each year)

**Quantitative Group****BBUQ-780****Quantitative Analysis****Registration #0106-780**

An introduction to quantitative approaches to decision making. Topics covered include linear programming, decision theory, computer simulation, and calculus-based solution procedures. The emphasis is not on the techniques per se, but rather on showing how quantitative approaches can be used to contribute to a better decision making process. (BBUQ-781 or concurrent registration)

Credit 4 (offered each year)

**BBUQ-781****Statistical Analysis I****Registration #0106-781**

A study of probability and statistics including discrete and continuous probability distributions, sampling distributions, point estimation, and interval estimation. Applications are made to the managerial decision making situation. The use of SPSS in analyzing data will be introduced. (Knowledge of undergraduate algebra is presumed)

Credit 4 (offered each year)

**BBUQ-782****Statistical Analysis II****Registration #0106-782**

A continuation of topics from classical statistics including hypothesis testing, non parametric tests, analysis of variance, regression and correlation analysis. All students will analyze several data sets using SPSS. (BBUQ-781)

Credit 4 (offered each year)

**BBUQ-784****Decision Analysis****Registration #0106-784**

An introduction to decision analysis for the manager. Emphasis will be on structuring the problem in terms of alternatives possible, decision attributes, and operational constraints; quantifying the manager's judgements as probabilities; assessing the utility of the manager's preferences; analyzing the problem via evaluation of the alternatives and checking the sensitivity of the solution(s). Single and multiple attribute cases under certainty and uncertainty will be covered. (BBUQ-782)

Credit 4 (offered upon sufficient demand)

**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 datasets using SPSS. Relevant theory will be introduced to enable the student to pursue further study in data analysis. (BBUQ-782)

Credit 4 (offered each year)

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

An indepth investigation of several mathematical programming techniques with an emphasis upon model development and the decision making process. Specific topics covered include linear programming, goal programming, and integer programming. (BBUQ-780)

Credit 4 (offered upon sufficient demand)



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

The following topics in survey design and sampling are covered: questionnaire development; types of sampling techniques; determination of sample size; methods for increasing the response rate; interpretation of results and report preparation. Students will be required to design a questionnaire, administer it, and analyze the results. (BBUQ-782)

Credit 4 (offered upon sufficient demand)

**BBUQ-789****Simulation****Registration #0106-789**

An introduction to the various uses of simulation as a management tool for decision making. Models of varying levels of sophistication employing simulation programming languages are constructed. (BBUQ-782)

Credit 4 (offered upon sufficient demand)

**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 procedure to use based upon an analysis of problem characteristics. A significant part of the course will involve analyzing several data sets using a set of interactive forecasting or econometric programs such as SIBYL/RUNNER and TSP. (BBUQ-785 or permission of the instructor)

Credit 4 (offered each year)

**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 for large scale data sets. Students will be required to use a standard statistical package (SPSS, BMDP, TSP) to carry out the analytical procedures. A major emphasis is placed on the interpretation of analytic output in terms of the decision making situation underlying the problem being investigated. (BBUA-770)

Credit 4 (offered upon sufficient demand)

**BBUQ-795****Seminar in Decision Sciences****Registration #0106-795**

This course will take on different content depending on the instructor and quarter when offered. Topics which may be covered are: multi-variate analysis, simulation, operations research, linear programming and Bayesian techniques. Specific content for a particular quarter will be announced prior to course offering. (Permission of instructor)

Credit 4 (offered each year)

**Human Services Group****BBUH-701****Economic Environment of Human Services****Registration #0115-701**

Studies of the macroeconomic forces impacting the agency environments such as funding and service populations and the microeconomic concepts which can be used to aid in agency resource allocation decisions and in the analysis of alternate agency policies. Topics include National Income concepts and policies and economic demand for services and benefit/cost considerations. (BBUQ-781)

Credit 4 (offered each year)

**BBUH-711****Law and the Administrative Process****Registration #0115-711**

Practices, problems, and issues in the implementation of public policy. Civil law, regulation, and statutes affecting contracts, internal and external publics, employee welfare, and fiduciary responsibilities. The exercise of governmental power and control over administrative action. Specific legal areas such as rule making, licensing, adjudication, and judicial review will be examined. (BBUH-701, BBUH-712)

Credit 4 (offered each year)

**BBUH-712****Bureaucracy in Modern Society****Registration #0115-712**

The nature of bureaucratic organization in modern Western societies, especially the United States; business corporations, trade unions, the military, hospitals, law enforcement agencies. Problems resulting from conflicts and values, constituencies, and theories among these institutions. (BBUB-740)

Credit 4 (offered each year)

**BBUH-721****Organization and Management in****Registration #0115-721****Criminal Justice**

Considerations of organization, management, and planning as tools of the administrator with emphasis on bureaucracy, authority, power, decision making, and tactics and strategies of effective management. Special consideration will be given to the problems of management in criminal justice agencies, law enforcement agencies, and correctional institutions. (BBUB-741)

Credit 4 (offered on demand)

**BBUH-722****Administration in the Social****Registration #0115-722****Work Setting**

Application of administrative skills and methods applicable to the Social Worker, with attention called to the needs determined by the non-profit organizational structure. Topics include areas of administration and management concerns, planning, development, the various supervisory roles, personnel, evaluation, and special concerns arising from funding considerations. (BBUB-741)

Credit 4 (offered on demand)

**BBUH-731****Intervention in the Community****Registration #0115-731**

Methods of agency intervention in specific problem areas, identified as needed by the community, with focus on the role of management. Covers approaches to community intervention with special attention focused on such problem areas as crime, poverty, health, mental health, education, cultural resources, and population conflict. Issues will regard the manner in which agencies formulate interventive strategies and implementation, particularly as the process involves the management role. (BBUA-712)

Credit 4 (offered each year)

**BBUH-732****Cooperation and Conflict****Registration #0115-732**

Establishing working relationships between various providers of services and the resolution of system conflict. Topics to be covered include: the development of conflict between and within agencies, the evolution of a cooperative system of services, incompatible interest groups, competition among providers, problems of limited funding, and problems associated with the growth or decline of services. Emphasis is placed on the manager in the resolution of conflict. (BBUB-741, BBUH-712)

Credit 4 (offered each year)

**BBUH-733****Interpersonal Skills****Registration #0115-733**

The development of skills related to leadership, group dynamics, public relations, and aspects of personal growth. Self-awareness for the person in a managerial role will be stressed, particularly as this involves interaction with colleagues both within and outside the agency of employment. Management styles will be analyzed for strengths and weaknesses to develop an increased awareness of the particular personal characteristics leading towards beneficial managerial outcomes. (BBUB-740)

Credit 4 (offered each year)

**BBUH-734****Deviance, Conformity, and****Registration #0115-734****Criminal Behavior**

A study of the social and psychological factors identified with the genesis of specific social pathologies which are exhibited by groups and individuals. The course presents an analysis of the various forms of deviance including deviance from professional rules and norms; deviance from expected interaction patterns and traditional areas of deviance such as crime alcoholism, mental illness, homosexuality, prostitution, counter culture, and revolutionary activities; methods of social reaction to deviance. (Foundation courses)

Credit 4 (offered each year)

**BBUH-735****Special Populations****Registration #0115-735**

The needs of special populations such as the elderly, youth, ethnic minorities, women, the educationally disadvantaged, poor, and others. The course will address the particular considerations relevant to programming for these specific populations. Historical considerations will be raised. (Foundation courses)

Credit 4 (offered each year)



## 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—Assistant Dean, Graduate Programs in Business; Associate Professor, Management

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

**Janet C. Barnard**, Ed.D., University of Rochester—Associate Director, Graduate Programs in Business; Assistant Professor, Management

**Andrew J. DuBrin**, Ph.D., Michigan; MS, Purdue—Staff Chairman, Management, Marketing and Quantitative Sciences, Professor, Behavioral Sciences

**E. James Meddaugh**, Ph.D., Pennsylvania State; MBA, Drexel; C.P.A., New York, Washington, D.C.—Staff Chairman, Accounting, Finance and Economics, Professor, Accounting

**Arnold J. Berman**, MSW, Syracuse University; MA, New York University—Coordinator, MS in Human Services Management; Director, Dept. of Social Work

**Brian C. Arnold**, Ph.D., Colorado State—Lecturer, Finance

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

**Bruce C. Burdick**, BA, Ohio Wesleyan University—Lecturer, Finance

**Thomas R. Burns**, J.D., Notre Dame—Lecturer, Law

**Robert C. Camp**, Ph.D., Pennsylvania State—Lecturer, Marketing

**You-Keng Chiang**, Ph.D., Chicago—Professor, Economics

**Frederick D. Crowley**, MBA, Iona—Assistant Professor, Finance

**Martin J. Cunniffe**, MS, University of Rochester—Lecturer, Information Systems

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

**Stanley M. Dye**, BA, Haverford, C.P.A., New York—Distinguished Lecturer, Accounting; Former Partner, Coopers Lybrand

**Larry O. Edwards**, MBA, Harvard—Lecturer, Management

**Daniel S. Ehrman, Jr.**, MBA, Michigan; C.P.A., Virginia—Lecturer, Accounting

**Leonard J. Fela**, Ph.D., Syracuse; MBA, MS, Rochester Institute of Technology—Lecturer, Marketing

**Eugene H. Fram**, Ed.D., SUNY at Buffalo—Director, Center for Management Study; Professor, Marketing

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

**Robert M. Gluckman**, MS, Carnegie-Mellon—Lecturer, Statistics

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

**C. Michael Hamilton**, Ph.D., Kansas—Lecturer, Finance

**John A. Helmuth II**, MA, Old Dominion—Assistant Professor, Economics

**Frank E. Holley**, BS, Illinois—Distinguished Lecturer, Finance/Economics; Former Chairman of the Board, Marine Midland

**Bernard J. Isselhardt**, MS, Southern Illinois—Assistant Professor, Operations Systems

**Paul A. Lebowitz**, MS, Rochester Institute of Technology; C.P.A., New York—Assistant Professor, Accounting

**Vernon G. Lippitt**, Ph.D., Harvard—Lecturer, Economics

**Henry E. Mattice**, MBA, Indiana—Lecturer, Statistics

**James McGuire**, MBA, Rochester Institute of Technology—Lecturer, Labor Relations

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

**Herbert J. Mossien**, BS, Alfred—J. Warren McClure Professor of Marketing; Former Vice President and General Manager, Scientific Apparatus Division, Bausch & Lomb, Inc.

**Donald J. Onimus**, MBA, Syracuse; C.P.A., New York—Lecturer, Accounting

**James E. Pawlukiewicz**, MA, Kentucky—Assistant Professor, Finance

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

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

**Jose A. Rullan**, MS, Rochester Institute of Technology; C.P.A., New York—Instructor, Accounting

**Harold P. Scheinkopf**, Ph.D., New York University—Lecturer, Marketing

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**Robert D. Spooner**, Ph.D., Pennsylvania—Lecturer, Finance

**Robert M. Stern**, MBA, Lehigh—Lecturer, Information Systems

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

**Charles Stubbart**, BS, Rochester Institute of Technology—Lecturer, Management

**Daniel D. Tesson**, MS, Clarkson; C.P.A. New York—Instructor, Accounting

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

**Paul H. Van Ness**, MBA, Michigan—Associate Professor, Quantitative Methods

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

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

**William H. Williams**, Ph.D., Syracuse—Lecturer, Information Systems

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

**John S. Zdanowicz**, Ph.D., MBA, Michigan State—Associate Professor, Finance

# College of Continuing Education

## Master of Science Degree in Applied and Mathematical Statistics



**Austin J. Bonis**, Chairman  
Department of Statistics: 475-2002

### 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 make predictions, and to aid those needing to update their present statistical skills, the graduate program in statistics is offered by the College of Continuing Education at RIT.

### Candidates

Specifically, the students are engineers, managers, scientists, auditors, production and inspection personnel and those interested in industrial research, quality control, reliability, metrology, and testing. Generally, the degree offers opportunity for immediate advancement in many early careers, and for career changes. The uniqueness of the program is its intent to help on the job today, or in the near future.

### Part-time evening program

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

### Independent study

In addition to serving those in the Rochester area with graduate education in statistics, the College of Continuing Education offers an MS in applied and mathematical statistics on an independent study basis for those who cannot attend formal classes. It now becomes possible for students anywhere in the world, who hold an undergraduate degree, to obtain the master of statistics degree without actually coming to the campus. Transfer credits and credits for experiential learning are granted in accordance with existing Graduate Council policies.

**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.

**A practical program**

Both teachers and students work to put job experience and class studies together. For example, thesis and papers often have job supervisor's approval and wind up being put into effect rather than into the library. Theory is used for understanding, but it not an end in itself. It is sometimes perceived as being only mathematical and proof-oriented. In this program, "theory" means gaining knowledge of the principles and learning how to solve problems intelligently rather than in "cookbook" style. The degree is considered as "terminal." Additional and higher level mathematics, not presently part of the program, are required for the Ph.D. degree.

**Requirements**

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

**Two basic courses:**

(These may be waived by the departmental chairperson upon evidence of equivalent learning, experience, or competency.)  
CTAM-711 and 712 Fundamentals of Statistics I & II

**Eight core courses:**

CTAM-801 and 802 Design of Experiments I & II  
CTAM-821 and 822 Theory of Statistics I & II  
CTAM-841 and 842 Regression Analysis I & II  
CTAM-851 Nonparametric Statistics  
CTAM-881 Bayesian Statistics

**Seven electives:**

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

The total of 15 or 17 courses, each counting 3 quarter credits, comes to 45 or 51 credits depending on whether the basic courses (711-712) are waived. As indicated above, studies are normally completed in two to four years by attendance one or two nights a week.

**Levels of courses**

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

**Career guidance**

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

**Admission**

Admission to the degree program will be granted to qualified holders of a baccalaureate degree from an accredited college or university who have acceptable mathematics credits through integral calculus. Applicants who fail to meet the latter requirement may, at the discretion of the department chairperson, be accepted and 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 six 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  
Rochester, NY 14623

**Transfer and interdisciplinary credits**

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

**Non-matriculated students**

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

**Grades, exams and theses**

The candidate must attain an overall average grade of 3.0 (B) for graduation. An oral examination is required at the end of six courses to assure subject matter and verbal proficiency as well as ability to perform as a statistician in a working environment. Successful completion of each quarter course 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 and to use the computer as ways to improve their knowledge.

### Location

Courses are offered at the Rochester campus, at selected off-campus locations, and at in-plant training facilities. Special arrangements are made for training for various engineering certification examinations given by the American Society for Quality Control. Those students pursuing individual courses of special interest work under the independent study option and can, of course, complete their courses at home.

### Plans of study

Students may, with the permission of the departmental chairperson, secure credits toward the master's degree in three 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 prior to registration by the departmental chairperson. 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. CTAM-896, 897, and 898 are the registration numbers used for thesis work.

Third, credits may be obtained by Independent Study. Under this option, students who register for a course must complete the readings, homework assignments, examinations, assigned papers, and projects by the end of the quarter, but without the necessity of attending formal classroom sessions. Contact with the instructor is maintained by visits, telephone, or mail. Local area residents will be asked to take final exams at the Rochester campus. Out of town students will take these examinations at suitable locations by arrangement with proctors. Any course may be taken on an independent study basis provided the chairperson agrees to accept the student as qualified to do the

work on his own. For registration, CTAM course numbers (shown under "Course Descriptions") with a 25 suffix added indicates the Independent Study Option will be used.

### Independent study

Using the independent study mode, qualified students may complete all required credits without attending formal classes on campus. To assure that the standards for this "external degree" are maintained at a high level, candidates will stand for both an early *oral* examination at the end of six quarters and for a comprehensive *written* examination at the end of formal course work. Arrangements for out of town proctors will make taking these examinations as convenient as possible for candidates. Independent study students may proceed at their own pace. Administrative necessity, however, dictates that they must register during the regular registration periods each quarter. Students are expected to keep up with the class to which they are assigned.

### Faculty

Two full-time and some 15 adjunct faculty 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's suppliers. As with many others dedicated to continuing education, faculty members have a commitment to give evening students personal attention. This involves needed help on the jobs and in career counseling.

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

### Program tries to serve local industry

"Security is an illusion; the only real security people have is their trade," says Dr. Austin J. Bonis, chairman of the graduate program at RIT.

And Bonis, since he joined RIT in 1970, has devoted all of his energy to helping employees of local firms stay secure in their positions by keeping their statistical skills polished.

"Basically, I believe we try to help people get ahead in the job that they're in," he says. "We hope that what they learn today will be applied in their work tomorrow."

Bonis, a recognized expert in the field of statistical reliability, is a former chief statistician for the Department of Defense and served as military aide to Presidents Roosevelt and Truman. He still does consulting for the Army, as well as private industry.

But his approach to teaching statistics is, he says, "definitely not the classical approach."

"The typical program is classic, in that it leads to further study in the field; ours is a terminal program...it's interdisciplinary and it really attempts to serve local industry."

"The leading researchers at Kodak and Xerox have considerable input into the structure of the program... they guide us toward teaching what industry needs."

The faculty, he says, are tops in their field: "Each of our faculty members is rated quarterly by his or her students. Those who don't measure up are not rehired."

Bonis, who was director of research for a division of General Motors Corp., said he left industry and came to RIT because "I've been teaching all my life, no matter what job I happened to be in. And I was attracted by the challenge of teaching in this program."

# Course descriptions

## Statistics

### CTAM-711 Fundamentals of Statistics I Registration #0240-711

For those taking statistics for the first time. Covers the statistical methods used most in industry, business and research. Essential for all scientists, engineers, and administrators.

Topics: organizing observed data for analysis and insight; learning to understand probability as the science of the uncertain; concepts of practical use of the Central Limit Theorem. (Consent of the department).

Credit 3 (offered each quarter)

### CTAM-712 Fundamentals of Statistics II Registration #0240-712

Continuation of CTAM-711.

Topics: concepts and strategies of statistical inference for making decisions about a population on the basis of sample evidence; tests for independence and adequacy of a proposed probability model; learning how to separate total variability of a system into identifiable components through analysis of variance; regression and correlation models for studying the relationship of a response variable to one or more predictor variables. (All standard statistical tests) (CTAM-711 or equivalent.)

Credit 3 (offered each quarter)

### CTAM-721 Quality Control: Control Charts Registration #0240-721

A practical course designed to give depth to practicing quality control personnel.

Topics: statistical measures; theory, construction, and application of control charts; for variables and for attributes; computerization procedures for control charts; tolerances, specifications, and process capability studies; basic concepts of total quality control, and management of the quality control function. (Consent of the department.)

Credit 3 (offered in Fall and Spring Quarters)

### CTAM-731 Quality Control: Acceptance Sampling Registration #0240-731

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

Topics: single, double, multiple, and sequential techniques for attributes sampling; variables sampling; techniques for sampling continuous production. The course highlights Dodge-Romig plans, Military Standard plans, and recent contributions from the literature. (Consent of the department.)

Credit 3 (offered in Winter and Summer Quarters)

### CTAM-751 Introduction to Decision Processes Registration #0240-751

A first course in statistical decision theory featuring concrete situations and realistic problems.

Topics: basic statistical ideas; how to make the best decision prior to sampling, after sampling, sequentially; optimum managerial strategies, practical applications. (Consent of the department.)

Credit 3 (offered in Fall Quarter)

### CTAM-761 Reliability Registration #0240-761

A methods course in reliability practices; what a reliability engineer must know about reliability prediction, estimation, analysis, demonstration, and other reliability activities. Covers most methods presently being used in industry.

Topics: applications of normal, binomial, exponential, and Weibull graphs to reliability problems; hazard plotting; reliability confidence limits and risks; strength and stress models; reliability safety margins; truncated and censored life tests; sequential test plans; Bayesian test programs. (CTAM-712 or equivalent.)

Credit 3 (offered in Spring Quarter)

### CTAM-801 Design of Experiments I

#### Registration #0240-801

How you design and analyze experiments in any subject matter area; What you do and why.

Topics: basic statistical concepts, scientific experimentation, completely randomized design, randomized complete block design, nested and split plot designs. Practical applications to civil engineering, pharmacy, aircraft, agronomy, photoscience, genetics, psychology, and advertising. (CTAM-712 or equivalent.)

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

### CT AM-802 Design of Experiments II Registration #0240-802

Continuation of CTAM-801

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

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

### CTAM-821 Theory of Statistics I Registration #0240-821

Provides a sound theoretical basis for continuing study and reading in statistics.

Topics: constructs and applications of mathematical probability; discrete and continuous distribution functions for a single variable and for the multivariate case; expected value and moment generating functions; special continuous distributions. (Consent of the department.)

Credit 3 (offered in Fall Quarter)

### CT AM-822 Theory of Statistics II Registration #0240-822

Continuation of CTAM-821.

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.

Credit 3 (offered in Winter Quarter)

### CTAM-830 Multivariate Analysis Registration #0240-830

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

Credit 3 (offered in Fall and Spring Quarters)

### CTAM-831 Multivariate Analysis II Registration #0240-831

A continuation of CTAM-830, this course covers the use of advanced multivariate techniques. Topics include Principal Component analysis, cluster analysis, multi-dimensional contingency tables, discrete discriminant analysis, multi-dimensional scaling, and regression with errors in the independent variables. Practical applications will be emphasized. (CTAM-830)

Credit 3 (offered in Summer only)

### CTAM-841 Regression Analysis I Registration #0240-841

A methods course dealing with the general relationship problem.

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

Credit 3 (offered in Winter Quarter)



**CTAM-842****Regression Analysis II****Registration #0240-842**

A continuation of CTAM-841.

Topics: selection of best linear models; regression applied to analysis of variance problems; nonlinear estimation and model building. (CTAM-841 or equivalent.)

Credit 3 (offered in Spring Quarter)

**CTAM-851****Nonparametric Statistics****Registration #0240-851**

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

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

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

**CTAM-853****Managerial Decision Making****Registration #0240-853**

Continuation of CTAM-751, statistical decision analysis for management.

Topics: utilities; how to make the best decision (but not necessarily the right one); normal and best Bayesian theory; many action problems; optimal sample size; decision diagrams. Applications to marketing; oil drilling, portfolio selection; quality control; production; and research programs. (CTAM-751 or equivalent.)

Credit 3 (offered in Winter Quarter)

**CTAM-861,862****Reliability Certification****Registration #0240-861, -862****Seminars I & II**

The American Society for Quality Control (ASQC) offers Certification as a Reliability Engineer by written examination. These two-quarter courses prepare students for this examination. Purpose is to increase reliability expertise. Offered are lectures, handouts, workshops, and practice examinations.

Topics: reliability management, prediction, estimation, analysis, apportionment, test and demonstration, math models growth; maintainability, parts selection, design review, human factors; and other selected reliability activities. (Consent of the department.)

Credit 3/Qtr. (offered in Fall and Winter Quarters)

**CTAM-871****Sampling Theory and Application****Registration #0240-871**

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. (CTAM-712 or equivalent.)

