Rochester Institute of Technology

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1979

1979-1980 Graduate Bulletin

Rochester Institute of Technology

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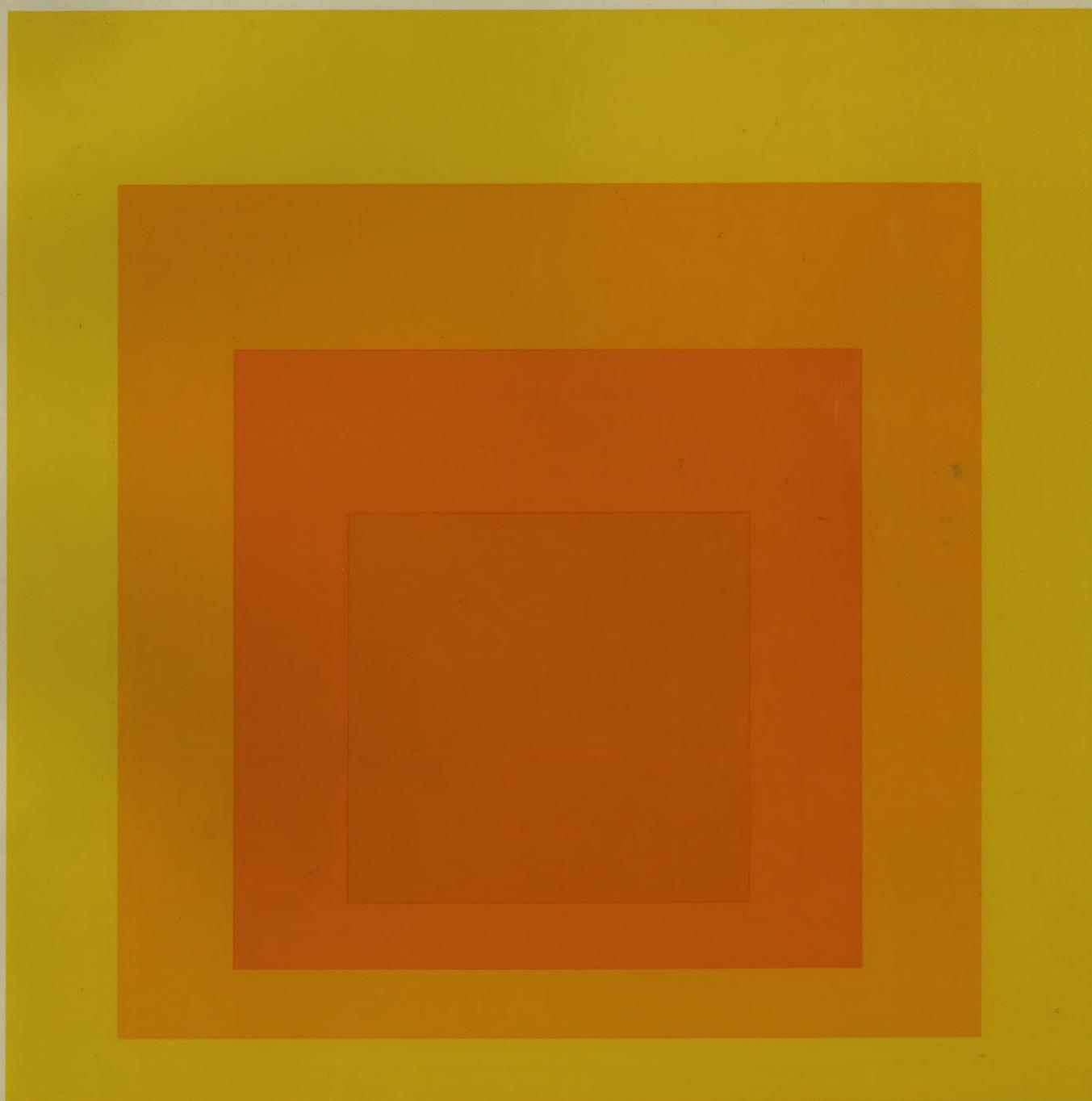
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GRADUATE STUDY

Rochester Institute of Technology Calendar 1979-80

	Graduate Registration	No Classes	Non-Matriculated Student Registration	Classes Begin Day Colleges	Exam Week	Last Day of Quarter
Fall Quarter 1979	Sept. 7,8	Nov. 21 Dec. 2	Sept. 10	Sept. 10	Nov. 16,17 19, 20	Nov. 20
Winter Quarter, 1980	Dec. 3	Dec. 22 Jan. 6 Feb. 5 March 2-9	Dec. 4	Dec. 4	Feb. 27, 28, 29 March 1	March 1
Spring Quarter, 1980	March 10	May 25- June 1	March 11	March 11	May 20-23	May 24

Bauhaus Artist Josef Albers personally supervised the painting of the monumental wall murals conceived by him for the main lobby of RIT's George Eastman Memorial Building (details on Page 2).

The covers

The covers of this 150th Anniversary Year Graduate Study Bulletin depict the monumental wall murals originally conceived by Bauhaus Artist Josef Albers in oranges and yellows. The Administration Building's interior designer wanted them in tones of gray; and gray they were for a few weeks, to the displeasure of just about everyone who saw them. In the end Albers had his way, and though already an octogenarian, came to RIT to supervise their repainting personally. As pictured above, they cover the expansive north and south walls of the Administration Building entrance, and like two sentinel suns, greet hundreds of campus people and visitors each week.
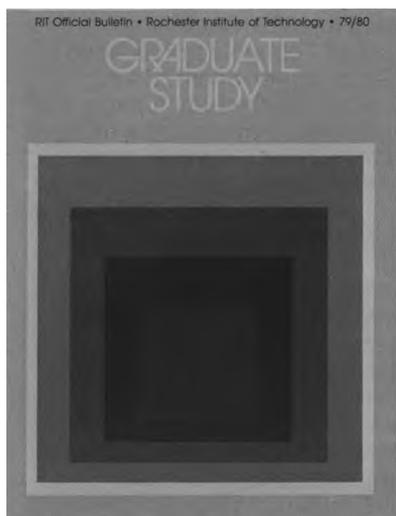
About this bulletin—
This Graduate Bulletin does not constitute a contract between the Institute and its students on either a collective or individual basis. It represents RIT's best academic, social, and financial planning at the time the Graduate Bulletin was published. Course and curriculum changes, 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 1979-80
Produced by RIT
Communications and the
Graduate Council

Write or phone:
Rochester Institute of Technology
Admission Office
One Lomb Memorial Drive
Rochester, NY 14623
(716) 475-6631

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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 consists of a modem 1,300 acre campus in suburban Rochester, The Eisenhower College campus in Seneca Falls, N.Y., and a 50 W. Main Street campus in the City of Rochester. The non-sectarian, co-educational, independent institute prepares students for technical and professional careers in a changing world. RIT consists of ten colleges: Business, Continuing Education, Eisenhower College (established as a living memorial to former President Dwight D. Eisenhower), Engineering, Fine and Applied Arts, Graphic Arts and Photography, Science, General Studies, Institute College and the federally funded National Technical Institute for the Deaf, the only national post-secondary technical college for the hearing impaired. RIT's world-of-work programs, developed and modified to meet industry's needs, are national and international in reputation.

Graduate Education At RIT

About 18 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 had been 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.

As a logical extension of RIT's long experience in technical education, a new area of graduate study for community and technical college faculty was also inaugurated. The Center for Community College Faculty Development was created to provide students with advanced knowledge in their technical specialty, and orientation to the objectives, programs, and philosophy of the two-year college, and those insights and skills required for teaching at the lower

division level. An interdisciplinary approach to graduate study was emphasized, since the educational objectives of two-year college faculty varied from those of traditional graduate students. Programs were made available in the fields of business technology and engineering technology.

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. Also, through the Center for Community/Junior College Relations, there is a new external degree, in cooperation with other graduate learning centers, leading to an MS in engineering technology. The center's most recent addition to its graduate programs is an MS in career information, designed for school, business, and industrial personnel.

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, Institute College now offers three new programs through its School of Computer Science and Technology. These are the MS in computer science, the MS in computer system management and the MS in information science.

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 Business	Master of Business Administration	Business Options Listed on page 22	0506	16
	Master of Science	Accountancy	0502	
College of Continuing Education	Master of Science	Applied and Mathematical Statistics	1702	28
College of Engineering	Master of Science	Electrical Engineering	0909	34
		Mechanical Engineering	0910	
	Master of Engineering	Engineering (EE, ME, IE)	0901	
College of Fine and Applied Arts	Master of Fine Arts	Ceramics and Ceramic Sculpture	1009	48
		Communication Design	1002	
		Environmental Design	1002	
		Glass	1009	
		Metalcrafts and Jewelry	1009	
		Painting	1002	
		Printmaking	1002	
		Weaving and Textile Design	1009	
		Woodworking and Furniture Design	1009	
	Master of Science for Teachers	All above areas plus Art Education	0831	
College of Graphic Arts and Photography	Master of Science	Printing Technology	0699	58
		Printing Education	0806	
	Master of Science for Teachers	Printing Education	0839	
	Master of Science	Photographic Science and Instrumentation	0999	
	Master of Fine Arts	Photography	1011	
College of Science	Master of Science	Chemistry	1905	72
		Clinical Chemistry	1223	
Institute College	Master of Science	Business Technology	0806	78
		Career Information	0826	
		Computer Science	0701	
		Computer Systems Management	0701	
		Instructional Technology	0699	
		Information Science	0702	
	Certificate	Information Science	0702	

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

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 30 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 this concern has arisen selective research projects and centers that aid education of students and the desire to provide continuing opportunities for professional growth. Research centers such as GARC (Graphic Arts Research Center) and the proposed Career Information Resource Center can also facilitate close relationships with those business, industrial, and academic units that have historically been central to the life of the Institute.

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 Admission Office, according to the following procedures:
1. Inquiries about, and applications for graduate study are directed to the Director of Admission, Rochester Institute of Technology, One Lomb Memorial Drive, Rochester, New York 14623.
2. The Admission 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 Admission Office will prepare an applicant folder for him or her. All correspondence and admission data will be collected by the Admission 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 Admission Office.
6. The Admission Office will notify the student of the admission decision.

Rochester Institute of Technology admits men and women of any race, color, national or ethnic origin, or marital status. RIT does not discriminate on the basis of handicap in recruitment and admission of students, the recruitment and employment of faculty and staff, and the operation of any of its programs and activities, as specified by federal laws and regulations. The designated coordinator for Institute compliance with Section 504 of the Rehabilitation Act of 1973 is James Papero.
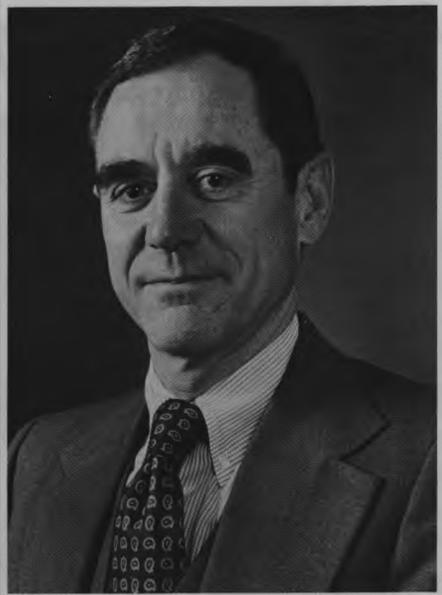
Dr. M. Richard Rose
Seventh President of RIT

"RIT means different things to different people. 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 educational programs.

"For its alumni, RIT hopefully has provided an opportunity to improve themselves and their families educationally, professionally, financially and socially.

"And, we hope, RIT also is something special to that vast majority in the Greater Rochester community who have never 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 and innovation.

"RIT is progressive and relevant. It always has been willing to take chances if chances were necessary to further its unique 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, we believe. 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. "They're programs designed to fill a specific need in their respective fields."

"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 computer management program. We perceived a real need for people to learn management skills as well as computer skills, and we didn't feel the need was being satisfied elsewhere. RIT has started a graduate program in career information for the same reasons."

Costs

On the date of publication, the tuition for graduate students pursuing a master's degree is:
  Full time (12-18 credit hours)-
  $ 1235/quarter
  Part-time (11 credit hours or less)-
  $105/credit hour
  Master of Science (CCE)-
  $77/credit hour
  Internship*-$39/credit hour

In addition, any graduate student carrying over 18 credit hours of study will be charged the full-time tuition rate plus $ 105/credit hour for each hour of study exceeding 18.

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, 1979; Winter Quarter, November 5, 1979; Spring Quarter, February 11, 1980; Summer Quarter, May 5, 1980. 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 price without prior notice.

*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 Institute College.

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

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% 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 acceptable reasons for withdrawal with refund during the quarter are:

Full refund:
1. Active military service: A student called to active military service during the first eight weeks of the term may receive a full tuition refund. If called after the eighth week, he may elect to complete the course by making special arrangements with both his instructor and department, or to withdraw and receive a full tuition refund. If he withdraws, he will have to repeat the course at a later date.
2. Academic reasons: Students sometimes register before grades for the previous quarter are available. If such a student later finds that he or she is subject to academic suspension, or had failed prerequisites, the student will be given a full refund upon withdrawal. It remains the student's responsibility to contact his or her department to assure that the withdrawal form and refund are properly processed.

Partial refund
A partial refund will be made during a quarter if withdrawal is necessitated for one of the following reasons:
1. Illness, certified by the attending physician, causing excessive absence from classes.
2. Withdrawal for academic reasons at the request of the Institute during a quarter.
3. Transfer by employer, making class attendance impossible.

4. Withdrawal for academic or personal reasons at the request of of the student; approved by the student's advisor or department representative, the Institute Coordinator for Academic Advising and the Bursar.

Tuition will be refunded according to the following schedule:
Withdrawal
During the first week of classes 90%
During the second week of classes 75%
During the third week of classes 60%
During the fourth week of classes 50%
Fifth and subsequent weeks No Refund

Withdrawal
A student is not "officially withdrawn" until he or she receives the student's copy of the withdrawal form. The date on which a withdrawal form is properly completed shall be the date of "official withdrawal" used to determine the refundable amount.

During the first week of classes 90% of *unused* room charge

During the second week of classes, 75% of *unused* room charge

During the third week of classes, 60% of *unused* room charge

During the fourth week of classes, 50% of *unused* room charge

Board charges will be refunded according to the following schedule:
During the first four weeks, 75% of *unused* board charge
After the first four weeks, 50% of the *unused* board charge

A specific rate schedule is available in the Housing Office.

Fees
Fees are not refundable.

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.

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

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.

Students enrolled in the external degree engineering technology area offered by the Center for Community/Junior College Relations are charged a $10 fee for each quarter of each academic year (not including summers), when not taking courses for credit at RIT under the normal tuition procedures. The charge is applicable after the student has been accepted into the external degree program. This fee is to partially defray the cost of committee time, correspondence, and faculty time needed for preparing and maintaining individual curriculum contracts.

Graduation Requirements

Credit hour requirements

The minimum credit requirements for a master's degree is 45* quarter credit hours (30* semester credit hours). A maximum of nine quarter credit hours with a grade of B or better (six semester credit hours) 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. 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. A program cumulative grade point average of 3.0 ("B" average) is required for graduation.

Thesis requirements

Included as a part of the total credit hour requirement is a research and thesis requirement as specified by each department.

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 his or her registration 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. It should be noted that some departments have requirements in place of a thesis.

Candidacy for an advanced degree

A graduate student must be a candidate for an advanced degree for at least one academic 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 being 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.

All RIT degree candidates are required to file an application with the Registrar's Office for graduation.

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 on the thesis, and a summary conference are examples of forms which would be appropriate 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.

Full- to part-time status

If a student drops his or her course load from full-time (12 or more credits) to part-time (less than 12 credits) status during the Official Drop Period, he or she may contact the Bursar for a refund based on the differential between the full-time tuition payments and the total per credit charge for the part-time load. Courses dropped after the Official Drop Period will not result in a tuition refund.

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 grade reports, transcripts, or other forms of recognition or recommendation from the Institute.

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

*For the College of Fine and Applied Arts, 48 quarter credit hours is the minimum for the MST degree, and 85 quarter credit hours is the minimum for the MFA degree. Other colleges such as the College of Business also require more than the minimum of 45 quarter credit hours.

Student Services

The Wallace Memorial Library
The Wallace Memorial Library is a true multi-media learning center with expanded services and innovative procedures to increase its usefulness.

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.

Automobile registration
Those students having automobiles on campus must register these vehicles with the Protective Services Department at the time they first register for classes, or upon bringing the automobile onto campus for the first time.
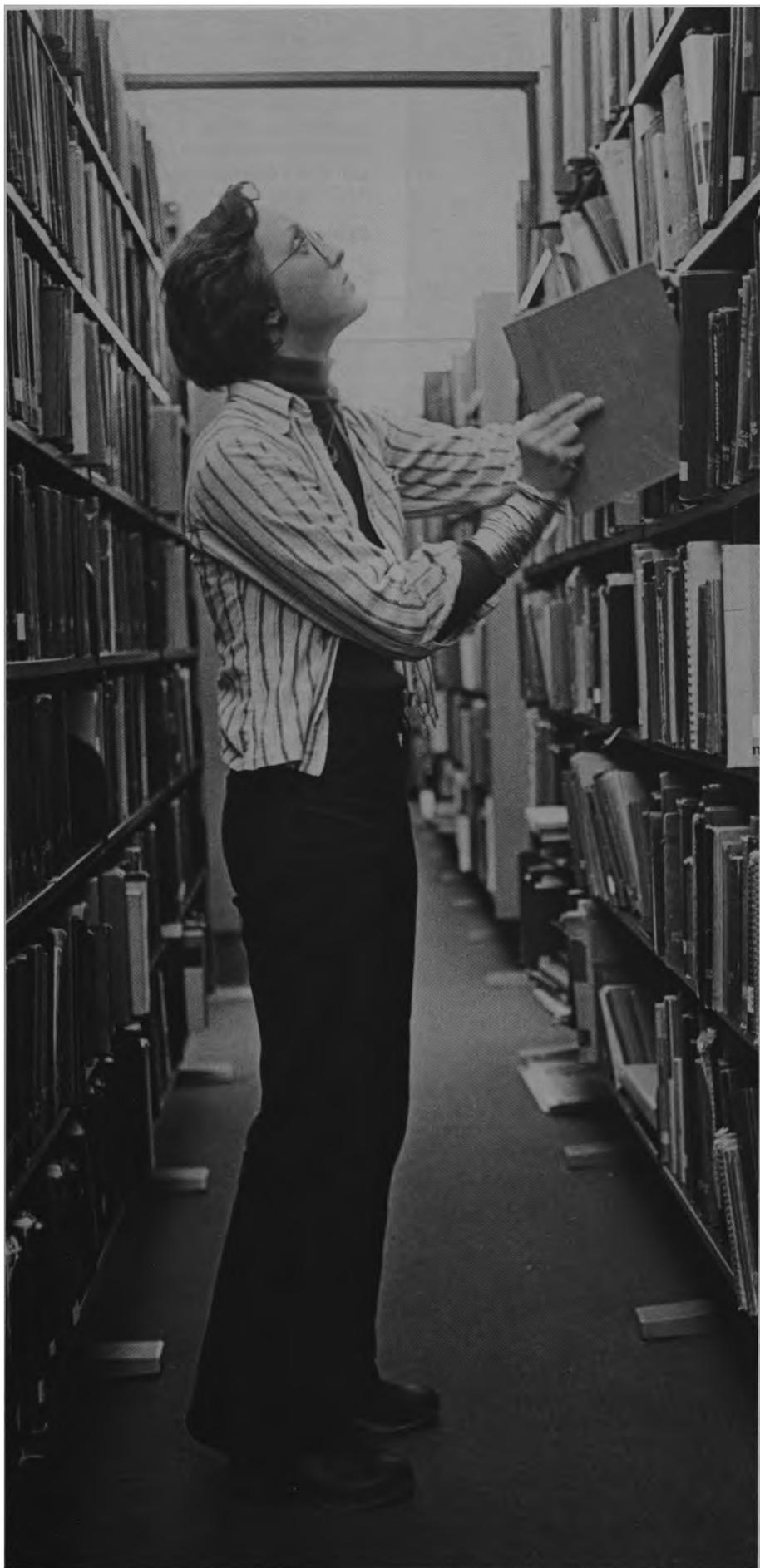
Gary MacMillan

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.