Credit 3 (offered in Winter and Summer Quarters)

**CTAM-881****Bayesian Statistics****Registration #0240-881**

Probability as a degree of belief; how we learn; the applications of Bayesian principles to: estimation of failure rates, revising odds, testing precise hypotheses, finding credible regions, tests of significance and goodness of fit from Bayesian point of view; handling several variables; straightline analysis. A potpourri of applications; reliability, acceptance sampling, decision-making etc. (CTAM-712 or equivalent.)

Credit 3 (offered in Fall Quarter)

**CTAM-886****Sample Size Determination****Registration #0240-886**

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. (CTAM-712 or equivalent.)

Credit 3 (offered in Summer Quarter)

**CTAM-891, 892, 893 Special Topics in Applied Statistics****Registration #0240-891, -892, -893**

This course provides for the presentation of subject matter of important specialized value in the field of applied and mathematical statistics not offered as a regular part of the statistics program. (Consent of the department.)

Credit 3/Qtr. (offered upon sufficient demand; usually in Fall Quarter)

**CTAM-895****Statistics Seminar****Registration #0240-895**

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 at RIT (or other colleges) to provide special training in statistics for students who desire an independent study program in partial fulfillment of graduate degree requirements. (Consent of all departments involved.)

Credit 3 (offered each quarter)

**CTAM-896,897, 898****Thesis****Registration #0240-896, -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 (offered each quarter)

## Faculty

**Robert Clark**, BS, MIT; Ph.D., University of Maryland—Associate Professor, Dean

**Austin J. Bonis**, BS, College of the City of New York, Ph.D., George Washington University—Professor, Chairman, Statistics

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

**Ann Barker**, BA, Nazareth College; MS, Rochester Institute of Technology

**Tom B. Barker**, BS, MS, Rochester Institute of Technology

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

**David Farnsworth**, BS, Union College; M.A., Ph.D., University of Texas

**Robert Kringle**, BS, MS, University of Wisconsin

**Michael Lotti**, BA, MA, Western Michigan University

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

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

**Gregg McLaughlin**, BS, MS, Florida State University

**Mitchell Mergenthaler**, BS, State University College of New York at Cortland; MS, Pennsylvania State University

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

**Joseph D. Patton, Jr.**, BS, Pennsylvania State University; MBA, University of Rochester

**Albert D. Rickmers**, BS, Bloomsburg State College; M.Ed., St. Bonaventure University; MS, Rochester Institute of Technology—Professor

**Barbara Rose**, BA, Roberts Wesleyan; MA, SUNY, Geneseo

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

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



**Allan F. Toth**, BS, Widener College; MS, Rochester Institute of Technology

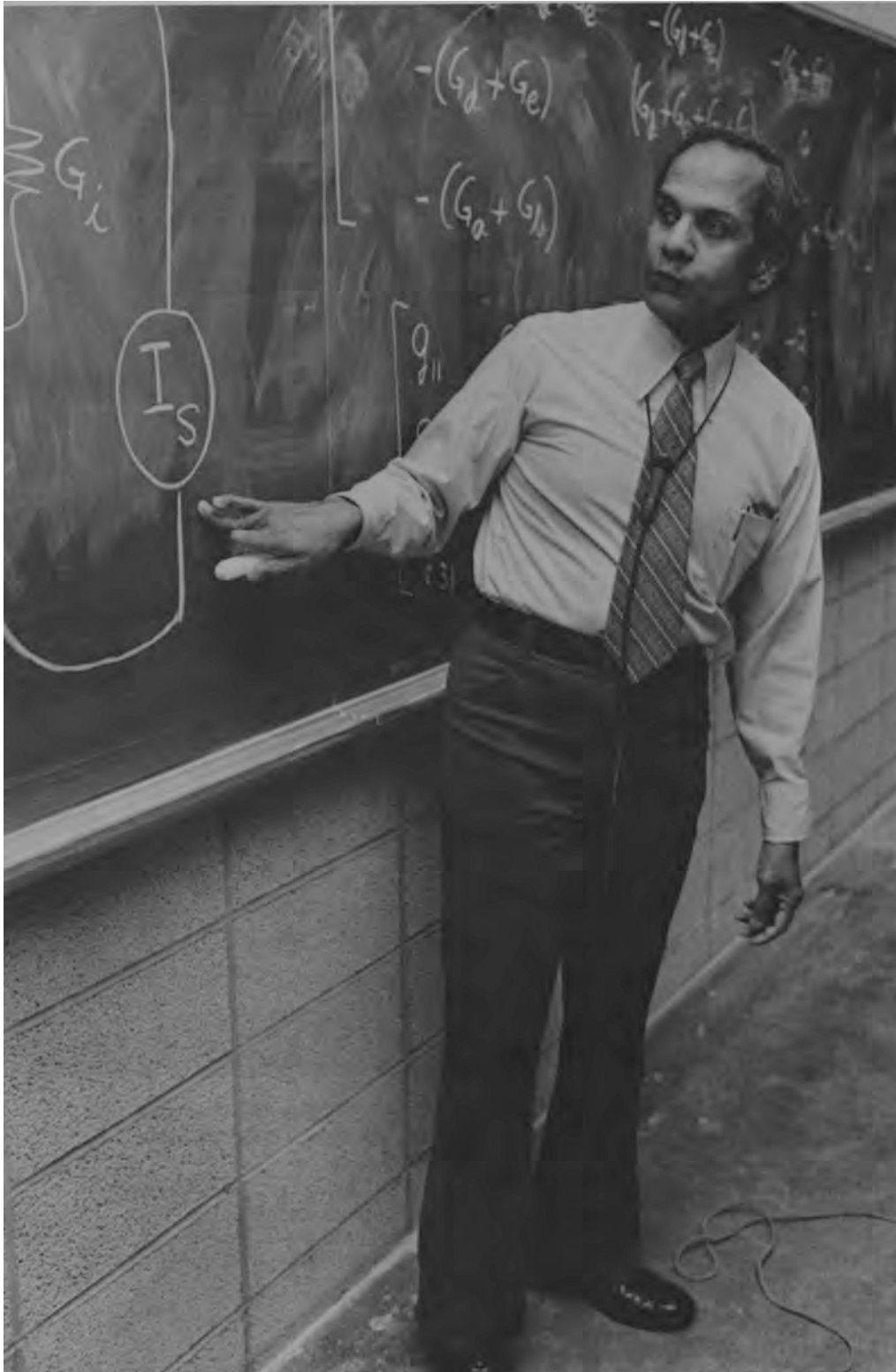
**Thomas Witt**, BS, Kansas State University; MS, Rochester Institute of Technology

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

**Raymond F. Woods**, BS, Canisius College; MA, Bowling Green State University

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

# College of Engineering



**Richard A. Kenyon**, Dean  
**Swaminathan Madhu**, Associate  
 Dean for Graduate Studies

## **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 or the master of engineering 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.

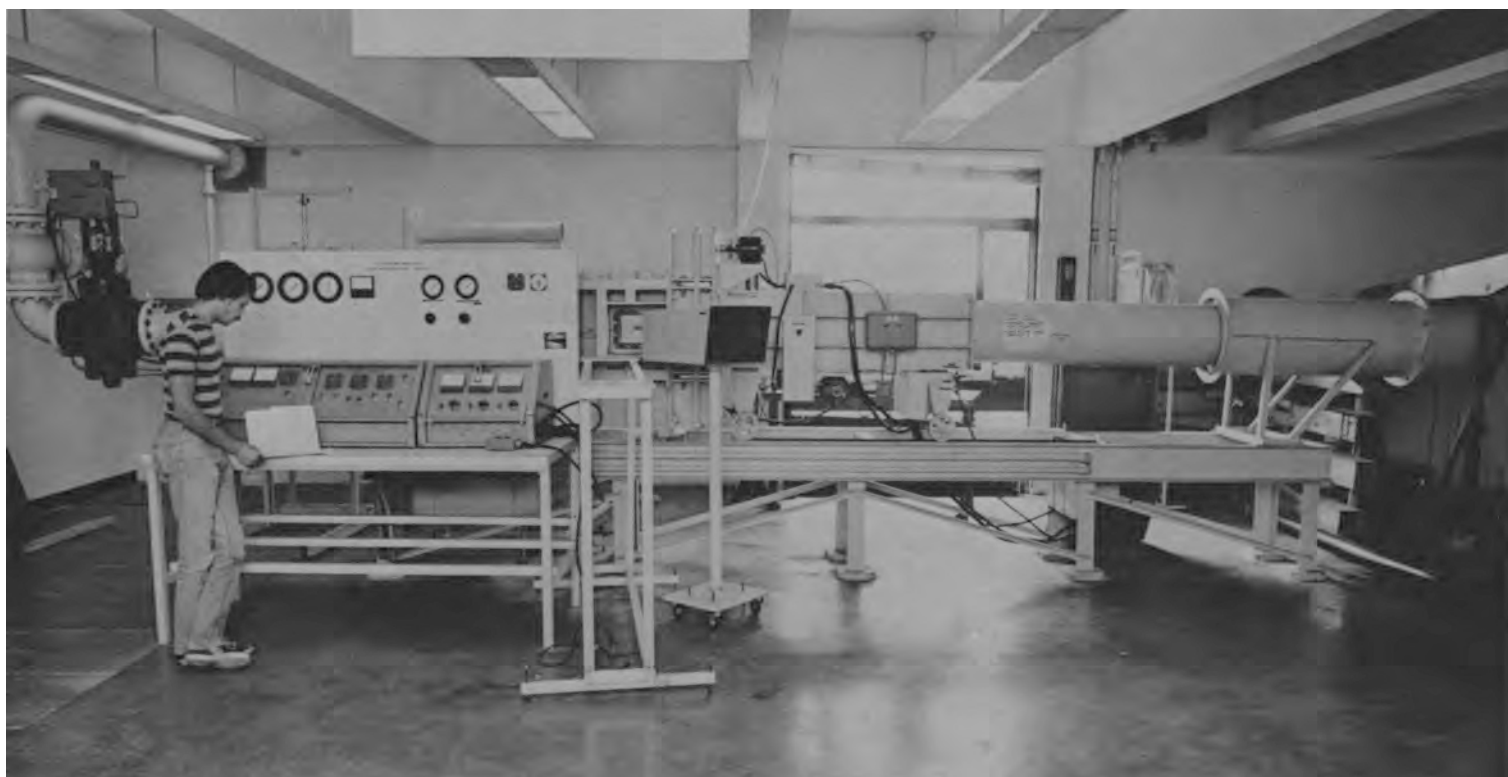
Students employed full-time in industry are limited to a maximum of two courses or eight credits each quarter. A student who wishes to register for more than eight credits while employed in full-time industry must obtain the permission of his or her advisor and the approval of the department head.

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 study at the graduate level must first be admitted to the graduate program.

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 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. 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.

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 on a non-matriculated status can usually be applied toward the master of science or master of engineering degree when the

student is admitted to the graduate program at a later date. However, the maximum number of credits which can be transferred to the degree program from courses taken as a non-matriculated student is normally 16 credits.

To be admitted as a non-matriculated student, the applicant must file an application/registration form each quarter. There is usually no need to submit supporting documents of the type required with the application for admission to a graduate program.

#### **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. If at any time after 12 quarter credit hours are taken a student's average falls below a "B," he or she will be placed on probation. 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.



*The solar panels and energy-efficient design of RIT's Energy House (right) are most effectively shown in an aerial view. Below, heat for the drying shed used by woodworking and furniture design students is wind-generated.*







## Master of Engineering degree program

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

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

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

and the director of graduate programs.

The program, although rooted in engineering, will be significantly interdisciplinary. By design, a student's program may range over several colleges of the Institute in assembling courses which will best help the student meet professional objectives. A maximum of 16 credits can be taken by the student in courses outside the traditional area of engineering and the sciences, subject to advisor approval.

### Admission requirements

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

### Degree requirements

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

### Faculty advisor

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

In cases where the student's background warrants it, a committee of two advisors will be assigned. The faculty advisor will assist the student in preparing a meaningful plan of study. The advisor will also monitor and evaluate the student's

internship experience (in cooperation with the student's industrial supervisor) and recommend to the Graduate Committee of the College of Engineering the number of academic credits to be awarded for the internship experience.

**Master of Science Degree in Materials Science and Engineering**  
A new degree program leading to the master of science degree in materials science and engineering will be offered jointly by the colleges of Engineering and Science. A detailed description of this program is contained in the College of Science section of this bulletin.

### For information

General questions on graduate engineering programs call 475-2167 (Dr. Madhu)

Specific questions on the individual department programs:

Electrical Engineering 475-2167

(Dr. Madhu)

Industrial Engineering 475-2147

(Dr. Reeve)

Mechanical Engineering 475-2163

(Dr. Karlekar)

Questions on course schedules and registration:

Electrical Engineering 475-2164

Industrial Engineering 475-2598

Mechanical Engineering 475-2163

## Electrical Engineering Department

Harvey E. Rhody, Department Head

Master of Science degree program

### Thesis

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

The inclusion of a thesis as a formal part of the master of science degree program in electrical engineering is optional. Students who decide to write a thesis can earn a minimum of six credits and a maximum of 12 credits toward their degree from the thesis.

### Non-thesis options

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

#### Option 1

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

#### Option 2

A student may choose to write a "graduate paper" in lieu of a thesis. The graduate paper is an extensive term paper on a topic of professional interest. The objective of the graduate paper is to enable the student to undertake an independent and in-depth literature search, and write a report summarizing the findings. A faculty member interested in the topic of the paper will serve as the student's supervisor and direct the scope and depth of the paper as well as the format of the final written version. The paper will normally be used to

earn a minimum of four and a maximum of eight academic credits. The student must first consult a faculty member about a suitable topic for the paper and obtain consent. The course numbers EEEE-800-801 Graduate Paper are 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.

### Core courses

The two courses EEEE-700, 701 Linear Systems I, II are required of all students entering the graduate programs in electrical engineering in fall, 1977 or later. The requirement will be waived only in cases where the student can clearly establish that he or she already has an adequate background in linear system theory.

With the exception of the above two courses, students choose courses in consultation with their advisors and according to their professional objectives. Students should, however, make sure that they have the proper prerequisite background (as stated in this Bulletin) for any course they plan to take.

It should be emphasized that, besides the two courses in linear systems mentioned above, the courses EEEE-702 Introduction to Random Variables and Signals and EEEE-713 Modern Control Theory are prerequisites for a number of courses in the department. The student should arrange to take these courses as early in the program as possible.

### Elective courses

A maximum of 12 quarter credit hours can be chosen from graduate or advanced undergraduate courses offered by any department of the Institute with prior approval of the faculty advisor. The remaining credit hours must be earned from graduate courses in electrical engineering.

### Course calendar

Most of the graduate courses in electrical engineering are scheduled on the basis of a two-year cycle as shown in the course calendar below. The calendar does not, however, apply to courses offered off campus at several industrial locations. Courses which are found in the course descriptions but not included in the following calendar, are offered when there is sufficient student interest, or on an independent study basis.

Fall 1981 and every odd-numbered year  
EEEE-700 Linear Systems I  
EEEE-718 Stochastic Estimation and Control  
EEEE-736 Information Theory  
EEEE-743 Microcomputer Fundamentals  
EEEE-750 Logic Design of Digital Systems I

Winter 1982 and every even-numbered year  
EEEE-701 Linear Systems II  
EEEE-702 Introduction to Random Variables and Signals  
EEEE-719 Digital Control Systems  
EEEE-744 Advanced Microcomputer Systems Design  
EEEE-751 Logic Design of Digital Systems II

Spring 1982 and every even-numbered year  
EEEE-708 Passive and Active Filter Design  
EEEE-721 Thyristor Power Control and Conversion  
EEEE-737 Random Signals and Noise  
EEEE-752 Logic Design of Digital Systems III

Fall 1982 and every even-numbered year  
EEEE-700 Linear Systems I  
EEEE-711 IC Operational Amplifiers  
EEEE-712 Control Systems Fundamentals  
EEEE-720 Optimum Control Systems  
EEEE-743 Microcomputer Fundamentals

Winter 1983 and every odd-numbered year  
EEEE-701 Linear Systems II  
EEEE-722 Control Systems Design  
EEEE-734 Communications Techniques  
EEEE-738 Physics of Semiconductor Devices  
EEEE-744 Advanced Microcomputer Systems Design

Spring 1983 and every odd-numbered year  
EEEE-713 Modern Control Theory  
EEEE-716 Digital Signal Processing  
EEEE-735 Digital Data Transmission  
EEEE-739 Integrated Circuits Design

## Industrial Engineering Department

Richard Reeve, Department Head

Graduate courses are offered by the Industrial Engineering Department primarily for candidates of the master of engineering degree whose professional interests fall within industrial engineering and/or engineering management. Close cooperation with the School of Business Administration insures the master of engineering (engineering management, industrial engineering) candidate a wide selection of courses and a unique opportunity to build a program tailored to his or her professional interests and goals. There is no master of science degree in industrial engineering at the present time.

## Mechanical Engineering Department

Bhalchandra V. Karlekar,  
Department Head  
Master of Science degree program

The master of science degree in mechanical engineering is awarded upon successful completion of an approved graduate program consisting of a minimum 45 quarter credit hours. A minimum of 33 credits are to be earned in course work, while the thesis as independent work carries a minimum of four credits and a maximum of 12 credits.

### Independent Work

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

Each student completing an independent work will be required to make a successful oral presentation of the work. The comprehensive examination when elected by a student, will be in his major field and it will be taken near the end of the formal program of study, but in any case no earlier than the completion of at least 30 graduate credits.

### Core courses

All graduate students in the Mechanical Engineering Department are expected to have a mathematics background equivalent to Analysis for Engineers, EMEM-692. Students not meeting this prerequisite will be expected to take EMEM-692 as soon as possible after enrolling.

All graduate students are required to complete the following:

Course Number and Title Credits	
EMEM-871 Mathematics for Engineers	4
EMEM-872 Mechanics	4
EMEM-873 Heat Transfer	4
EMEM-874 Numerical Methods 4	
EMEM-875 Instrumentation and Experimental Analysis	4
EMEM-876 Engineering Materials	4

In those 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.

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

### Elective Courses

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

Course Number and Title Credits	
EMEM-812 Theory of Plates and Shells	4
EMEM-815 Experimental Stress Analysis.	4
EMEM-816 Finite Elements	4
EMEM-821 Vibration Theory and Applications	4
EMEM-833 Heat Exchanger Design	4
EMEM-845 Turbomachines	4

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 (for example, Advanced Strength of Materials, Turbomachinery, Nuclear Power, and Stress Analysis). However, a maximum of two such courses are 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, theory of elasticity, energy methods in mechanics, analytical mechanics, lubrication, convective and radiative heat transfer, thermodynamics, fluid mechanics, wind and solar energy, and control systems.

All graduate student programs must be submitted to and approved by the Departmental Graduate Committee.

### Course descriptions

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

### Assistantships and fellowships

Some assistantships and fellowships are available for full-time students. Appointment as a teaching assistant carries a 12-hour per week commitment to a teaching function, and permits a student to take graduate work at the rate of 12 credits per quarter. Appointment as a research assistant also permits taking 12 credits per quarter while the remaining time is devoted to the research effort which serves as a thesis subject. Fellowships generally permit taking courses at the rate of 16 credits per quarter. All appointments provide full tuition and may provide stipends up to \$3,200 per academic year. Applicants for financial aid should write directly to the department head for details.

### Course calendar

The core courses are offered every quarter so that, in a given academic year, a student can fulfill the core requirements. The elective courses are generally given at least every other year. For further information on current course offerings, the student should contact the office of the Mechanical Engineering Department (716-475-2163).

## Engineering Courses

## Electrical Engineering

The courses listed below are normally open only to students who have been formally admitted into the graduate electrical engineering programs. Students with a baccalaureate degree in engineering or science may be permitted to enroll in any of these courses as non-matriculated students if they have already completed the stated prerequisites for a particular course. Undergraduate students may be permitted to take some of these courses as undergraduate technical electives provided they are fourth or fifth year students and have already completed the prerequisites. The permission of the director of Graduate Programs is required for enrolling in these courses except in the case of matriculated graduate students.

Whenever a prerequisite is stated in the form of a specific course number, the words "or equivalent" are always implied. Prerequisites if any, are shown in parentheses following the description of the course.

EEEE-700, 701    Linear Systems I, II  
Registration #0301-700, -701

These two courses are required of all graduate students in Electrical Engineering (Except those who were admitted before September 1977). Topics in the first course (700) include differential equations, linear algebra, linearity and superposition, convolution, Fourier series and Fourier Transforms. Topics in the second course include LaPlace Transforms, complex variables, Inverse LaPlace transformation, transfer functions of networks, state variables, Z transform and difference equations. Many of above topics might be familiar to the graduate student because they are covered in undergraduate EE courses in some form or other. However, these topics will be covered in these two courses in greater depth and the student will be expected to develop a higher level of understanding.

Credits 4/Quarter (EEEE-700 offered every fall)  
(EEEE-701 offered every winter)

EEEE-702 Introduction to Random Variables and Signals  
 Registration #0301 -702

Random events, random variables, histograms, probability density functions; functions of a random variable, moments; multivariate topics; statistical decision theory; parameter estimation. This course is a prerequisite for the sequence 735.736.737.

Credit 4 (Winter 82 and every other winter)

EEEE-704 Electromagnetic Fields  
Registration #0301-704

Vector analysis; electrostatic fields in vacuum and in dielectrics; energy and forces; analytical methods of solution of electrostatic problems; approximate methods; magnetic field of steady currents; magnetic materials; electromagnetic induction; Maxwell's equations. (EEEE-471, 472)

Credit 4 (Offered upon sufficient demand\*)

EEEE-705 Electromagnetic Waves  
Registration #0301-705

Maxwell's equations; propagation of plane waves in unbounded regions; reflection and refraction of waves; total reflection, polarizing angle, multiple dielectric boundaries, guided electromagnetic waves; characteristics of common waveguides; circular waveguides; resonant cavities; radiation and antennas. (EEEE-471, 472)

Credit 4 (Offered upon sufficient demand.)\*

EEEE-706                      Special Topics in Electromagnetics  
Registration #0301-706

Selection of one or more of the following topics depending upon the interest of the students: interaction of fields and matter; wave propagation in anisotropic media; theory of antenna arrays; microwave networks; field computation by method of moments; generation of microwaves. (EEEE-704, 705)

Credit 4 (Offered upon sufficient demand.)\*

EEEE-708      Passive and Active Filter Design

Registration #0301-708

Network analysis (review); classical frequency domain filters and passive filter design; filter transformations; low pass to high pass and bandpass; active filter design using single Op amps and RC networks; filter design using multiple Op amps for two-pole and two-zero sections; realization of n-pole filters using two-pole sections; sensitivity analysis; tuning of filters; effect of non-ideal Op amp characteristics on filter performance; design examples and demonstrations. (EEEE-700, 701)

Credit 4 (Spring 82 and every other spring)

EEEE-709 Active Network Synthesis

Registration #0301 -70g

Fundamentals of network synthesis; energy functions, P.R. functions; properties of network functions; synthesis of RC one-port and two-port networks; approximation, normalization and frequency scaling; active network analysis; active network elements; tunnel diodes, gyrators, impedance converter, impedance inverter; realizability, stability and sensitivity of active networks; synthesis of one-port and two-port active networks using negative resistances; synthesis of one-port and two-port active networks using controlled sources. (EEEE-700, 701)

Credit 4 (offered upon sufficient demand)

## EEEE-711 Integrated Circuit Operational Amplifiers

Registration #0301-711

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, 700, 701)

Credit 4 (Fall 82 and every other fall)

## EEEE-712 Control System Fundamentals

Registration #0301-712

This course is intended for graduate students who have not had a formal course in control systems in their undergraduate program. It is not open to those who have already had an introductory control systems course.

It is a study of linear control systems, their physical behavior, dynamical analysis and stability using mathematical models. This involves the use of root locus, Bode, and Nyquist techniques for the analysis of single and multiple-loop systems. (Elementary knowledge of LaPlace transforms)

Credit 4 (Fall 82 and every other fall)

## EEEE-713 Modern Control Theory

Registration #0301-713

The development of the analytical techniques of modern theory as applied to linear control systems. Topics include vector spaces, state space, state variables, matrices and matrix functions, controllability, observability and stability theory. (EEEE-613 or EEEE-700 and either 613, or 712)

Credit 4 (Spring 83 and every other spring)

## EEEE-714 Nonlinear Control Systems

Registration #0301-714

An introduction to the physical nature and mathematical theory of nonlinear control systems' behavior using phase plane techniques, Liapunov theory, (including Aizerman's method, variable gradient methods and the Lure Forms), perturbation methods, describing function techniques and Popov's criterion; analysis of switching and relays. These are applied to both piecewise-linear and analytical nonlinear systems. (EEEE-713)

Credit 4 (offered upon sufficient demand)

EEEE-716 Digital Signal Processing  
Registration #0301-716  
A course in sampled data methods aimed at the development and study of discrete signal processing techniques. Elementary sampling theory and the one-sided Z transform are the principal tools used. Emphasis is placed on the design of digital filters and the use of fast Fourier transform methods. (EEEE-700, 701)  
Credit 4 (Spring 83 and every other spring)

EEEE-718 Stochastic Estimation and Control  
Registration #0301-718  
Review of random process theory; stochastic control and optimization; estimation and filtering techniques such as Wiener filtering and Kalman filtering; stochastic stability; applications. (EEEE-713 or equivalent)  
Credit 4 (Fall 81 and every other fall)

EEEE-719 Digital Control Systems  
Registration #0301-719  
An introduction to the analysis and design of systems in which the mini/micro digital computer plays a central role. Topics include: mathematics of discrete-time systems, control algorithms, analytical design of discrete systems, computer word length requirements, engineering characteristics of computer control systems. (EEEE-701, 702, 713)  
Credit 4 (Winter 82 and every other winter)

EEEE-720 Optimum Control Systems  
Registration #0301-720  
Introduction to calculus of variations: conditions of optimality; optimizing transient performance by statistical and variational procedures, dynamic programming and by Pontryagin's maximum principle; design of optimal linear systems with quadratic criteria. (EEEE-713)  
Credit 4 (Fall 82 and every other fall)

EEEE-721 Thyristor Power Control and Conversion  
Registration #0301-721  
Thyristor family of semiconductors is becoming increasingly important in the area of power control and conversion. The objective of this course is to provide an adequate, application-oriented knowledge to those interested in the areas of control, power and power electronics. Topics to be discussed: preliminaries; basic principles of static switching, thyristor theory, triggering, commutations; rectifiers; principles of controlled rectification, analysis of single- and three-phase controlled rectifiers; inverters; series and parallel SCR inverters, design of inverters, sinewave filters, forced commutated inverter, McMurray inverter; DC systems; principles of DC-DC conversion, choppers, DC motor control, single-phase DC motor drives, three-phase DC motor drives, dual converter; cyclo-converter; frequency conversion using SCR's phase-controlled cycloconverters, cycloconverter controls.  
Modeling and simulation of thyristor circuits; thyristor models, approximations, digital simulation of choppers, inverters and cyclo-converters, areas for further research.  
Demonstration experiments will be set up. Also, individual projects by interested students will be encouraged.  
Credit 4 (Spring 82 and every other spring)

EEEE-722 Control System Design  
Registration #0301-722  
Evaluation of feedback control system performance; design using root locus and frequency response plots; compensating networks; realization of transfer functions—cascade and feedback compensation; applications; analysis and design of AC feedback control systems; introduction to nonlinear system representation and design. (EEEE-613 or EEEE-712)  
Credit 4 (Winter 83 and every other winter)

EEEE-734 Communication Techniques  
Registration #0301-734  
Study of different modulation schemes; linear modulation; angle modulation; Heuristic discussion of noise in linear modulation and FM systems; noise figure; brief discussion of pulse modulation. (EEEE-700)  
Credit 4 (Winter 83 and every other winter)

EEEE-735 Digital Data Transmission  
Registration #0301-735  
Pulse code modulation and pulse amplitude modulation: carrier systems, FSK and PSK systems, DCPSK system; signal space representation of data signals and discussion of signal space. (EEEE-702, 734)  
Credit 4 (Spring 83 and every other spring)

EEEE-736 Information Theory  
Registration #0301-736  
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-702)  
Credit 4 (Fall 81 and every other fall)

EEEE-737 Random Signals and Noise  
Registration #0301-737  
Random processes; correlation functions; spectrum of periodic functions and periodic random processes; orthogonal series for a random process; spectral densities; the Gaussian random process; noise through a linear system; physical sources of noise; noise figure; statistical decision theory. (EEEE-700, 702)  
Credit 4 (Spring 82 and every other spring)

EEEE-738 Physics of Semiconductor Devices  
Registration #0301-738  
A basic course dealing with the physics of semiconductor devices. Topics include: physics of semiconductor materials, metal-semiconductor contacts, PN junctions, bipolar transistors, MOS structures, and IGFET transistors.  
Credit 4 (Winter 83 and every other winter)

EEEE-739 Integrated Circuit Design  
Registration #0301-739  
An introductory course in integrated circuit design and fabrication. 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, bipolar transistors, MOS transistors, assembly techniques, and in-process measurement and testing.  
Credit 4 (Spring 83 and every other spring)

EEEE-742 Computer Methods in Electrical Engineering  
Registration #0301-742  
A study of numerical methods for the solution of problems in electrical engineering with special emphasis on approximation techniques. The method of moments and computer solutions of problems in antennas and microwave networks are studied. (SMAM-611)  
Credit 4 (offered upon sufficient demand)

NOTE: The microcomputer course sequence has been reorganized effective Fall 1980, as reflected in the new titles for 743 and 744. The material covered in the new two-course sequence 743, 744 includes the material originally covered in the old two-course sequence, as well as some additional topics which were not taught before. Students who had taken the old 743,744 sequence will not be permitted to take the new 743. They may be permitted, however, to take the new 744.

EEEE-743 Microcomputer Fundamentals  
Registration #0301-743  
This course provides an understanding of the operation and use of microcomputers. It begins with discussions of computer architecture and computer number systems. It then analyzes the major components of a computer including the CPU, memory and I/O structures. Computer instruction sets and addressing modes as well as machine language programming are studied in detail. The software and hardware aspects of input/output operations are considered including discussions of some special purpose I/O chips. The course concludes with an introduction to subroutines and stack operations. Most of the discussion is based on Motorola 6800 and Intel 8085 microprocessors. *Laboratory exercises are an integral part of the course.*  
Credit 4 (offered every fall)

#### EEEE-744 Advanced Microcomputer 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. Concepts relating to the use of multiprocessor systems will also be discussed. Laboratory sessions will be used to provide experience in the use of software development systems, in-circuit emulators, and logic analyzers in developing and testing a microcomputer system design. (EEEE-743)

Credit 4 (offered every winter)

#### EEEE-750 Logic Design of Digital Systems I Registration #0301-750

This is the first in a sequence of three courses dealing with the logical design of digital systems. The student is assumed to be already familiar with the fundamental concepts of logic, logic gates, logic networks, truth tables, as well as some knowledge of Karnaugh maps and their applications. The topics that will be covered in this course are as follows. *I. Boolean algebra and applications:* A formal development of Boolean algebra and its theorems. Emphasis will be placed on algebraic proofs of theorems and their applications to the manipulation and simplification of switching functions. Karnaugh maps will be reviewed and discussed in a formal manner. *II. Number Systems and Arithmetic:* Binary, octal, and hexadecimal number systems. Addition and subtraction in the different number systems. Adders, subtractors, and high speed addition of numbers. Subtraction using 1's complement and 2's complement representation of negative numbers. Arithmetic units. *III. Asynchronous Sequential Circuits:* Flip flops and their application to sequential circuits. Fundamental mode asynchronous sequential circuits will be studied in detail covering their analysis, design, equivalence of states and state minimization, races and the elimination of critical races. Pulse mode sequential circuits.

Credit 4 (offered Fall 81 and every other fall)

#### EEEE-751 Logic Design of Digital Systems II Registration #0301-751

The objective of this course is to study the switching characteristics of transistors (BJT, JFET, MOSFET) and to teach the students how to analyze digital electronic circuits. Topics include: transistor in the saturation, active, and cutoff modes - normal and inverse modes; JFETs and MOSFETs as switches. Logic families: RTL, I<sup>2</sup>L, DTL, T<sub>TL</sub>, ECL, CMOS, NMOS, PMOS. Analog switches. (EEEE-441, 442 or equivalent background in electronic circuit analysis.)

Credit 4 (offered Winter 82 and every other winter)

NOTE: The course EEEE-740 Digital Integrated Circuits is no longer offered. However, much of the material from that course has been included in 751.

#### EEEE-752 Logic Design of Digital Systems III Registration #0301-752

This course will discuss a selected list of topics which follow those covered in 750 and 751. The exact list of topics and the outline of the course is in the process of being developed and will be available by Fall 1981.

Credit 4 (offered Spring 82 and every other spring)

#### EEEE-760 Practical R & D Management Registration #0301-760

The course is intended to help engineers currently in industrial R&D or engineering and students interested in R&D management careers, understand the concepts and practical aspects of project and organizational management and planning in R&D environment. Topics to be discussed will include: objectives of industrial R&D, types of R&D organizations, selection of new products for development, long and short range planning, methods of project scheduling and control, communication within R&D and with other organizations, task assignment, problem solving in R&D, financial controls and budget preparation, proposal and report writing. The participants will be expected to carry out planning, organization and control of a simulated R&D project.

Credit 4 (offered upon sufficient demand)

EEEE-772, 773, 774 Special Topics in  
Registration #0301-772, -773, -774 Electrical Engineering  
Topics and subject areas that are not among the courses listed above are frequently offered under the title of Special Topics. Such courses are offered in the normal course format (regularly scheduled class sessions taught by an instructor). The number of credits may vary from course to course, but usually it is 4 credits per course. (No regular schedule)

Credit variable (maximum 4 per course number)

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

This course number should be used by students wishing to study a topic on an independent study basis. The student must obtain the permission of the faculty member prior to registration.

Credit 4

#### EEEE-800, 801 Graduate Paper Registration #0301-800, -801

This course number is used to fulfill the graduate paper requirement under the non-thesis option for the master of science degree in electrical engineering. The graduate paper is an extensive term paper on a topic of professional interest. The student must obtain the consent of a faculty member to supervise the paper before registering for these course numbers.

Credit 4 for EEEE-800; variable (maximum 4) for EEEE-801

#### EEEE-890 Research and Thesis Guidance Registration #0301-890

An independent engineering project or research problem to demonstrate professional maturity, preferably involving the reduction of theory to practice. An oral examination and a written thesis are required.

Credit variable (maximum of 12 credits total)

#### EENG-790 Engineering Internship Registration #0302-790

This course number is used by the students in the master of engineering degree program for earning internship credits. The actual number of credits to be determined by the student's faculty advisor and subject to approval of the Graduate Committee of the College of Engineering.

Credit variable.

## Industrial Engineering

The following courses are recommended as part of the master of engineering program in industrial engineering and engineering management. They are offered on an annual basis:

#### EIEI-620 Engineering Economy Registration #0303-620

Time value of money, methods of comparing alternatives, depreciation and depletion, income tax consideration, replacement, retirement and obsolescence, and capital budgeting.

Credit 4



EIEI-715,716 Statistical Analysis for Engineers I & II  
Registration #0303-715, -716  
A basic two-quarter course in probability and statistics designed to give the student a foundation for further study in areas such as design of experiments, stochastic systems, and simulation.

Credit 4

The following courses can be used as part of the master of engineering program in industrial engineering and engineering management. The courses are generally offered in alternating years and/or as demand dictates:

EIEI-601 Value Analysis  
Registration #0303-601

This course examines the nature and measurement of value. The concept and construction of a value index representing average value is related. Numerical estimation methods such as ranking, pair comparison, magnitude estimation, and criteria analysis are explained and used to measure the value of diverse items. The methods used are applicable to the study of a wide variety of problems and have special utility in engineering design studies.

Credit 4

EIEI-701 Principles of Operations Research I  
Registration #0303-701

Applied linear programming. Computational techniques for solving constrained optimization problems. Linear programming, the Simplex method and variations, duality and sensitivity testing.

Credit 4

EIEI-702 Mathematical Programming  
Registration #0303-702

Application of non-linear programming techniques. Classical optimization techniques; quadratic, stochastic, integer programming and dynamic programming. Applications to industry. (EIEI-701)

Credit 4

EIEI-705 Survey of Operations Research  
Registration #0303-705

A survey course designed to introduce the student to such topics as waiting line analysis, inventory, scheduling, replacement, and simulation. This course is intended to present an integrated view of the field of operations research to students who will take more specialized courses as well as those in other disciplines desiring only a limited exposure to the field.

Credit 4

EIEI-710 Systems Simulation  
Registration #0303-710

Methods of modeling and simulation 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 #0303-703

Basic functional anatomy and physiology. Human body systems. Anthropometry. Applications on the design for man and man-machine systems. Work physiology. Industrial biomechanics.

Credit 4

EIEI-731 Biotechnology and Human Factors II  
Registration #0303-731

Effect of mechanical and physical environment on: physiology, behavior, performance of man. Design considerations to protect man against environmental effects (thermal environment, noise, vibration, acceleration, light, altitude).

Credit 4

EIEI-732 Biotechnology and Human Factors III  
Registration #0303-732

Theoretical fundamentals of human body mechanics. Development and applications of biomechanics and biomechanical models. Kinematics of the link system of the body and extremity joints.

Credit 4

EIEI-733 Biotechnology and Human Factors IV  
Registration #0303-733

Measurements of human performance. Functions that man performs in man-machine systems. Techniques to quantify man's behavior at work.

Credit 4

EIEI-734 Systems Safety Engineering  
Registration #0303-734

Accident study of the human component in occupational systems. Product systems safety analysis. Approaches in accident prevention.

Credit 4

Special courses related to a particular student's interest can be arranged via the following course:

EIEI-771, 772, 773, 774 Special Topics in Industrial Engineering  
Registration #0303-771, -772, -773, -774  
This is a variable credit, variable topics course which can be in the form of regular courses or independent study under faculty supervision.

Credit variable (maximum 4 per course number)

## Mechanical Engineering

The courses EMEM-871, EMEM-872, EMEM-873, EMEM-874, EMEM-875, and EMEM-876 are offered every year. The other courses will be offered every other year (except those listed as "offered on sufficient demand").

**EMEM-692\*** Analysis for Engineers  
Registration #0304-692  
Partial differentiation, chain rule, and total differential; multiple integration and manipulation of multiple integrals; linear constant coefficient ordinary differential equations; vector algebra and differentiation of vectors or complex variables.  
Credit 4

**EMEM-693\*** Thermo Fluid System Analysis  
Registration #0304-693\*  
Thermodynamic properties and processes, ideal and real gas, vapors and gases; laws of thermodynamics and selected power cycles; fluid statics; control volume and conservation of mass, momentum and energy; Bernoulli's equation, viscosity, loss of heat due to friction (flow through pipes), concept of boundary layer; basic law of conduction; convection; radiation.  
Credit 4

**EMEM-699\*** Applied Mechanics System Analysis  
Registration #0304-699\*  
Methods currently employed in component and system analysis of the static and dynamic behavior of rigid and elastic bodies. The topics will include a review and advanced studies of vector statics and dynamics of rigid and elastic bodies and systems.  
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, elliptical and triangular plates. Membrane theory of shells, cylindrical shells, pressure vessels, shells of revolution. (EMEM-685 or equivalent)  
Credit 4

**EMEM-815** Experimental Stress Analysis  
Registration #0304-815  
Experimental methods of analysis of structural machine members, including strain gages and instrumentation, photo-elastic methods, brittle coating, Moire fringe method, holographic techniques; and the hydrodynamic, electrical, and membrane analogs. Laboratory tests of models. (EMEM-694 or equivalent)  
Credit 4

**EMEM-816** Finite Elements  
Registration #0304-816  
Development of theory from variational principles. Two-dimensional applications to elastic continua, considering plane stress, plane strain, and axisymmetric loading examples. Problem-solving sessions using RIT computer. Applications in structural mechanics, considering beam elements, plate elements, and shell elements. Utilization of these elements in solving specific structural problems. Introduction to three-dimensional stress analysis. Features of large general-purpose computer programs. (EMEM-694 or equivalent)  
Credit 4

**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. Computer situations.  
Credit 4

**EMEM-828,829** Special Topics in Applied Mechanics  
Registration #0304-828, -829  
An opportunity for the advanced student to undertake an independent investigation in the area of applied mechanics. Assistance will be given only when the student requests it. The project may be a comprehensive literature investigation, theoretical study, or an investigation involving laboratory experiment.  
Credit variable (maximum of 4 credits/quarter)

**EMEM-833** Heat Exchanger Design  
Registration #0304-833  
The course covers analytical models for forced convection through tubes and over surfaces, experimental correlations for the Nusselt number and pressure drop; design of single and multiple pass shell and tube heat exchangers; compact, baffled, direct contact, plate, and fluidized bed heat exchangers; radiators, recuperators, and regenerators. (EMEM-514)  
Credit 4

**EMEM-845** Turbomachinery  
Registration #0304-845  
One-dimensional analysis of centrifugal pumps, water turbines, and axial flow turbines and compressors. Emphasis on blending the application of physical principles, dimensional analysis, and empirical data to design turbomachines. (EMEM-516)  
Credit 4

**EMEM-848,849** Special Topics in Thermo Fluid Systems  
Registration #0304-848, -849  
An opportunity for the advanced student to undertake an independent investigation in the area of thermo fluid systems. Assistance will be given only when the student requests it. The project may be a comprehensive literature investigation, a theoretical study, or an investigation involving laboratory experiment.  
Credit variable (maximum of 4 credits/quarter)

**EMEM-858, 859** Special Topics in Systems Analysis  
Registration #0304-858, -859  
An opportunity for the advanced student to undertake an independent investigation in the area of systems analysis. Assistance will be given only when the student requests it. The project may be a comprehensive literature investigation, a theoretical study, or an investigation involving laboratory experiment.  
Credit variable (maximum of 4 credits/quarter)

**EMEM-862** Solid Wastes Engineering  
Registration #0304-862  
A study of the collection, processing, disposal and reuse of solid wastes of municipal, industrial, and agricultural origin. A discussion of the basic design parameters of landfilling, burning, and processing solid wastes. A presentation of considerations of importance to the development of workable regional and municipal management systems.  
Credit 4

**EMEM-871** Mathematics for Engineers  
Registration #0304-871  
Vector calculus including directional derivative, gradient, divergence, and curl of a vector, Gauss, Green and Stokes theorems; solutions to ordinary differential equations using the method of Frobenius, and Laplace transforms, and an introduction to complex numbers. (SMAM-308, EMEM-692, or equivalent)  
Credit 4

**EMEM-872** Mechanics  
Registration #0304-872  
Advanced dynamics and vibrations are emphasized. Newtonian vector mechanics and energy formulations are applied to two- and three-dimensional problems of single and multi-degree of freedom. The concepts of Virtual Work, Hamilton's Principle, and Lagrange's equations are covered. The vibration of discrete multi-mass systems includes the formulation and eigenvalue solutions by computer, and the method of finite elements are included. The vibration of continuous systems and discrete modeling is introduced. (SMAM-308 or EMEM-692 and EMEM-543)  
Credit 4

EMEM-873 Heat Transfer  
 Registration #0304-873  
 Formulation of the heat conduction equation, solution of the one-dimensional, unsteady heat conduction equation by separation of variables: Sturm-Liouville system, orthogonal functions, generalized Fourier series, Bessel functions. Solution of the two-dimensional, steady heat conduction equation; Cartesian and cylindrical geometry. (SMAM-308, EMEM-514)

Credit 4

EMEM-874 Numerical Methods  
 Registration #0304-874  
 The course emphasizes the use of digital computers for obtaining solutions to practical engineering problems through numerical techniques. Algebraic and transcendental equations, systems of linear algebraic equations using matrix manipulations and iterative methods, numerical integration and differentiation, ordinary differential equations including initial value and boundary value problems, partial differential equations including elliptic, parabolic, and hyperbolic with stability analysis. Extensive use of the computer will be required. (Graduate standing and experience in the use of digital computers.)

Credit 4

EMEM-875 Instrumentation and Experimental Analysis  
 Registration #0304-875  
 Various displacement, strain, velocity, acceleration, pressure transducers will be discussed along with the associated electronic equipment and recorders to measure and record the variables. A laboratory session will be substituted in place of class when experiments are assigned. The static and dynamic characteristics of the instruments will be obtained as these instruments are mathematically modeled and subjected to impulse, step and ramp frequency functions of time. (Graduate standing)

Credit 4

EMEM-876 Engineering Materials  
 Registration #0304-876  
 Review of physical metallurgy, effects of alloying elements in steel, corrosion, fatigue, fracture, high and low temperature behavior, plastics, welding (EMEM-344)

Credit 4

EMEM-890 Research and Thesis Guidance  
 Registration #0304-890  
 In conference with a thesis advisor, a topic is decided on, and either a theoretical or laboratory type research program is carried out. Periodic progress reports and final written thesis with oral examination.

Credit variable (maximum 12 credits total)

Courses will be offered in the following areas if there is sufficient demand.