And so, Wallace Library has phased out the traditional clumsy card catalog in favor of a microfiche system. "The entire card catalog," MacMillan says, "can be held in a notebook."

Other 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 Orientation Office at 716-475-2070 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.

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

The Institute Student Health Service maintains out-patient services at the Health Center on the second floor of the Eastman Building. A nurse and physician are on duty Monday through Friday during the daytime hours posted at the Health Center. The usual out-patient services are rendered to students without charge while they are attending the Institute. Other medical expenses are the responsibility of the student. The student should bring his or her Blue Cross-Blue Shield or other prepaid medical plan identification card to the Center.

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 any time.

Course numbering

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

The alpha-numeric course number 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 number 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

Course Number

FADF-001

- Course Sequence
- Course Level
- Discipline
- School of Art and Design
- College of Fine and Applied Arts

0404-001

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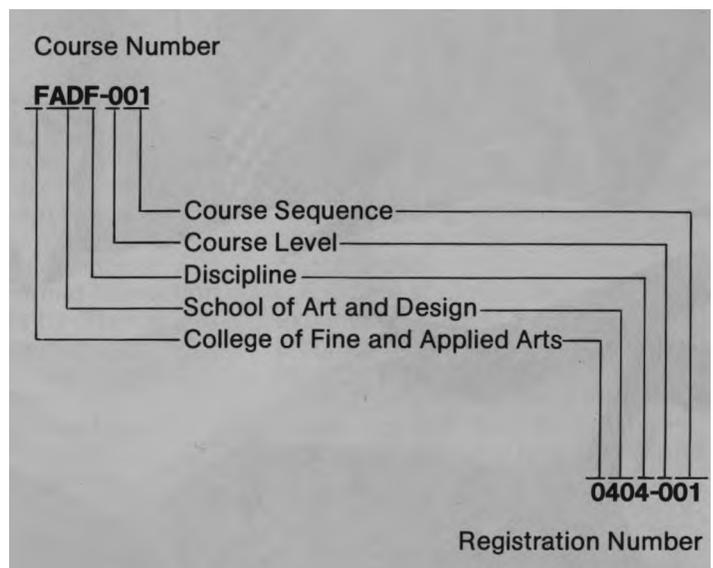
Directly below the alpha-numeric number in the course description is the **registration number.** You must use this number with a section number (i.e. 01, 02) when you register for a course, because the alpha-numeric number cannot be read by the computer system. Course prerequisites are shown in parenthesis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

College of Business

Dean C. Siewers, Director, Graduate Programs (475-2256)

RIT's graduate programs in management include the master of business administration and the master of science with an emphasis in accountancy. 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 common 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 gears its graduate management and accounting programs to education in sophisticated analytical techniques. In addition, an effective manager must have an appreciation for the behavioral facets of his or her position. The faculty arranges courses and experiences that offer the requisite knowledge necessary for a leadership role in business and government.

The College of Business is housed in the George Eastman Memorial Building on RIT's Henrietta campus. Facilities include a Learning Support Center, time-sharing computer terminals on-line with RIT's Sigma 9 computer, 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; a base from which the individual 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 common element found in 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.

While the MBA degree was originally conceived for education in the profit-oriented business discipline, this is no longer the only area where broad based managerial talent can be employed to advantage. Whether you are running a business, government agency, social service organization, school or other non-profit group, management is the key to success. The MBA program presents a body of knowledge that provides a foundation common to both profit and non-profit organizations and then allows the student to explore concentrations suited to his or her particular desires. In its early stages, the program includes courses in basic management skills. At the intermediate level, the student is exposed to forces influencing decisions. Advanced courses allow application of previously acquired skills to specialized areas as well as the integration of the various management functions.

To accomplish program objectives, the curriculum will provide:
1. education in the basic tools needed for management decision making;
2. a background in the functional areas of marketing, finance, accounting, and management;
3. an understanding of the environment in which business operates;
4. an opportunity to develop a specialty with the broad foundation of required courses by offering concentrations in accounting, finance, marketing, management, and decision sciences;
5. an opportunity to practice management problem solving through the use of cases, computers, simulation, gaming, and other dynamic management techniques;
6. an opportunity to integrate fundamental and advanced knowledge through course work and job experiences.

Full-time program

The full-time MBA program allows two possible routes to the degree. 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. After a thorough grounding in tools and foundations, the student pursues a course in each of the functional areas. Simultaneously with functional courses, a major area may be explored by concentrating in a sequence of option area courses. The particular major area may also influence the minimum time in school. Alternatively, a general business option may be completed by selecting appropriate free electives. Details on available programs will be found in the following material. 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 business and non-profit organizations, both locally and nationally. 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 Division for more information. In order to gain academic credit for a management internship, a research paper is required and the internship must be approved by the director of the Graduate Business Programs prior to its start.

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

Part-time program
In addition to full-time study, all graduate programs are available on a part-time basis, with courses offered in the evening and on Saturday. 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 normal course load for the part-time student is two courses per quarter, permitting program completion in approximately two years if no courses are waived. Credit hour requirements and curriculum will be found in the following material. Normally the student should complete the program within seven years of initial registration.

Graduate programs in Accountancy

The increasing demands on the professional accountant have produced a need for a broad, extensive 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.

These two programs are registered with the New York State Education Department. This means that graduates 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.

Proper selection of electives within an accounting program will also prepare a student for a number of possible accounting careers other than in public accounting. Not only has the curriculum been designed to help prepare students for the Certificate in Management Accounting examination as administered by the Institute of Management Accounting of the National Association of Accountants, but also the student has the opportunity to gain an in-depth knowledge in taxation, international accounting, and accounting for non-profit organizations, by electing courses in a seminar series. Students desiring to pursue an accounting major must notify the Graduate Office to insure 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 with or without an extensive background in accounting or business at the undergraduate level. The program normally 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 with an emphasis in accountancy is an intensive 48 quarter credit hour program and is specifically designed for students with 28 to 32 undergraduate quarter credit hours of accounting in their bachelor's degree program who desire to continue their accounting studies at an advanced level. Those students lacking the prerequisite undergraduate hours in accounting may still pursue the MS degree by making up those courses, on an accelerated basis, in which they are deficient. This program also 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.

Programs prepare students to 'go out and manage'
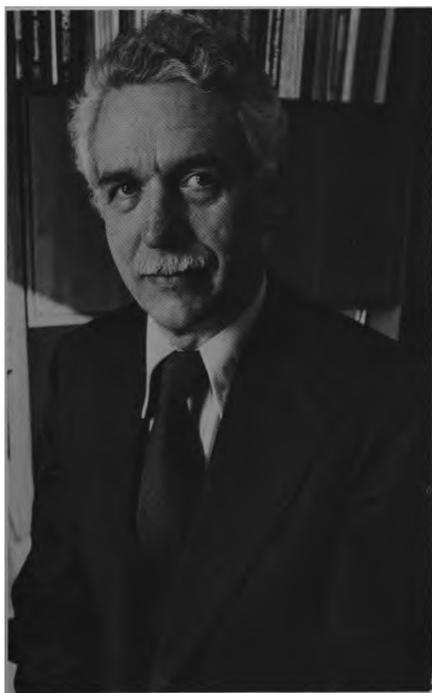
Dr. Dean C. Siewers

"We want students to go through one of our management programs and then be able to go out and manage-to apply what they've learned directly on their jobs and to continue their management growth," says Dr. Dean C. Siewers, director of Graduate Business Programs at RIT.

"We're a very 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 think we're tuned in to what people in business need to know to achieve success in their careers," he says.

He must be right.

RIT graduated its first class of graduate business students in 1970 and the classes have grown consistently since then. During the past academic year, more than 600 students were enrolled. And, Siewers says, full-time enrollment in the program is steadily increasing.

"We think there's a trend for people who've done undergraduate work in other areas-like social work or graphic arts or liberal arts or engineering-to come over and enroll for a graduate program in business because they see a need not only to be able to do what they do well, but to be able to manage others in the same field.

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

The faculty in the College of Business, Siewers said, brings to the classroom a blend of high 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.

"We think it's important for everyone on the faculty to be exposed to all the students as they come here, and not be shelved with any particular group. It's good for both the faculty and the students."

Siewers is a graduate of Marietta College (BS, physics and mathematics), Duke University (MBA, finance and marketing), and the University of North Carolina (Ph.D., marketing). He has been at RIT since 1976, and has been acting director of Graduate Programs since 1978. Prior to coming to RIT, he had extensive industrial experience in domestic and international spheres.

Admission

Any student who wishes to study in the graduate business programs must first be admitted to one of the graduate programs. 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, through their achievements in their undergraduate program, through the results of the Graduate Management Admission Test, and applicable professional experience, their potential to successfully complete graduate business studies.

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, also.

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.

Procedures

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

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.
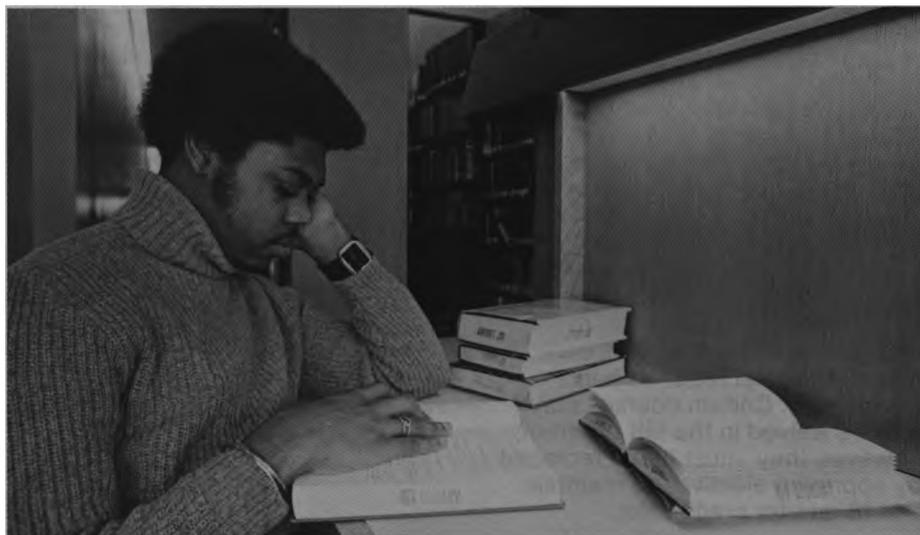
Financial aid
Graduate research assistantships are available to deserving full-time graduate students. Assistants work with faculty on research projects, thus enhancing their education, and receive in turn tuition remission. The amount of the grant is dependent upon the nature of the appointment. Interested individuals should write to the director, 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.

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
RIT maintains a fully staffed Central Placement Service. Students seeking employment after graduation should register with the Placement Service 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. The Placement Service is located in the administration building.

Credit hour requirements
Credit hour requirements vary depending on the particular program and a student's prior academic achievements. A maximum of 72 quarter credit hours are required in the master of business administration program* The master of science with an emphasis in accountancy program requires a maximum of 48 quarter credit hours. Each course carries four quarter credit hours. In certain cases, total credit hours 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 program, carrying grades of "B" or better, may waive up to 24 quarter credit hours and thus reduce the total required hours accordingly. Certain courses may also be waived in the MS program; however, they must be replaced by approved electives to maintain the 48 quarter credit total.

Ordinarily, courses eligible for waiver will be those commonly referred to as foundation or tool courses. Elective courses cannot be waived.

Transfer credit
A maximum of nine quarter credit hours (six semester credit hours) may be awarded as transfer credit from other graduate programs provided the courses in question carry a grade of "B" or better. This applies to both the MBA and MS programs. Courses designated for transfer must not have been used for any other degree, and must be relevant to the MBA program. However, courses that are required for both degrees may be waived for replacement by other advanced courses. In some cases, transfer credit may be granted if residency requirements at the professional level are also met. All such cases will be governed by current graduate policy at the time application for waiver is made. 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. Any questions concerning waiver or transfer credit should be referred to the director, Graduate Business Programs.

Grade requirements
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. Graduate course credit cannot be given for undergraduate courses taken while in the graduate program. If at any time a student's average falls below "B", he or she will be placed on probation and must raise the average back to a "B" level within the next 12 credit hours or face suspension from the program. In addition, failure in any course at any time in the program or the demonstration of other unacceptable academic performance may result in a faculty recommendation that the director review a student's case and take appropriate action.

Incomplete grades may be given when a student has justifiable reasons for not completing course requirements during the quarter he or she is registered for the course. Incomplete grades must be removed by the second quarter following that in which the "Incomplete" grade was given. If the Incomplete is not removed within two quarters, the student will receive a failing grade for the course, possibly necessitating retaking the course.

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.

Curriculum
The master of business administration curriculum is designed so that a student will progress through the program in a logical sequence while allowing for maximum flexibility. Three curriculum phases are evident in the accompanying model. 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.

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, applied decision sciences, finance, management, marketing or general business. These options are illustrated in the following example programs. Except for the registered accounting programs, these options are not indicated by title on the transcript or degree itself.

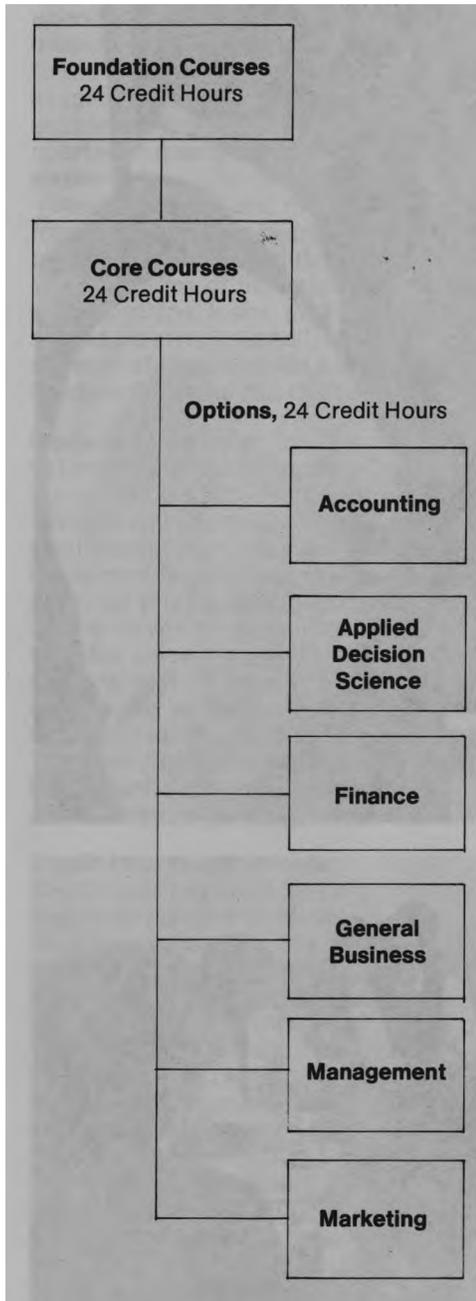*See *additional requirements in Accounting option— CPA preparation.*

**Credit offerings subject to same time restriction as program courses.*

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 director of Graduate Business Programs.

Master of Business Administration curriculum

Foundation Courses
24 Credit Hours

Core Courses
24 Credit Hours

Options, 24 Credit Hours

- Accounting
- Applied Decision Science
- Finance
- General Business
- Management
- Marketing

Foundation Courses: Phase I

Course Number and Title	Credit Hours
BBUA-701 Financial Accounting	4
BBUB-744 Behavioral Science in Management	4
BBUF-745 Economic Environment of American Business	4
BBUQ-781 Statistical Analysis I	4
BBUQ-782 Statistical Analysis II	4
BBUQ-792 Concepts in Computer Utilization*	4
	~24

Core Courses: Phase II
(Prerequisites listed in parentheses)

Course Number and Title	Credit Hours
BBUA-702 Cost and Managerial Accounting (Phase I)	4
BBUF-722 Financial Management (Phase I)	4
BBUB-741 Management and Organization (Phase I)	4
BBUB-743 Operations Management (Phase I)	4
BBUM-761 Marketing Concepts (Phase I)	4
BBUB-759 Integrated Business Analysis (All other Phase II courses)	4
	~24

Option Courses

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 director of Graduate Business Programs. In addition to elective courses, students may earn up to eight hours of Research Option credit in fulfilling elective requirements.

	24
Total hours	72

Note that the required foundation courses must be completed before a student attempts core or option courses.

This course offering and structure is under current review. Students entering in the Fall Quarter of 1979 and later should consult the MBA Program Office for applicable course requirements and description.

Accounting Option-CPA Preparation
(Prerequisites listed in parentheses)
(Accounting programs may exceed 72 hours)

Course Number and Title	Credit Hours
*BBUA-704 Accounting Theory I (Phase I)	4
*BBUA-705 Accounting Theory II (BBUA-704)	4
BBUA-707 Advanced Accounting and Theory (BBUA-705)	4
BBUA-708 Auditing (BBUA-705)	4
**BBUA-709 Basic Taxation Accounting (Phase I)	4
BBUB-751 Legal Environment of Business (Phase I)	4
BBUF-724 Problems in Financial Management (BBUF-722)	4
	~28

Note: If BBUF-745, Economic Environment of American Business is waived, it must be replaced by a graduate level economics elective if the student wishes to qualify for the New York State Uniform Certified Public Accounting Examination. Students deficient in undergraduate economics may be required to complete two graduate economics courses making the maximum possible total program 80 quarter hours for CPA preparation.

*Can be waived with 28 to 32 undergraduate quarter credit hours in accounting. If waived, other approved electives must be taken. **Can be waived on the basis of an equivalent undergraduate tax course. The approved elective to be substituted must be a graduate level tax course.*

Applied Decision Science Option*
(Prerequisites listed in parentheses)

Course Numbers and Title	Credit Hours
BBUB-770 Business Research Methods (Phase I)	4
BBUQ-778 Probability Theory (Differential and Integral Calculus**)	4
Four courses from Group A or other quantitative electives approved by Graduate Program director	16
	~24

Group A
BBUB-747 Systems Administration (Phase I)
BBUB-790 Information Systems (BBUB-743)
BBUQ-784 Decision Theory (BBUQ-778)
BBUQ-786 Operations Research-Mathematical Programming (BBUQ-743)
BBUQ-787 Operations Research-Probabilisitc Models (BBUQ-778)
BBUQ-789 Simulation (Phase I)

This option is currently being revised; certain decision science courses may not be offered in the current year.