Introduction to Continuum Mechanics  
 Theory of Elasticity  
 Energy Methods in Mechanics  
 Advanced Finite Elements  
 Analytical Mechanics  
 Advanced Vibration Theory  
 Lubrication  
 Advanced Heat Transfer  
 Thermodynamics  
 Statistical Thermodynamics  
 Fluid Dynamics  
 Gas Dynamics  
 Automatic Control Systems  
 Optimal Control Systems Design  
 Thermal Stresses  
 Solid Waste Management



## Graduate Faculty College of Engineering

Richard A. Kenyon, Ph.D., P.E.,  
Syracuse—Dean, Professor,  
Mechanical Engineering

Swaminathan Madhu, Ph.D.,  
University of Washington—Associate  
Dean, Graduate Studies; Professor,  
Electrical Engineering

Wendy L. Baker, Ph.D., Michigan  
State University—Assistant Dean  
Electrical Engineering Department

Harvey E. Rhody, Ph.D., Syracuse—  
Professor, Communication Theory,  
Department Head

Frank J. Bogacki, MS, Pennsylvania  
—Assistant Professor, Solid State  
Devices

George Brown, MSEE, University of  
Rochester—Associate Professor,  
Systems and Control

Roy S. Czernikowski, Ph.D.,  
Rensselaer Polytechnic Institute—  
Associate Professor, Computer  
Engineering

Mohamed K. El-Sherbiny, Ph.D.,  
Iowa—Visiting Associate Professor,  
Power Systems

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

Kenneth Hsu, Ph.D., Marquette—  
Assistant Professor,  
Microcomputers and Control  
Systems

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

Robert E. Lee, Ph.D., University of  
Rochester—Associate Professor,  
Systems and Control

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

A.V. Mathew, Ph.D., Queens  
University (Ontario)—Visiting  
Professor, Control Systems

James E. Palmer, Ph.D., Case  
Institute of Technology—Professor,  
Digital Systems

Sadasiva S. Rao, Ph.D., Mississippi—  
Visiting Assistant Professor,  
Electromagnetic Theory

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

Tapan K. Sarkar, Ph.D., Syracuse—  
Associate Professor, E.M. Fields,  
Antenna Theory

A. Chandra Sekar, Ph.D., Indian Inst.  
of Tech—Visiting Associate  
Professor, Power Systems

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

Raman M. Unnikirshnan, Ph.D.,  
Missouri—Associate Professor,  
Power Electronics, Control Systems

Watson F. Walker, Ph.D., Syracuse—  
Professor, Communication Theory  
Adjunct Faculty in Electrical  
Engineering

Alex Martens, MS, Rochester—Vice  
President, Bausch and Lomb, R&D  
Management

William Nelson, M.S., Rensselaer  
Polytechnic Institute, Xerox  
Corporation, Control Systems

Douglas Sargent, Ph.D., NTID,  
Digital Signal Processing and  
Microcomputers

Jack Taylor, Ph.D., University of  
Wisconsin, Stromberg Carlson, Solid  
State

Douglas Wiggins, M.S., RIT, Xerox  
Corporation, Microcomputers  
Industrial Engineering Department

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

Gary D. Christie, MS, Virginia  
Polytechnic Institute and State  
University—Assistant Professor,  
Simulation, Information Systems,  
Operations Research

Sudhakar R. Paidy, Ph.D., Kansas  
State University—Assistant  
Professor, Statistics, Reliability, and  
Operations Research

Jasper E. Shealy, Ph.D., SUNY at  
Buffalo—Associate Professor,  
Human Factors

Ralph H. Stearns, P.E., MBA, New  
York University—Lecturer, Work  
Measurement, Engineering  
Management

Kai Sung, Ph.D., Case Western  
Reserve—Distinguished Visiting  
Professor, Systems Engineering

Mechanical Engineering  
Department

Bhalchandra V. Karlekar, Ph.D., P.E.,  
University of Illinois—Professor and  
Department Head, Heat Transfer,  
Applied Mathematics, Energy

William Bober, Ph.D., P.E., Purdue—  
Associate Professor, Fluid  
Mechanics, Heat Transfer, Applied  
Mathematics

Richard G. Budynas, Ph.D., P.E.,  
Massachusetts—Associate  
Professor, Applied Mechanics

Robert M. Desmond, Ph.D., P.E.,  
University of Minnesota—Professor,  
Heat Transfer

Robert A. Ellson, Ph.D., P.E.,  
University of Rochester—Associate  
Professor, Energy Conversion,  
Fluid Mechanics

Amitabha Ghosh, Ph.D., Mississippi  
State University—Visiting Assistant

Charles W. Haines, Ph.D.,  
Rensselaer Polytechnic Institute—  
Associate Professor, Applied  
Mathematics

William F. Halbleib, Ph.D., P.E.,  
Cornell—Professor, Stress Analysis,  
Vibrations

Richard B. Hetnarski, Dr. Tech. Sci.,  
P.E., Polish Academy of Sciences—  
Professor, Thermoelasticity

Ray C. Johnson, M.S., University of  
Rochester—James E. Gleason  
Professor, Optimal Design

Satish G. Kandlikar, Ph.D., Indian  
Institute of Technology—Assistant  
Professor, Thermal Systems and  
Energy

Richard Kenyon, Ph.D., P.E.,  
Syracuse—Professor,  
Thermodynamics and Fluid  
Mechanics

Hyun W. Kim, Ph.D., University of  
Toledo—Visiting Assistant Professor,  
Fluid Mechanics, Mathematics

Chris Nilsen, Ph.D., P.E., Michigan  
State—Associate Professor,  
Metallurgy and Materials Science

Alan H. Nye, Ph.D., University of  
Rochester—Assistant Professor,  
Fluid Mechanics

Frank Sciremammano, Jr., Ph.D.,  
University of Rochester—Assistant  
Professor, Geophysical Fluid  
Dynamics and Environmental  
Control

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

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

Paul Wojciechowski, Ph.D.,  
University of Rochester—Associate  
Professor, Systems Analysis,  
Environmental Studies, Energy

# College of Fine & Applied Arts



Robert H. Johnston, Dean  
Peter Giopulos, Associate Dean  
(475-2634)

Master of Fine Arts  
Master of Science for Teachers

The College of Fine and Applied Arts, in its School for American Craftsmen, and in the environmental design, communication design, medical illustration\*, painting and printmaking 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 or crafts 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, painting, sculpture, printmaking, 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.

## Graduate degrees

The College of Fine and Applied Arts offers two graduate degrees. The master of science for teachers may be taken in nine studio areas and in art education. The art education concentration leads toward permanent art N-12 certification to teach in the public schools of the State of New York and involves pedagogical studies and student teaching. The master of science for teachers may also be pursued in the studio areas of communication design, environmental design,

\*Only MFA in Medical Illustration.



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 three 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 the MST programs are constituted to reflect the goals of Rochester Institute of Technology.

They are designed to graduate artists, designers, craftsmen and teachers who can meet the needs of the environmental condition through 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 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 or education from a regionally accredited college in the United States or Canada and demonstrate, in the quality of the undergraduate record and creative production, a genuine, professional potential (See also non-matriculated students.) The undergraduate degree should include 75 quarter credit hours (50 semester hours) in studio courses.

#### Acceptance for graduate study

Students are admitted to graduate study by action of the Graduate Committee. Enrollment in graduate courses does not constitute admission to the graduate program,

and credit is not given for courses taken prior to acceptance unless the grade received in the course is a "B" or higher; in such a case the student, if admitted to graduate study, may petition for a grant of credit, but not in excess of 12 quarter credit hours.

A student may be admitted who needs additional undergraduate study requirements. This study will be structured for breadth or increased performance in areas designated and will be determined at the time of acceptance.

Such prerequisites must be satisfied as defined in the letter of acceptance which students will receive prior to admission as a graduate student. Extended study may require additional time on campus.

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.

#### 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 upper level undergraduate courses, as advised by the Graduate Committee, 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. A foreign student will receive individual evaluation and be considered for admission at the highest level commensurate with his or her preparation.

#### Admission procedure

To apply for admission to graduate study a student must submit evidence of his or her baccalaureate degree, a portfolio or other evidence of creative work, a statement of purpose, and references.

The portfolio is to consist of 20 to 24 slides in plastic folders or photographs (no larger than 8x10). No original work is to be sent unless it is specifically requested by the Graduate Committee. Return postage must be included. All correspondence concerning applications, catalogs and portfolios should be addressed to Director of Admission, 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 credits (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.

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 85 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 three 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: communication design, environmental design, painting, printmaking, ceramics, metals, textiles, wood or glass. Three 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 almost any program at the Institute."

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 13 years, and has been named associate dean of that college and coordinator of graduate programs.

## The Programs

The Master of Fine Arts program includes five 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 ten areas: ceramics and ceramic sculpture, metalcrafts and jewelry, woodworking and furniture design, weaving and textile design, glass, environmental design, communication design, fine art (painting), fine art (printmaking), medical illustration.
  2. Minor Concentration\* 15  
From the above, to consist of studio and related electives, or internship, other than major.
  3. Electives 18
  4. Humanities, art history 10
  5. Thesis 12
- Total 85 cr.

The 15 credits of minor for Medical Illustration are required in Instructional Technology: ICIT-715, Instructional TV; ICIT-700, Introduction to Instructional Technology; ICIT-703, Training Health Professionals; ICIT-762, Management Budgeting; ICIT-757, Techniques of Work Analysis; ICIT-719, Programmed Instruction. See College of Applied Science and Technology for course descriptions.

Another minor concentration can be arranged for those interested in teaching at a two-year college. The three required courses concern: 1) the student; 2) the institution; and 3) methods, along with 11 weeks of teaching in an area community college.

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: 20 cr.

Developmental Psychology, History of American Educational Thought and Practice, Educational Psychology, Educational Sociology, Art Education Concentration: 22

Methods and Materials in Art Education, Seminar in Art Education, Practice Teaching Studio elective: 6

Total 48 cr.

### MST STUDIO

2. Master of science for teachers in *studio art* (for those holding the BS degree in art education or industrial arts education, who desire permanent certificates, or for the BA or BFA student wishing advanced study).

The degree offers a major concentration of studies designed to meet the needs of individual students, and may include appropriate or relevant courses from other schools and departments of the Institute.

The following general pattern of studies covers requirements for the degree.

### 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, educational, 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.

The degree offers a concentration consisting of background courses in Education: 20cr.

Developmental Psychology, History of American Educational Thought and Practice, Educational Psychology, Educational Sociology

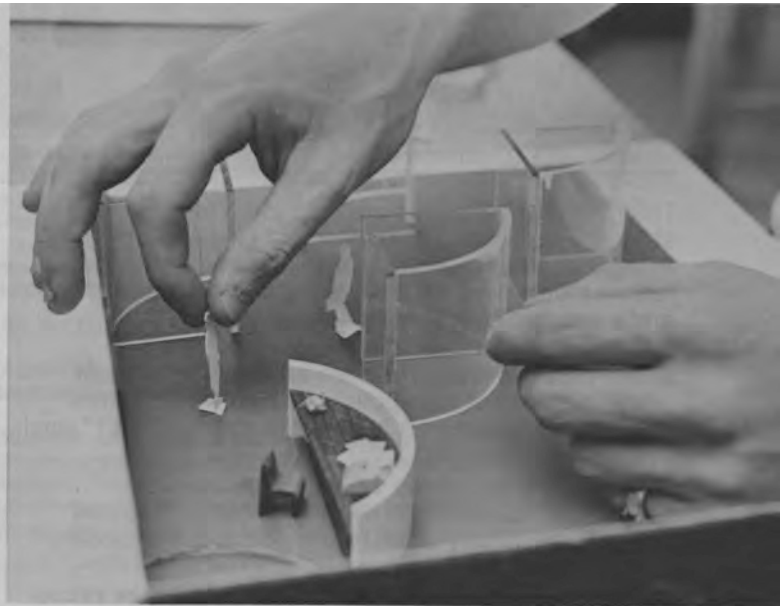
Art Education Concentration: 22  
Methods and Materials in Art Education, Seminar in Art Education, Practice Teaching Studio elective: 6

Total 48cr.

	MFA	MST STUDIO	MST ART EDUCATION
Major	30 credits	24 credits	22 credits
Minor	15	14	
Humanities	10	10	20 Social Sciences
Electives	18		6
Thesis	12		
	85 credits	*48 credits	**48 credits

\*One year or three summers

*\*In certain cases the minor concentration or courses may be taken elsewhere in the Institute (photography, printing, business, 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.*



## 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.
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  
Rochester, New York 14623  
Telephone: (716) 475-6631

*Environmental 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 Giopoulos, associate dean, College of Fine and Applied Arts (716) 475-2634.*

## Fine and Applied Arts Courses

### School of Art and Design

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

#### Art Education

FADA-701,702 (MST) Methods and Materials  
Registration #0401 -701, -702 in Art Education  
(Major)

Intensive study of curriculum in terms of teaching materials for both studio and appreciation aspects of elementary, early secondary and high school art education. Includes studio and elementary school teaching experience.

Class 2, Lab. 9, Credit 5 (offered every year-fall, winter)

FADA-820 (MST) Seminar in Art Education  
Registration #0401 -820 (Major)  
Evaluation and study of the practice teaching experience. Discussion of the professional role of the art teacher in terms of professional associations, supervision, teacher training, and research. A final project on some intensively studied aspect of art education is required.

Lab. 25, Credit 3 (offered every year-spring)

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)

#### Communication Design

FADC-750 (elective, minor) Communication Design  
Registration #0402-750  
Advanced creative problem solving experiences in communication design imagery. Professional problems in graphic design and related visual techniques for communication media such as print, television, film, computer and business practices. Media Center facility available for extension of studio problems.

Lab. 6, Credit 3 (offered every quarter)

FADC-780 Communication Design  
Registration #0402-780 (Major)  
Advanced creative problem-solving experiences relating to visual communications 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, repeat up to 30 cr.)

#### Environmental Design

FADD-750 (elective, minor) Design Applications  
Registration #0403-750  
Various problems will emerge from the study of products and interiors. The reasoned application of theoretical three-dimensional design world will be probed by considering the importance of the decision making role of the designer in an industrialized world.

Lab. 6, Credit 3 (offered every quarter)

FADD-780 Design Applications  
Registration #0403-780 (Major)  
The reasoned application of theoretical three-dimensional design, to responsible practical solutions that are valid in our complex and dynamic world environment by considering the importance of the decision making role of the individual designer in a mass industrialized society. Studio involvement is directed toward the solution of individual, group and assigned product, industrial to interior problems. The individualized solutions lead toward a master's thesis.

Lab 9-27, Credit 3-9 (offered every quarter, repeat up to 30 cr.)

#### Painting

FADP-750 (elective, minor) Painting  
Registration #0405-750  
The pursuit and comprehension of the pertinent, the ecstatic and the beautiful, by a small group of those who intend to both paint and teach the young to understand and appreciate painting.

Lab. 6, Credit 3 (offered every quarter)

FADP-780 Painting  
Registration #0405-780 (Major)  
The pursuit of the pertinent, the ecstatic, the beautiful, by a small group of those dedicated to the art. The student will become familiar with the trends and questings of modern painting, and by strengthening both his intellectual and technical facilities, be prepared for a career as a professional painter. The work leads toward the master's thesis.

Lab. 9-27, Credit 3-9 (offered every quarter, repeat up to 30 cr.)

## Printmaking

FADR-750 (elective, minor) Printmaking  
Registration #0406-750

Advanced techniques in etching, lithography and woodcutting, as well as in many experimental areas including color processes, photo-etching, photo-lithography, vacuum-forming 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, repeat up to 30 cr.)

FADS-750 Sculpture  
Registration #0407-750

Sculptural concepts are approached through a variety of processes and materials. The studio work is executed in paper, wood, fabrics, metal, stone, clay and plastics.

Lab. 6, Credit 3 (offered each year)

## Medical Illustration

FADM-781 Medical Illustration Topics  
Registration #0408-781 (MFA Major)

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

Lab. 6, Credit 3 (offered each year)

FADM-782 Medical Illustration Graphics  
Registration #0408-782 (MFA Major)

A course emphasizing the use of titles, animation, charts and graphs, schematics, and illustrative procedures as vehicles for meeting instructional and communicative needs. Students will learn the various techniques available and will apply those techniques to needs presented, culminating in a personal project dealing with "real world" contingencies.

Lab. 6, Credit 3 (offered each year)

FADM-783 Medical Illustration Surgical I  
Registration #0408-783 (MFA Major)

Students will apply their knowledge of anatomy to illustrating operative procedures. Emphasis will be placed on techniques for surgical illustration and situations wherein those techniques are appropriate. Students will learn to simplify and highlight complex procedures. Finally, they will select illustrative techniques best suited for reproduction in medical journals, texts, motion pictures and television.

Lab. 6, Credit 3 (offered each year)

FADM-784 Medical Illustration Surgical II  
Registration #0408-784 (MFA Major)

A continuation of Surgical Illustration I, wherein students: work and communicate closely with the surgeon. Interpret medical terminology and recognize relevant issues and problems affecting the illustration. Develop an analysis of theoretical concepts when planning, executing, and evaluating surgical illustrations for the doctor and the publisher.

Lab. 6, Credit 3 (offered each year)

PPHB-781 Medical Illustration Advanced Photography  
Registration #0g01-781 (MFA Major)

This is photography for the medical illustration major. It involves the study of sophisticated and creative applications of scientific photography used by contemporary medical illustrators: students review basic photographic techniques, including film selection, exposure determination and copying. They explore a variety of specialized photographic techniques such as surgical photography, ophthalmic photography and photomicrography. Assignments are performed in the laboratory and studio as well as in hospital environments, including the surgical suite and the morgue. (Undergraduate photography courses in RIT medical illustration or equivalent)

Lab. 4, Lecture 2, Credit 3 (offered each year)

FADM-785 Medical Illustration Exhibits  
Registration #0408-785 and Design  
(MFA Major)

Students will learn to plan cost, analyze and construct three-dimensional illustrations for in-house presentation or for traveling displays. Practical experience will be given in the problems of collaborating with clients, selecting appropriate display techniques and modes, and developing a manageable display.

Lab. 6, Credit 3 (offered each year)

## Thesis

FAD (C, D, P, R or M)-890 Research and Thesis Guidance  
Registration #040 (2, 3, 5, 6 or 8)-8g0

The development of a thesis project instigated by the student and approved by a faculty committee and the Graduate Academic Council representative. Primarily creative production, the thesis must also include a written report.

Credit 12 (offered every quarter)

## School for American Craftsmen

### Ceramics and Ceramic Sculpture

FSCC-750 (elective, minoi) Ceramics and  
Registration #0409-750 Ceramic Sculpture  
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 and glazes 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  
Registration #0409-780 Ceramic Sculpture  
(Major)

A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. There will be a strengthening of ceramic techniques, design fundamentals and encouragement of personal ceramic expression. The student will be encouraged to evaluate new techniques, materials and concepts through clay into its uses in pottery, murals, lights, fountains, space dividers and other forms. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab. 9-27, (offered every quarter, repeat up to 30 cr.)

### Glass

FSCG-720 Monumental Stained Glass  
Registration #0411 -720

This elective teaches the basics to stained glass designing, cutting, soldering, leading, glazing, and other fabrication techniques.

Lab. 6, Credit 3 (offered each year)

FSCG-750 (elective, minor) Glass  
Registration #0411 -750

This will expand the appreciation of glass and add cold glass techniques to the student's understanding. Sandblasting, grinding, belt sanding, flexible shaft drawing, cutting and epoxy painting are techniques presented for student to apply toward design concepts.

Lab. 6, Credit 3 (offered every quarter)

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

The study and manipulation of hot glass, including refinement of traditional and innovation of new techniques will be undertaken: design, cold glass, sagging, slumping, casting, industrial and studio glass lines, copper wheel and stone engraving along with glass technology and history. The program is structured on individual needs, interests and background preparation as they may be determined through faculty counseling. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab. 9-27, Credit 3-9 (offered every quarter, repeat up to 30 cr.)

### Metalcrafts and Jewelry

FSCM-750 (elective, minor) Metalcrafts and Jewelry  
Registration #0412-750

This is the study and manipulation of metals for hollow ware/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 hollow ware 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, repeat up to 30 cr.)

### Weaving and Textile Design

FSCT-750 (elective, minoi) Weaving and Textile Design  
Registration #0413-750

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-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, fineweave, ikat, multiple layer, dyeing, non-loom, pile rug, printed surface, silkscreen, tapestry, and soft sculpture. Design concepts are complements to the techniques. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.

Lab. 9-27, Credit 3-9 (offered every quarter, repeat up to 30 cr.)

### Woodworking and Furniture Design

FSCW-750 (elective, minor) Woodworking and  
Registration #0414-750 Furniture Design

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. The MST student selects a chair, table or cabinet for design execution.

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, joinery 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, repeat up to 30 cr.)

### Thesis

FSC(C, G, M, T or W)-890 Research and Thesis Guidance  
Registration #04 (09,11,12,13 or 14)-890

Research and presentation of an acceptable thesis with a focus on technique, design, production, or a combination of these approved by the faculty. 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 presentation program.

Lab. 27, Credit 12 (offered every quarter)



## Graduate Faculty College of Fine and Applied Arts

Robert H. Johnston, Ph.D.,  
Pennsylvania State—Dean

Peter Giopulos, Ph.D., Pennsylvania  
State—Associate Dean

Philip W. Bornarth, MAE School of  
the Art Institute—Professor, Painting,  
School of Art and Design

Donald G. Bujnowski, MA, University  
of Minnesota—Professor, Weaving  
and Textile Design, School for  
American Craftsmen

Hans Christensen, Diploma,  
National College of Arts and Crafts,  
Copenhagen—Charlotte Fredericks  
Mowris Professor of Contemporary  
Crafts, School for American  
Craftsmen

David Dickinson, MFA, Rochester  
Institute of Technology—Assistant  
Professor, Printmaking, School of  
Art and Design

Gary S. Griffin, MFA, Tyler School of  
Art, Temple University—Associate  
Professor, Metalcrafts and Jewelry,  
School for American Craftsmen

Robert Heischman, U.C.F.A., Ruskin  
School of Drawing and Fine Art,  
Oxford University—Associate  
Professor, Painting, 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—Associate Professor,  
Weaving and Textile Design, School  
for American Craftsmen

Graham Marks, MFA, Alfred  
University, Assistant Professor,  
Ceramics, School for American  
Craftsmen

Craig McArt, MFA, Rochester  
Institute of Technology—Professor,  
Environmental Design, School of Art  
and Design

Frederick R. Meyer, MFA, Cranbrook  
Academy of Art—Professor, Painting,  
School of Art and Design

R. Roger Remington, MS, University  
of Wisconsin—Professor,  
Communication Design, School of  
Art and Design

Robert Schmitz, MFA, University of  
Wisconsin; MS, Alfred University—  
Associate Professor, Ceramics,  
School for American Craftsmen

Douglas Sigler, MFA, Rochester  
Institute of Technology—Associate  
Professor, Woodworking and  
Furniture Design, School for  
American Craftsmen

Toby Thompson, MFA, Rochester  
Institute of Technology—Professor,  
Environmental Design, School of Art  
and Design

James C. Ver Hague, Jr., MFA, State  
University of New York at Buffalo;  
MS, Rensselaer Polytechnic  
Institute—Associate Professor,  
Graphic Design, School of Art and  
Design

Lawrence Williams, MFA, Illinois  
State—Professor, Printmaking,  
School of Art and Design

Norman Williams, MS, Syracuse  
University—Associate Professor, Art  
Education, School of Art and Design



# College of General Studies



Mary Sullivan, Dean

The College of General Studies provides a number of graduate courses as part of some of the master's degree programs of Rochester Institute of Technology. A primary objective of the course offerings is to complement the professional emphasis of these programs by contributing humanistic perspectives; that is, by exploring the humanistic implications embodied in these programs. In this way General Studies courses play an integral role in professional education by making a direct and distinctive contribution to the student's preparation for a specialized career.

## Graduate Courses College of General Studies

### GLLL-701

Registration #0504-701

Film History and Criticism

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 5 (offered occasionally)

### GLLL-702

Registration #0504-702

Film and Society

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 5 (offered occasionally)

### GSHF-703

Registration #0505-703

American Architecture

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 the 20th centuries.

Class 3, Credit 5 (offered occasionally)

### GSHF-705

Registration #0505-705

Theories of Aesthetics  
and Art Criticism

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

Class 3, Credit 5 (offered occasionally)

### GSHF-707

Registration #0505-707

Cubism to the Present

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 5 (offered occasionally)

### GSHF-708

Registration #0505-708

Oriental Art

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

Class 3, Credit 5 (offered occasionally)

### GSHF-711

Registration #0505-711

20th Century American Art

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 5 (offered occasionally)

### GSHF-712

Registration #0505-712

Arts and Crafts in Tribal Societies

A study of the function of "primitive" art and the techniques of its production, including the use of clay, stone, fibers, bark, wood, bronze, gold, etc. Hair-styling, body painting and scarification will also be discussed.

Class 3, Credit 5 (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 5 (offered occasionally)

**GSHF-714** Art: Vision and Concept Class 3, Credit 5 (offered annually)  
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 5 (offered occasionally)

**GSHF-715** Picasso  
Registration #0505-715  
The impact of Picasso and his circle on twentieth century art. Their affinities with modern scientific and philosophical attitudes will also be discussed.  
Class 3, Credit 5 (offered occasionally)

**GSHF-716** Rembrandt  
Registration #0505-716  
A detailed analysis of the art and times of the Baroque master. Emphasis will be placed on the development of his style and technique, on his and other artists' relationship to their society, and on the character of the Baroque outlook.  
Class 3, Credit 5 (offered occasionally)

**GSHF-717** Music Literature  
Registration #0505-717  
A comparison of various musical styles from the 17th to the 20th century with emphasis on music's relationship to the other fine arts and its socio-cultural environments. Representative composers include Bach, Beethoven, Chopin and Stravinsky.  
Class 3, Credit 5 (offered on sufficient demand)

**GSHH-701** History of American Educational Thought and Practice  
Registration #0507-701  
This course traces the history of formal and informal education in America from the colonial era to the present. It examines the growth of progressive education, and the evolution of the open education movement of the 1960s and 1970s. The course evaluates the role of education among women and ethnic and religious minorities. Emphasis is given to such educative institutions as family, television, churches, factories, business corporations, public libraries and art galleries.  
Class 3, Credit 5 (offered annually)

**GSHP-705** Seminar in Aesthetics  
Registration #0509-705  
A range of questions will be addressed in the seminar. What is it to perceive something aesthetically? Are there any essential or defining properties shared by all works of art? Are our evaluations and interpretations of art works objective or subjective? Are an artist's intentions relevant factors in critical arguments? Understanding how answers to these questions are constrained by features of actual art works will be an important part of discussion.  
Class 3, Credit 5 (offered occasionally)

**GSSP-701** Developmental Psychology  
Registration #0514-701  
This course seeks to investigate the broad developmental patterns of human behavior with emphasis upon the cognitive and moral aspects of development, personality and culturally patterned behaviors. Consideration is given to major theoretical perspectives. It is strongly suggested that students have a background in introductory psychology before taking this course.  
Class 3, Credit 5 (offered annually)

**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 help students apply them to concrete situations that may arise for persons doing teaching. Students will find the material covered in Developmental Psychology (GSSP-701) useful for this course.

**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.  
Class 3, Credit 5 (offered annually)

## Graduate Faculty

Mary Sullivan, Ph.D., Notre Dame—  
Dean, Professor

Robert Golden, Ph.D., Rochester—  
Acting Associate Dean, Associate  
Professor

Dane Gordon, MA, Cambridge and  
Rochester—Associate Dean,  
Professor

Bruce Austin, MS, Illinois State—  
Assistant Professor,  
Communications

Douglas Coffey, MA, Case Western  
Reserve—Associate Professor, Fine  
Arts

Kathleen Chen, Ph.D., Pennsylvania  
State—Professor, Psychology

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

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

Linda Nagle, MA, Rutgers—Visiting  
Assistant Professor, Philosophy

Houghton Wetherald, MA, Oberlin—  
Professor, Fine Arts

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

# College of Graphic Arts And Photography

## Master of Science degree in Printing



Mark F. Guldin, Acting Dean

### Printing Technology or Printing Education

The curriculum leading to a master of science degree in the School of Printing is a professional program designed to provide graduate education in printing for students whose undergraduate majors were in the arts, sciences, education, or other non-printing areas, as well as for graduates with a major in printing.

The program is formulated to allow the individual student to specialize in a particular area and develop research skills. The goal of the program is to educate students who will have, in addition to a broad understanding of the procedures and theoretical concepts in printing processes, an appreciation of particular problems in special areas at an advanced level. This can normally be completed in six academic quarters.

### Special libraries

Special libraries housed in the college include the Technical and Education Center of the Graphic Arts Library, and the Melbert B. Cary, Jr. Graphic Arts Collection. The latter contains over 3,500 volumes including many rare books and other materials illustrating past and present fine printing, book design and illustration, papermaking, and other aspects of the graphic arts. The Frederick W. Goudy—Howard W. Coggeshall Memorial Workshop contains letters, papers, photos, memorabilia and cases of Goudy types which can be seen and used only at RIT, since matrices for their manufacture were destroyed by fire in 1939.

### The majors

The student may major in either printing technology or printing education. There is a program in the technology major for the student who has an undergraduate degree in printing as well as a program for the student who has an undergraduate degree in another area. These programs are normally followed by those whose career will be in the printing industry or as specialists in related fields.

The graduate programs in printing are designed on a two-fold basis: to provide extended competence for persons with an interest in entering an area of printing technology, and to offer an opportunity for furthering

and expanding the education of individuals who wish to teach printing.

The printing education major offers two options, related to certification. The printing education major emphasizing teacher preparation for the secondary school has separate programs for the student with an undergraduate degree in printing, in education, or in some different field. Upon successful completion of this printing education major program the student will qualify for permanent New York State certification as a teacher of graphic arts as a trade subject. Included in this program is one year's experience in actual printing which must be arranged by the student to meet state certification requirements. This program culminates in a master of science for teachers degree.

Students wishing to pursue the MST degree should note this in the appropriate place on the graduate application form.

The printing education major emphasizing teacher preparation for the two-year college has a program for students with varying undergraduate backgrounds. This culminates in the MS degree.

Those teachers within the secondary school system who already hold permanent certification will normally follow a program leading to the MS degree.

The printing education programs are designed to develop teachers with sufficient breadth in printing-technology education so that they will be equipped to encourage and assist students who are interested in printing as a career, whether at the high school or two-year college level. Such development is necessary to support the growth of the printing industry. It is desirable for students entering the education major programs to have taken basic courses in psychology and sociology at the undergraduate level.

A goal of the technology major is to graduate students with well-rounded backgrounds in both the theoretical and practical aspects of graphic arts technology. An additional goal is to provide graduates with the education to approach printing problems by an orientation to processes and materials based on systematic analysis.

Technology majors' preparation is for entry as a professional into the printing field in areas such as

production, administration, research and development, sales, etc. The printing field is extremely varied and requires an interdisciplinary approach. In this regard, students are encouraged to broaden their backgrounds in a variety of academic areas.

All students may elect certain graduate courses which will be beneficial in introducing them to particular areas of the graphic arts, updating their knowledge in the area, and helping them with their research problems. However, regardless of the major which the student chooses, there is a core of instructional areas vital to advanced instruction.

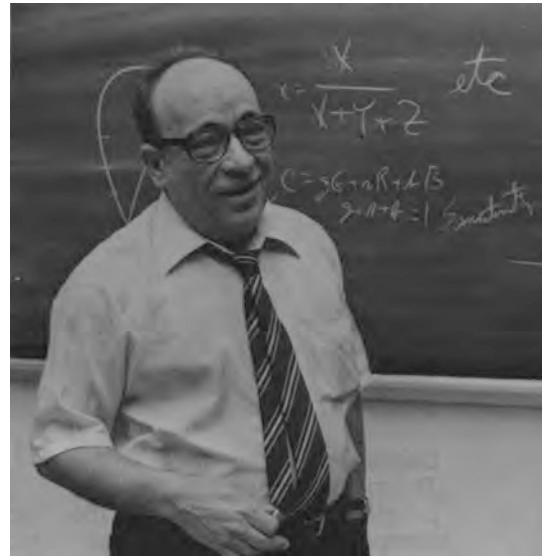
This "core" is to develop:

1. An increased awareness of an emerging theory of graphic reproduction and an appreciation of how this theory may be applied to graphic arts procedures in the future.
2. An understanding of the importance and value of statistical techniques as they apply to the graphic arts today.
3. An understanding of how computer technology can be applied to graphic arts management and reproduction at the present time and what potential the computer has in the future for reproduction, management, and educational applications.
4. An ability to carry through an acceptable research project on either an experimental or survey basis.

#### Admission

Prior to being admitted to the master of science degree program applicants must satisfy the Graduate Admissions Committee of the School of Printing that their previous training, ability, and practical experience indicate a reasonable chance of success. Applicants may be admitted who hold a baccalaureate degree from an accredited institution. The School of Printing encourages applicants with undergraduate records at the "B" (3.0) level or higher. All applicants are required to take the Graduate Record Examination. An on-campus interview is encouraged for all applicants.

Technology in the printing industry continues to evolve rapidly with incorporation of innovative materials and concepts from other disciplines. This evolution covers all aspects of graphic communication as well as non-communicative graphics such as circuit printing and textile



Julius L. Silver

decorating. The graduate program is designed to teach the student methods of remaining current after leaving RIT.

The graduate program is specifically arranged for each student so that completion prepares him or her 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. With few exceptions, the student must complete a thesis allowing the student to bring to bear acquired knowledge on a specific problem. Thesis work affords the student the opportunity to contribute to the existent knowledge of the printing technologies. This work is done under the guidance of faculty experienced in the area of printing which the student has chosen to focus upon.

The graduate program is planned with recognition of the value of aesthetics in the Graphic Arts and allows opportunity for the student to bring technology to bear on form and beauty. 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. However, the program remains a technical one with strongest attraction for the students primarily interested in technology.

Julius L. Silver, (475-2696)  
Graduate Program Coordinator  
School of Printing



### Degree requirements

The master of science degree program in printing requires the completion of 70 quarter credit hours of study including eight hours for the thesis. Normally this study would be completed in six quarters. Depending on the student's graphic arts experience, however, the total number of hours may be reduced. Programs are individually tailored for each student according to his or her needs, interests, and educational-industrial experience. A typical distribution of credits might be:

	Quarter Credit Hours
Core to the program	12
Core to the major	20
Electives	30
Thesis	8

### Printing graduate programs

Technology major: undergraduate degree in printing (MS)

Computers in the Graphic Arts-PPRM-301

Graphic Reproduction Theory-PPRT-702

Statistical Inference-PPRT-703

Application of Mechanics/  
Electronics-PPRT-705, 706, 707 or

Theory of Photographic  
Processes-PPHS-711, 712, 713  
and

one graduate elective

Introduction to Systems Analysis-PPRT-708

Research Methods in the Graphic Arts-PPRT-701

Design of Experiments-PPRT-704

Thesis-PPRT-890

Technology major: undergraduate degree other than printing (MS)

Prerequisite printing courses as needed

Computers in the Graphic Arts-PPRM-301

Graphic Reproduction Theory-PPRT-702

Statistical Inference-PPRT-703

History of Printing Technology-PPRT-709

Introduction to Paper-PPRT-410

Tone and Color Analysis-

PPRT-711

Research Methods in the Graphic Arts-PPRT-701

Thesis-PPRT-890

Graduate Printing Electives as needed

Education major: undergraduate degree in education (MS)

Prerequisite printing courses as needed

Introduction to Graphic Arts Education-PPRE-701

Computers in the Graphic Arts-PPRM-301

Graphic Reproduction Theory-PPRT-702

Statistical Inference-PPRT-703

Typographical Procedures-PPRE-713

Graduate Printing Electives as needed

Thesis-PPRT-890

or

two additional graduate electives

Education major: undergraduate degree other than printing or ' education (MST) Trade-Technical

Certification Program

Prerequisite printing courses as needed

Introduction to Graphic Arts Education-PPRE-701

Computers in the Graphic Arts-PPRM-301

Graphic Reproduction Theory-PPRT-702

Statistical Inference-PPRT-703

Educational Psychology-GSSP-702

History of American Educational Thought-GSHH-701

Educational Sociology-GSSS-701

Teaching Methods in the Graphic Arts-PPRE-702

Practice Teaching in the Graphic Arts-PPRE-860

History of Printing Technology-PPRT-709

Thesis-PPRT-890

Graduate printing electives as needed

Education major: undergraduate degree in printing (MST) Trade-Technical Certification Program  
Computers in the Graphic Arts-PPRM-301

Graphic Reproduction Theory-PPRT-702

Statistical Inference-PPRT-703

Introduction to Graphic Arts

Education-PPRE-701

Teaching Methods in Graphic Arts Education-PPRE-702

Practice Teaching in the Graphic Arts (secondary)-PPRE-860

History of Printing Technology-PPRT-709

History of American Education Thought and Practice-GSHH-701

Educational Psychology-GSSP-702

Educational Sociology-GSSS-701

Thesis-PPRT-890

Graduate printing electives as needed

Two-year college education major: undergraduate degree in printing (MS)

Computers in the Graphic Arts-PPRM-301

Graphic Reproduction Theory-PPRT-702

Statistical Inference-PPRT-703

Introduction to Graphic Arts Education-PPRE-701

The Two-Year College-IJCC-701

The Student in the Two-Year College-IJCC-702

Instructional Techniques-IJCC-704

Teaching Internship (Two-Year College)-IJCC-840

Thesis-PPRT-890

Graduate printing electives as needed

Two-year college education major: undergraduate degree other than printing (MS)

Prerequisite printing courses as needed

Computers in the Graphic Arts-PPRM-301

Graphic Reproduction Theory-PPRT-702

Statistical Inference-PPRT-703

Introduction to Graphic Arts Education-PPRE-701

The Two-Year College-IJCC-701

The Student in the Two-Year College-IJCC-702

Teaching Internship-IJCC-840

Instructional Techniques-IJCC-704

Thesis-PPRT-890

Graduate printing electives as needed

# Printing Courses

## Prerequisite Printing Courses

**PPRM-301** Application of Computers to the Graphic Arts  
Registration #0910-301  
A study of the applications of electronic computer systems to the graphic arts industry. Topics include fundamental data processing concepts, software development, and technical and managerial graphic arts applications.

Class 4, Credit 3

**PPRT-203** Layout and Printing Design  
Registration #0911-203  
Practical application of theory relating to typography and idea development in solving printing design problems. Introduction of basic artistic techniques for rendering. Application of requirements and principles of layout design as applied to commercial printing and advertising. Analyzing alphanumeric, pictorial, and related graphics and their interpretation into printing tasks and procedures.

Class 2, Lab. 3, Credit 3

**PPRT-204** Relief Press  
Registration #0911-204  
An introduction to the theory and practices used in printing from relief image plates. Letterpress operations are covered when applicable or related to flexographic printing. Emphasis is placed on the elements of flexography from art work through plates, inks and presswork. Printing is done on a wide variety of substrates. General study of trends and applications of the relief printing process is advanced.

Class 2, Lab. 3, Credit 3

**PPRT-205** Gravure Printing  
Registration #0911-205  
Introductory course designed to survey the gravure printing process and the study of related information regarding applications, techniques, equipment, materials and supplies. The course is conducted by means of lectures, class discussions, demonstrations and supervised laboratory exercises using a 4-color Champlain Web Press.

Class 2, Lab. 3, Credit 3

**PPRT-206** Reproduction Photography  
Registration #0911-206  
A basic course in the fundamental principles, procedures, techniques, and applications of the photographic process as it is related to the production of film negatives or film positives for the major printing processes.

Class 2, Lab. 3, Credit 3

**PPRT-207** Printing Plates  
Registration #0911-207  
An introductory course in the principles and practices of plate-making for letterpress, flexographic, planographic, and gravure printing processes. It covers a survey of major printing processes with emphasis on their plate characteristics and platemaking requirements; important physical as well as chemical principles that are applicable to the plate image-forming process; laboratory work that deals with plate processing variables; also an introduction to recent development in printing plate technology.

Class 2, Lab. 3, Credit 3

**PPRT-208** Lithographic Press  
Registration #0911-208  
An introductory study of the principles and methods of offset presswork; press functions; operations and care of presses; exercise in running simple jobs.

Class 2, Lab. 3, Credit 3

**PPRT-209** Screen Printing  
Registration #0911-209  
Theory and practice of screen printing covering areas such as preparation of positives, frames, fabrics, stretching of fabrics, stencil methods, fillers, squeegees, inks, presses, and dryers; a study of some of the economic aspects of screen printing and its place in the total concept of graphic arts.

Class 2, Lab. 3, Credit 3

**PPRT-302** Composition Systems  
Registration #0911-302  
Detailed study of photocomposition with emphasis on systems approach; introduction to use of computers in composing rooms, and operation of specialized equipment.

Class 2, Lab. 3, Credit 3

**PPRT-306** Tone Reproduction Photography  
Registration #0911-306  
The photographic processes as they relate to the measurement and reproduction of tones for the major printing processes. The emphasis will be on the scientific analysis of a complete system of halftone sensitometry and process control. (PPRT-206)

Class 2, Lab. 3, Credit 3

**PPRT-311** Imposition and Finishing  
Registration #0911-311  
Printing production planning to correlate pre-press and post-press operations. Topics include preparing layouts, forms and a study of how they are affected by various bindery operations. Laboratory experiments include the operation of modern bindery equipment, evaluation and application of adhesives, binding materials and book performance testing. Several projects are followed through from design, signature layout to a finished product, including a gold stamped, hardcover bound book.

Class 2, Lab. 3, Credit 3

**PPRT-313** Copy Preparation  
Registration #0911-313  
Preparation of copy for camera; working from layouts, making analysis of requirements; paste-up techniques, methods of pre-separation mechanicals, use of photographic and typographic copy, relation to production steps in follow-up for offset platemaking and photo-engraving; proper instructional specification writing. (PPRT-203)

Class 2, Lab. 6, Credit 4

**PPRT-315** Ink and Color  
Registration #0911-315  
Theory of light and color; basic theory of process color and correction; use of color comparator and spectrophotometer; the study of color systems and color matching systems; theory and application of various ink systems: practice in standard ink mixing and color matching emphasizing offset and letterpress processes; correlation of ink properties with applications: emphasis on relationship of ink to paper and press; study of ink problems and their correction.

Class 2, Lab 3, Credit 4

**PPRT-406** Color Separation Photography  
Registration #0911-406  
Color separation and color correction methods in the graphic arts industry; color theory, masking requirements, tone reproduction for color, color proofing systems, electronic scanners.

Class 2, Lab. 3, Credit 3

**PPRT-410** Introduction to Paper  
Registration #0911-410  
This course begins with a discussion of papermaking fibers, pulping procedures, papermaking machines, and proceeds to show how they affect paper properties and printing characteristics. Laboratory experiences include making paper from various raw materials, physical and optical testing of paper and paper identification.

Class 3, Lab. 2, Credit 3



## Graduate Courses Master of Science in Printing

### Printing Education

**PPRE-701** Introduction to Graphic Arts Education  
Registration #0908-701  
A prerequisite course for most students working in the printing education major. A study of historical trends along with the development and overview of philosophy and methodology, including a survey of current industrial education teaching problems.

Credit 4 (offered every other year)

**PPRE-702** Teaching Methods in Graphic Arts Education  
Registration #0908-702  
The study of the criteria necessary for selecting the methods, procedures, and materials relevant to planning and executing an effective lecture or demonstration lesson.

Credit 4 (offered every other year)

**PPRE-713** Typographical Procedures  
Registration #0908-713  
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.

Credit 4

**PPRE-860** Practice Teaching in the Graphic Arts  
Registration #0908-860  
A 10-week teaching experience in a school offering an appropriate exposure for the student teacher in the areas of student relationships and understanding, development of teaching methods and procedures, and a supervised involvement in the duties of the cooperating teacher.

Credit 12 (offered every other year)

### Printing Management

**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

### 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 5

**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 5

**PPRT-705,706,707** Application of Mechanics and Electronics  
Registration #0911-705, -706, -707 to Materials, Machine Design, and Processes in Printing  
Force systems, elementary dynamics, work, power, energy, stress and strain, axial loads, beams, torsion bars, and columns, particularly as applicable to printing equipment and processes. Design of machine elements; bearings, gears, shafts, fasteners, and frames. Application of basic circuits to electronic devices and systems.

Credit 4/Qtr.

**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-709** History of 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-799** Independent Study  
Registration #0911-799  
Student selects and develops, with approval from a faculty sponsor, an independent study project of his or her own design. Project and amount of credit assigned must have final approval from the director of the School of Printing.

Credit 1 to 5

**PPRT-850** Research Projects  
Registration #0911-850  
Individual research projects in which independent data is collected by the student, followed by analysis and evaluation. A comprehensive written report is required. Consent of advisor required.

Credit variable

**PPRT-890** Research and Thesis Guidance  
Registration #0911-890  
An experimental survey of a problem area in the graphic arts.