**No credit will be given for calculus in the MBA program. The calculus requirement may be satisfied by courses taken at the baccalaureate level prior to or concurrently with the graduate program.*

Finance Option
(Prerequisites listed in parentheses)
Credit
Course Number and Title Hours
BBUF-723 Theory of Finance
  and Research (BBUF-722) 4
BBUF-724 Problems in Financial
  Management (BBUF-722)   4
BBUF-725 Securities and
  Investment Analysis
  (BBUF-722)   4
One course from Group A   4
One course from Group B   4
One graduate elective from the
  College of Business or approved
  by Graduate Programs director   4
                                 24

Group A
BBUF-767 Advanced
  Microeconomic Theory (Phase I)
BBUF-768 Advanced
  Macroeconomic Theory (Phase I)
Group B
BBUA-704 Accounting
  Theory (Phase I)
BBUF-729 Seminar in Finance
  (various; permission of director)

General Business Option
(Prerequisites listed in parentheses)
Credit
Course Number and Title Hours
One course from Group A   4
Five graduate electives from the
  College of Business or approved
  by Graduate Programs director 20
                                 24
Group A
BBUB-770 Business Research
  Methods (Phase I and BBUM-761)
BBUA-707 Advanced
  Accounting and Theory
  (BBUA-704)
BBUF-723 Theory of Finance and
  Research (BBUF-722)

Management Option
(Prerequisites listed in parentheses)
Credit
Course Number and Title Hours
BBUB-748 Labor/Management
  Problems (Phase I)   4
BBUB-770 Business Research
  Methods (Phase I)   4
Completion of courses in Group
  A or Group B   16
                                 24

Group A: Organization and Human
  Resources
BBUB-746 Seminar in Management
  Development (BBUB-741)
BBUB-750 Personnel Systems
  (Phase I)

BBUB-758 Seminar in Management
  (various; permission of director)
One graduate elective from the
  College of Business or approved
  by Graduate Programs director

Group B: Environmental Policy and
  Analysis
BBUB-742 Business and Society
  (Phase I)
BBUB-751 Legal Environment of
  Business (Phase I)
Two graduate electives from the
  College of Business or approved
  by Graduate Programs director

Marketing Option
(Prerequisites listed in parentheses)
Credit
Course Number and Title Hours
BBUM-762 Advanced Marketing
  Management (BBUM-761)   4
BBUF-767 Advanced
  Microeconomic Theory
  (Phase I)   4
BBUB-770 Business Research
  Methods (Phase I)   4
Two courses from Group A   8
One graduate elective from the
  College of Business or approved
  by Graduate Programs director   4
                                 24

Group A
BBUM-763 Seminar in Consumer
  Behavior (BBUM-761)
BBUM-764 Marketing Logistics
  (BBUM-761)
BBUM-766 International Marketing
  (BBUM-761)
BBUM-769 Seminar in Marketing
  (various; permission of director)
BBUF-757 Seminar (Business
  Forecasting)

Master of Science in Accountancy curriculum

Foundation Courses: Phase I*
(Prerequisites listed in parentheses)
Credit
Course Number and Title Hours
BBUB-744 Behavioral Science
  in Management   4
BBUF-745 Economic Environment
  of American Business   4
BBUQ-781 Statistical
  Analysis I   4
BBUQ-782 Statistical
  Analysis II   4
                                 16

Advanced Courses: Phase II*
(Foundation courses must be
completed before taking advanced
courses)
Credit
Course Number and Title Hours
BBUB-741 Management
  and Organization   4
BBUF-724 Problems in
  Financial Management   4
BBUA-707 Advanced
  Accounting and Theory   4
BBUA-708 Auditing   4
BBUA-710 Advanced Taxation
  Accounting   4
BBUA-712 Seminar in Accounting
  (various; permission of
  director)   4
Approved Electives   8
                                 32

                                 48

*Phases I and II course requirements are currently
under review. Students entering in the Fall Quarter of
1979 and later should consult the MBA Program
Office for applicable course requirements and
descriptions.*

If eight quarter credit hours of
business law and/or eight quarter
credit hours of finance were not
completed at the undergraduate
level, BBUB-751, Legal Environment
of Business and/or BBUF-722,
Financial Management, must be
part of the approved electives.
Foundation courses are waivable
with appropriate undergraduate
background. However, any courses
waived must be replaced with
approved courses to maintain the
48 quarter credit hours minimum. If
BBUF-745, Economic Environment
of American Business, is waived, it
must be replaced with a graduate
level economics elective. The
suggested course is BBUF-765.

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
Emphasizes 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. (Foundation courses).

Credit 4 (offered each year.)

BBUA-704   **Accounting Theory I**
Registration #0202-704
Theory and practice of accounting for assets based upon the latest pronouncements of the APB and FASB. Study of alternative valuation systems and their impact on income and financial position is the central focus of each asset category as it is studied in detail. (Foundation courses).

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 or admission to MS program).

Credit 4 (offered each year.)

BBUA-708   **Auditing**
Registration #0101-708
The theory and practice of advanced public accounting are 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 or admission to MS program).

Credit 4 (offered each year.)

BBUA-709   **Basic Taxation Accounting**
Registration #0101-709
A study of the basic field of federal income taxation is undertaken emphasizing its importance in business decisions and policies: application of income taxation to individuals, partnerships, and corporations is examined; income tax and accounting concepts affecting revenues and deductions are compared, including concepts of gross income, basis, recognition of gain and loss, capital asset transactions, exemptions and deductions. (Foundation courses or admission to MS program).

Credit 4 (offered each year.)

BBUA-710   **Advanced Taxation Accounting**
Registration #0101-710
A study of federal income taxes with special emphasis on corporate tax problems affecting business decisions and policies, including corporate reorganizations, personal holding companies, dividends, liquidations, capital gains transactions, federal gifts and estate taxes; tax planning and management. (BBUA-709 or admission to MS in accountancy).

Credit 4 (offered upon sufficient demand.)

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 director of Graduate Programs).

Credit 4 (offered upon sufficient demand.)

Business group

BBUB-741   **Management and Organization**
Registration #0102-741
Analysis and description of management principles and processes from the classical and behavioral viewpoints. Study of organizations and organizational change from the structural, systematic, and humanistic perspectives. Text and reading of original sources supplemented by case analysis and/or research paper. (Foundation courses).

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. (Foundation courses)

Credit 4 (offered each year.)

BBUB-744   **Behavioral Science in Management**
Registration #0102-744
The implications of studies from the fields of psychology are discussed; problems in perception, motivation, social interaction, group dynamics, attitudes and values are stressed. Lecture, discussion, case studies and emphasis on critical analysis and interpretation of original research readings.

Credit 4 (offered each year.)

BBUB-746   **Seminar in Management Development**
Registration #0102-746
Concepts of individual 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 at 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. (Foundation courses).

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. (Foundation courses).

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 accounting decisions. (Foundation courses).

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 director of Graduate Programs).

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).

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. (Foundation courses).

Credit 4 (offered each year.)

BBUB-771, 772   **Research Option**
Registration #0102-771,-772
A thesis course requiring the student to confront a real business problem. Requirements include steps from design to completed management report. (Core courses and one of the following: BBUB-770, BBUA-718, BBUF-723, BBUQ-784).

Credit 8 (offered upon sufficient demand.)

BBUB-790   **Information Systems**
Registration #0102-790
The concepts and techniques for the design and implementation of a computer-based management information system are studied. Topics include systems theory, the generation and collection of data, the transformation of information, and the economics of information. (BBUB-743).

Credit 4 (offered upon sufficient demand.)

Finance group

BBUF-722   **Financial Management**
Registration #0104-722
A broad coverage of business finance with emphasis on the analytical techniques of resource allocation and asset management. Covers securities and securities markets, capital structure, analysis of financial statements, financing business operations, cost of capital and capital budgeting. (Foundation courses).

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).

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-722).

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 director).

Credit 4 (offered upon sufficient demand.)

BBUF-745 Economic Environment of American Business
Registration #0104-745
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.

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 director).

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; micro-economic 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
An in-depth 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   **Seminar in Consumer Behavior**
Registration #0105-763
A study of the market in terms of the psychological and socio-economic determinants of the buyer's behavior, including current trends in purchasing power and population movements. (BBUM-761).

Credit 4 (offered upon sufficient demand.)

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-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-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. (Foundation courses, BBUM-761)

Credit 4 (offered each year.)

Quantitative group

BBUQ-778   **Probability Theory**
Registration #0106-778
A calculus-based introduction to probability theory. The course includes set theory, theorems, axioms, and concepts of probability, discontinuous and continuous distributions, moment gener-ating functions and probability generating functions. (Differential and Integral Calculus and Foundation courses).

Credit 4 (offered upon sufficient demand.)

BBUQ-781   **Statistical Analysis I**
Registration #0106-781
A study of probability and classical statistics including set theory, discrete and continuous probability distributions, sampling distributions, point estimation, and hypothesis testing. Applications are made to the managerial decision making situation.

Credit 4 (offered each year.)

BBUQ-782   **Statistical Analysis II**
Registration #0106-782
A continuation of topics from classical statistics including interval estimation, nonparametric tests, analysis of variance, regression and correlation analysis, time series, and index numbers. (BBUQ-781).

Credit 4 (offered each year.)

BBUQ-783   **Bayesian Decision Analysis**
Registration #0106-783
An introduction to decision theory for managerial decision situations with a strong emphasis on Bayesian decision analysis. Topics include modeling, principles of choice, the expected opportunity loss, the expected value of information, revision of discrete and continuous prior distributions, the expected value of sample information, optimal sampling, utility functions, and decision diagramming. (BBUQ-782) (Not open to decision science majors).

Credit 4 (offered upon sufficient demand.)

BBUQ-784   **Decision Theory**
Registration #0106-784
The decision theory approach to decisions under uncertainty is examined. The modeling of business decision situations, the utilization of utility theory, and the application of various principles of choice are considered. The Bayesian approach to decision theory is primarily emphasized. (BBUQ-778).

Credit 4 (offered upon sufficient demand.)

BBUQ-786 Operations Research—Mathematical Programming
Registration #0106-786
An introduction to the application of operations research techniques to business decision making. Specific topics covered are linear programming, algebraic and geometric concepts, simplex method, sensitivity testing and duality, optimization, dynamic programming and integer programming. (BBUB-743).

Credit 4 (offered upon sufficient demand.)

BBUQ-787   **Operations Research—Probabilistic Models**
Registration #0106-787
An introduction to the use of probability in operations research models. Probabilistic techniques are applied to the problems of forecasting, capital budgeting, PERT, inventory, queueing and Markov processes. (BBUB-778).

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. (Foundation courses).

Credit 4 (offered upon sufficient demand.)

BBUQ-792   **Concepts in Computer Utilization**
Registration #0106-792
An introduction to the use of computers in problem solving. Students are exposed to BASIC programming language. Computer systems and their use in business are examined.

Credit 4 (offered each year.)

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 director of Graduate programs).

Credit 4 (offered each year.)

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Thomas R. Burns, J.D., Notre Dame-Lecturer, Law

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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, theses 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 is 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 or are not 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:
Dean of Admission
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 as well to use the computer as ways to improve their knowledge.

Location

Courses are offered at the Henrietta campus, at selected off-campus locations, and at in-plant training facilities. Special arrangements are made for training for various engineering certification

examination granted by the American Society for Quality Control. Those students pursuing individual courses of special interest work under the independent study option, 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 or are not 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 Henrietta 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 fulltime and some fifteen 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[7]

"Security is an illusion; the only real security people have is their trade," says Dr. Austin J. Bonis, chairman of the graduate statistics 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 for adequacy of a proposed probability model; learning how to separate total variability of a system into identifiable components through analysis of variance; regression and correlation models for studying the relationship of a response variable to one or more predictor variables. (All standard statistical tests) (CTAM-711 or equivalent.)

(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-741 **Techniques for Investigational Analysis**
Registration #0240-741
Studies of special statistical techniques applicable to industrial, educational, accounting, medical, and business-type problems. Helpful to those doing research in these fields.
Topics: use of special probability papers, profit analysis, sensitivity testing, order statistics and extreme value applications, analysis of means, goodness of fit tests, and special plotting techniques. (CTAM-712 or equivalent.)

Credit 3 (not offered in 1979-80.)

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.)

CTAM-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-811 **Probability Theory and Applications I**
Registration #0240-811
How to handle processes that have some chance element in their structure.
Topics: review of basic concepts of mathematical theory; Markov sequences; Poisson processes, and discrete parameter random processes; applications. (CTAM-822 or equivalent.)

Credit 3 (not offered in 1979-80.)

CTAM-812 **Probability Theory and Applications II**
Registration #0240-812
Continuation of CTAM-811, with more on stochastic processes.
Topics: algebraic methods useful for solving Markov chains, non-finite and continuous Markov chains, limiting distributions, and an introduction to queuing theory. (CTAM-811 or equivalent.)

Credit 3 (not offered in 1979-80.)

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.)

CTAM-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. (CTAM-821 or equivalent.)

Credit 3 (offered in Winter Quarter.)

CTAM-823 **Theory of Statistics III**
Registration #0240-823
Continuation of CTAM-821, 822.
Point estimation theory and applications, the multivariate normal probability model, its properties and applications; interval estimation theory and applications. (CTAM-822 or equivalent.)

Credit 3 (offered in Spring 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, as 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-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.)

CT AM-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.)

CT AM-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 Seminars I & II**
Registration #0240-861, -862
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 I**
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.)

CT AM-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.)

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

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

Wilma Priester, BS, Prairie View A&M; MS, Rochester Institute of Technology

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

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

A. Said El Shami, BS, MS, The American University in Cairo

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

Joseph Tsiakals, BS, MS, Bradley University

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

Faculty

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

Thomas B Barker, BS MS Rochester Institute of Technology

Larry P. Chapman, BS, North Carolina State; MS, Rochester Institute of Technology

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Richard A. Garth, BS, University of Rhode Island; MS, Rochester Institute of Technology

Robert Kringle, BS, MS, University of Wisconsin

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

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

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

College of Engineering

Richard A. Kenyon, Dean
Swaminathan Madhu, Director of Graduate Programs

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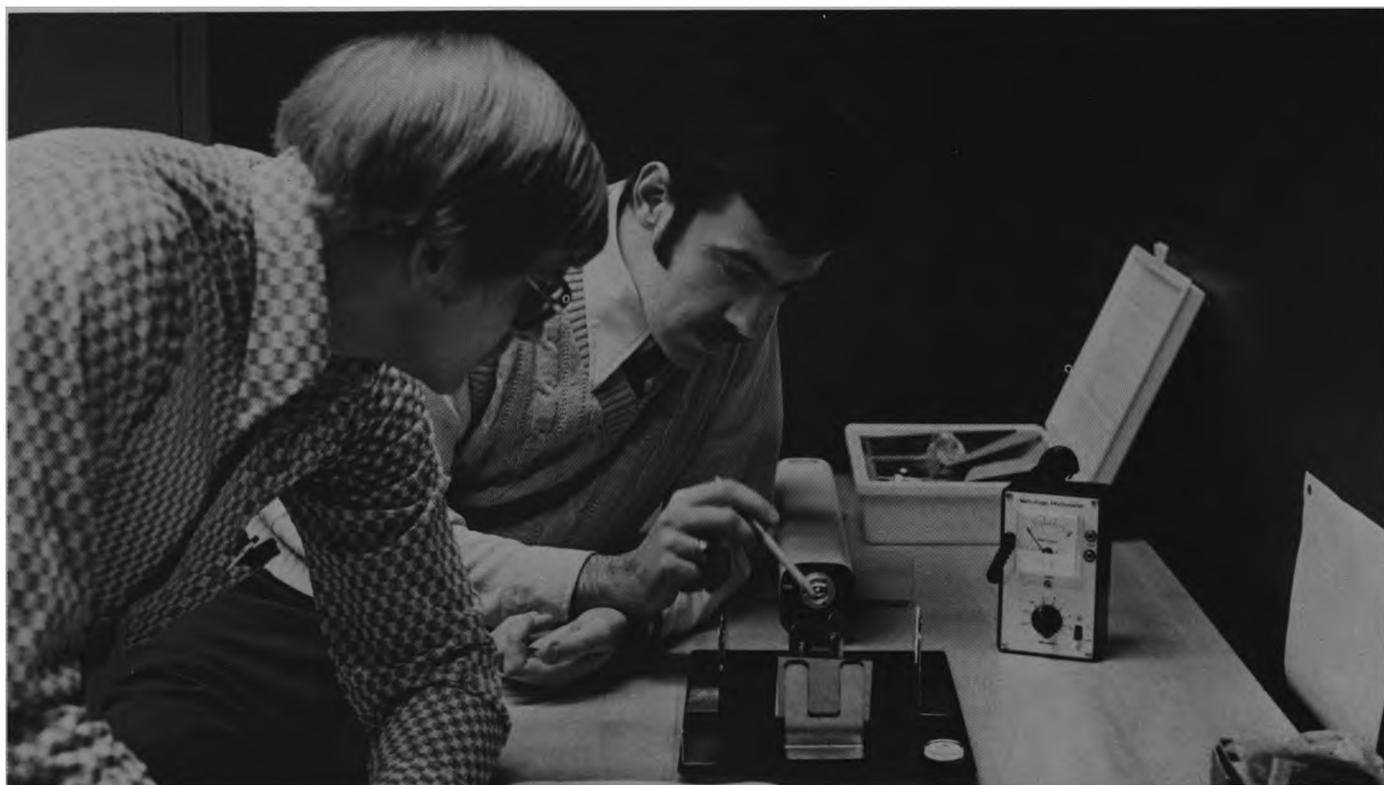
Full-time study
Even though graduate programs in engineering serve the need of a large number of practicing engineers who wish to pursue a part-time program, the different programs may also enroll full-time graduate students. A full-time student may take up to 16 credits per quarter.

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 using a combination of video tapes and in-person discussion sessions.

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.

Applicants whose past performance does not satisfy all conditions of admission but who appear to merit a trial period will be admitted and reviewed after the completion of 16 credit hours of graduate level work.

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 (or six semester credits) 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 on the following pages.

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 a student's average falls below a "B", or if he or she fails in 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.

RIT's Solar Energy House

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 and carefully chosen cooperative, 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 specially developed 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 position 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 adrr>ission and the selection procedure will be essentially similar to those for the MS degree programs. However, the number of full-time students admitted into the program will be limited by the number of internship positions available.

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 progam.

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.

For information
General questions of 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 475-2166 (Dr. Halbleib)
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 31 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 1979 and every odd-numbered year
EEEE-700 Linear Systems I
EEEE-718 Statistical Design of Control Systems
EEEE-736 Information Theory
EEEE-743 Minicomputer Fundamentals
EEEE-750 Logic Design of Digital Systems I

Winter 1980 and every even numbered year
EEEE-701 Linear Systems II
EEEE-702 Introduction to Random Variables and Signals
EEEE-719 Sampled Data Control Systems
EEEE-740 Digital Integrated Circuits
EEEE-744 Microprocessors
EEEE-751 Logic Design of Digital Systems II

Spring 1980 and every even-numbered year
EEEE-708 Passive and Active Filter Design
EEEE-713 Modern Control Theory
EEEE-721 Thyristor Power Control and Conversion
EEEE-737 Random Signals and Noise
EEEE-752 Logic Design of Digital Systems II

Fall 1980 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 Minicomputer Fundamentals

Winter 1981 and every odd-numbered year
EEEE-701 Linear Systems II
EEEE-702 Introduction to Random Variables and Signals
EEEE-722 Control Systems Design
EEEE-734 Communications Techniques
EEEE-738 Physics of Semiconductor Devices
EEEE-744 Microprocessors

Spring 1981 and every odd-numbered year
EEEE-713 Modern Control Theory
EEEE-716 Digital Signal Processing
EEEE-735 Digital Data Transmission
EEEE-739 Integrated Circuit 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

Robert M. Desmond, 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 of 45 quarter credits. A minimum of 33 credits are to be earned in course work, while the thesis-when required-carries a minimum of four credits and a maximum of 12 credits.

Thesis option
There are five options offered by the department with regard to completing the requirements of the master of science degree. Each student is free to select either a research thesis, design thesis, literature thesis, project option, or additional work with a comprehensive examination. Detailed information can be obtained from the department head.

Each student completing a thesis will be required to pass, as a minimum, an oral examination on the thesis subject. Students in a non-thesis program will be required to pass a comprehensive examination in their major field. This examination 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-800 Applied Engineering Analysis I	4
EMEM-801 Applied Engineering Analysis II	4
EMEM-810 Introduction to Continuum Mechanics	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.

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 majority of a student's program will be developed from the mechanical engineering graduate courses. However, 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 descriptions as EMEM-6XX. However, a maximum of two such courses are allowed for graduate credit. 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 following 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 $2,500 per academic year. Applicants for financial aid should write directly to the department head for details.