Credit variable

## Graduate Faculty School of Printing

Mark F. Guldin, Ph.D., University of Iowa—Director, Professor, School of Printing

Sven Ahrenkilde, MS, Polytechnic University, Denmark—Research Associate, Technical and Education Center of the Graphic Arts

William H. Birkett, MBA, University of Michigan, C.M.A.—Associate Professor, Printing Management

Joseph E. Brown, Jr., MS, Kansas State—Associate Professor, Paper Technology

Walter A. Campbell, M Ed, MBA, University of Rochester—Professor, Printing Management

Robert Y. Chung, MS, Rochester Institute of Technology—Instructor Printing Plate Technology

Chester J. Daniels, BS, MS, Rochester Institute of Technology—Senior Technologist, Technical and Education Center of the Graphic Arts

Robert G. Hacker, Ph.D., University of Iowa—Paul and Louise Miller Professor in Newspaper Management, Computer Applications

Joseph L. Noga, MS, Bridgeport—Associate Professor, Reproduction Photography

Irving Pobboravsky, MS, Rochester Institute of Technology—Senior Technologist, Technical and Education Center of the Graphic Arts

Harry Rab, MSME, Newark College of Engineering—Assistant Professor, Electro-Mechanics of Printing

Albert D. Rickmers, M Ed, St. Bonaventure; MS, Rochester Institute of Technology—Professor, Statistics

Julius L. Silver, Ph.D., Connecticut—Coordinator, MS Program, Professor, Ink Technology, Graphic Theory

Robert J. Webster, MS, Ball State—Associate Professor, Photo-Mechanical Reproduction Processes

Charles J. Weigand, MS, SUNY at Oswego—Associate Professor, Relief Press Technology

Hermann Zapf, Calligrapher and Type Designer—Adjunct Professor



### Associates of the Graduate Faculty

William H. Addy, BS, Rochester Institute of Technology—Instructor Reproduction Photography

Brent Archer, AAS, Rochester Institute of Technology—Research Associate, Technical and Education Center of the Graphic Arts

Bekir E. Arpag, BS, Rochester Institute of Technology—Associate Professor, Photo-Mechanical Reproduction Processes

Edward A. Brabant, BS, Rochester Institute of Technology—Professor, Gravure Technology

W. Frederick Craig, M Ed, University of Rochester—Associate Professor, Newspaper Production Management

Zenon A. Elyjiw, Senior Technologist—Technical and Education Center of the Graphic Arts

Clifton T. Frazier, M Ed, University of Rochester—Associate Professor, Photo-Lithography Technology

Charles A. Goodykoontz III, BS, Rochester Institute of Technology—Instructor, Computer Applications

Walter G. Horne, M Ed, University of Rochester—Professor, Printing Plate Technology

Alfred F. Horton, AAS, Rochester Institute of Technology—Associate Professor, Layout and Design

James I. Horton, M Ed, University of Rochester—Associate Professor, Layout and Design

Jack D. Jenkins, BS, Rochester Institute of Technology—Assistant Professor, Newspaper Production Management

Herbert J. Johnson, BS, Rochester Institute of Technology—Melbert B. Cary, Jr. Professor in Graphic Arts, Book Design

Richard N. McAllen, AAS, Rochester Institute of Technology—Director, Web Offset Laboratory, Technical and Education Center of the Graphic Arts

James V. Mannino, BS, Rochester Institute of Technology—Instructor Typography

Milton Pearson, BS, Rochester Institute of Technology—Senior Technologist, Technical and Education Center of the Graphic Arts

Archibald D. Provan, M Ed, University of Rochester—Associate Professor, Typography

Werner Rebsamen, Diploma, Academy of Fine Arts, Zurich—Associate Professor, Imposition and Finishing

Emery E. Schneider, M Ed, University of Rochester—Associate Professor, Phototypesetting

Anthony R. Sears, BS, Rochester Institute of Technology—Professor, Photo-Lithography Technology

Miles F. Southworth, M Ed, University of Rochester—Professor, Reproduction Photography

Robert S. Tompkins—Assistant Professor, Composition Specialist

James R. Walsh, M Ed, University of Rochester—Associate Professor, Printing Management



## Master of Science degree in Photographic Science and Instrumentation

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 photographic 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 photographic science and instrumentation. A thesis is required.

Faculty members within the division supervise research in areas of the chemistry and physics of radiation-sensitive materials and processes, photo-optical

instrumentation, and objective and subjective image evaluation. Thesis work may be done in the field of graphic arts in conjunction with the Technical and Educational Center of the Graphic Arts. Other interdisciplinary efforts are possible with the colleges of Engineering and Science. Opportunities also exist to perform thesis work under the direction of selected scientists and engineers in local industries who act as adjunct faculty.

The division offers three programs of study leading to the master of science degree in photographic science and instrumentation:

### 1. Bachelor of Science and Master of Science in Photographic Science and Instrumentation

This program offers qualified undergraduate students in the division the opportunity to obtain both the bachelor of science and master of science degrees simultaneously after five years of study. Admission into this program must be 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 at the end of the fourth year. 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.

### 2. Master of Science in Photographic Science and Instrumentation (Full-time)

This program is designed for persons holding a bachelor of science degree in physics, chemistry, or engineering.

Before admission to candidacy and beginning in the graduate level courses in photographic science, the student must have an adequate foundation in principles of photographic science. This knowledge may be acquired by enrolling in the full-time summer course, Principles of Photographic Science, PPHS-600. This course begins in June and runs for 10 weeks.

Although the 45 graduate credits required can be accumulated in three quarters, it has been found that only in exceptional cases is this time sufficient for successful completion of the experimental work in the thesis and for the preparation of the report. Hence full-time students should plan on at least five quarters of residence, beginning with the Summer Quarter.

### 3. Master of Science in Photographic Science and Instrumentation (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 photographic science may be obtained by taking Principles of Photographic Science, PPHS-601, 602, 603 which is equivalent to PPHS-600 in content. This sequence is offered during the evening, with Saturday laboratory sessions. Part-time students must plan to complete the graduate requirements within seven years. The courses will be offered in alternate years on a schedule such that part-time students may complete them in three or four years.

Information concerning the particular courses to be offered during a particular academic year may be obtained from the Graduate Program coordinator.

### Admission

Admission to the full-time or part-time programs will be granted to graduates of accredited degree granting institutions whose undergraduate studies have included at least the following courses in the major areas of study: mathematics through calculus; a full-year, college-level course in physics, with laboratory; a similar course in chemistry.

Applicants must demonstrate to the Graduate Committee (MS) of the School of Photographic Arts and Sciences that they have the capability to pursue graduate work successfully. Normally this will include an interview, the submission of a statement of purpose, presentation of the undergraduate academic record, letters of evaluation from individuals familiar with the applicant's capabilities, and any other pertinent data furnished by the applicant. While previous high academic achievement does not guarantee admission, such achievement or other unusually persuasive evidence of professional promise is expected.

### Requirements for the degree

For graduation, 45 credits in graduate-level courses are required. Of this total, 36 credits must be in courses other than Research and Thesis Guidance and must include the courses shown in the following table, the submission of an acceptable thesis, and an oral examination.

Certain upper class elective courses in supporting areas may be accepted toward the degree requirements in photographic science, provided they were agreed to in writing by the Graduate Program coordinator prior to the beginning of the course\*

### The thesis

The thesis is to be based on experimental evidence obtained by the candidate in an appropriate field as arranged between the candidate and his or her advisor. The minimum number of thesis credits required is nine. The thesis requirement may be fulfilled by experiments in Institute laboratories. In some cases, the requirement may be fulfilled by work done in other laboratories. An example might be the candidate's place of employment, under the following conditions: 1. The results must be fully publishable. 2. The

candidate shall have an advisor assigned by the School of Photographic Arts and Sciences.

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 results of original work or non-classified 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.

**Ronald Francis,  
Coordinator,  
Photographic  
Science and  
Instrumentation  
(475-2786)**

"The photographic science and instrumentation graduate program is currently designed to give the student a general background in the field with an opportunity to specialize in a particular area

through the research project," says Associate Professor John F. Carson.

"One of the most interesting courses in the program is PPHS-600 Principles of Photographic 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 photography in some way, such as microelectronics, remote sensing, micrographics, graphic arts, photographic manufacturing, and many others. We are always delighted to have students from other disciplines take the course and apply the information to other fields."



Dr. Ronald Francis

Course title and number	Quarter Credit Hours		
	Fall	Winter	Spring
Principles of Photographic Science-PPHS-600 or PPHS-601, 602, 603	No Graduate Credit^		
Theory of the Photographic Process-PPHS-711, 712, 713	3	3	3
Mathematics and Statistics for Photographic Systems-PPHS-721, 722^	4	4	
Instrumental and Photographic Optics-PPHS-731, 732, 733	3	3	3
Analysis and Evaluation of Imaging Systems-PPHS-741, 742, 743	3	4	3
Research and Thesis Guidance-PPHS-890^	1	1	

(1) The three quarters cover photographic chemistry, radiometry, sensitometry, tone reproduction, and color. Courses PPHS-600, 601, 602, and 603 are intended for students who previously received acceptance into the MS program in photographic science. Other students are welcome if they have the necessary background in physics, mathematics, and chemistry. Consent of the Graduate Coordinator is necessary for registration. Each quarter of PPHS-601, 602, 603 carries 5 undergraduate quarter credits. PPHS-600 carries 15 quarter credits.

(2) Students in the part-time program may substitute College of Continuing Education courses CTAM-711, CTAM-712, and CT AM-801. PPHS-721, 722 is not offered during the evening hours.

(3) The remaining 7 credits are distributed as required by project work.

\* All graduate courses applied toward the degree, including Research and Thesis, must be completed within seven years.

## Master of Fine Arts Degree in Photography

The master of fine arts program in photography emphasizes photography as an art form, with the intention of inspiring and nurturing the individuality of each student as a creative, productive person. It is rooted in the belief that the study of photography as a fine art can be enhanced by the study of photography as an applied art, as a 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 printmaking, film making, printing, and museum practice. 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



*Aerial view of Nazca, Peru ©1979 Marilyn Bridges*

concentration must be planned with and approved by the Coordinator. Elective courses are available in film making, television, animation, 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.

#### The faculty

The MFA photography program is supported by a staff of 50 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 General Studies. Resource personnel from RIT's Technical and Educational Center for the Graphic Arts also support the program by providing students with technical advice and by serving as members of their thesis board.

#### 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. 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 (painting, sculpture, crafts, printmaking, photography, photographic printing, any form of image making).

#### Transfer credit

Course work taken prior to admission to the program should be submitted for approval upon entrance into the program. Up to 12 quarter credit hours of B or better (nine semester hours) of graduate work is transferable toward the degree with the approval of the coordinator. Up to 12 quarter credit hours of credit by examination may also be included in the program and can be arranged for with the coordinator.

#### Portfolio

Selection of candidates for the graduate program is a difficult process. Along with written records of accomplishment and recommendations, the portfolio serves to inform the faculty of the applicant's photographic accomplishments. It is a pictorial statement of the candidate's performance to date in terms of her or his photographic skills and visual sophistication.

About 15 black-and-white and/or color photographs that represent a cohesive body of work should be sent. (The word *photograph* includes such photo-related media as printmaking, screen printing, electrophotography, color proofing, gum bichromate, cyanotype and albumen.) *Original* prints, slides or transparencies provide the best means of assessment. 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.

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 should reach the coordinator of the MFA photography program the first week in February. Applicants will be notified of their status in March.

#### Advisors

The MFA coordinator is the advisor for all candidates.

#### Thesis

The thesis should be an original body of work appropriate to the major commitment of the degree candidate. A 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.

#### Degree requirements

The MFA degree in photography normally requires a minimum of two years of full-time resident graduate study. A minimum of 85 quarter credit hours of graduate work is outlined below. These minimums may be exceeded through the intent of the candidate or as a result of necessity to cover certain areas of study.

The 85 hours do not include undergraduate work required by action of the MFA admission committee in accepting a particular applicant, or undergraduate course prerequisite for graduate courses.

	Quarter Credit Hours
Major	
Designed to give depth of experience to photography	37
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	26
Humanities	10
Research and Thesis	<u>12</u>
Total	85

Distribution of work within these guidelines is subject to modification based upon the candidate's background, abilities, and interests. An individualized course of study will be prepared with the help of the MFA coordinator and made a matter of record. Modifications in this prescribed program thereafter must be approved and recorded.

#### Humanities

The required 10 quarter credit hours of humanities courses are usually taken in the College of General Studies. 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.

### Richard Zakia Coordinator, MFA Program (475-2616)

"Rochester is a unique place for anyone seriously interested in a broad pursuit of photographic studies. Photography touches upon many other disciplines, and the opportunities for study are limited only by the student's interest. 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 50 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."

Zakia is a native of Rochester and holds a BS degree in photographic science from RIT and a Ed.D. in educational psychology from the University of Rochester. Prior to joining RIT in 1959 he was employed as a photographic engineer with Eastman Kodak. He has also served as director of Instructional Research and Development at RIT.

All course work, including an accepted thesis must be completed within seven years of entrance into the program.

#### MFA Gallery

The gallery, which is part of the MFA center, is used to exhibit graduate thesis work, student work and works of contemporary photographers. A conference telephdne is available in the gallery area to conduct seminars with photographers whose work is being exhibited.

#### Visiting artists

Through the assistance of grants from the National Endowment for the Arts (NEA) prominent personalities in the field of photography are brought to campus to enrich the program. They usually give a lecture on campus Thursday evening, which is open to the public, and then meet on Friday morning in a two-hour seminar with MFA students. The most recent speakers have been Ralph Hattersley, Jerry Uelsmann, Bruce Davidson, Starr Ockenga and Ralph Steiner.



Dr. Richard Zakia





*(Above) When RIT alumnus Jerry Uelsmann (seated, second from right) visited this graduate seminar, student John Samaha set up the shot and then joined the dog in front of the group. (Left) Seated among his works in the MFA Gallery, Bruce Davidson spoke to another graduate seminar while on campus as a Visiting Distinguished Lecturer. (Photo: Alexander Syndikas)*



*(Right) Arnold Newman, who delivered the William A. Reedy Memorial Lecture in Photography in 1981, also autographed copies of one of his books in the RIT Bookstore*



# Photography Courses

## Master of Science in Photographic Science and Instrumentation\*

**PPHS-600** Principles of Photographic Science  
Registration #0907-600  
A course intended for students who have completed their undergraduate programs in engineering or the sciences and who desire to prepare themselves for entry into the graduate program in photographic science and instrumentation or who desire a working knowledge of photographic science at an undergraduate level. It is an intensive course, assuming working knowledge of undergraduate mathematics, physics and chemistry. Course topics include radiation and radiometry, properties of radiation-sensitive materials, chemistry of photographic processing, sensitometry, tone reproduction, principles of color measurement, color photographic systems, image microstructure, and photographic instruments. The course includes both lectures and laboratory work.

Credit 15 (Summers only)

(Not applicable to 45 required graduate credits in the photographic science and instrumentation graduate program)

**PPHS-601, 602, 603** Principles of Photographic Science  
Registration #0907-601, -602, -603  
Equivalent to PPHS-600, but offered in the evening and Saturdays during the regular Fall, Winter, and Spring Quarters. (Admission to the MS program in Photographic Science and Instrumentation or consent of graduate coordinator)

Credit 5/Qtr.

(Not applicable to 45 required graduate credits in the photographic science and instrumentation graduate program)

**PPHS-711, 712, 713** Theory of the Photographic Process  
Registration #0907-711, -712, 713  
Physical structure and optical properties of the silver halide emulsion and their relations to the characteristic curve; 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 processes.

Class 3, Credit 3/Qtr.

**PPHS-721, 722** Mathematics and Statistics  
Registration #0907-721, -722 for Photographic Systems  
A special graduate course in mathematics and applied statistics involving those areas of direct concern in design, analysis, and evaluation of photographic systems.

Credit 4/Qtr.

**PPHS-731, 732, 733** Instrumental and Photographic Optics  
Registration #0907-731, -732, -733  
The principles of geometrical and physical optics with application to photographic instrumentation systems. First-order imaging, aberrations and geometrical image evaluation, mirror and prism systems, basic instrument systems, electromagnetic waves, polarization, interference and interferometers, coherence, Fraunhofer and Fresnel diffraction, transfer function description of imaging system performance.

Class 3, Credit 3/Qtr.

**PPHS-741, 742, 743** Analysis and Evaluation of Imaging Systems  
Registration #0907-741, -742, -743  
Complex variables and Fourier analysis with application to the evaluation of imaging systems; properties of optical images, structure of photographic images; methods of photo-optical system evaluation.

Class 2, Lab. 6, Credit 4 (winter)  
Class 3, Credit 3 (fall and spring)

**PPHS-751, 752, 753** Special Topics in Photographic Science  
Registration #0907-751, 752, -753  
Advanced topics of current or special interest, varying from quarter to quarter, selected from the field of photographic science. Specific topics announced in advance. (Not offered every quarter. Consult coordinator of the photographic science graduate program.)

Credit varies

**PPHS-890** Research and Thesis Guidance  
Registration #0907-890  
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

**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.  
Credit 3-9/Qtr.

**PPHG-750, 751, 752** Special Topics Workshop  
Registration #0903-750, -751, -752  
Advanced topics of current or special interest designed to broaden and intensify the student's ability to use photography as a means of communication and expression.  
Credit 3-9/Qtr.

## Master of Fine Arts in Photography\* Required Major Courses

**PPHG-701, 702, 703** History and Aesthetics of Photography  
Registration #0903-701, -702, -703  
An intensive inquiry into the history and aesthetics of photography to the present. Some of the areas of exploration: the rise and development of portrait, architectural and landscape photography in the 19th and 20th centuries; a survey of old and recent processes and how they affect the image-making of their particular period; exploring new frontiers; the photographers of the geological and geographical U.S. Surveys and NASA moon-scapes; "straight" photography vs. pictorialism: 135-year battle; the document and Robert Frank's *Americans* and the evolution of color photography.  
Credit 3/Qtr.

**PPHG-705, -706, -707** Student/Faculty Seminar  
Registration #0903-705, -706, -707  
An all purpose weekly meeting to facilitate communication among members of the MFA community and to introduce them to the resources available on campus and in the community.  
Credit 1/Qtr.

**PPHG-720, 721, 722** Photographic Workshop  
Registration #0903-720, -721, -722  
Each faculty member offers a different opportunity for students to explore the multiplicity of ways that photography can be used as a vehicle for expression and for communication. Visual research, group critiques, seminars, field trips, studio and laboratory practice are used.  
Credit 4/Qtr.

**PPHG-725, 726, 727** Photography Core  
Registration #0903-725, -726, -727  
Major emphasis is placed on the individual's learning to generate and intensify his or her personal statement through photography. Some of the projects are assigned while others are selected by the candidate.  
Credit 4/Qtr.

**PPHG-889** Pre-Thesis Seminar  
Registration #0903-889  
An introduction to research and thesis procedures and requirements with a review of existing thesis proposals and accepted thesis reports. Each student will be encouraged to develop his/her own thesis proposal during the course.  
Credit 1 (Spring only)

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 12

### Electives

PPHG-730,731,732 Cinematography  
 Registration #0903-730, -731, -732  
 Film making workshop. Individually planned studies in cinematography, as determined by faculty-student consultation, group critiques, seminars, studio and laboratory practice, field trips.  
 Credit 3/Qtr.

PPHG-755 Applied Sensitometry  
 Registration #0903-755  
 This course presents relevant sensitometry and photographic theory, principles and practices in a manner sensitive to the background and needs of a fine art photographer.  
 Credits 4/Qtr.

PPHG-756 Zone System Principles  
 Registration #0903-756  
 The application of selected sensitometric and perceptual principles to the understanding and practice of Zone System techniques for calibration and visualization.  
 Credit 4

PPHG-760 Perception and 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/Qtr.

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/Qtr.

## Graduate Faculty School of Photographic Arts and Sciences

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

Burt H. Carroll, Ph.D., University of  
 Wisconsin—Professor, Photographic  
 Science and Instrumentation

Andrew Davidhazy, MFA, Rochester  
 Institute of Technology, Associate  
 Professor, Photography

Lothar K. Engelmann, Ph.D., J.W.  
 Goethe University, Germany—  
 Professor

Ronald Francis, Ph.D.,  
 Massachusetts Institute of  
 Technology—Professor,  
 Photographic Science and  
 Instrumentation.

Nathan Lyons, Director, Visual  
 Studies Workshop—Adjunct  
 Lecturer, Photography

James E. McMillion, Jr., MFA Ohio  
 University—Professor, Photographic  
 Management

Beatrice Nettles, BFA, Florida; MFA  
 Illinois—Associate Professor,  
 Photography

Elliott Rubenstein, MFA, University of  
 Buffalo; MA, St. John's University—  
 Assistant Professor, Photography

John R. Schott, Ph.D., Syracuse  
 University—Assistant Professor,  
 Photographic Science and  
 Instrumentation

Leslie D. Stroebe, BS, Ed.D.  
 University of Rochester—Professor,  
 Photography

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

### Associates of Graduate Faculty

Owen Butler, BFA, Rochester  
 Institute of Technology—Assistant  
 Professor, Photography

John F. Carson, MSEE,  
 Massachusetts Institute of  
 Technology—Associate Professor,  
 Photographic Science and  
 Instrumentation

David A. Engdahl, M.Ed., University  
 of Rochester—Associate Director,  
 School of Photographic Arts and  
 Sciences, Professor

Andrew H. Eskin, MS, Illinois  
 Institute of Technology—  
 Interdepartmental Services, George  
 Eastman House; Lecturer,  
 Photography

Richard Floberg, MS, Boston  
 University—Associate Professor,  
 Photography

Edward Granger, Ph.D., University of  
 Rochester, Lecturer—Photographic  
 Science and Instrumentation

Weston Kemp, MFA, Rochester  
 Institute of Technology—Associate  
 Professor, Photography.

Russell Kraus, Ed.D.,  
 Massachusetts—Director, School of  
 Photographic Arts and Sciences,  
 Associate Professor

Frank Moser, MS, Minnesota—  
 Lecturer, Photographic Science and  
 Instrumentation

John Pfahl, MA, Syracuse—  
 Associate Professor, Photography

Martin Rennalls, MS, Boston  
 University—Associate Professor,  
 Photography

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

William S. Shoemaker, MS,  
 University of Miami—Professor,  
 Photographic Science and  
 Instrumentation

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

Charles C. Werberig, BFA, MS,  
 Syracuse—Assistant Professor,  
 Photography

# College of Science

## Master of Science in Chemistry



John D. Paliouras, Dean, College of Science

Earl Krakower, Department Head, Chemistry (475-2497)

Kay G. Henzei, Chairman of Chemistry Graduate Committee and Graduate Advisor (475-2077)

The Chemistry Department offers graduate programs leading to the master of science degree in chemistry on either a part-time or full-time basis with a variety of program options designed to fill the needs of both the practicing chemist in the Greater Rochester industrial community and the full-time graduate student.

### Objectives

The objectives of the program are, through course work and research experience, to increase both the breadth and depth of the graduate student's background and to provide an opportunity for the student to attack scientific problems on his or her own initiative with a minimum of supervision.

Five program options are available to cover the differing needs of graduate chemists.

### Admission

Admission to the program will be granted to qualified graduates who are holders of a bachelor's degree from an accredited college or university. Before a student is admitted to candidacy for the MS degree, one must have experience equivalent to a full year's course in each of the following: analytical chemistry, organic chemistry, physical chemistry, physics, and calculus.

The student must further demonstrate mastery of analytical, organic, and physical chemistry in qualifying examinations administered by the RIT Chemistry Department.

### Full-time graduate work

A limited number of teaching assistantships are available to qualified students to undertake full-time graduate work that would include research experience. The Chemistry Department has a vigorous, research oriented faculty and excellent equipment and facilities to enable full-time graduate students to carry on a program of independent study which will develop their ability to attack scientific problems at the research level.

Students enrolled in the full-time program are expected to complete 45 hours of course work and submit an independent research thesis. A full-time student is permitted to take a maximum of 16 credits per quarter. Typically, all requirements are met within two years.

#### Part-time study

The Department of Chemistry encourages practicing chemists in the Greater Rochester industrial community to pursue a program toward the master of science degree in chemistry without interrupting their employment. Consequently, most of the courses in the graduate programs in chemistry are scheduled in the late afternoons or early evenings.

Students employed full-time are normally limited to a maximum of two courses or eight credits each quarter.

The part-time MS program does not require a research thesis.

#### Internship option

The Department of Chemistry recognizes that the in-plant experience of a number of chemists employed in local industry includes independent, creative research. This experience may be applied, to a maximum of 16 hours of research credit, towards the completion of the master of science degree in chemistry in either the full- or part-time program.

The industrial research submitted for research credit must be originated by the graduate student and be presented to the scientific community as either a published paper, presentation at a professional meeting, or a report to the RIT Chemistry Department.

#### Cooperative education option

The cooperative education option is to accommodate students at the master's level who have or are able to obtain industrial employment which allows for quarters of full-time academic work. If industrial employment permits research, up to 16 of the 45 required credits may be obtained through the industrial internship option. If industrial employment does not permit research, research credits may be obtained within the Department of Chemistry.

#### Community college teacher option

To better prepare the graduate student for a career as a chemistry instructor in a two-year college, the Department of Chemistry provides



an opportunity through course work and actual teaching experience at two-year colleges, to obtain experience in the development of course material and instructional ability at the community college level.

This instructional development is provided in addition to the requirements of the full-time master of science in chemistry program which includes both independent research experience and a thesis.

#### Program

Each student, together with an advisor, will arrange a program best suited to the student's interests and needs. This program will be subject to the approval of the department head and the chairperson of the Graduate Committee.

A deliberate effort will be made to strengthen any areas of weakness indicated by the student's undergraduate records and/or the qualifying examinations.

In order to qualify for the MS degree, a candidate must satisfy the following requirements:

1. A minimum of 45 quarter credits beyond the bachelor's degree. Courses in chemistry will be chosen from those with SCH-700 and SCH-

800 numbers and should include one or more representing each of the four fields: analytical, inorganic, organic and physical. Each student must take or have demonstrated proficiency in the areas represented by the following courses: SCHI-763, SCHA-711, SCHO-737 or 739 and SCHP-741. As part of the required credits, each student must have one or two quarter credit hours in seminar SCHC-870, and six quarter credit hours from outside of the Department of Chemistry.

2. A minimum of nine quarter credit hours in research and submission of a satisfactory thesis. This may be waived for part-time students.
3. Demonstrated competence in a foreign or computer language.
4. Pass an oral thesis defense or comprehensive examination.

#### Additional information

More information may be obtained by phoning the chairperson of the Graduate Committee (716) 475-2077, or the Department of Chemistry (716) 475-2497.

## Master of Science in Clinical Chemistry

John D. Paliouras, Dean, College of Science

Edward B. Stockham, Acting Head, Clinical Sciences Department (475-2445)

The clinical chemistry program is designed for either full-time or part-time graduate study. Required courses are offered during the late afternoon or evening on a regular basis in order to accommodate the work schedules of part-time students.

### Objectives

The program is designed to provide formal educational background for individuals aspiring to careers in middle management in clinical chemistry laboratories.

### Admission

Qualified graduates who hold a bachelor's degree in chemistry, biology, medical technology, nuclear medicine technology, or a related field from an accredited college or university are invited to apply.

### Financial support

Teaching assistantship applications should be completed by March 15. Late applications may be considered under unusual circumstances. Information regarding other types of financial aid may be obtained from the RIT Student Aid office.

### Program

Each student, together with the program director, will arrange a program that not only meets the minimum degree requirements but also considers educational and experience background and the career goals of the student. Because of the diversity of backgrounds of applicants to the program, interested individuals are encouraged to write or phone the Clinical Sciences Department (716-475-2978) regarding program planning, prerequisites, transfer credits and course sequencing.

A minimum of 50 quarter credits beyond the bachelor's degree are required. Required courses include Biochemistry, SCHB-702;



Biochemistry-Metabolism, SCHB-703; Advanced Clinical Chemistry, SH PC-820, 821, 822, 810, 811, 812; Clinical Laboratory Management I & II, SHPC-741, 742; Statistics and Quality Control in the Clinical Laboratory, SHPC-712; Survey of Physical Chemistry, SCHP-742; Introduction to Electricity and Electronics, SPSP-331; Clinical Laboratory Computer Applications, SHPC-722; Clinical Chemistry Research, SHPC-859 or 879; Advanced Physiology, SBIQ-705.

Two oral examinations must be passed during the program. The first includes a presentation, by the student, of a proposal for a clinical chemistry research project. The oral committee must evaluate not only the proposal but also the presentation and the overall academic progress of the student. The second oral examination deals with the presentation of the research project data.

# Science Courses

## Department of Chemistry

SCHA-711 Instrumental Analysis  
Registration #1008-711

Theory, applications and limitations of instrumental methods in qualitative, quantitative, and structural analysis. Topics covered include fluorescence and phosphorescence, Raman, mass spectrometry, nuclear magnetic resonance, X-ray and radiochemistry, and electrochemistry. (SCHA-312)

Class 3, Credit 3 (offered twice a year) (F, W)

SCHA-720 Instrumental Analysis Laboratory  
Registration #1008-720

Lab accompanying SCHA-711. Experiments include A.A., fluorimetry, coulometry,  $^{13}\text{C}$  and  $^1\text{H}$  NMR, polarography. Assignments depend on student background.

Lab. 6, Credit 2 (offered every year) (F, W)

SCHB-702 Biochemistry  
Registration #1000-702

Introduction to biological chemistry. Chemical structures, reactions and physiological functions of molecular components of cells: amino acids, sugars, lipids, nucleotides and selected biopolymers. Solution behavior, catalytic properties and structure of proteins and enzymes. (SCHO-433 or SCHO-232)

Class 3, Credit 3 (offered every year) (F)

SCHB-703 Biochemistry—Metabolism  
Registration #1009-703

Bioenergetics principles; catabolism of carbohydrates, fatty acids and amino acids; photosynthesis, biosynthesis of carbohydrates, lipids, and nitrogenous compounds; active transport; metabolic diseases. (SCHB-702)

Class 3, Credit 3 (offered every year) (W)

SCHB-704 Biochemistry—Nucleic Acids and Molecular Genetics  
Registration #1009-704

The biochemistry of inheritance, expression of genetic information, protein biosynthesis, differentiation, viral and bacterial infection and the "origin of life." (SCHB-702)

Class 3, Credit 3 (offered every year) (S)

SCHC-772 Special Topics—  
Registration #1010-772

Advanced courses which are of current interest and/or logical continuations of the course already being offered. These courses should be structured as ordinary courses and have specified prerequisites, contact hours, and examination procedures.

Class variable, Credit variable (offered every year)

SCHC-859 External Research  
Registration #1010-859

Industrial internship research.

Credit 1-16 (offered every year)

SCHC-870 Chemistry Seminar  
Registration #1010-870

Credit 1 (offered every year.)

SCHC-879 Research and Thesis Guidance  
Registration #1010-879

Hours and credits to be arranged. Chemical research in a field chosen by the candidate, subject to approval of the department head and advisor.

Credit variable (offered every year.)

SCHC-899 Independent Study-Chemistry  
Registration #1010-899

Credit variable (offered every year)

SCHI-762 Inorganic Chemistry

Registration #1012-762

The properties and structures of the elements and their compounds in relation to electronic and stereochemical configurations; acid-base theories; non-aqueous solvents. (SCHO-433 and SCHK-442)

Class 3, Credit 3 (offered every year) (S, SR)

SCHI-763 Inorganic Chemistry

Registration #1012-763

Transition metal coordination chemistry; lanthanides and actinides; organometallic compounds and special topics. (SCHO-433 and SCHK-443)

Class 3, Credit 3 (offered every year) (F, W)

SCHO-736 Spectrometric Chemical Identification of Organic Compounds  
Registration #1013-736

Theory and application of nuclear magnetic resonance, infrared, mass spectrometry, and ultraviolet spectra as applied to organic structure determination. (SCHO-433)

Class 3, Credit 3 (offered every year)

SCHO-737 Advanced Organic Chemistry  
Registration #1013-737

Several of the following advanced topics in organic chemistry are covered: polyfunctional compounds, modern synthetic methods, stereochemistry, conformational analysis, free radical reactions, natural products, new synthetic reagents. (SCHO-433)

Class 3, Credit 3 (offered every year)

SCHO-739 Advanced Organic Chemistry  
Registration #1013-739

Selected topics in physical organic chemistry including: techniques for elucidation of mechanism (kinetic, linear free energy relationships, isotope effects), molecular orbital theory, electrocyclic reactions, (SCHO-433 and SCHK-443. Note: SCHO-737 is recommended but not required)

Class 3, Credit 3 (offered every year)

SCHO-832 Stereochemistry  
Registration #1013-832

Advanced treatment of steric relationships and stereoisomerism in organic compounds. (SCHO-433, SCHK-443)

Class 3, Credit 3 (offered upon sufficient request)

SCHO-833 Heterocyclic Chemistry  
Registration #1013-833

The preparation, properties, and reactions of heterocyclic systems, especially heteroaromatic rings. (SCHO-433)

Class 3, Credit 3 (offered upon sufficient request)

SCHO-835 Organic Chemistry of Polymers  
Registration #1013-835

Introduction to the chemistry of synthetic, high molecular weight polymers and a survey of their diverse structures and properties. Mechanisms of condensation, free radical and ionic polymerization. (SCHO-433)

Class 3, Credit 3 (offered in alternate years)

SCHK-741 Chemical Thermodynamics  
Registration #1014-741

A study of the basic fundamentals of thermodynamics and their use in deriving the interrelationships of thermodynamic functions. Thermodynamic properties of gases will be calculated based on spectroscopic data. (SCHK-443 and SMAM-307)

Class 3, Credit 3 (offered every year)



SCHP-742 Survey of Physical Chemistry  
Registration #1014-742  
This course will present principles of physical chemistry to students who have an interest in the health related sciences. Molecular structure, thermodynamics and kinetics will be discussed with a view to their biological applications. (SCHG-217, SCHO-232)

Class 3, Credit 3 (offered upon sufficient request) Not acceptable for M.S. in Chemistry.

SCHP-743 Chemical Kinetics  
Registration #1014-743  
Methods of investigating the kinetics of chemical reactions and the theories used to interpret their results. Focus on homogeneous reactions in gas and liquid phases. Discussions of references from recent chemical literature. (SCHP-443)

Class 3, Credit 3 (offered alternate years)

SCHP-744 Quantum Mechanics  
Registration #1014-744  
Matrix formulation of quantum mechanics; variation and perturbation methods; group theory; molecular orbital energies of complex molecules; calculation of vibrational frequencies and selection rules for complex molecules. Emphasis on use of spectroscopy and quantum chemistry to obtain chemical information. (SCHP-442)

Class 3, Credit 3 (offered every year)

SCHP-746 Physical Chemistry of Polymers  
Registration #1014-746  
Study of the theoretical and experimental aspects of polymer characterization. In addition, theoretical considerations of the configuration of polymer chains and statistical thermodynamics of polymer solutions will be related to experimental results. (SCHP-443)

Class 3, Credit 3 (offered upon sufficient request)

SCHP-747 Principles of Magnetic Resonance  
Registration #1014-747  
A development of the principal ideas of magnetic resonance including the theory of resonance line shapes, magnetic interactions, experimental considerations, and spectral analysis. These concepts are discussed in terms of nuclear magnetic, nuclear quadrupole, and electron spin resonance spectroscopy. (SCHP-443)

Class 3, Credit 3 (offered upon sufficient request)

## Department of Clinical Sciences

SHPC-712 Statistics and Quality Control  
Registration #1023-712  
Principles of statistics as they apply to biomedical sciences and to clinical laboratory analyses. Illustrative examples will involve clinical laboratory data. Probability, normal distributions, analysis of variance sampling, normal values, quality control, applications in patient care hypothesis testing.

Class 3, Credit 3 (Spring Quarter of even numbered years)

SHPC-722 Clinical Laboratory Computer Applications  
Registration #1023-722  
Data processing overview and terminology, hospital computer utilizations, evaluation of the need for computers in the laboratory, design of laboratory and hospital systems, evaluation-selection-installation of computer systems, legal aspects of biomedical data processing, instrument interfacing.

Class 3, Credit 3 (Winter Quarter of even number years e.g., 80-81)

SHPC-741,742 Clinical Laboratory Management I, II  
Registration #1023-741  
Organization of health care facilities, regulatory agencies, Q.C., personnel relations, productivity analyses, equipment maintenance, education and safety programs, extra-laboratory interactions, cost-accounting of laboratory tests.

Class 4, Credit 4

(I: Winter of even-numbered years)

(II: Summer of odd-numbered years)

SHPC-772 Special Topics  
Registration #1023-772  
In response to student and/or faculty interest, special courses which are of current interest and/or logical continuations of regular courses will be presented. These courses will be structured as ordinary courses with specified prerequisites, contact hours and examination.

Class variable, Credit variable

SHPC-810 Advanced Clinical Chemistry  
Registration #1023-810-30 Laboratory I  
Comparison of current methods for analysis of toxicology samples—gas-liquid chromatography, radioimmunoassay, enzyme multiplied immunoassay. (Permission of instructor, class size limited to 12)  
Lab. 4, Credit 1  
Concurrent with SHPC-820

SHPC-811 Advanced Clinical Chemistry  
Registration #1023-811-30 Laboratory II  
Comparison of current methods for separation and determination of isoenzymes. (Permission of instructor, class size limited to 12)  
Lab. 4, Credit 1  
Concurrent with SHPC-821

SHPC-812 Advanced Clinical Chemistry  
Registration #1023-812-30 Laboratory III  
Methods for the development, improvement, and trouble shooting of radioimmunoassay analyses. (Permission of instructor, class size limited to 12)  
Lab. 4, Credit 1  
Concurrent with SHPC-822

SHPC-820 Advanced Clinical Chemistry I  
Registration #1023-820-01  
Toxicology, therapeutic drug monitoring, electrolytes acid-base, vitamins, oncology, hepatitis, coagulation, and various standard methods. (Permission of instructor)  
2 hr lecture, 2 hr seminar, credit 3

On a rotating basis Ad. Clin. Chem I, II, III will be offered two courses per year; one in the fall, another in the spring, and the third the following fall. They are independent courses that may be taken in any sequence.

820 will be offered in (Spring 1981, Fall 1982)

SHPC-821 Advanced Clinical Chemistry II  
Registration #1023-821-01  
Proteins, enzymes, hemoglobins, iron, renal function, lipids, quality control, automation, and method selection. (Permission of instructor)  
2 hr lecture, 2 hr seminar, credit 3 (Fall 1981, Spring 1983)

SHPC-822 Advanced Clinical Chemistry III  
Registration #1023-822-01  
Radioimmunoassay, hormones, fetal-placement unit, integration of laboratory data. (Permission of instructor)  
2 hr lecture, 2 hr seminar, Credit 3 (Fall 1980, Spring 1982)

SHPC-859 External Clinical Chemistry Research  
Registration #1023-859  
Credit 1-16

SHPC-870 Clinical Chemistry Seminar  
Registration #1023-870  
Credit 1

SHPC-879 Clinical Chemistry Research  
Registration #1023-879  
Credit 1-16

SHPC-899 Independent Study  
Registration #1023-899  
Credit variable

## Graduate Faculty College of Science

John D. Paliouras, Ph.D., University of Illinois—Professor and Dean

### Department of Chemistry

Earl Krakower, Ph.D., University of British Columbia—Department Head, Professor, physical chemistry: nuclear magnetic resonance, structure, and properties of molecules, development

Jerry M. Adduci, Ph.D., University of Pennsylvania—Associate Professor, organic chemistry: organic mechanisms, polymer synthesis, and chemical technology

Edward B. Stockham, Ph.D., University of Pennsylvania—Acting Head, Clinical Sciences Dept.

Susannah M. Butler, Ph.D., SUNY/Stonybrook—Visiting Assistant Professor, physical chemistry: laser fusion targets and plasma chemistry, gas phase reaction kinetics and characterization of small molecules and atomic species

B. Edward Cain, Ph.D., SUNY/Binghamton—Associate Professor, inorganic chemistry: chemical education, methodologies and adaptations for the handicapped student

Robert E. Gilman, Ph.D., Iowa State—Professor, physical and inorganic chemistry: chemical kinetics and computer applications to chemistry.

Kay G. Henzel, Ph.D., Ohio State University—Chairman, Chemistry Graduate Committee; Graduate Advisor; Visiting Assistant Professor: synthetic organic synthesis of natural products and sesquiterpenes using novel organic reactions

Joseph L. Lippert, Ph.D., University of Colorado—Associate Professor, physical chemistry: laser-Raman spectroscopy and biophysical chemistry

Terence C. Morrill, Ph.D., University of Colorado—Professor, organic chemistry: stereochemistry and mechanism of organic reactions, and organic structure effects upon lanthanide-induced shifts in NMR spectrometry; computer assisted instruction

Francis L. Scott, Ph.D., and D.Sc., Cork—Visiting Professor, bio-organic mechanisms: particularity of bio-organic reactions and exploration of mechanism whereby drugs and other xenobiotics, exert toxic effects.

Gerald A. Takacs, Ph.D., University of Wisconsin—Associate Professor, physical chemistry: chemical kinetics, atmospheric chemistry and photochemistry

Vladimir Vukanovic, Ph.D., University of Belgrade—Visiting Professor, physical chemistry: Plasma physical chemistry, atomic spectroscopy with arc plasma source

### Department of Clinical Sciences

Edward B. Stockham, Ph.D., University of Pennsylvania—Acting Head, Clinical Sciences Dept.

James C. Aumer, M.S., Michigan Technological University—Program Director, medical technology; Assistant Professor

William A. Burns, MS, Elmira—Associate Dean, medical technology; Professor

Jerome Wagner, Ph.D., University of Wisconsin—Assistant Professor and Program Director, nuclear medicine technology

## Clinical Faculty

Richard M. Bayer, Ph.D., Rutgers University—Rochester General Hospital, Adjunct Clinical Assistant Professor

James Bertsch, MS, Rochester Institute of Technology—The Genesee Hospital, Adjunct Assistant Professor

Robert Kringle, MS, University of Wisconsin—Adjunct Assistant Professor

Norman P. Kubasik, Ph.D., Syracuse University—Upstate Medical Center—The Genesee Hospital, Adjunct Clinical Associate Professor

Royden N. Rand, Ph.D., University of Buffalo—Health, Safety and Human Factors Laboratory, Eastman Kodak, Adjunct Professor

Harrison E. Sine, Jr., Ph.D., SUNY at Buffalo—The Genesee Hospital, Adjunct Clinical Associate Professor

James D. Salvatore, MS, University of Rochester—Strong Memorial Hospital, Adjunct Clinical Assistant Professor

## Materials Science and Engineering

Richard A. Kenyon, Dean, College of Engineering

John D. Paliouras, Dean, College of Science

Hrishikesh Banerjee, Director, Materials Science and Engineering Program

For information call 475-2536 (Dr. Banerjee)

The program, under the joint auspices of the colleges of Engineering and Science, offers graduate studies leading to the master of science degree in materials science and engineering with a variety of options designed to satisfy individual and industry needs in the rapidly growing field of materials.

The objectives of the program are threefold:

- With the advent of whole new classes of materials and instruments in recent times, the traditional practice of empiricism in the search for and selection of materials is rapidly becoming obsolete. The program will offer, therefore, a serious interdisciplinary learning experience in materials studies, crossing over the traditional boundaries of such classical disciplines as chemistry, physics, electrical and mechanical engineering.
- The program will provide extensive experimental courses in diverse areas of materials-related studies.
- The program will explore avenues for introducing greater harmony between industrial expansion and academic training.

### Special Features of the Program

A special feature of the program is the offering of five required core courses. The core courses are specially designed a) to establish a common base of materials-oriented knowledge for students with baccalaureate degrees in chemistry, chemical engineering, electrical engineering, mechanical engineering, and physics; and consequently, b) to provide a new intellectual identity to those involved in the study of materials.

Second, there is an emphasis on experimental techniques in the program. It offers one required experimental course and makes available additional optional

experimental courses. These are organized into appropriate units covering many aspects of analysis of materials. This aspect of the program should enhance student confidence when dealing with materials-related problems.

Finally, a large number of highly qualified scientists and engineers in the Rochester area are engaged in the research and development of materials. This reservoir of talent is utilized to ensure the breadth and quality of the program. The program offers an "industrial option" that allows participants to continue their studies in their work environment and thus enhance their job satisfaction.

The overall thrust of the program is to establish a positive relationship between academia and industry by building a sound academic base in the field of materials.

### Governance of the Program

A Program Council will be established, consisting of 12 members, eight from the Institute and four from Rochester industries. The council will be responsible for decisions on all academic aspects of the program. The program director will serve as chairman of the council.

### Admission

The program is open to individuals with a bachelor's degree in chemistry, physics, and chemical, electrical or mechanical engineering from an accredited college or university. Any student who wishes to study at the graduate level must first be admitted to the program. An applicant is permitted to take graduate courses as a non-matriculated student, however, if he or she meets the general requirements mentioned above.

A person not meeting the general requirements may petition for admission to the program. In such cases, the Program Council would decide on the necessary background courses to be taken at the undergraduate level. However, undergraduate credits that make up deficiencies may not be counted toward the master's degree.

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

### Degree requirements

A minimum of 45 quarter credit hours is required for the completion of the program.

A course unit will normally carry four quarter credit hours, with the exception of the seminar which will carry one quarter credit hour.

The five core courses and the seminar course are required for the completion of the program. Together, they carry a total of 21 quarter credit hours.

The remaining 24 quarter credit hours may be taken in a combination of advanced courses including "special topics," electives in courses currently available in other master's programs in the Institute, and the "research thesis" option, subject to prior approval. Also, the Program Council may award transfer credits based on academic background above and beyond the baccalaureate degree or credit by examination based on experience.

### Part-Time Study

Because practicing scientists and engineers are encouraged to pursue the program on a part-time basis, most of the courses are scheduled in the late afternoon. (This may not apply to courses offered off campus at several industrial locations.)

Students employed full time in industry are normally limited to a maximum of two courses, or eight credit hours, each quarter. A student who wishes to register for more than eight credit hours while employed full time must obtain the permission of the Program Council.

### Thesis Option and the Industrial Internship Option

The inclusion of a research thesis as a formal part of the master of science degree program in materials science and engineering is optional. The research thesis option would carry a minimum of eight and a maximum of 16 quarter credit hours, subject to review and approval of the project.

It is also recognized that in-plant work experience in the materials-related areas may include independent study and creative research. This industrial internship option may be applied, for a minimum of four and a maximum of 16 quarter credit hours, toward the completion of the master of science degree.