Course calendar
The courses Introduction to Continuum Mechanics, EMEM-810; Applied Engineering Analysis I, EMEM-800; and Applied Engineering Analysis II, EMEM-801 are offered in the fall, winter, and spring quarters, respectively, each year. Other courses in mechanical engineering are generally given in alternate years. For further information on current course offerings, the student should contact the office of the Mechanical Engineering Department (475-2163).
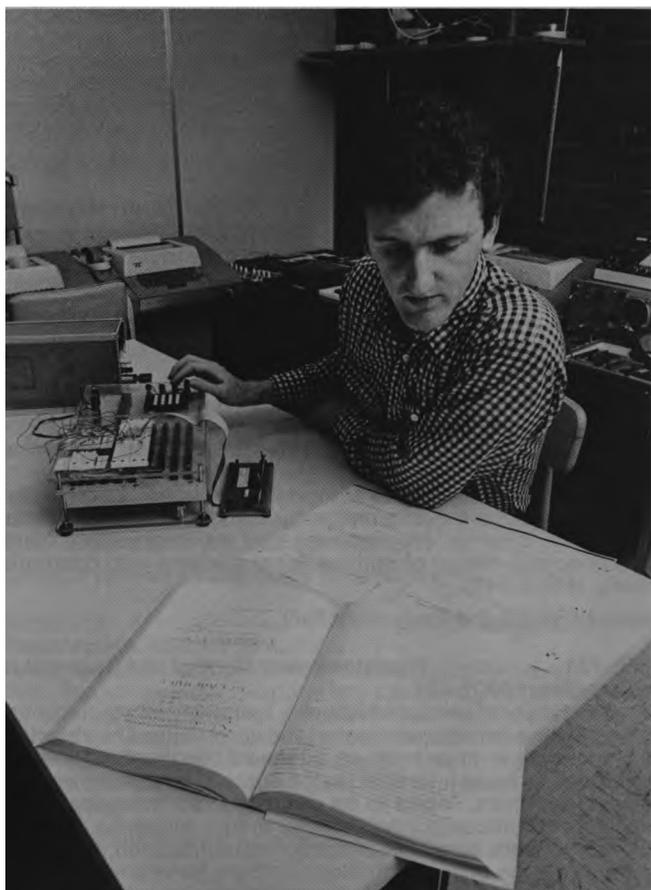
Engineering Courses

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 80 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.)

*"sufficient demand" normally is interpreted as a minimum of 10 students interest in the course.

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 80 and every other Spring)

EEEE-709   **Active Network Synthesis**
Registration #0301-709
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 80 and every other Fall)

EEEE-712   **Control System Fundamentals**
Registration #0301-712
This course is intented 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 80 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 81 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, Liapounov 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 81 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 79 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 80 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 80 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 80 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 80 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 81 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 81 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 79 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 fora 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 80 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 81 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. (EEEE-738)

Credit 4 (Spring 81 and every other spring)

EEEE-740   **Digital Integrated Circuits**
Registration #0301-740
Evolution of digital IC's pertinent properties, overview of logic families. Techniques to: measure characteristics, model via computer, employ standard MSI/LSI, minimize package count, use programmed logic interface. Small system case studies; microcomputer, TV terminal, etc., (EEEE-650 or EEEE-750, 751. 751 may be taken concurrently).

Credit 4 (Winter 80 and every other Winter)

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.)

EEEE-743   **Minicomputer Fundamentals**
Registration #0301-743
A course designed to provide engineers with a practical knowledge of minicomputers. Stress will be placed on basic architecture, software fundamentals, interfacing characteristics, and interrupt structures and control of I/O devices.

Credit 4 (Every Fall)

EEEE-744   **Microprocessors**
Registration #0301-744
This course aims to provide an understanding of basic microprocessor architecture, develop an understanding of microcomputer programming techniques and software aids, and illustrate methods of interfacing microcomputers to digital systems. Typical microprocessor applications which illustrate conventional logic replacement, hardware and software design trade-offs and design flexibility will be discussed. Most discussions will be based upon the Intel 8080 and the Motorola M6800. Lab exercises are an integral part of the course. (EEEE-743)

Credit 4 (Every Winter)

EEEE-750,751,752 Logic Design of Digital Systems I, II, III
Registration #0301 -750, -751, -752
These three courses are devoted to the study of various aspects of logic and design and digital systems, both theoretical and practical. The first course (750) covers combinational logic. Topics include: Boolean algebra, classical approaches to the design of combinational logic networks, NAND and NOR networks, multiplexers, encoders and decoders, ROM's and their applications and arithmetic units. The second course (751) covers sequential circuits. Topics include: asynchronous fundamental mode and pulse mode sequential circuits, synchronous sequential circuits, counters, shift registers, shift registers with feedback and programmable counters. The third course (752) covers miscellaneous topics which deal with the extension of the concepts covered in the first two to more complex digital systems. Topics include some or all of the following: finite state models, arithmetic logic units, programmable logic arrays, logic design with microprocessors, fault detection.

Credit 4 per course (Sequence offered 1979-80 and every other year)

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 RD&E 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 Electrical Engineering
Registration #0301-772, -773, -774
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**
Registration #0303-771, -772, -773, -774 **Engineering**
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

All courses are offered upon sufficient enrollment and availability of faculty.

EMEM-800   **Applied Engineering Analysis I**
Registration #0304-800
Use of matrices including matrix algebra, matrix inversion, diagonalization of matrices, eigenvalues and eigenvectors; application of matrices to the solution of partial differential equations by separation of variables using orthogonal functions, including Bessel functions; introduction to LaPlace transforms.

Credit 4

EMEM-801   **Applied Engineering Analysis II**
Registration #0304-801
Theory of complex variables including analytic functions, mapping, power series, and residues; application of complex variables, LaPlace and Fourier transform inversion for solving partial differential equations.

Credit 4

EMEM-802   **Applied Engineering Analysis III**
Registration #0304-802
Introduction to optimization techniques: calculus of variations, Hamilton's principle, Rayleigh-Ritz method; Volterra and Fredholm integral equations with applications. (EMEM-801)

Credit 4

EMEM-806   **Numerical Analysis**
Registration #0304-806
Numerical methods for solving algebraic and transcendental equations, finite difference methods, error and convergence analysis, numerical methods of solutions of initial value and boundary value problems in engineering. Extensive use of computer is anticipated. (Graduate standing)

Credit 4

EMEM-810   **Introduction to Continuum Mechanics**
Registration #0304-810
Cartesian tensors and indicial notation. Analysis of the stress and deformation in a continuous media. Introduction to the linear theory of elasticity and the mechanics of fluids. (SMAM-308 or EMEM-692)

Credit 4

EMEM-811   **Theory of Elasticity**
Registration #0304-811
Formulation of elasticity problems. Plane strain, plane stress solutions by potentials, torsion, thick cylinders, disks, and spheres, advanced problems of bending of beams, curved beams. The semi-infinite medium and related problems. Stability problems. (EMEM-810)

Credit 4

EMEM-812   **Theory of Plates and Shells**
Registration #0304-812
Theory of thin plates for small deflectors. Rectangular and circular plates with various boundary conditions, elliptic and triangular plates. Membrane theoi^ of shells, cylindrical shells, pressure vessels, shells of revolution. (EMEM-811)

Credit 4

EMEM-813   **Energy Methods in Mechanics**
Registration #0304-813
Energy principles; virtual work, Betti theorem, Castigliano's theorems, Rayleigh-Ritz method. Statics of structure: beams, frames, rings, and columns. Matrix methods. Dynamics of structures: free and forced vibrations for structures with one degree of freedom, many degrees of freedom. Continuous structures. (EMEM-811)

Credit 4

EMEM-815   **Experimental Stress Analysis**
Registration #0304-815
Experimental methods of analysis of structural machine members, including strain gages and instrumentation, photoelastic methods, brittle coating, Moire fringe method, holographic techniques; and the hydrodynamic, electrical, and membrane analogs. Laboratory tests of models. (EMEM-694 or equivalent)

Credit 4

EMEM-816   **Finite Elements I**
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.

Credit 4

EMEM-818   **Finite Elements II**
Registration #0304-818
Variational principles for linear and nonlinear elements. Three-dimensional element derivations using natural coordinate systems. Solid elements, tetrahedron and hexahedron: various thin shell elements. Computer workshops with use of various programs demonstrating the above theory.

Credit 4

EMEM-820   **Analytical Mechanics**
Registration #0304-820
Brief review of vectorial mechanics with emphasis on the dynamics of rigid bodies and applications to systems of degrees. Introduction to continuum using the limiting case of a system with an infinite degree of freedom. (Graduate standing or departmental approval)

Credit 4

EMEM-821   **Vibration Theory and Applications I**
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-822   **Vibration Theory and Applications II**
Registration #0304-822
Analysis of vibrations of linear continuous systems, involving beams, frames, plates, and shells. Solution by classical methods or by approximate methods, as expedient. Introduction to finite-element analysis of vibration. System analysis techniques such as mobility and receptance methods. Applications of methods discussed to practical problems.

Credit 4

EMEM-825   **Lubrication**
Registration #0304-825
Incompressible lubrication in one-dimensional and finite journal bearings, hydrodynamic gas bearings, hydrostatic bearings, squeeze film and dynamic loading, rolling elements, thrust bearings, sliding bearings. Design considerations. (EMEM-415)

Credit 4

EMEM-826   **Materials, Principles and Selection**
Registration #0304-826
A study of the principles of material behavior as applied to design. Application of these materials according to these principles is stressed. Ferrous and non-ferrous materials are covered. Among the possible topics are strength, hardness, corrosion, fatigue, economy, welding, and machining. (EMEM-344)

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-830   **Heat Transfer I**
Registration #0304-830
The formulation of conduction heat transfer problems. Solutions to steady state and unsteady state problems by separation of variables, LaPlace transforms and numerical methods. Empirical methods for forced convection and their use in the design of industrial systems. (EMEM-514)

Credit 4

EMEM-833   **Heat Transfer II**
Registration #0304-833
Principles of natural and forced convection, thermal boundary layers and their solutions. Convection heat transfer systems such as flows inside tubes, outside tubes, and over external surfaces. Empirical relations; applications to heat exchangers; nature of thermal radiation, radiation properties of surfaces and gases, radiant energy interchange in an enclosure filled with participating media. Problems involving simultaneous conduction, convection, and radiation. (EMEM-514)

Credit 4

EMEM-835   **Thermodynamics**
Registration #0304-835
An advanced study of thermodynamics equilibrium and stability. The thermodynamics of chemical reactions, combustion and flame phenomenon, phase change, stressed solids and other topics depending on the interest of the students. An introduction to irreversible thermodynamics.

Credit 4

EMEM-836   **Statistical Thermodynamics**
Registration #0304-836
The relationship between macroscopic thermodynamic properties and microscopic behavior of matter. Calculation of macroscopic thermodynamic properties using Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics. Determination of transport properties from kinetic theory of gases.

Credit 4

EMEM-840   **Fluid Dynamics**
Registration #0304-840
Selected topics from hydrodynamics, compressible flow, viscous flow, hydrodynamic instability and turbulence, depending on interests of the students. (EMEM-415)

Credit 4

EMEM-841   **Gas Dynamics**
Registration #0304-841
Governing equations of compressible isentropic flow through nozzles and diffusers. Perturbation techniques and sound waves. Subsonic and supersonic flow, mach cones. Theory of characteristics, rarefaction and compression waves. Normal shock waves in a converging/diverging nozzle and infront of a moving piston. Hugonoit relations across a shock. The shock tube. One-dimensional flow with friction, Fanno line flow.

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-851   **Automatic Control Systems I**
Registration #0304-851
A first course in control systems analysis at the graduate level. Topics include mathematical modeling and response of lumped-parameter systems, stability analysis and multi-variable techniques. Bode and root-locus analysis of feedback systems. Compensation is introduced. Physical systems and analog computer used for lecture demonstrations throughout the course. Level of mathematical rigor is sufficiently above "classical" undergraduate controls course to allow those with previous undergraduate background to take this course.

Credit 4

EMEM-852   **Automatic Control Systems II**
Registration #0304-852
A continuation of EMEM-851. Topics include Nyquist plots and stability theorem, Nichols charts, compensation, state-space formulation of multi-variable systems and non-linear systems. Students will undertake individual projects requiring both analytical and experimental work. Individual use of analog and digital computers is encouraged. (EMEM-851)

Credit 4

EMEM-854   **Optimal Control Systems Design**
Registration #0304-854
An advanced study of feedback systems in terms of optimal and adaptive control. Variational calculus, the maximum principle, Hamilton-Jacobi theory, criteria for optimal design, constrained and unconstrained optimization, examples of optimal systems control. Introduction to the adaptive problem, gradient methods and examples of adaptive or self-optimizing control systems. (EMEM-851, 852, 800)

Credit 4

EMEM-857   **Advanced Topics in Systems Analysis**
Registration #0304-857
A project-oriented course examining a spectrum of feedback systems and problems. Systems to be studied include mechanical, electromechanical, optical, biomedical, and systems associated with transportation: hybrid propulsion systems, car-driver interaction, vehicular traffic flow and high-speed vehicle guidance systems. (Subject to instructor's approval)

Credit 4

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 maybe a comprehensive literature investigation, a theoretical study, or an investigation involving laboratory experiment.

Credit variable (maximum of 4 credits/quarter)

EMEM-861   **Engineering Hydrology**
Registration #0304-861
A study of the dynamics of the physical processes involving the waters of the earth. Included in the course will be: the meaning of hydrology, the hydrological cycle, transport processes, physical composition of the atmosphere, physical composition of oceans and lakes, planetary fluid mechanics, circulation of the atmosphere, and precipitation.

Credit 4

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-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)

Graduate Faculty College of Engineering

Richard A. Kenyon, Ph.D., P.E., Syracuse-Dean, Professor, Mechanical Engineering

Swaminathan Madhu, Ph.D., University of Washington-Director of Graduate Programs; Professor, Electrical Engineering

Douglas M. Marshall, MSEM, West Virginia University-Associate Dean, Associate Professor, Mechanical Engineering

Electrical Engineering Department

Harvey E. Rhody, Ph.D., Syracuse-Associate 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

James E. Palmer, Ph.D., Case Institute of Technology-Professor, Digital Systems

George W. Reed, MEE, P.E., University of Delaware-Professor, Electromagnetic Theory

Edward R. Salem, Ph.D., Buffalo-Associate Professor, Digital Processing, Microcomputers

Tapan K. Sarkar, Ph.D., Syracuse-Assistant Professor, E.M. Fields, Antenna Theory

George L. Thompson, MSEE, University of Rochester-Associate Professor, Switching Theory, Digital Electronics

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

Raman M. Unnikirshnan, Ph.D., Missouri-Assistant 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

Roger Morton, Ph.D., Monash-Director of Research, Bausch & Lomb, Digital Electronics and Integrated Circuits

Sukumar Sikdar, Ph.D., Kharagpur-Director of Research, Rochester Products, Control Systems

Industrial Engineering Department

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

Gary D. Christie, MS, Virginia Polytechnic Institute and State University-Instructor, Simulation, Information Systems, 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

Mechanical Engineering Department

Robert M. Desmond, Ph.D., P.E. University of Minnesota-Professor, Heat Transfer; Department Head

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 A. Ellson, Ph.D., P.E., University of Rochester-Associate Professor, Energy Conversion, Mechanics

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

Bhalchandra V. Karlekar, Ph.D., P.E., University of Illinois-Professor, Heat Transfer, Applied Mathematics, Energy

Richard A. Kenyon, Ph.D., P.E., Syracuse-Professor, Thermodynamics and Fluid Mechanics

Chris Nilsen, Ph.D., P.E., Michigan State-Associate Professor, Metallurgy and Materials Science

Alan H. Nye, Ph.D., University of Rochester-Visiting Assistant Professor, Fluid Mechanics

Neville F. Rieger, Ph.D., University of Nottingham-Gleason Professor of Mechanical Engineering Mechanics

Martin P. Sherman, Ph.D., P.E., Princeton-Associate Professor, Fluid Mechanics, Thermodynamics

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 and 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 design applications, communication design, and fine arts 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 also prepares graduates to teach at colleges and at secondary levels.

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 which 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 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, discussions 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 (which may be taken as a concentration in art education leading to permanent certification to teach in the public schools of the State of New York or as concentration in the practice of the creative arts and crafts), and the master of fine arts.

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 and craftsmen who can meet the needs of the environmental condition through high standards of personal discipline.

Requirements for admission to the MST degree program
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 background 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 nine 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.

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.

Teacher training 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 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 or photographs (no larger than 8 x 10). 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 nine quarter credits (six 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 years preceding.

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, design applications, painting, printmaking, ceramics, metals, textiles, wood or glass. Three summer sessions can accommodate teachers seeking permanent certification through study in an art area.

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.). He has been on the faculty of the College of Fine and Applied Arts for eight 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:

	Quarter Credit Hours
1. Major concentration	30

Designed to give depth of experience in the area of the student's major interest and chosen from one of the following: ceramics and ceramic sculpture, metalcrafts and jewelry, woodworking and furniture design, weaving and textile design, glass, design applications (emphasizing environmental design), communication design, fine art (painting), fine art (printmaking).

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

*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.
Another minor concentration can be taken in the Center for Community College Faculty Development program. The three required courses concern (1) the student, (2) the institution and (3) methods, along with eleven weeks of teaching in an area community college.

The **Master of Science** for teachers program requirements include two categories of studies:

1. Master of Science for teachers in *art education* (for those holding the BFA or BA (art major) degree and permanent certification for teaching in the public schools.

	Quarter Credit Hours
The degree offers a concentration consisting of background courses in Education:	20

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

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.

	Quarter Credit Hours
Major Concentration:	
Studio art, or crafts:	24
Art history and humanities:	10
Minor Concentration and electives from above:	14
Total	48

The Metropolitan 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.

	MFA	MST STUDIO	MST ART EDUCATION
Major	30 credits	24 credits	22 credits
Minor	15	14	6
Humanities	10	10	20 Social Sciences
Electives	18		
Thesis	12		
	85 credits	*48 credits	**48 credits

*1 year or three summers **September start

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 Admission
One Lomb Memorial Drive
Rochester, NY 14623
Telephone: (716) 475-6631

Design applications and art education majors are offered only during Fall, Winter and Spring Quarters. Art education applicants should arrange a personal interview with Mr. Peter Giopulos, 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 a GS call number.

Art Education

FADA-701, 702   **Methods and Materials**
Registration #0401 -701, -702   **in Art Education**
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   **Seminar in Art Education**
Registration #0401-820

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   **Practice Teaching in Art**
Registration #0401 -860

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 (MST, 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 (MFA)   **Communication Design**
Registration #0402-780

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)

Environmental Design

FADE-750 (MST, 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)

FADE-780 (MFA)   **Design Applications**
Registration #0403-780
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)

Painting

FADP-750 (MST, 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 (MFA)   **Painting**
Registration #0405-780

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)

Printmaking

FADR-750 (MST, 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 (MFA)   **Printmaking**
Registration #0406-780

Contemporary and historical printmaking concepts are presented as stimulant and provocation for the development of an individual approach to expression. Advanced techniques are demonstrated in intaglio, relief and lithography with resources available in non-silver photo processes, paper making and combinations. A complete understanding of the development and maintenance of the print studio is supportive for the professional artist. The work leads toward the master's thesis.

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

Thesis

FAD (C, E, P, or R)-890   **Research and Thesis Guidance**
Registration #040 (2,3,5 or 6)-890
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

FSCC-750 (MST, elective, minor)   **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 (MFA)   **Ceramics and**
Registration #0409-780   **Ceramic Sculpture**
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)

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 (MST, 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 (MFA)   **Glass**
Registration #0411-780
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)

Metalcrafts and Jewelry

FSCM-750 (MST, 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 (MFA)   **Metalcrafts and Jewelry**
Registration #0412-780
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)

Weaving and Textile Design

FSCT-750 (MST, elective, minor) 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 (MFA)   Weaving and Textile Design
Registration #0413-780
A program structured on the basis of individual needs, interests and background preparation as they may be determined through faculty counseling. Techniques offered are combination weaves and pattern design, double weave, embroidery and stitchery, finnweave, Ikat, multiple layer, dyeing, non-loom, pile rug, printed surface, silkscreen, tapestry, and soft sculpture. Design concepts are compliments to the techniques. This sequence leads to the master's thesis, suggested by the student and approved by the faculty.
Lab. 9-27, Credit 3-9 (offered every quarter)
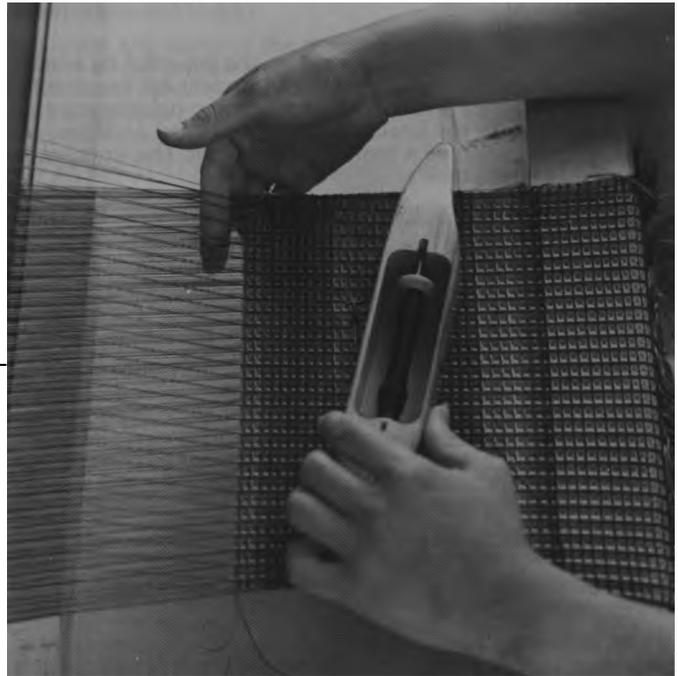
Woodworking and Furniture Design

FSCW-750 (MST, 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 (MFA)   Woodworking and
Registration #0414-780   Furniture Design
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)

Thesis

FSC (C, G, M, To or W)-890 Research and Thesis Guidance
Registration #040 (9,11,12,13 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, Director, School for American Craftsmen; Professor

Peter Giopulos, M.Ed., Pennsylvania State-Associate Dean, Director, School of Art and Design-Associate Professor

Kener Bond, MFA, Rochester Institute of Technology-Assistant Dean, Professor

Norman Bate, MFA, University of Illinois-Professor, Printmaking, School of Art and Design

Philip W. Bornarth, M.A.E. 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

Hobart Cowles, MA, Ohio State-Professor, Ceramics, School for American Craftsmen

David Dickinson, MFA, Rochester Institute of Technology-Lecturer, Printmaking, School of Art and Design

Gary S. Griffin, MFA, Tyler School of Art, Temple University-Assistant Professor, Metalcrafts and Jewelry, School for American Craftsmen*

Robert Heischman, U.C.F.A., Ruskin School of Drawing and Fine Art, Oxford University-Assistant Professor, Painting, School of Art and Design

Janies M. Hennessey, MFA, California Institute of the Arts-Assistant Professor, Environmental Design, School of Art and Design

William Keyser, MFA, Rochester Institute of Technology-Professor, Woodworking and Furniture Design, School for American Craftsmen

Max Lenderman, MFA, University of Kansas; MS, Indiana State University-Associate Professor, Weaving and Textile Design, School for American Craftsmen

Craig McArt, MFA, Rochester Institute of Technology-Associate Professor, Environmental Design, School of Art and Design*

Frederick R. Meyer, MFA, Cranbrook Academy of Art-Professor, Painting, School of Art and Design*

Jon Meyer, BS, University of Vermont, Orrefors, Sweden-Assistant Professor, Glass, School for American Craftsmen

R. Roger Remington, MS, University of Wisconsin-Professor, Communication Design, School of Art and Design

Robert Schmitz, MFA, University of Wisconsin; MS, Alfred University-Assistant Professor, Ceramics, School for American Craftsmen

Douglas Sigler, MFA, Rochester Institute of Technology-Associate Professor, Woodworking and Furniture Design, School for American Crafftsmen

Toby Thompson, MFA, Rochester Institute of Technology-Professor, Environmental 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

James C. Ver Hague, Jr., MFA, State University of New York at Buffalo; MS, Rensselaer Polytechnic Institute-Assistant Professor, Graphic Design, School of Art and Design

Representative to the Academic Council

College of Graphic Arts and Photography

Lothar K. Engelmann, Dean

Master of Science degree in Printing

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 Graphic Arts Research Center 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.
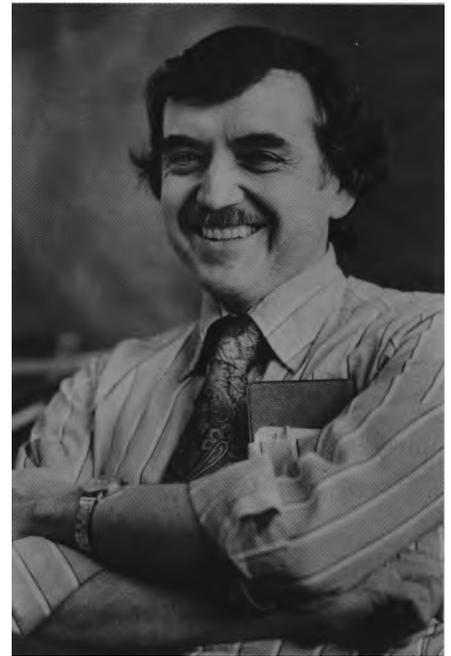
Dr. Robert G. Hacker

Our philosophy is to provide the opportunity for graduate study in depth, in a primary interest area for our students. Our approach is to treat printing as an information processing and conversion system and analyze it from that standpoint.

The laboratory and lecture classes are formulated to give background while providing opportunity for detailed study. We hope our graduate students learn to "think" and not just engage in pure assimilation of diverse bits of information.

Robert G. Hacker (475-2633)
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	13
Core to the major	20
Electives	29
Thesis	8

Core Courses: Printing graduate programs

Required for all majors and programs
Computers in the Graphic Arts-PPRM-701
Graphic Reproduction Theory-PPRT-702
Statistical Inference-PPRT-703

Technology major: undergraduate degree in printing (MS)

Application of Mechanics/Electronics-PPRT-705, 706, 707
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)

History of Printing Technology-PPRT-709
Introduction to Paper-PPRT-710
Tone and Color Analysis-PPRT-711
Research Methods in the Graphic Arts-PPRT-701
Eight prerequisite graduate printing courses
Thesis-PPRT-890
One graduate printing elective

Education major: required for all educational programs

Introduction to Graphic Arts Education-PPRE-701

Education major: undergraduate degree in education (MS)

Typographical Procedures-PPRE-713
Layout and Printing Design-PPRT-716
or
Copy Preparation-PPRT-717
Photographic Reproduction Technology-PPRE-720
Printing Plate Methodology-PPRT-712
or
Relief Press Methodology-PPRT-714
Screen Printing Methodology (or elective)-PPRE-721
Photo-Composition Technology-PPRT-719
Two graduate printing electives
Thesis-PPRT-890
or
Two graduate electives

Education major: undergraduate degree other than printing or education (MST) Trade-Technical Certification Program

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
Six graduate printing electives

Education major: undergraduate degree in printing (MST) Trade-Technical Certification Program

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
Two graduate printing electives

Two-year college education major: undergraduate degree in printing (MS)

The Two-Year College-IJCG-701
The Student in the Two-Year College-IJCG-702
Instructional Techniques-IJCG-704
Teaching Internship (Two-Year College)-IJCG-840
Thesis-PPRT-890
Two graduate printing electives

Core courses—two-year college education major: undergraduate degree other than printing (MS)

The Two-Year College-IJCG-701
The Student in the Two-Year College-IJCG-702
Teaching Internship-IJCG-840
Instructional Techniques-IJCG-704
Thesis-PPRT-890
Six graduate printing electives

Printing Courses

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

PPRE-702   **Teaching Methods in Graphic Arts**
Registration #0908-702   **Education**
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

PPRE-712   **Lithographic Press Methodology**
Registration #0908-712
A study of the principles, materials, and equipment used in lithographic presswork, set-up and operation of sheet-fed presses. An independent graduate research project is required.

Credit 4

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-714   **Color Separation Photography**
Registration #0908-714
Color separation and color corrections; color theory, masking requirements, tone reproduction for color, color proofing systems, electronic scanner. An independent graduate research project is required.

Credit 4

PPRE-715   **Tone Reproduction Photography**
Registration #0908-715
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 half tone sensitometry and process control.

Credit 4

PPRE-720   **Photographic Reproduction**
Registration #0908-720   **Technology**
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. An independent graduate research project is required.

Credit 4

PPRE-721   **Screen Printing**
Registration #0908-721
Theory and practice of screen printing including preparation of positives, frames, fabrics, stretching of fabrics, stencil methods, fillers, squeegees, inks, presses, and dryers; experiences in printing of papers, plastics and irregular shapes. An independent graduate research project is required.

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

Printing Management*

PPRM-701   **Computers in the Graphic Arts**
Registration #0910-701
Introduction to basic computer characteristics; function of hardware components in relation to software requirements; discussion of computer languages as they relate to applications in printing. An independent graduate research project is required.

Credit 4

PPRM-702   **Computers in Management**
Registration #0910-702
Discussion of printing requirements in relation to computer system configurations; applications of computers to management and production control problems; investigation of computer-oriented production control techniques. (PPRM-701)

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 Applications of Mechanics and Electronics
Registration #0911 -705, -706, -707 to Materials, Machine
                        Design, and Processes in Printing
Force systems, elementary dynamics, work, power, and energy. Relations to stress and strains, particularly as applicable to printing equipment and processes; torsion stresses of printing materials; design of machine elements; bearings, gears, shafts, fasteners, and frames; application of basic circuits to electronic devices and systems.

Credit 4/Qtr.

All courses, unless otherwise noted, are offered annually.

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 study. (PPRM-701)
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-710   Introduction to Paper
Registration #0911-710
A study of the interrelationships of paper, ink and printing processes; emphasis is placed upon physical and optical properties of paper, including the pulping and papermaking, paper testing and problem solving. An independent graduate research project is required.
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-712   Printing Plate Methodology
Registration #0911-712
Elements of platemaking procedures for letterpress, flexographic and lithographic plates, and gravure cylinders; theoretical study plus practical involvement in making of various plates. An independent graduate research project is required.
Credit 4

PPRT-714   Relief Press Methodology
Registration #0911-714
Theory and practice of letterpress presswork using platen and cylinder presses; techniques, mechanics of equipment, care of equipment and materials used; application of special techniques on letterpresses, die cutting, scoring, numbering, perforating, embossing; makeready methods for line and halftone printing; introduction to flexographic printing. An independent graduate research project is required.
Credit 4

PPRT-715   Gravure
Registration #0911-715
An 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 web press. An independent graduate research project is required.
Credit 4

PPRT-716   Layout and Printing Design
Registration #0911-716
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. Library research project required.
Credit 4

PPRT-717   Copy Preparation
Registration #0911-717
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 plate-making and photoengraving; proper instructional specification writing. An independent graduate project is required.
Credit 4

PPRT-718   Imposition and Finishing Procedures
Registration #0911-718
This course is designed to help the student understand imposition planning as related to and governed by folding and other finishing operations; content deals with the concepts of pre-press planning, binding and finishing. Included are topics on preparing layouts, forms and folded paper material for binding. Laboratory experiments include operation of modern bindery equipment and the binding of a hardcover bound book. An independent graduate research project is required.
Credit 4

PPRT-719   Photocomposition
Registration #0911-719
Emphasis on use and operation of composing machines; introduction to use of computers in printing; operation and application of photocomposition; practice on specialized equipment. An independent graduate research project is required.
Credit 4

PPRT-720   Ink and Color
Registration #0911-720
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 relationships of ink to paper and press; study of ink problems and their correction. An independent graduate research project is required.
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, Graphic Arts Research Center

Brent Archer, AAS, Rochester Institute of Technology-Research Associate, Graphic Arts Research Center

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

William H. Birkett, MBA, University of Michigan, C.M.A.-Assistant Professor, Printing Management

Joseph E. Brown, Jr., MS, Kansas State-Associate Professor, Paper Technology

Walter A. Campbell, M Ed, MBA, University of Rochester-Associate Professor, Printing Management

W. Frederick Craig, M Ed, University of Rochester-Associate Professor, Newspaper Production Management

Chester J. Daniels, BS, MS, Rochester Institute of Technology-Senior Technologist, Graphic Arts Research Center

Zenon A. Elyjiw, Senior Technologist-Graphic Arts Research Center

Clifton T. Frazier, M Ed, University of Rochester-Associate Professor, Photo-Lithography Technology

Robert G. Hacker, Ph.D., University of Iowa-Coordinator, MS Program; Professor, 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

Herbert J. Johnson, BS, Rochester Institute of Technology-Melbert B. Cary, Jr. Professor in Graphic Arts, Book Design

Alexander S. Lawson, Diploma, Rochester Institute of Technology-Professor Emeritus, Typography

Richard N. McAllen, AAS, Rochester Institute of Technology-Director, Web Offset Laboratory, Graphic Arts Research Center

Joseph L. Noga, MS, Bridgeport-Associate Professor, Reproduction Photography

Milton Pearson, BS, Rochester Institute of Technology-Senior Technologist, Graphic Arts Research Center

Irving Pobboravsky, MS, Rochester Institute of Technology-Senior Technologist, Graphic Arts Research Center

Archibald D. Provan, M Ed, University of Rochester-Associate Professor, Typography

Harry Rab, MSME, Newark College of Engineering-Assistant Professor, Electro-Mechanics of Printing

Werner Rebsamen, Diploma, Academy of Fine Arts, Zurich-Assistant Professor, Imposition and Finishing

Albert D. Rickmers, M Ed, St. Bonaventure; MS, Rochester Institute of Technology-Professor, Statistics

Emery E. Schneider, M Ed, University of Rochester-Assistant Professor, Phototypesetting, Machine Composition

Anthony R. Sears, BS, Rochester Institute of Technology-Professor, Photo-Lithography technology

Julius L. Silver, Ph.D., Connecticut-Associate Professor, Ink Technology, Graphic Theory

Miles F. Southworth, M Ed, University of Rochester-Professor, Reproduction Photography

Hector H. Sutherland, MA, New York University-Professor, Educational Foundations

James R. Walsh, M Ed, University of Rochester-Associate Professor, Printing Management

Robert J. Webster, MS, Ball State-Associate Professor, Photo-Mechanical Reproduction Processes

Charles J. Weigand, MS, SUNY at Oswego-Assistant Professor, Relief Press Technology

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 Graphic Arts Research Center. 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 undergraudate studies have included at least the following courses in the major areas of study: mathematics through calculus; a full-year, collegeHevel 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 to the beginning of the course.(A)

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

(A)All graduate courses applied toward the degree, including Research and Thesis, must be completed within seven years.

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(1)		
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-890CT	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 CTAM-801. PPHS-721, 722 is not offered during the evening hours.

(3) The remaining 7 credits are distributed as required by project work.

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.

Three majors are available within the program: Photography, Filmmaking, and Museum Practice. Successful completion of the program enables a student to pursue careers in education, museums, business and as self-employed professionals.

David Rickerd

Major and minor areas
The filmmaking major is oriented toward production.

The museum practice major includes the Photography Core course and an internship at the International Museum of Photography, George Eastman House.

Minor concentrations may be pursued in several areas with the exception of museum practice. This includes areas in art, printing, film, television, education and courses such as filmmaking, printmaking, bookbinding, typography, reproduction photography, platemaking, photojournalism, color photography, nature photography, portrait photography, advertising photography, sensitometry, perception, computer graphics, materials and processes of photography. Minors must be planned with the MFA coordinator and approved by him.

The faculty
The MFA photography program is supported by a staff of 50 diverse faculty members within the School of Photographic Arts and Sciences and several adjunct faculty members at the International Museum of Photography, George Eastman House. Faculty and course work are also available from the School of Printing, College of Fine and Applied Arts and the College of General Studies. Resource personnel from RIT's Graphic Arts Research Center also support the program by providing students with technical advice and by serving as members of their thesis board.

Admission
Applicants should hold baccalaureate degrees from an accredited degree granting institution or have appropriate demonstrable equivalent experience. The Office of Admission will supply a list of the materials to be submitted.

Applicants are accepted with diverse educational backgrounds and there are no specific photographic prerequisites required in their bachelor's programs. However, some photographic competence is required, both visually and technically, and the MFA faculty will evaluate this from a submitted portfolio.

The portfolio should be mailed directly to: Coordinator MFA Program, School of Photographic Arts and Sciences. Please enclose a

cover letter stating application date and the purpose of the portfolio. Return postage must also be enclosed.

Prerequisites
Most applicants are expected to successfully complete a summer preparatory course. Photography and museum practice students will take Fundamentals of Photographic Communications (PPHG-700), while those who plan to major in filmmaking will take Motion Picture Workshop (PPHF-711,712).

Student status
Entrance into the program is on a full-time basis. Extenuating circumstances, however, sometimes necessitate a temporary part-time basis.

Full-time student status requires a minimum of 12 quarter credit hours per quarter. A maximum of 18 quarter credit hours is allowable with the approval of the coordinator.

Part-time student status involves from 1 to 11 quarter credit hours at a cost of $98 per credit hour.

Transfer credit
Course work taken prior to admission to the program should be submitted for approval upon entrance into the program. Up to nine quarter credit hours of B or better (six 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. Presentation, as well as content, is important. The images should provide a representative sampling of one's pictorial abilities. They could include black-and-white images, color prints and transparencies, non-silver images, photographic derivations, paintings, drawings, graphics, computer generated images, etc. A reasonable number of images would be about 15 or 20.

Candidates interested in filmmaking as a major are invited to submit films and videotapes of their best work as well as any experimental efforts in film or video. They may also submit still photographs.

The portfolio should reflect photographic excellence, visual awareness and some diversity. If highly personal statements are being attempted in the photographs or films some written information would be helpful in placing the images into a context and forming judgments.

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 81 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 81 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 Concentration	30
Minor	15
History and Aesthetics	9
Humanities	15
Thesis	12

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 15 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 timelimit
The *average* of all grades for graduate courses taken at the Institute must be at least a "B" (3.0) to qualify for the MFA Photography degree.

Thesis hours are usually taken over several quarters. Only the letter "R" is recorded, indicating a thesis in process. No letter grade is assigned. Acceptance or rejection of the thesis is made by the candidate's thesis board.

All course work, including an accepted thesis must be completed within seven years of entrance into the program.

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 telephone is available in the Gallery area to conduct seminars with photographers whose work is being exhibited. Telephone seminars were recently conducted with Barbara Morgan and Arthur Taussig while many of their major photographs were on exhibition in the MFA Gallery.

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 Mark Cohen, George Krause, Bart Parker, and Robert Heinecken.