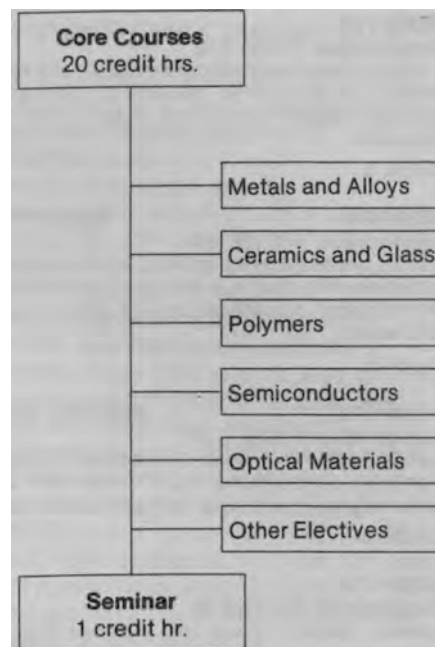
## Materials Science and Engineering Curriculum

It is envisioned that the core courses will be offered on the basis of a one-year cycle and the advanced courses will be scheduled on the basis of a two-year cycle. The final format will be announced after the Program Council is established.

## Course Number and Title

### Core Courses:

SESM-701 Introduction to Materials Science  
 SESM-702 Introduction to Polymer Science  
 SESM-703 Introduction to Solid State Science  
 SESM-704 Introductory Theoretical Methods  
 SESM-705 Introductory Experimental Techniques



## Course Descriptions

### Core Courses

SESM-701 Introduction to Materials Science  
 Registration #1028-701  
 Crystal structure and defects, strength of materials, metals, alloy principles, ferrous alloys.  
 Credit 4 (offered every year)

SESM-702 Introduction to Polymer Science  
 Registration #1028-702  
 Introduction to the physical chemistry and organic chemistry of polymers, structure, preparation and properties of polymers.  
 Credit 4 (offered every year)

SESM-703 Solid State Science  
 Registration #1028-703  
 Crystal structure and x-ray diffraction; lattice vibrations and thermal properties; electron band theory of insulators, metals, and semiconductors, junction diodes and transistors.  
 Credit 4 (offered every year)

SESM-704 Introductory Theoretical Methods  
 Registration #1028-704  
 Treatment of waves and fields; selected topics of interest in electrodynamics and fluid mechanics; statistical mechanics, Maxwell-Boltzmann, Bose Einstein, and Fermi-Dirac distributions and their applications.  
 Credit 4 (offered every year)

SESM-705 Introductory Experimental Techniques  
 Registration #1028-705  
 The list of laboratory projects includes the areas of:  
 a) Microanalysis of materials; x-ray diffraction, scanning electron microscopy, metallography, microelectronics, fluorescence, phosphorescence, etc.;  
 b) Thermal systems: thermomechanical and thermogravimetric systems and differential scanning calorimetry;  
 c) Thin films: thermal evaporation system, sputter coating system, phase contrast microscopy, chemical vapor deposition system;  
 d) Sonics and ultrasonics  
 Credit 4 (offered every year)

### Elective Courses

SESM-706, 707, 708 Experimental Techniques  
 Registration #1028-706, 707, 708  
 The study of more topics listed in Introductory Experimental Techniques.  
 Credit 4 (offered every year)

SESM-710, 711 Materials Properties and Selection I and II  
 Registration #1028-710, 711  
 Mechanical properties of metallic polymeric materials; application and selection of such materials based on strength, fatigue, impact, creep, processing, and economy.  
 Credit 4 per quarter

SESM-714 Ceramics and Glass  
 Registration #1028-714  
 Nature of ceramics, nature of glass, processing of ceramics and glass materials, properties and application of ceramics and glass.  
 Credit 4

SESM-717 Materials Degradation: Corrosion  
 Registration #1028-717  
 Electrochemical nature of corrosion, high-temperature corrosion, anticorrosion techniques, materials selection for corrosion services.  
 Credit 4

SESM-720 Organic Polymers  
 Registration #1028-720  
 This course is designed to meet the needs of students in the area of organic chemistry related to synthesis, polymerization mechanism, structures, stereochemistry and reactions of organic polymers and their industrial usage.  
 Credit 4

SESM-721 Physical Chemistry of Polymers  
 Registration #1028-721  
 This course is designed to meet the needs of students of materials science in the area of theoretical and experimental physical chemistry related to solution properties, morphology and physical behavior of macromolecules.

<p>SESM-722 Registration #1028-722 A study of the basic principles and methods involved in the technology of polymeric materials, including treatment of heat transfer, mass flow, mixing, shaping and moulding of polymeric materials. Credit 4</p>	<p>Polymer Processing</p>	<p>SESM-740 Registration #1028-740 Systematics of the atom nuclei; radioactivity; neutron induced reactions; fission; nuclear reactor principles, designs and materials. Credit 4</p>	<p>Nuclear Science and Engineering</p>
<p>SESM-730 Registration #1028-730 Fundamentals of geometrical and physical optics; interaction of radiation with atoms, molecules, and matter; dielectrics; phenomenological considerations of electro-optics, acousto-optics, and lasers. Credit 4</p>	<p>Optical Properties of Materials</p>	<p>SESM-800 Registration #1028-800 In addition to in-depth study of any of the courses listed under Elective Courses, special topics may be selected from such areas as elastomers, organometallics, radiation damage, processing of materials, superconductivity, etc. Credit 4</p>	<p>Special Topics</p>
<p>SESM-733 Registration #1028-733 Band structures of pure and doped solids and solid compounds, transport phenomena, semiconduction, optical properties, galvanomagnetic and magneto-optic effects. Credit 4</p>	<p>Electrical and Magnetic Properties of Materials</p>	<p>SESM-879 Registration #1028-879 A project involving research on a topic in materials science and engineering carried out either on campus or off campus under the industrial internship option. An oral examination and written thesis are required. Credit variable</p>	<p>Research and Thesis Guidance</p>
<p>SESM-734 Registration #1028-734 Lasers: theory, types and construction; optical properties of various metals and alloys; thin films: multilayerdielectric coating; principles and applications of electro-optical and acousto-optical materials: shutters and modulators. Credit 4</p>	<p>Advanced Optics</p>	<p>SESM-890 Registration #1028-890 This course is required for completion of the program and will involve a one-hour presentation on some topic in materials science and engineering. Credit 1</p>	<p>Seminar</p>
<p>SESM-736 Registration #1028-736 Electrical, thermal, and optical properties of amorphous materials; models of conduction. Credit 4</p>	<p>Amorphous and Semicrystalline Materials</p>	<p>SESM-899 Registration #1028-899 This course number should be used by students wishing to study a topic on an independent study basis. Permission to register required. Credit variable</p>	<p>Independent Study</p>

## Graduate Faculty

### Materials Science and Engineering

College of Engineering and College of Science

Richard A. Kenyon, Ph.D., P.E., Syracuse University—Dean, College of Engineering, Professor: Mechanical Engineering, Thermodynamics and Fluid Mechanics

John D. Paliouras, Ph.D., University of Illinois—Dean, College of Science, Professor: Mathematics, Analysis  
Hrishikesh Banerjee, Ph.D., University of Calcutta—Director of Materials Science and Engineering, Professor: Physics, Nuclear Physics, Solid State and Semiconductor Physics

Swaminathan Madhu, Ph.D., University of Washington—Director of Graduate Programs in Engineering, Professor: Electrical Engineering, Communications Theory, Logic Design

Bhalchandra V. Karlekar, Ph.D., P.E., University of Illinois—Professor and Department Head, Mechanical Engineering: Heat Transfer, Applied Mathematics

Arthur Z. Kovacs, Ph.D., Duke University—Professor and Department Head: Physics, High Energy Physics, System and Management Science

Earl Krakower, Ph.D., University of British Columbia—Professor and Department Head: Chemistry, Physical Chemistry, Nuclear Magnetic Resonance

Harvey E. Rhody, Ph.D., Syracuse University—Professor and Department Head, Electrical Engineering: Communication Theory

Jerry M. Adduci, Ph.D., University of Pennsylvania, Associate Professor: Chemistry, Organic Mechanisms, Polymer Synthesis and Characterization

Frank J. Bogacki, M.S., University of Pennsylvania, Assistant Professor: Electrical Engineering, Solid State Devices

Robert A. Clark, Ph.D., University of Maryland—Dean, College of Continuing Education, Professor: Physical and Organic Chemistry, Polymers

Lynn Fuller, Ph.D., University of Buffalo, Assistant Professor: Electrical Engineering, Solid State Devices and Microelectronics

David A. Glocker, Ph.D., Clemson University, Assistant Professor: Physics, Solid State, Superconductors and Thin Films

Roger E. Heintz, Ph.D., Syracuse University, Associate Professor: Electrical Engineering, Solid State Devices

Ronald E. Jodoin, Ph.D., University of Rochester, Assistant Professor: Physics, Optics, Lasers and Digital Image Processing

Edwin D. Lillie, Ph.D., Queen's University of Belfast, Visiting Assistant Professor: Chemistry, Physical Chemistry, Polymers, NMR Studies of Polymers

Chris Nilsen, Ph.D., P.E., Michigan State, Associate Professor: Mechanical Engineering, Metallurgy and Materials Science

Robert L. Snyder, Ph.D., P.E., Iowa State, Professor: Mechanical Engineering, Materials Science, Chemistry

Gerald A. Takacs, Ph.D., University of Wisconsin, Associate Professor: Chemistry, Chemical Kinetics, Atmospheric and Photochemistry

Vladimir Vukanovic, Ph.D., University of Belgrade, Visiting Professor: Plasma Physical Chemistry, Atomic Spectroscopy with Arc Plasma Source.

# The National Technical Institute for the Deaf

William E. Castle, Director

The National Technical Institute for the Deaf (NTID) was created to provide deaf students with technical and professional education which will lead to meaningful employment in business, industry, government and education. Public Law 89-36, passed by the United States Congress in 1965, authorized the establishment of NTID, and Rochester Institute of Technology (RIT) was chosen as the sponsoring institution in late 1966 by the Department of Health, Education and Welfare. In the fall of 1968, the first group of deaf students began their studies at NTID. In the fall of 1981, NTID at RIT will have completed its first 13 years of providing postsecondary education to deaf citizens from all parts of the nation.

While it is a national institution, NTID is also one of the 10 colleges of RIT. Further, it is the nation's only technical college of its kind serving deaf students in comprehensive career-oriented postsecondary programs.

## Graduate Programs for Deaf Students

NTID encourages deaf students qualified for admission to NTID and for admission to graduate programs at RIT to pursue master's degree programs at RIT. Such deaf persons who enter graduate programs at RIT will receive appropriate support services, through NTID, for their graduate studies. Support services available to these deaf students include: sign-language interpreting in classrooms, tutoring, notetaking, career counseling, personal/social counseling, and job placement assistance.

Deaf students enrolled at RIT through NTID make a distinct contribution to the educational processes of the Institute, and after completing appropriate prerequisites may pursue master's degrees through other colleges of RIT.

In addition, NTID faculty teach in the graduate programs of RIT and share a wide range of technical expertise as well as knowledge of both deafness and education of deaf people.

For more information, contact the RIT Office of Admissions or the NTID Office for Career Opportunities, One Lomb Memorial Drive, Rochester, New York 14623.



## Joint Program to Prepare Educational Specialists for the Deaf at the Secondary Level

Co-Sponsors: University of Rochester through the Graduate School of Education and Human Development  
Walter I. Garms, Dean and  
Rochester Institute of Technology through the National Technical Institute for the Deaf  
William E. Castle, Director

A new type of professional The University of Rochester's Graduate School of Education and Human Development and Rochester Institute of Technology through the National Technical Institute for the Deaf have jointly developed a new graduate program designed to improve the quality of education and services for deaf people.

Graduates of the program will receive master's degrees and be qualified to work as professionals with deaf people at the secondary level in:

- teaching deaf and normally hearing secondary students in such areas as English, mathematics, science and social studies;
- managing special educational support service systems such as tutoring, notetaking and interpreting;
- serving as resources on deafness to schools involved in mainstreaming deaf students into regular school systems.

Graduates will work in secondary schools serving deaf students, or function as instructional leaders, working with colleagues to enrich and upgrade the quality of education for deaf people nationally.

### Certification

Graduates of this program will be eligible for:

- provisional certification from New York State as an academic teacher of the normally hearing, for grades 7-12, in one or more of these areas: English, social studies, mathematics, biology, chemistry, physics, earth science or general science.

- provisional certification from New York State as a teacher of the deaf and hearing-impaired, nursery through grade 12.
- a master of science in education degree from the University of Rochester co-sponsored by Rochester Institute of Technology through the National Technical Institute for the Deaf.

To be certified to teach one or more of the broad fields listed below at the secondary level in New York State, applicants must satisfy the following minimum course work (undergraduate or graduate level) requirements in one of these areas:

English - 36 semester hours including work in linguistics, literature and writing;

Mathematics - 36 semester hours including a calculus sequence;

Science - 44 semester hours in the natural sciences including a calculus sequence;

Social Studies - 36 semester hours in history, geography and the social sciences, with American studies and at least one course in the methods of inquiry in history, geography or one of the social sciences.

The University of Rochester and National Technical Institute for the Deaf: uniquely qualified to jointly prepare educational specialists The University of Rochester, one of the smallest of the nation's distinguished universities, enrolls about 8,000 students, upwards of 3,000 of them at the graduate level. One of its eight colleges and schools, the Graduate School of Education and Human Development, offers doctor's and master's degrees in a variety of educational specialties. The school maintains long-established programs of teacher preparation for students in the university's outstanding departments of English, mathematics, social sciences, and natural sciences in the College of Arts and Science. Individuals and groups from the school's faculty have engaged in a number of joint activities with NTID personnel over the past 10 years: members of the university's School of Medicine and Dentistry and Center for Visual Science have joined in similar collaboration.

NTID, an integral part of Rochester Institute of Technology, is the world's largest technical college for the deaf. It has led the way, both nationally and internationally, in efforts to integrate higher education

for deaf students into college life on a campus planned primarily for hearing students. Today nearly 1,000 hearing-impaired students from 49 states, Puerto Rico, and the District of Columbia study and reside on the RIT campus with 8,500 hearing students.

RIT's students are enrolled in the Colleges of Business, Continuing Education, Engineering, Fine and Applied Arts, General Studies, Graphic Arts and Photography, Science, Institute College (engineering technologies and other career fields), Eisenhower College and, of course, NTID.

RIT offers a wide range of programs, including more than 200 individual career study areas offering master's, bachelor's and associate's degrees.

### About the program

This full-time master's degree program normally will require three to five semesters to complete depending upon the applicant's entry-level qualifications. The program is designed for people who seek academic certification to teach both hearing and deaf students. It also will serve those who are already certified to teach academic subjects to hearing students at the secondary level and who seek additional certification to teach deaf students.

Applicants must have at least an undergraduate major in an academic area normally taught at the secondary school level, such as English literature, mathematics, chemistry, or history. Some successful applicants also may need more advanced work in their area of academic expertise, or may need to develop a broader perspective in several academic areas. For example, persons with an undergraduate degree in mathematics may need additional mathematics preparation to meet the University of Rochester's program requirements, or to attain an appropriate breadth of knowledge in mathematics.

### Sign language

Participants will be required to demonstrate basic skills in expressive and receptive sign language before their student teaching begins. Those without sign language skills will be encouraged to participate in sign language courses at NTID in the summer that precedes their first semester of graduate study.



### Admission requirements:

To gain admittance to this new graduate program, applicants must:

- Complete the equivalent of an undergraduate major in at least one academic area directly related to subjects normally taught at the secondary level.
- Demonstrate an interest in serving the needs of deaf people.
- Satisfy the University of Rochester admission requirements: solid undergraduate background in an academic area, good recommendations, and a successful on-campus interview.
- Applicants are encouraged to take the aptitude section of the Graduate Record Examination (GRE) prior to admission. Those who have not done so before admission will be required to take the GRE subsequent to admission.

The participants will determine their individual programs of study with the assistance of a faculty advisor. Among the major areas of study available to participants will be specialized courses which relate deafness to the communication sciences and disorders, instructional theories and techniques, educational goals and processes, and psycho-social-cultural development. Student teaching will provide exposure to the full range of educational environments available to deaf adolescents in the region.

### How to apply

Admission is open without discrimination to hearing-impaired or hearing applicants. Enrollment will be limited to 15. Some financial aid may be available. For an application, please write to:

Associate Dean for Graduate Studies  
Graduate School of Education and Human Development  
304 Lattimore Hall  
University of Rochester  
Rochester, NY 14627

For additional information, please contact:

Dr. Kenneth R. Nash  
Director, Joint Program to Prepare Educational Specialist for the Deaf at the Secondary Level  
422 Lattimore Hall  
University of Rochester  
Rochester, NY 14627  
Phone (716) 275-4009 (voice or TTY)

## Graduate Faculty

William E. Castle, Ph.D., Stanford University—Professor, Director

Jack R. Clarcq, Ed.D., Syracuse University—Associate Professor, Associate Vice President, Technical Assistance Program?

Kenneth R. Nash, Ed.D., Columbia University—Associate Professor, Director Joint Educational Specialist Program, Adjunct Associate Professor, Graduate School of Education and Human Development, University of Rochester

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Kathleen E. Crandall, Ph.D., Northwestern University—Assistant Professor

Greg Emerton, Ph.D., Western Michigan University—Assistant Professor

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T. Alan Hurwitz, Ed.D., University of Rochester—Associate Professor

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Graphic Systems Division  
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Wallace E. Wilson\*  
Group Vice President (Retired)  
General Motors Corporation  
Kenneth W. Woodward, M.D.  
Executive Director  
Neighborhood Health Centers of  
Monroe County Inc.

*\*Member, Honorary Board*

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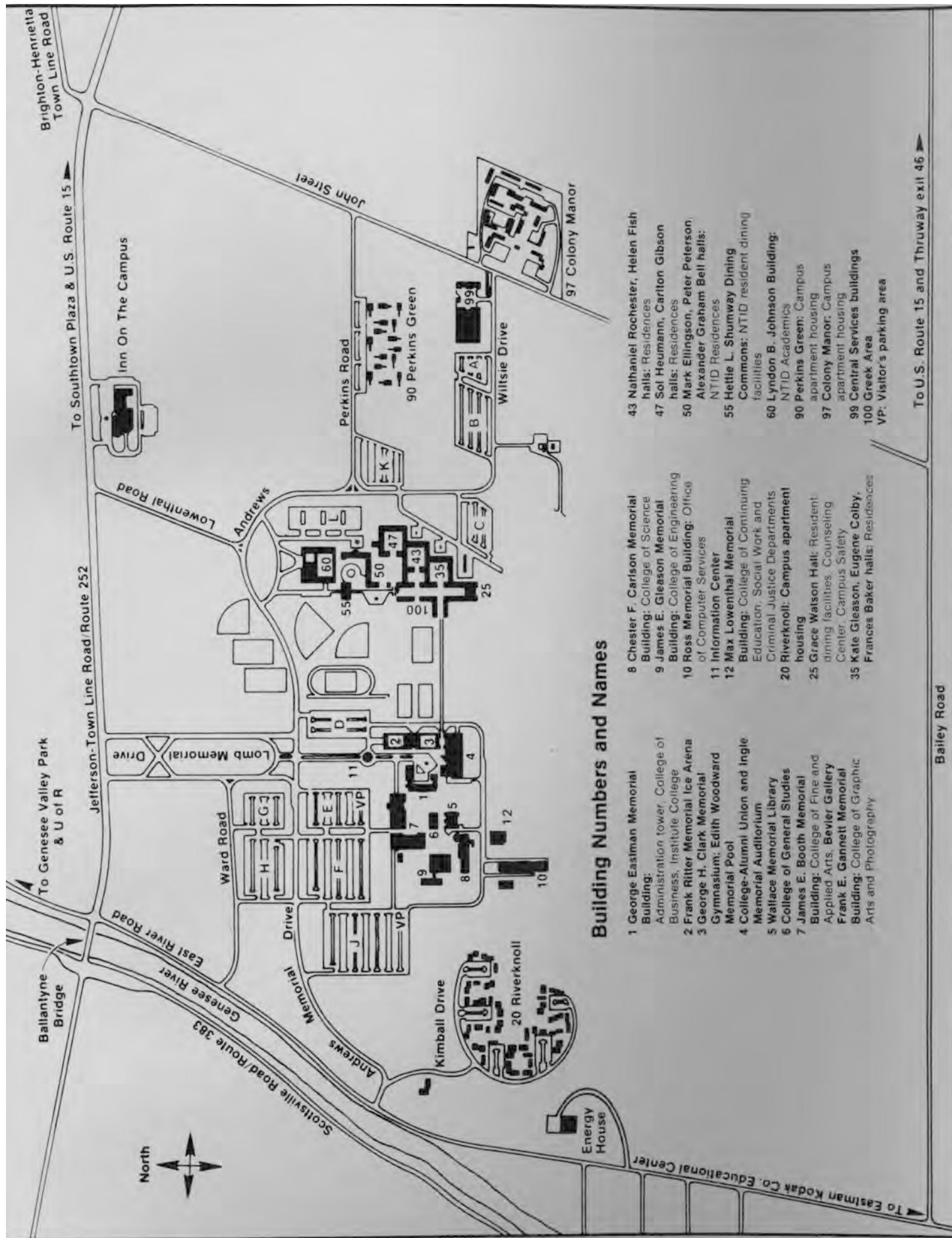
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- |  |   |  |
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| 1 George Eastman Memorial Building: Administration tower, College of Business, Institute College | 8 Chester F. Carlson Memorial Building: College of Science  | 43 Nathaniel Rochester, Helen Fish halls: Residences                             |
| 2 Frank Ritter Memorial Ice Arena  | 9 James E. Gleason Memorial Building: College of Engineering  | 47 Sol Heumann, Carlton Gibson halls: Residences                                 |
| 3 George H. Clark Memorial Gymnasium; Edith Woodward Memorial Pool                               | 10 Ross Memorial Building: Office of Computer Services  | 50 Mark Ellingson, Peter Petersson, Alexander Graham Bell halls: NTID Residences |
| 4 College-Alumni Union and Ingle Memorial Auditorium   | 11 Information Center   | 55 Hettie L. Shumway Dining Commons: NTID resident dining facilities             |
| 5 Wallace Memorial Library   | 12 Max Lowenthal Memorial Building: College of Continuing Education, Social Work and Criminal Justice Departments | 60 Lyndon B. Johnson Building: NTID Academics                                    |
| 6 College of General Studies   | 20 Riverknoll: Campus apartment housing   | 90 Perkins Green: Campus apartment housing                                       |
| 7 James E. Booth Memorial Building: College of Fine and Applied Arts, Bevier Gallery             | 25 Grace Watson Hall: Resident dining facilities, Counseling Center, Campus Safety                                | 97 Colony Manor: Campus apartment housing  |
| Frank E. Gannett Memorial Building: College of Graphic Arts and Photography                      | 35 Kate Gleason, Eugene Colby, Frances Baker halls: Residences  | 99 Central Services buildings  |
|  |   | 100 Greek Area   |
|  |   | VP: Visitor's parking area   |

To U.S. Route 15 and Thruway exit 46

Bailey Road