Richard Zakia

Coordinator,

MFA Program

(716-475-2616)

"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.
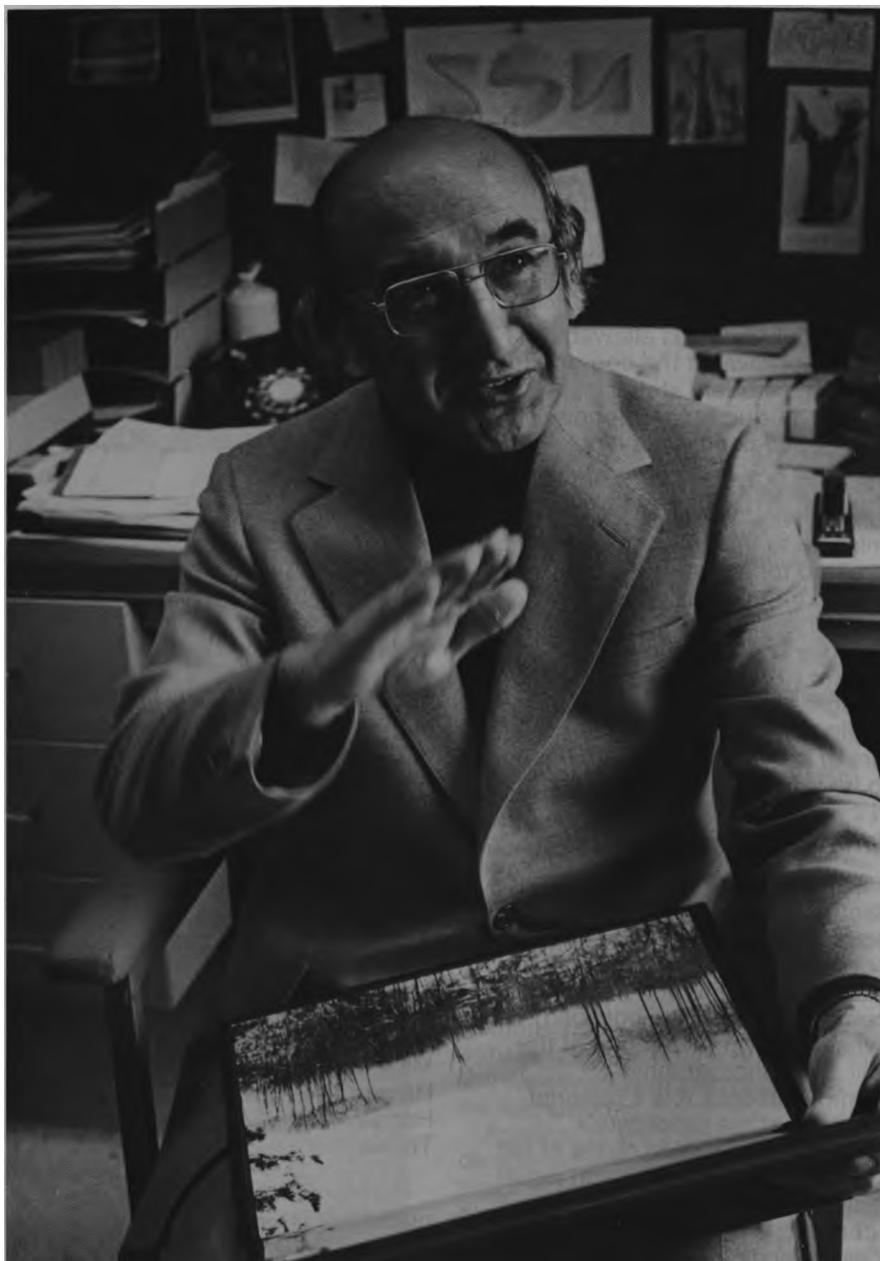
Richard Zakia

Photography Courses

Master of Science in Photographic Science*

PPHS-600 **Principles of Photographic Science**
Registration #0907-600
A course intended for students who have completed their undergraduate programs in engineering or the sciences and who desire to prepare themselves for entry into the graduate program in photographic science and instrumentation or who desire a working knowledge of photographic science at an undergraduate level. It is an intensive course, assuming working knowledge of undergraduate mathematics, physics and chemistry. Course topics include radiation and radiometry, properties of radiation-sensitive materials, chemistry of photographic processing, sensitometry, tone reproduction, principles of color measurement, color photographic systems, image microstructure, and photographic instruments. The course includes both lectures and laboratory work.

Credit 15 (Summers only)

(Not applicable to the 45 required graduate credits in the photographic science and instrumentation graduate program)

PPHS-601,602,603 **Principles of Photographic**
Registration #0907-601, -602, -603 **Science**
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**
Registration #0907-711, -712, -713 **Process**
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**
Registration #0907-731, -732, -733 Photographic Optics
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, the eye and vision characteristics, radiometry of optical images, 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**
Registration #0907-741, -742, -743 **of Imaging Systems**
Complex variables and Fourier analysis with application to the evaluation of imaging systems; properties of optical images, structure of photographic images; methods of photo-optical system evaluation.

Class 3, Credit 3, (Fall and Spring)
Class 2, Lab. 6, Credit 4 (Winter)

PPHS-751, 752, 753 **Special Topics in**
Registration #0907-751, -752, -753 Photographic Science
Advanced topics of current or special interest, varying from quarter to quarter, selected from the field of photographic science. Specific topics announced in advance. (Not offered every quarter. Consult coordinator of the photographic science graduate program.)

Credit variable

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

Master of Fine Arts in Photography*

PPHG-500 **Fundamentals of Photographic**
Registration #0903-500 **Communication**
A special 10 week summer course for students entering the graduate program with insufficient undergraduate credits and experience in photography and/or the visual arts.

An intensive survey of photographic materials, processes, equipment and practice; workshop in the application of photography to the solution of problems in visual communication and design.

Undergraduate credit (15 hours) will be granted upon completion.

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 moonscapes; "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-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-740, 741,742 **Photographic Museum Practice**
Registration #0903-740, -741,-742
Museum internship workshop, still or motion picture; research, assigned projects, seminars in history, function and administration of museums, with emphasis on photographic curatorial duties; practice in exhibition planning and development; field trips. This cannot be selected as a minor concentration.

Credit 3-9/Qtr.

All courses, unless otherwise noted, are offered annually.

PPHG-750,751, 752   **Special Topics Workshop**
Registration #0903-750, -751, -752
Advanced topics of current or special interest designed to broaden and intensify the student's ability to use photography as a means of communication and expression.

Credit 3-9/Qtr.

PPHG-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   **Photography, Art and Perception**
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. (offered on sufficient demand)

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.

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 1-12

Filmmaking

Museum Practice

Graduate Faculty College of Graphic Arts and Photography

Lothar K. Englemann, Ph.D., J.W. Goethe University, Germany-Dean, Professor

School of Photographic Arts and Sciences

Russell Kraus, Ed.D., Massachusetts-Director, School of Photographic Arts and Sciences

David A. Engdahl, M.Ed., University of Rochester-Associate Director, School of Photographic Arts and Sciences, Professor

Sven Ahrenkilde, MS, Polytechnical University, Denmark, Research Associate, Graphic Arts Research Center

Brent H. Archer, AAS, Rochester Institute of Technology-Research Associate, Graphic Arts Research Center

Charles A. Arnold, Jr., MFA, Rochester Institute of Technology-Professor, Photography

Owen B. Butler, BFA, Rochester Institute of Technology-Assistant Professor, Photography

Burt H. Carroll, Ph.D., University of Wisconsin-Professor, Photographic Science and Instrumentation

John F. Carson, MSEE, Massachusetts Institute of Technology-Associate Professor, Photographic Science and Instrumentation

Andrew Davidhazy, MFA, Rochester Institute of Technology-Assistant Professor, Photography

Robert Doherty, MFA, Yale-Director, International Museum of Photography, George Eastman House; Lecturer, Photography

Lothar K. Engelmann, Ph.D., J.W. Goethe University, Germany-Dean, Professor

Andrew H. Eskind, MS, Illinois Institute of Technology-Assistant to the Director, International Museum of Photography, George Eastman House; Lecturer, Photography

Richard Floberg, MS, Boston University-Associate Professor, Photography

Ronald Francis, Ph.D., Massachusetts Institute of Technology- Professor, Photographic Science and Instrumentation

Thomas T. Hill, BS, University of Wisconsin-Associate Professor, Photographic Science and Instrumentation

James E. McMillion, Jr., MFA, Ohio State-Professor, James E. McGhee Professor in Photographic Management

Frank Moser, MS, Minnesota-Lecturer, Photographic Science and Instrumentation

Beatrice Nettles, BFA, Florida; MFA, Illinois-Assistant Professor

John Pfahl, MA, Syracuse-Associate Professor, Photography

Irving Pobborasvsky, MS, Rochester Institute of Technology-Senior Technologist, Graphic Arts Research Center

Martin A. Rennalls, MS, Boston University-Associate Professor, Photography

Albert D. Rickmers, M.Ed., St. Bonaventure; MS, Rochester Institute of Technology-Professor, Photographic Science and Instrumentation

David J. Robertson, MS, Columbia-Professor, Photography

Elliott Rubenstein, MFA, University of Buffalo; MA, St. John's University-Assistant Professor, Photography

Gerhard W. Schumann, Ph.D., J.W. Goethe University, Germany-Professor, Photographic Science and Instrumentation

William S. Shoemaker, MS, University of Miami-Professor, Photographic Science and Instrumentation

Robert A. Sobieszek, MA, Stanford-Associate Curator and Director, Research Center, International Museum of Photography, George Eastman House; Lecturer, Photography

Leslie D. Stroebel, BS, Ed.D., University of Rochester-Professor

Charles C. Werberig, BFA, MS, Syracuse-Assistant Professor

Richard D. Zakia, BS, Rochester Institute of Technology, Ed.D., Rochester-Coordinator, MFA Photography Program, Professor

Saul Bass, multi-talented filmmaker, director and graphic designer, chats with photography and design students while at RIT to deliver the 1979 William A. Reedy Lecture in Photography.

College of Science

John D. Paliouras, Dean, College of Science

Earl Krakower, Department Head, Chemistry (475-2497)

Terrence C. Morrill, Graduate Advisor (475-2544)

Craig L. VanAntwerp, Chairman of Chemistry Graduate Committee (475-2479)

Master of Science in Chemistry

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.

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 work at their place of 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 in industry 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 in courses 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. A foreign or computer language requirement.
4. The passing of an oral thesis defense or comprehensive examination.

Additional information

More information may be obtained by phoning the graduate advisor (716) 475-2544, the chairperson of the Graduate Committee (716) 475-2479, or the Department of Chemistry (716) 475-2497.

Master of Science in

Clinical Chemistry

John D. Paliouras, Dean, College of Science

Edward B. Stockham, Director School of Health Related Professions

William N. Bigler, Head, Clinical Sciences Department, and Program Director, Clinical Chemistry (475-2978)

The clinical chemistry program is designed for either full-time or part-time graduate study. Required courses are offered during the late afternoon or evening on a regular basis in order to accommodate the work schedules of part time students.

Objectives
The program is designed to provide formal educational background for individuals aspiring to 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 15th. 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, SHPC-820, 821, 822, 810, 811, 812; Clinical Laboratory Management, SHPC-741; 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; Behavioral Science, BBUF-744; Clinical Chemistry Research, SHPC-859 or 879; Advanced Physiology, SBIO-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
Master of Science in 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 5, Credit 2 (offered twice a year) (F, W)

SCHB-702   **Biochemistry**
Registration #1009-702
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 orSCHO-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; 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**
Registration #1009-704   **Genetics**
The biochemistry of inheritance, expression of genetic information, protein biosynthesis, differentiation, viral and bacterial infection and the "origin of life." (SCHB-702)

Class 3, Credit 3 (offered every year) (S)

SCHC-772   **Special Topics—Chemistry**
Registration #1010-772
Advanced courses which are of current interest and/or logical continuations of the course already being offered. These courses should be structured as ordinary courses and should have specified prerequisites, contact hours, and examination procedures.

Class variable, Credit variable (offered every year)

SCHC-850   **Media Design Project**
Registration #1010-850
Students in small groups will design, produce, test and evaluate a media form or device for use in the teaching of science at the two-year college level.

Credit 2-4 (offered upon sufficient demand)

SCHC-851   **Media Design Seminar**
Registration #1010-851
A seminar workshop on evaluation and critique, human information processing, and instructional systems management as applied to media production.

No Credit (offered upon sufficient demand)

SCHC-852   **Internal Internship**
Registration #1010-852
Students in small groups will be assigned to a particular general chemistry course for a minimum of one quarter for the purpose of investigating more efficient utilization of the instructional media, recitation/laboratory periods, and computer aided instruction. Various ways will be explored to assist hearing-impaired and first-year students with remedial work as well as provide advanced work for rapid learners and those with advanced high school preparation.

Credit variable (offered upon sufficient demand)

SCHC-859   **External Research**
Registration #1010-859
Industrial internship research.

Credit 1-16 (offered every year.)

SCHC-870   **Chemistry Seminar**
Registration #0101-870

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, 763   **Inorganic Chemistry**
Registration #1012-762, -763
The properties and structures of the elements and their compounds in relation to electric and stereochemical principles; inorganic laboratory techniques. (SCHO-433 and SCHP-443)

Class 3, Lab. (optional) 3, Credit 3 or 4/Qtr. (offered every year)

SCHO-736   **Spectrometric Identification of**
Registration #1013-736   **Organic Compounds**
This course is concerned with the theory and application of nuclear magnetic resonance, infrared, mass spectrometry, and ultraviolet spectra as applied to organic structure determination. The use of C-13 nmr is included. (SCHO-433)

Credit **2** (offered every year)

SCH0-737   **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 and synthetic polymers. (SCHO-433)

Class 3, Credit 3 (offered every year)

SCHO-738 Systematic Identification of Organic Compounds
Registration #1013-738
The laboratory utilizes systematic chemical and spectral tests to deduce the structure of organic compounds. (SCHO-433)

Class **2** (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 SCHP-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, SCHP-443)

Class 3, Credit 3 (offered upon sufficient demand)

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 demand)

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)

SCHP-741   **Chemical Thermodynamics**
Registration #1014-741
A study of the basic fundamentals of thermodynamics and their use in deriving the interrelationships of thermodynamic functions. Thermodynamic properties of gases will be calculated based on spectroscopic data. (SCHP-443 and SMAM-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 whose interests are in those areas (such as biology, health related professions, printing, photography, etc.) in which they may have had a minimal exposure to physical chemistry. Molecular structure, thermodynamics, and kinetics will be discussed with a minimum of mathematics. (This course is not allowed for graduate credit in the MS Chemistry program). (SCHG-215, 216, 217; SCHO-231, 232 or consent of instructor)

Class 3, Credit 3 (offered upon sufficient demand)

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 every year)

SCHP-744   **Quantum Mechanics**
Registration #1014-744
Matrix formulation of quantum mechanics, variations and perturbational methods, the uncertainty relations, particle in a box, tunneling, harmonic oscillator, angular momentum and magnetic resonance, the hydrogen atom and more complex atoms. (SCHP-443)

Class 3, Credit 3 (offered in alternate years)

SCHP-745   **Quantum Chemistry**
Registration #1024-745
Application of quantum mechanics to problems of chemical interest. Group theory; calculations of vibrational frequencies and selection rules for complex molecules; molecular orbital energies of complex molecules. (SCHP-744)

Class 3, Credit 3 (offered upon sufficient demand)

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 demand)

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 demand)

School of Health Related Professions

Department of Clinical Sciences
Master of Science in Clinical Chemistry

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 Fall 1979

SHPC-810   **Advanced Clinical Chemistry Laboratory I**
Registration #1023-810-30
Comparison of current methods for analysis of toxicology samples-gas-liquid chromatography, radioimmunoassay, enzyme multiplied immunoassay. (Permission of instructor, class size limited to 12)

Lab 4, Credit 1

Offered concurrently with SHPC-820

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 (Spring 1980, Fall 1981)

SHPC-811   **Advanced Clinical Chemistry Laboratory II**
Registration #1023-811-30
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-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-812   **Advanced Clinical Chemistry Laboratory III**
Registration #1023-812-30
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-859   **External Clinical Chemistry Research**
Registration #1023-859
Credit 1-16

SHPC-879   **Clinical Chemistry Research**
Registration #1023-879
Credit 1-16

SHPC-899   **Independent Study**
Registration #1023-899
Credit variable

SHPC-741   **Clinical Laboratory Management**
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 (Spring of odd numbered years)

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 of even numbered years)

SHPC-870   **Clinical Chemistry Seminar**
Registration #1023-870

Credit 1

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-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 of even number years; e.g. 80-81)

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

William N. Bigler, Ph.D., University of Colorado-Associate Professor, Biochemistry: regulatory enzymes, radiation sensitivity, metabolic control, and chemical mutagenesis.

Robert E. Gilman, Ph.D., University of Michigan-Professor, Organic Chemistry: organic synthesis and mechanisms in cyclophane, thiophene, and xanthate systems

William J. Hayles, Ph.D., Iowa State-Professor, Physical and Inorganic Chemistry: chemical kinetics and computer applications to chemistry

David A. Hilborn, Ph.D., Cornell-Assistant Professor, Physical and Biophysical Chemistry

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-Graduate Advisor, Professor, Organic Chemistry: stereochemistry and mechanism of organic reactions, and organic structure effects upon lanthanide-induced shifts in NMR spectrometry; Computer Assisted Instruction

Elizabeth V. Patton, Ph.D., University of Wisconsin-Lecturer, Physical and Biophysical Chemistry

Nina M. Sandberg, Ed.D., University of Florida-Associate Professor, Science Education

Gerald A. Takacs, Ph.D., University of Wisconsin-Associate Professor, Physical Chemistry: chemical kinetics, atmospheric chemistry and photochemistry

Craig L. VanAntwerp, Ph.D., Stanford University-Chairman, Chemistry Graduate Committee; Visiting Assistant Professor, Organic Chemistry: synthesis and C-13 nmr spectra of organic model systems

James Wilson, Jr., Ed.M., University of Rochester-Professor, Organic Chemistry: qualitative organic analysis and chemistry of the graphic arts

School of Health Related Professions

Edward B. Stockham, Ph.D., University of Pennsylvania-Director and Associate Professor

Department of Clinical Sciences

William N. Bigler, Department Head; Program Director, Clinical Chemistry; Associate Professor

James C. Aumer, M.S., Michigan Technological University-Visiting Assistant Professor

William A. Burns, MS, Elmira-Associate Dean; Program Director, Medical Technology; Professor

Jerome Wagner, Ph.D., University of Wisconsin-Assistant Professor and Program Director of Nuclear Medicine Technology

Clinical Faculty

Richard M. Bayer, Ph.D., Rutgers University-Rochester General Hospital, Adjunct Clinical Assistant Professor

Norman P. Kubasik, Ph.D., Syracuse University-Upstate Medical Center-The Genesee Hospital, Adjunct Clinical Assistant Professor

Royden N. Rand, Ph.D., University of Buffalo-Health, Safety and Human Factors Laboratory, Eastman Kodak, Adjunct Associate Professor

Harrison E. Sine, Jr., Ph.D., SUNY at Buffalo-The Genesee Hospital Adjunct Clinical Assistant Professor

James D. Salvatore, MS, University of Rochester-Strong Memorial Hospital

Institute College

Roy I. Satre, Jr., Dean

New, innovative, flexible, unique- are all adjectives that describe the graduate and undergraduate program of RIT's Institute college. Established in 1973, Institute College is composed of five units: The Center for Community/Junior College Relations, School of Computer Science and Technology, Department of Instructional Technology, Department of Packaging Science, and the School of Engineering Technology. With its beginnings in the Center for Community College Faculty Development, started in 1968, the programs offered through this unusual college have evolved and grown in number until today there are 17 distinct curricula and five options.

Programs included within Institute College are usually one-of-a-kind in the regional, state or even national educational communities. Students entering computer science have four undergraduate and three graduate programs to select from; and others will follow in succeeding years. A first is the Career Information program begun in 1977. Programs in Instructional Technology are answering the demand for skilled and professional systems oriented training and educational technologists.

The following graduate programs are currently offered in Institute College.

Master of Science degree in Business Technology
Planned for the graduate of a business program who wishes to teach in the two-year college, the MS (BT) has developed out of the expressed needs of the community/junior colleges for faculty persons educated in the broadest aspects of business education.

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 student 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. IT 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.

Master of Science degree in Career Information
This program provides the necessary courses and internship experiences to enable the graduate to serve in a variety of positions related to career education: public schools, community/junior colleges, business and industry, and service organizations. 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.

Center for

Community/ Junior

College Relations

Richard L. Rinehart, Director

The center offers master of science degrees and non-degree graduate studies that have a relationship to community and junior college functions. The students may be full-time or part-time, academic year or summer enrollees. Some individuals participate in selected courses an non-matriculated students, while others plan to complete a master's degree.

Master of Science in Business Technology program
Graduates of this program will be able to teach a variety of business courses, seminars and related learning activities in community and junior colleges. They may also plan and instruct equivalent studies in business/industrial training programs.

Admission
In addition to the basic requirements and procedures for graduate studies at RIT, the applicant must achieve a qualifying score on the Graduate Management Admission Test. Further details regarding the test and other information can be secured from the center.

Curriculum

Foundation Courses   **Credit**
Phase I   **Hours**

These courses may be waived for those having a grade of "B" or better in appropriate undergraduate courses, using guidelines established by RIT.

	Credit Hours
Financial Accounting-BBUA-701	4
Behavioral Science in Management-BBUB-744	4
Economic Environment of American Business-BBUF-745	4
Statistical Analysis I-BBUQ-781	4
Concepts in Computer Utilization-BBUQ-792	4
	0 to 20

Core Courses: **Credit**
Phase II   **Hours**

These are required of all MS (BT) students, and follow as a general prerequisite, the completion of Phase I.

	Credit Hours
Management & Organization-BBUB-741	4
Personnel Systems-BBUB-750*	4
Legal Environment of Business-BBUB-751*	4
Financial Management-BBUF-722	4
Marketing Concepts-BBUM-761	4
Advanced Marketing Management-BBUM-762*	4
	24

Or approved electives in the field.

Specialization & Options:
Phase III
Business Specializations:
A minimum of 16 additional credits spanning two of the following specializations:
Accounting, (BBUA, or equivalent courses)
Management (BBUB, or equivalent graduate courses)
Marketing, (BBUM, or equivalent graduate courses)
Computers, (IJCB, or equivalent courses)

Teaching Option:
A minimum of 12 credits to be selected from the following:
Specialized graduate courses.
The Two-Year Colleges-IJCG-701,
Teaching, Learning, Content & Environment-IJCG-702,
Management of Learning-IJCG-703,
Instructional Techniques-IJCG-704,
Seminar-IJCG-750, Internship-IJCG-840 (required if the candidate has insufficient experience)

Master of Science in Career Information

Full-time and part-time students in the program would be either improving and expanding their functions in existing employment (in-service), or seeking employment (pre-service). The potential employers for both types of students would include: community/junior colleges, K-12 school systems, large corporation personnel and training divisions, governmental agencies that provide career information services, quasi-governmental and independent agencies/organizations whose clients need career planning and change information, and career information centers.

A goal of the program is to give the student a sufficiently broad knowledge of careers to be able to explain: the educational involvements, characteristics of career clusters, the satisfactions and rewards of different career patterns, the realities of work in most specializations, the validity of published information, and the aptitudes or talents needed for success in diverse fields. This broad knowledge must be such that the graduate can provide a sense of perspective and the range of opportunities to others. The knowledge must also include an understanding or feeling for the expectations of employers and clients.

A graduate of the program should possess the leadership skills needed to establish and operate cooperative activities related to career education. The activities could include career centers and other projects that require the involvement of several levels of educational organizations, business and industrial organizations, and social agencies that deal with career planning and advisement. The skills needed are the personal ability to facilitate cooperative efforts, the ability to overcome barriers in solving problems, the technical skills needed for particular activities, and the management skills related to cooperative ventures.

Students in the program will be taught to be able to help clients investigate career options, to identify the skills and interests that are needed for various jobs, and to translate career trends and opportunities into valid and viable information.

Since much of this work will be in groups, and include teaching functions, he or she will be able to be effective and efficient in the needed group dynamics and teaching competencies.

The program will help the student to be able to assist others in conducting new program feasibility studies; providing perspective; demonstrating and understanding curriculum planning; and being able to conduct or guide the needed studies.

The graduate of the program should be aware of special problems in career advising and be able to organize and implement his or her own continuing education. The individual will recognize the need for continued learning and have the motivation for it.

The graduate, through his or her selected electives will study the particular characteristics and special expectations of one group of employing institutions.

Admission
Admission decisions for this program will be based upon the requirement of a baccalaureate degree, undergraduate grades, interviews, a personal goals statement, work experience, and test. (Recommended: Miller Analogies).

It is expected that the applicant will have had at least three years of experience as a full-time employee, or the equivalent of prorated part-time work. At least two years of full-time experience outside of education is desired. Individuals not having these minimum work experiences will be given lower priority in selection, and if selected, will be required to complete one additional quarter of internship prior to graduation.

Normally, either a "B" average or better in the most recent year (senior year) of undergraduate studies, or "B" or better grades in at least 12 graduate credits, will be required. Satisfactory scores, however, will offset a lower than desired grade point average.

Interviews and the personal goals statement are evaluated in terms of their relating program goals to the individual's personality and aptitudes for functioning as a career information specialist.

Degree requirements
A minimum of 48 credits of combined required and elective courses is required for the degree.

A maximum of 9 (of the 48) credits may be transferred from other graduate institutions.

A maximum of 18 credits may be satisfied by the combination of transfer credits and credit by examination. Opportunities for credit by examination will depend upon documentation of related work experience and other learning.

Variable credit courses are arranged to accommodate persons who may have demonstrated a prior mastery of parts of the general courses.

Curriculum foundation studies

These are specific educational competencies that are expected of individuals in the program. They 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
E. Testing and Measurements

*Required Courses:

	Credits
0604-702 Teaching, Learning, Content, & Environment	1-3
0604-704 Instructional Techniques	1-4

	Credits
0604-850 Special Project	1-6
0615-741 Nature of Work	3
0615-742 Career Decision Making Concepts	3
0615-743 Education/Business/ Industry Interrelationships	2
0615-744 Legal Aspects of Career Plans	2
0615-745 Career Concepts: Production	3
0615-746 Career Concepts: Commerce	3
0615-747 Career Concepts: Services	3
0615-748 Information Retrieval Systems in Career Planning	3
0615-749 Manpower Forecasting Fundamentals	4
0615-754 Occupational Environment & Human Resource Topics	1-4
0615-755 Internship	1-5
0615-760 Basic Career Counseling Skills	3
*Subtotal of Required Courses:	34-51

**Recommended Electives:

	Credits
For College Positions:	
0604-701 The Two Year Colleges	3
0604-703 Management of Learning	1-4
0604-750 Seminar-Teaching	2
0615-752 Career Education: Colleges & Special Settings	3
For Business/Industry Positions:	
0102-741 Management & Organization	4
0102-744 Behavioral Science in Management	4
0102-750 Personnel Systems	4
0514-501 Industrial Psychology	5
0613-757 Techniques of Work Analysis	2
For Specialized Counseling Positions:	
0615-753 Group Dynamics for Career Development	3
0615-762 Career Education Seminar - Women	3
0615-763 Career Education Seminar - Handicapped	3
0613-770 Interpersonal Communications	2
Total: Minimum Requirement	48

*Waivers for particular studies may be made on the basis of documented learning through experience, non-credit workshops, etc., or undergraduate studies. Individuals having waivers will, however, need to complete a minimum of 48 graduate credits (including approved transfer credit). These individuals may complete additional elective courses or increase the credits in variable credit required courses.

**Other courses and studies may also be accepted as electives if they are an appropriate part of an integrated degree program for the individual.

School of Computer

Science and

Technology

Dr. Richard T. Cheng, 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.

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 system, 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

Stewart Shen, 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, 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 "B" or better to graduate.

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, 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

Stewart Shen, Acting Coordinator

This program provides students with professional competence in managing a computer installation or complex. Graduates will be prepared to enter employment in industrial, educational and governmental institutions, where they would direct or assist to direct computer installations.

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 a high level programming language and an assembly language. Entering students without an adequate background will be advised to take additional courses to make up for deficiencies.

Graduation requirements
The master of science degree requires the successful completion of 48 quarter credits, of which a minimum of 24 credits are in graduate computer science courses and 12-24 credits are in management and free electives. A graduate student must maintain an average of "B" or higher to graduate.

Curriculum

Curricula for entering students differ, depending on their undergraduate programs. However, a set of required core courses must be taken in order to complete the MS degree. If a student enters with prerequisite deficiencies, the undergraduate credits which make up the deficiencies will not be counted towards the MS degree. A student may take day and/or evening courses through the School of Computer Science and Technology.

Computer science courses (ICSS-825,1 CSS-830, ICSS-845, ICSS-850, I CSS-855,1CSS-875, ICSS-880, ICSS-885) can be used as technical graduate electives.

Further information about the program is contained in the Computer Science Graduate Student Handbook, available from the school office.

MS, Computer System Management: Sample Program Quarter Courses
1   ICSM-710 Computer Systems Software
    BBUQ-781-Managerial Decision Making I
2   ICSM-715-Computer Systems Hardware
    BBUQ-782-Managerial Decision Making II
3   ICSM-703-Data Management Concepts
    BBUF-745-Economic Environment of American Business
4   ICSM-740-Computer System Personnel and Management
    BBUA-713-Basic Financial & Managerial Accounting
5   ICSM-765-Advanced Computer Utilization
    BBUF-722-Financial Management
6   ICSM-790-Seminar

Master of Science in Information Sciences

Richard T. Cheng,
  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.

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 "B" or better to graduate.

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

B. Recommended Electives (12-24 Credits)

Course Title and Number	Credit
Data Structure and Analysis-ICSS-320	4
Sorting and Searching Techniques-I CSS-321	4
Data Communication Systems-I CSS-420	4
Operating Systems-I CSS-440	4
Intro, to Management Info. Systems-ICSS-465	4
Microprocessor and Microcomputers-ICSS-721	4
Discrete Simulation-I CSS-730	4
On-Line Information Systems Design-ICSS-735	4

Computer Communication
  Networks-ICSS-740   4
Assemblers, Interpreters, &
  Compilers-ICSS-825   4
Minicomputer Systems &
  Applications-ICSS-875   4
MS Thesis-ICSS-895   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.

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

Data Base Concepts-
  ICSS-485   4
Information Storage & Retrieval-
  ICSS-846   4

Library Automation &
  Management-ICSI-722   4
Information Media and Design-
  ICSI-733   4

B. Recommended Electives (20 Credits)
Course Title and Number Credit

Computer Languages-
  ICSS-800   4
Data Structure Analysis-
  I CSS-320   4
Sorting and Searching Techniques-
  I CSS-321   4
On-Line Information Systems
  Design-ICSS-735   4
Data Base System
  Implementation-ICSS-736   4
Computer Communication
  Networks-ICSS-740   4
Assemblers, Interpreters, &
  Comp.-ICSS-825   4
Minicomputer Systems &
  Applications-ICSS-875   4

Instructional Technology

Clint Wallington, Chairperson

Instructional Technology is a relatively new field concerned with the development of instructional programs and related instructional materials. People in this field work in a variety of settings-education, business, industry, government. All use a systematic approach to training and instruction. Instructional technology includes such areas as: learner behavior; instructional techniques and systems; media and

communications; management of media centers and learning resources; 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 sectors. The program also focuses on instructional development in postsecondary education, particularly in community colleges and in allied health training. The program also covers the selection, evaluation, and distribution of instructional resources. 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 pragmatically oriented without sacrificing adequate coverage of the new literature and theory 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. In order to reinforce this concept, 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, and 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 readily seen from the course listing, the department does not emphasize media production skills. Students entering the program are assumed to have skills in such areas as photography, filmmaking, graphics, audio, and television production. Students without these basic skills are encouraged to obtain them through course work or personal projects.

The degree requires completion of a minimum of 48 quarter credit hours, of which 14-18 (depending on the option chosen) are required. Of the 48, the equivalent of nine quarter hours can be transferred from other graduate programs outside of RIT. Independent studies, internships, and research projects may be attempted by students who have completed 20 or more hours. A maximum of 10 credit hours may be taken in this fashion, and a proposal for the study must be approved prior to registration for such units. Students may also take graduate courses (maximum of 10 hours) in other departments at RIT.

Applicants must take and report scores on the Miller Analogies Test; however, no minimum score is required for entry.

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

Application materials may be obtained from the Department or from the Office of Admission.

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

Course Title and Number Credit Hours

Course	Credit Hours
Introduction to Instructional Technology I - ICIT-700*	2-4
Introduction to Instructional Technology II - ICIT-701	2-3
Training Health Professionals - ICIT-703	2
Sources of Information in Instructional Technology - ICIT-705	3
Sources of Visual Information - ICIT-706	3
Programed Instruction - ICIT-710	4
Computer Assisted Instruction - ICIT-712	4
Instructional Television - ICIT-715	4
Research in Instructional Technology - ICIT-720	4
Evaluation of Training and Instruction - ICIT-721	4
Research Project - ICIT-722	1-4
Psychology of Learning and Teaching - ICIT-735	4
Applications of Behavioral Psychology to Training and Adult Learning - ICIT-736	2-3
Instructional Facility Design - ICIT-745	4
Instructional Development I - ICIT-750*	4
Instructional Development II - ICIT-751*	4
Instructional Development III - ICIT-752	4
Criterion Referenced Instruction and Technical Training I - ICIT-755	3
Criterion Referenced Instruction and Technical Training II - ICIT-756	3
Techniques of Work Analysis - ICIT-757	2
Management & Budgeting in Instructional Technology - ICIT-762	4
Individual Learning Style Analysis - ICIT-765	4
Interpersonal Communications - ICIT-770*	2
Group Development and Organizational Change - ICIT-772	3
Selected Topics in Instructional Technology - ICIT-780*	2
Internship - ICIT-840	1-4
Independent Study - ICIT-850	1-4
Quarter hours required for MS:	48

Maximum of 9 hours may be transferred from non-RIT graduate programs.
Maximum of 10 hours may be taken in other RIT graduate programs.
Maximum of 10 hours may be cumulatively taken in Research Project, Internship, Independent Study, and Criterion Referenced Instruction and Technical Training.

*Required for graduation

Institute College Courses

Center for Community/Junior College Relations

All courses taught through CCJCR are offered on demand with sufficient enrollment.

Note: Graduate courses applicable to the MS in business technology are listed under College of Business. A more detailed statement of course objectives, assumed prior knowledge, and topics to be covered is available through the CCJCR office.

IJCG-701   **The Two-Year Colleges**
Registration #0604-701
    The study of the philosophies, organizations, developments, finance, goals, curricula, and spirit of the two-year college.

Credit variable (1-3 credits)

IJCG-702   **Teaching, Learning, Content,**
Registration #0604-702   **& 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)

IJCG-703   **Management of Learning**
Registration #0604-703
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 (1-4 credits)

IJCG-704   **Instructional Techniques**
Registration #0604-704
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)

IJCG-750   **Seminar**
Registration #0604-750
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.

(All degree candidates should enroll once in Seminar)

Credit 2

IJCG-760   **Collective Bargaining in**
Registration #0604-760   **Community Colleges**
An introduction to the collective bargaining process. This workshop course includes various role implications, legal aspects, impact analysis, strategies, preparations, procedures, and mock negotiation sessions.

Credit 2

IJCG-761   **Administration of Technology Education**
Registration #0604-761
This course introduces the student to the various administrative techniques and roles that are expected of technology department chairmen in the two-year colleges. Topics such as management by objectives, human relations, budgeting, equipment and facility planning, union contracts and negotiating are included. Other topics may be included according to the needs and desires of the class. Guest lecturers and discussion leaders will be invited to address the class as appropriate.

Credit 4

IJCG-840   **Internship**
Registration #0604-840
An individual arrangement with an appropriate community or junior college will be made for those persons not having sufficient experience. This will provide definite teaching assignments and responsibilities, together with participation in other faculty functions, including advising, committee work, planning, and student evaluation on a full semester or term basis at a two-year college. Supervision, assistance, and evaluation will be provided by a mentor in the participating college and by the CCJCR.

Credit variable (3-6 credits)

IJCG-850   **Special Projects**
Registration #0604-850
This course provides for independent study, investigation, or research activity in subject matter areas not formalized by the Center's program, but having specialized value to the field of community college teaching. Projects may be directed at teaching, curriculum development, or instructional technology. Proposals require approval by the director.

Credit variable (1-6)

Career Information

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 3

IJCC-743   **Education/Business/Industry**   **Interrelationships**
Registration #0615-743
A study of the interrelationship of the world of formal education to the business, industrial, and labor communities. Constraints, problems, and values of cooperative effort will be studied in relation to organizations of varying size. Elementary, secondary and post-secondary education, differing size business organizations and industrial groups that involve differing levels of technical specialization are studied.

Credit 2

IJCC-744   **Legal Aspects of Career Planning**
Registration #0615-744
The principal goal is that the participant will have a sufficient knowledge of general law and government agency rulings that control career decisions. Topics include: constitutional law, affirmative action, union affiliation for closed and open shops, exempt and non-exempt employment, collective bargaining, the several labor departments and their functions, job qualifications and requirements, handicapped persons, civil service regulations, laws relating to various cooperative education arrangements, and employment related liability. The student will then examine conflicts between the law and selected practices or procedures. (Assumed prior knowledge of the nature of constitutional, statutory, civil and common law.)

Credit 2

IJCC-745   **Career Concepts: Production**
Registration #0615-745
Credit 3

IJCC-746   **Career Concepts: Commerce**
Registration #0615-746
Credit 3

IJCC-747   **Career Concepts: Services**
Registration #0615-747
Credit 3

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 in Career Planning
Registration #0615-748
The primary goal is the ability to use several data based computer systems for the storage and retrieval of career information. This includes a sufficient understanding of the computer systems, languages and dictionaries for efficient utilization.

Additional goals are an awareness of other systems based upon media and print materials, and the ability to evaluate various systems. (Satisfaction of all foundation studies)

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-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   **Group Dynamics for Career Development**
Registration #0615-753
This course concentrates on the abilities needed to plan, conduct, and evaluate various group counseling and peer assistance processes as used in assisting individuals to formulate career plans. Each participant will understand the appropriate functions, advantages and disadvantages of different group dynamic procedures; and will demonstrate the required "attending", listening, guidance, problem solving, and decision making skills needed to plan and moderate such sessions.

Credit 3

IJCC-754   **Occupational Environments &**
Registration #0615-754   **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   **Career Internship—Project/Experience**
Registration #0615-755
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-756   **Career Internship—Business/Industry**
Registration #0615-756
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)

IJCC-757   **Career Internship—Services/Education**
Registration #0615-757
This is identical to the 756 internship except that it applies to practice in educational and service occupation fields.

Credit variable (1-5 credits)

IJCC-760   **Basic Career Counseling Skills**
Registration #0615-760
Students are introduced to selected counseling skills including attending, listening, questioning, paraphrasing and reflection of feelings through demonstration and role playing. The application of these skills to a select population (women, handicapped, minorities, etc.) is demonstrated through an independent project.

Credit 3

IJCC-762   **Career Education Seminai^Women**
Registration #0615-762
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   **Career Education Seminar-Handicapped**
Registration #0615-763
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

Computer Systems Management*

ICSM-700   **Review of Programming Languages**
Registration #0611-700
A review of programming techniques and the applications of FOR-TRAN and assembly language for the incoming graduate student with deficiencies in programming.

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. (For System Management majors only)

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. Both case studies and comparative studies will be made to large, medium, and small scale computers, as well as to mini computers.

Credit 4

ICSM-740 Computer System Personnel and Management
Registration #0611-740
A study of computer installation personnel and management structure. Topics include system programmer and system analyst qualification and selection, applications programmer qualification and selection, responsibility assignment, scheduling procedures, cost analysis, performance evaluation quality control and other behavioral aspects.

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 application. 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
Topics discussed include management problems, production problems, maintenance problems, hardware and software system problems, and invited topics given by Computer Center directors.

Credit 4

ICSM-799   **Independent Study**
Registration #0611-799

Credit variable (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. (Graduate standing in Information Science, Computer Science or consent of instructor.)

Credit 4 (offered upon sufficient demand)

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

ICSI-733   **Information Media and Design**
Registration #0616-733
A study of current information media and their design. Topics include microfilm system, video system, computer input and out devices, computer interface with media devices, and system design concepts and techniques in the application to libraries and information centers. (Graduate standing in Information Science or Computer Science or consent of instructor.)

Credit 4 (offered upon sufficient demand)

Computer Science

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

I CSS-720   **Computer Architecture**
Registration #0603-720
A study of computer architectural analysis and design. Topics include review of basic theories, hardware technology, parallel and distributive logic, asynchronous and synchronous machines and case study. (ICSS-315)

Credit 4

I CSS-721   **Microprocessor and Microcomputers**
Registration #0603-721
A study of microprocessors, microcomputers and their applications. Topics include microprocessor hardware, microcomputer organization, software, microcomputer programming, interface techniques and trend of development. Case studies will be provided. Intel 8080 will be extensively studied. Students must have background in assembly language programming and knowledge in microprogramming. (ICSP-305 or equivalent)

Credit 4

ICSS-730   **Discrete Simulation**
Registration #0603-730
Computer simulation techniques are examined. Topics include abstract properties of simulations, modeling, analysis of a simulation run, and statistics. At least one general purpose simulation language (GPDS) will be taught. Each student will be required to write at least one simulation program, run it on a digital computer, and present an analysis thereof. (SMAM-309 or equivalent)

Credit 4

ICSS-735   **On-Line Information Systems Design**
Registration #0603-735
Design of on-line informative systems. 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. (Consent of instructor)

Credit 4

ICSS-736   **Data Base System Implementation**
Registration #0603-736
Requirements and characterization of generalized data base systems, the role of data base administrator, creation of general data base, elements of data base management systems, data base management in multi-access environment, survey of data base management systems, selecting a data base management system, projects in data base systems implementation. (ICSS-485)

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.

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 and either ICSS-315 or ICSS-720 required)

Credit 4

ICSS-770   **Computer Graphics**
Registration #0603-770
Theory and technology of computer graphics; display devices and processors; display files and transformations; interactive and three-dimensional graphics and graphic systems; graphic languages and systems design.

Credit 4

ICSS-805   **Fundamentals of Computing**
Registration #0603-805
Computer systems, number representations, arithmetic operations and error analysis, structured programming, recursive programming, systems software, computer architecture and microprogramming. (ICSM-700 or equivalent)

Credit 4

I CSS-806   **Foundations of Computing Theory**
Registration #0603-806
Principles of computing theory; mathematical logic, set theory, relations; functions, grammars and languages, lattices and Boolean algebra, graph theory. (SMAM-431 or equivalent)

Credit 4

I CSS-815   **Computational Complexity**
Registration #0603-815
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. Background in analysis techniques is presumed. (ICSS-806)

Credit 4

I CSS-825   **Assemblers, Interpreters and Compilers**
Registration #0603-825
A survey of the software processors. Topics include design and construction of programming language processors, relative merits vis-a-vis cost, user demands, ease of modification, conversational computing, large scale data reduction, and macro processors. (ICSP-305 or equivalent)

Credit 4

I CSS-826   **Deterministic and Probability Models**
Registration #0603-826   **of Operating Systems**
Concurrent processes control, processor scheduling models, computer sequencing problems, auxiliary and buffer storage models, storage allocation in paging systems, memory management of multiprogramming computers. (ICSS-440 and SMAM-352 orSMAM-522)

Credit 4

ICSS-836   **Data Base Systems**
Registration #0603-836
Data base concepts, information storage structures, data models and data sub-languages, the relational approach, the hierarchical approach, the network approach, data security and integrity, performance and restructuring application and management issues. (ICSS-485)

Credit 4

ICSS-846   **Information Storage and Retrieval**
Registration #0603-846
Information structure and file organization, dictionary and thesaurus construction, utilization and maintenance, statistical and syntactic language analysis; question-answering systems; systems evaluation.

Credit 4

I CSS-850   **Computability**
Registration #0603-850
This course examines the theory of computation as it relates to computable functions. Topics include finite state machines. Turing machines, recursive function theory, and Post's symbol manipulation systems. The limitations of the notion of effective computability are examined. (ICSS-806)

Credit 4

ICSS-852   **Coding Theory**
Registration #0603-852
Study of error correcting codes. 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 #0503-856
Application of theoretical concepts developed in formal language and automata theory to the design of programming language and its 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-480)

Credit 4

ICSS-860   **Compiler Construction**
Registration #0603-860
Language definition, lexical analysis, syntactic analysis, storage allocation and management, code generation, code optimization, diagnostic generation, bootstrapping. (ICSS-480 and (ICSS-525)

Credit 4

ICSS-875   **Minicomputer Systems and Applications**
Registration #0603-875
A study of minicomputer hardware architecture, logical design, system interface, software organization, operation systems and applications in various areas. Hands-on experimentation on the PDP 11/45 and Microdata 1600D dual processing system is emphasized.

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; macro-processors; linkage editors and loaders; compilers; text processors. The course includes programming assignments in several of these areas.

Credit 4

ICSS-885   **Systems Programming Laboratory**
Registration #0603-885
A follow-up course to Systems Programming in which students design and implement a large systems program or module. Past projects have included floating point simulators; a small data base system, a graphics package, and a command language interpreter. (ICSS-880)

Credit 4

ICSS-890   **Seminar**
Registration #0603-890
Credit variable 2-4

I CSS-895   **MS Thesis**
Registration #0603-895
Credit variable 4-8

ICSS-899   **Independent Study**
Registration #0603-899
Credit variable 2-4

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 Technology I**
Registration #0613-700
An overview of the basic elements of instructional technology including: technology and its application to instruction; instructional development; past, present, and future trends in instructional technology; and, instructional objectives. The course is a mix of self-instructional modules and seminars. Completion of modules and seminars on topics above are required (2 cr.). Additional modules cover specialized areas of instructional technology such as health sciences and community college applications, television and instruction, training and development. Course credit varies with the number of modules completed. Course required for graduation.

Credit variable (2-4)

ICIT-701   **Introduction to Instructional Technology II**
Registration #0613-701
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 (2-3)

ICIT-703   **Training Health Professionals**
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   **Sources of Information in**
Registration #0613-705   **Instructional Technology**
Examines the wealth of information sources available to instructional technologists, including catalogs of nonprint material, handbooks, newsletters, ERIC, hardware and software dealers, conference proceedings and books. Students are given problems to solve requiring use of these sources.

Credit 3

ICIT-706   **Sources of Visual Information**
Registration #0613-706
Students develop general search techniques and strategies for finding information, evaluating it, and establishing a reference file for development of instructional materials. Specific application of these techniques is made to locating sources of original visual (graphic, photographic, print) material and of prepared visuals in secondary sources. Interpreting and following recent copyright regulations is discussed. Major search paper required.

Credit 3

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

Credit 4

ICIT-712   **Computer Assisted Instruction**
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 T elevision**
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   **Evaluation of Training and Instruction**
Registration #0613-721
A course to train students in the development and application of testing methods used in measuring performance, principally cognitive and psychomotor skills, as well as methods to determine overall course effectiveness. Covers methods for both formative and summative evaluation, test construction, and means of validating instructional materials and instructional systems.

Credit 4

ICIT-722   **Research Project**
Registration #0613-722
A variable credit course which allows a student to conduct a research project based on the student's interests and with the advice and consent of a faculty member. A formal research proposal must be submitted before registering for this course. Proposal guidelines are available from the department.

Credit **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.

Credit 4

ICIT-736 Applications of Behavioral Psychology to Training
Registration #0613-736   **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   **Instructional Facility Design**
Registration #0613-745
Designed to enable the instructional technologist 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. (ICIT-750)

Credit 4

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

Credit 4

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

ICIT-756   **Criterion Referenced Instruction and**
Registration #0613-756   **Technical Training II**
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-750 and ICIT-751 or permission of the department).

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 2

ICIT-762   **Management & Budgeting in**
Registration #0613-762   **Instructional Technology**
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. (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.

Credit 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.

Credit 1-4

Graduate Faculty Institute College

Roy I. Satre, Jr., BA, MA, Ph.D., Syracuse-Dean; Professor

Richard T. Cheng, BS, MSEE, Ph.D., Illinois—Director, School of Computer Science and Technology, Professor

Richard L. Rinehart, BS, MS, Ed.D., Michigan State-Director, Center for Community/Junior College Relations, Professor

Clinton James Wallington, BA, Ph.D., Southern California-Chairperson, Department of Instructional Technology, Professor

Center for Community/Junior College Relations

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

Larry D. Hoffman, Ph.D., Iowa State University-Chairman, Graduate Engineering Technology, Associate Professor

Dennis C. Nystrom, Ed.D., Texas A&M University-Industrial Education, Professor

Institute Faculty and Professional Personnel Providing Major Services for CCJCR Programs

Donald D. Baker, Ed.D., University of Rochester

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

Paul Bernstein, Ph.D., University of Pennsylvania

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

Paul Kazmierski, Ph.D., Syracuse University

Edward A. Maruggi, Ph.D., University of Minnesota

Roy I. Satre, Jr., Ph.D., Syracuse University

School of Computer Science and Technology

Hussein Abdel-Wahab, Ph.D., University of Waterloo-Assistant Professor, Systems Software, Language Processing, Theory of Computation

Rodger Baker, MS, University of Rochester-Associate Professor, Compilers, Programming Languages, Applications

Peter Bartram, Ph.D., Ohio State University-Assistant Professor, Real-time Computation, Mini-computer Systems

Richard Cheng, Ph.D., University of Illinois-Urbana-Professor, Computer Hardware, Logical Design, Operating Systems

James Chmura, MS, Rutgers University-Instructor, Programming Languages

Evelyn Culbertson, MS, University of Syracuse-Assistant Professor, Computer Graphics, Simulation Programming Languages

Roy Czernikowski, Ph.D., Rensselaer Polytechnic Institute-Associate Professor, Simulation, Micro-processors, Process Control

Guy Johnson, MS, Syracuse University-Assistant Professor, Theory of Computing, Algorithms

Michael Lutz, MS, SUNY at Buffalo-Instructor, Microprogramming, Operating Systems, Systems Software

Peter Lutz, Ph.D., SUNY at Buffalo-Assistant Professor, Operating System, Language Processing

Jeff Levine, Ph.D., Rutgers University-Assistant Professor, Numerical Analysis, Computer Applications.

Wiley McKinzie, MS, SUNY at Buffalo- Assistant Professor, Systems Software, Artificial Intelligence

Stewart Shen, Ph.D., Northwestern University-Associate Professor, Large Data Base Systems, Compiler Design

William Stratton, MS, SUNY at Buffalo-Assistant Professor, Data Base Systems, Minicomputer Systems

Chi-Tong Tang, Ph.D., Yale University-Assistant Professor, Numerical Methods, Applications

Adjunct Graduate Faculty Computer Science and Technology

Richard Black, MBA, Rochester Institute of Technology, Computer Management

Stewart Hirshfield, MS, Ph.D., Syracuse University, Programming Languages, Applications

James Iverson, Ph.D., Purdue University, Data Base

Ralph Longobardi, Ph.D., University of Syracuse, Coding Theory, Programming Languages, Atomata Theory

Walter Maurer, MS, Rochester Institute of Technology; BS, University of Wisconsin, EDP Auditing

T.C. Soong, Ph.D., Stanford University, Numerical Analysis, Applications

Department of Instructional Technology

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

Wallace S. Goya, MA, Indiana University-Assistant Professor

Adjunct Faculty Instructional Technology

Lawrence W. Bell, Ph.D., University of Rochester

The National Technical Institute for the Deaf

NTID graduate Anthony Spiecker is a recent graduate of the Institute College's master's degree program in electrical engineering technology. He received support services through NTID and currently teaches electromechanical technology courses to deaf students.

William E. Castle, Dean and Director

The National Technical Institute for the Deaf (NTID) was created to provide deaf students with technological 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 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.

While it is a national institution, NTID is also one of the nine 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 and oral interpreting in classrooms, tutoring, notetaking, career counseling, personal/social counseling, and job placement assistance.

Deaf students enrolled from the outset in 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.

NTID faculty teach in RIT graduate programs and share a wide range of technical expertise as well as knowledge of both deafness and education of deaf people.

For more information, contact the RIT Office of Admission or the NTID Office for Career Opportunities, One Lomb Memorial Drive, Rochester, New York 14623.

College of General Studies

Mary Sullivan, Dean

The College of General Studies provides a number of graduate courses as part of the master's degree programs of the 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 each of the graduate level disciplines. In this way General Studies courses play an integral role in the professional education by making a direct and distinctive contribution to the student's preparation for a specialized career.

Graduate Faculty

Mary Sullivan, MA, Ph.D., Notre Dame-Dean

Dane Gordon, MA, Cambridge and Rochester-Assistant Dean, Professor

Douglas Coffey, MA, Case Western Reserve-Assistant Professor, Fine Arts

Kathleen Chen, Ph.D., Pennsylvania State-Associate Professor, Psychology

Robert Golden, Ph.D., Rochester-Associate Professor, Literature

Morton Isaacs, Ph.D., Rochester-Associate Professor, Psychology

Richard D. Lunt, Ph.D., New Mexico-Professor, History

Boris Mikolji, Ph.D., Case Western Reserve-Associate Professor, Sociology

Salvatore Mondello, Ph.D., New York University-Professor, History

Pellegrino Nazzaro, Ph.D., University of Naples-Professor, History

Thomas R. Plough, Ph.D., Michigan State-Associate Professor, Sociology

John T. Sanders, Ph.D., Boston University-Assistant Professor

Hertha Schulze, Ph.D., Minnesota-Assistant Professor, Fine Arts

David B. Suits, Ph.D., University of Waterloo-Assistant Professor

Houghton Wetherald, MA, Oberlin-Associate Professor, Fine Arts

Hans Zandvoort, MFA, Royal Academy of Fine Arts, The Hague-Assistant Professor

Graduate Courses
College of General Studies

GLLL-701   **Film History and Criticism**
Registration #0504-701
A critical examination of certain films as an integral part of modern culture. 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)

GSHF-703   **American Architecture**
Registration #0505-703
An examination of American architecture from the 17th century to the present designed for the graduate level of study. Emphasis will be placed on American building art in the late 19th and 20th century.

Class 3, Credit 5 (offered annually)

GSHF-705   **Theories of Aesthetics**
Registration #0505-705
A course for the art oriented graduate student centering on the student's search for a supportable and reliable basis for making value judgments about works of art as well as introducing the student to major concepts in aesthetics.

Class 3, Credit 5 (offered annually)

GSHF-707   **Cubism to the Present**
Registration #0505-707
Cubism as a way of seeing and as an expression of 20th century thinking. Differences and similarities with art forms of earlier eras and other cultures.

Class 3, Credit 5 (offered annually)

GSHF-708   **Oriental Art**
Registration #0505-708
A survey outlining the development of art in India, China and Japan and examining the philosophical circumstances that distinguish eastern artistic traditions.

Class 3, Credit **5** (offered occasionally)

GSHF-710   **Art, Music and Ideas**
Registration #0505-710
An introduction to and analysis of those ideas, philosophies and human attitudes that are associated with and expressed in major works of art from Giotto and des Prez to Stravinsky, Picasso and Wright.

Class 3, Credit 5 (offered occasionally)

GSHF-711   **20th Century American Art**
Registration #0505-711
An investigation of American art from the Civil War to the present. Emphasis will be placed on the visual arts but many references will be made to music and architecture.

Class 3, Credit 5 (offered occasionally)

GSHF-712   **Arts and Crafts in Tribal Societies**
Registration #0505-712
A study of the function of "primitive" art and the techniques of its production, including the use of clay, stone, fibers, bark, wood, bronze, gold, etc. Hair-styling, body painting and scarification will also be discussed.

Class 3, Credit 5 (offered occasionally)

GSHF-715   **Picasso**
Registration #0505-715
The impact of Picasso and his circle on twentieth century art. Affinities with modern scientific and philosophical attitudes.

Class 3, Credit 5 (offered annually)

GSHF-716   **Rembrandt**
Registration #0505-716
A detailed analysis of the art and times of the Baroque master. Emphasis will be placed on the development of his style and technique, on his and other artists' relationship to their society and to the character of the Baroque outlook.

Class 3, Credit 5 (offered annually)

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 occasionally)

GSHH-701   **History of American Educational**
Registration #0507-701   **Thought and Practice**
Traces the history of American education from the pre-Civil War years to the present.

Class 3, Credit 5 (offered annually)

GSHH-703   **History of the Renaissance**
Registration #0507-703
The course will analyze the revival in society, literature, the arts, architecture, and political thought that occurred in Europe from 1300 to 1600. Major emphasis will be given European efflorescence associated with the ideal of Renaissance art and life.

Class 3, Credit 5 (offered on sufficient demand)

GSHP-704   **Ethics and Philosophy of Education**
Registration #0509-704
To develop insights into various philosophies of education through a critical examination of their origins and viewpoints.

Class 3, Credit 5 (offered annually)

GSSP-701   **Developmental Psychology**
Registration #0514-701
The course seeks to investigate the broad developmental patterns of normal human behavior, with emphasis on the growth of cognitive, personality, and culturally patterned behaviors.

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 apply them to concrete situations that may arise for persons doing teaching.

Class 3, Credit 5 (offered annually)

GSSP-710   **Visual Concepts for Visual Practitioners**
Registration #0514-710
An introduction to the analysis of basic principles of visual perception as they apply to the creation and interpretation of visual images, including 3-dimensional scenes, paintings, photographs, sketches, graphics, motion pictures and television. Emphasis will be on providing a structure for a better understanding on how the human visual system represents and relates visual information.

Class 3, Credit 5 (offered on sufficient demand)

GSSP-711   **Psychology of Creativity**
Registration #0514-711
A psychological investigation of the creative process and creative individuals with a focus on measures which stimulate creativity.

Class 3, Credit 5 (offered on sufficient demand)

GSSS-701   **Educational Sociology**
Registration #0515-701
The development of sociological and socio-psychological types of knowledge that have relevancy for or logical connection with educational processes. Based on substantive material about social phenomena making up the social order in which school systems are operating and by which they are influenced.

Class 3, Credit 5 (offered annually)

Index

North

Ballantyne Bridge

To Genesee Valley Park & U of R

Brighton-Henrietta Town Line Road

To Southtown Plaza & U.S. Route 15 ▶

Jefferson-Town Line Road/Route 252

Scottsville Road/Route 383

Genesee River

East River Road

Lomb Memorial Drive

Lowenthal Road

Inn On The Campus

Ward Road

Andrews

H   G

Andrews Memorial Drive

F   E

J   VP

D

11

VP

9   7

6

8   5

1

2

3

4

12

10

Kimball Drive

20 Riverknoll

Energy House

To Eastman Kodak Co. Educational Center

60

55

50   47

43

35

25

L

K

Perkins Road

90 Perkins Green

John Street

B   A   99

C

Wiltsie Drive

97 Colony Manor

To U.S. Route 15 and Thruway exit 46 ▶

Bailey Road

Building Numbers and Names

1 George Eastman Memorial Building:
   Administration tower, College of Business,
   College of Continuing Education,
   Institute College
2 Frank Ritter Memorial Ice Arena
3 George H. Clark Memorial Gymnasium;
   Edith Woodward Memorial Pool
4 College-Alumni Union and Ingle Memorial
   Auditorium
5 Wallace Memorial Library
6 College of General Studies

7 James E. Booth Memorial Building: College of
   Fine and Applied Arts, Bevier Gallery
   Frank E. Gannett Memorial Building: College
   of Graphic Arts and Photography
8 Chester F. Carlson Memorial Building:
   College of Science
9 James E. Gleason Memorial Building:
   College of Engineering
10 Ross Memorial Building: Office of Computer
   Services
11 Information Center
12 Max Lowenthal Memorial Building:
   College of Continuing Education,
   Social Work and Criminal Justice Departments

20 Riverknoll: Campus apartment housing
25 Grace Watson Hall: Resident dining facilities,
   Counseling Center, Protective Services
35 Kate Gleason Hall: residence
43 Nathaniel Rochester Hall: residence
47 Sol Heumann Hall: residence
50 NTID resident
55 NTID resident dining facilities
60 NTID academic building
90 Perkins Green: Campus apartment housing
97 Colony Manor: Campus apartment housing
99 Central Services buildings
VP: Visitor's parking area