Rochester Institute of Technology

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1973

1973-1974 Graduate Bulletin

Rochester Institute of Technology

Official Bulletin
Rochester Institute of Technology
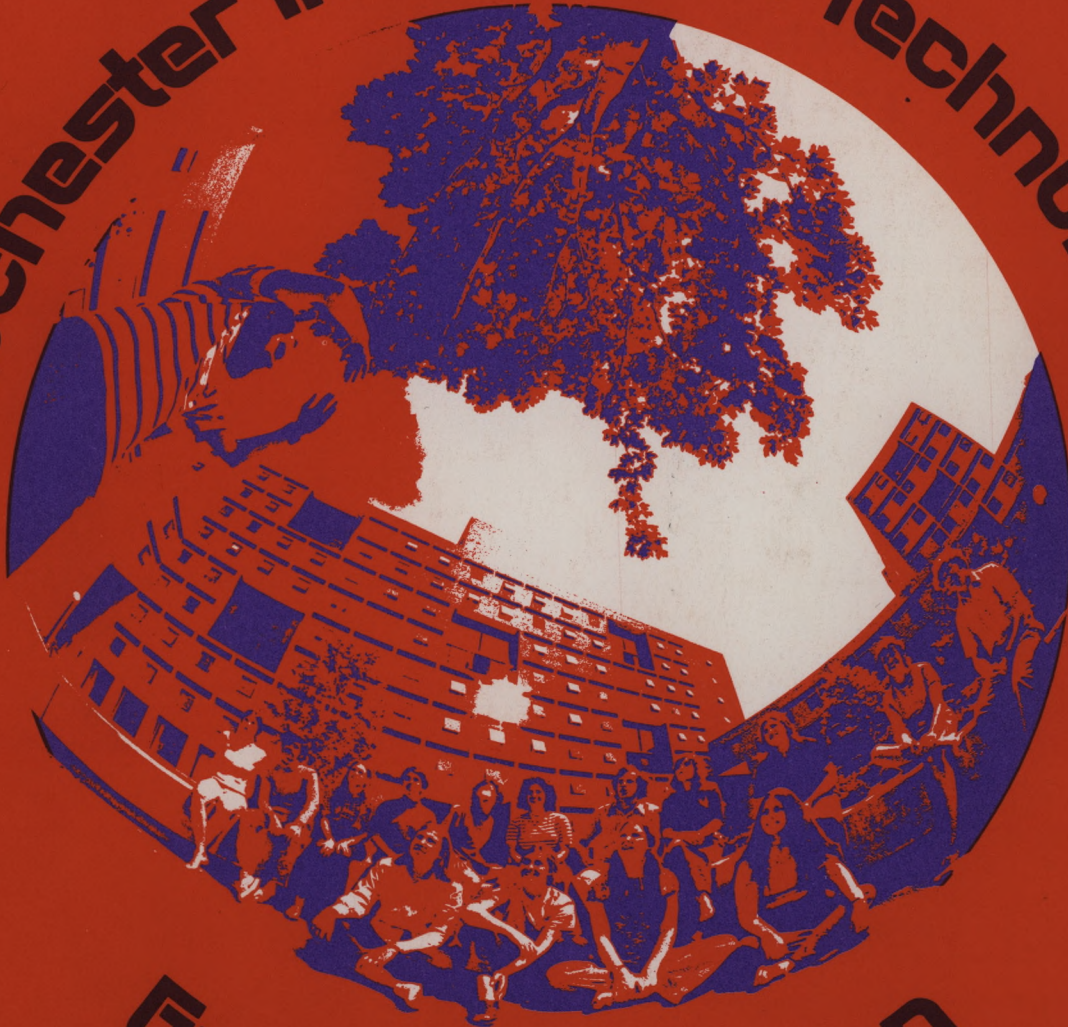
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Graduate Education at RIT

HISTORY AND OBJECTIVES
About fifteen 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 Council on Graduate Studies and petitioned for a charter change 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 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 still 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, an 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 M.F.A. program, the College of Fine and Applied Arts developed a program in Art Education leading to the M.S.T. 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 M.S. degree.

Recent additions to the list of graduate degree programs now available include the M.F.A. in Photography, meeting the demand for higher level professional offerings by the School of Photographic Arts and Sciences, and in 1971-72 a new program leading to an M.S. degree in Accountancy. A new program for 1972-73 is 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 M.S. in Engineering Technology.

The Center for Community/Junior College Relations (formerly Center for Community College Faculty Development) is now developing an M.S. 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.

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.

Admission Requirements

POLICY Decisions of graduate selection rest within the colleges offering the program to which the student is applying. Correspondence between the student and the Institute will be conducted through the Admissions Office.

PROCEDURE 1. Inquiries about, and applications for graduate study are directed to the Director of Admissions.

2. The Admissions Office will acknowledge the inquiry or application, instructing the student as to the information required of him by the school or department to which he is applying before the admissions decision can be made.

3. Once a student has made formal application, the Admissions Office will prepare an applicant folder for him. All correspondence and admission data will be collected by the Admissions Office, and placed in the applicant's folder.

4. When all relevant admissions data have been received, the Applicant 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 Folder will be returned to the Admissions Office.

6. The Admissions Office will notify the student of the admissions decision.

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

Graduation Requirements

The minimum credit requirement for a Master's degree is 45 quarter credit hours (30 semester credit hours). A maximum of 9 quarter credit hours (6 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. 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 degree work at the Institute must obtain prior permission. All references to credit in Course Descriptions section are in terms of *quarter credit hours.* Prerequisites, if any, are shown with course descriptions.

CREDIT HOUR 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 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 candidate's thesis must be recorded on his permanent record.**

THESIS REQUIREMENTS

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 Council on Graduate Studies is that a student is a candidate for the Master's Degree when he has been formally admitted to the Institute as a graduate student (Policy: GC-Al). The Council, however, recognizes the right of a college, or school or department within a college, to require its graduate students to file a separate application for *Candidacy for Master's degree* **at some specified time after resident study has begun.**

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

CANDIDACY FOR AN ADVANCED DEGREE

The Council on Graduate Studies regards some form of integrative experience for candidates of advanced degrees necessary. The nature and format of this experience is a matter of judgment and decision for the individual colleges or schools or departments within the colleges. 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 total learning experience.

SUMMARY EXPERIENCE

Tuition

On the date of publication, the tuition for Graduate Students pursuing a Master's degree is as follows:

A. **FULL-TIME** (12-18 credit hours) -$810.00

B. **PART-TIME** (11 credit hours *or less)* -$70.00/credit hour

C. MASTER OF SCIENCE (C.C.E.) $56.00/credit hour

D. INTERNSHIP* $26.00/credit hour

'NOTE: Applies only to the internship portion of the Master of Engineering Degree in the College of Engineering.

1. Any graduate student carrying over 18 credit hours of study will be charged the full-time tuition rate plus $70.00/credit hour for *each* hour of study exceeding eighteen.

2. The graduation fee charge for those receiving a Master's degree is $20.00, which also includes rental of the Master's Hood.

3. Tuition and fee payments are due on the following dates:

Fall Quarter - September 10, 1973 Spring Quarter - March 11, 1974

Winter Quarter - December 12, 1973 Summer Quarter - to be announced

REFUND POLICY Advance deposits are non-refundable.

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

A. Full Refund:

1. Active Military Service—A student called to active military service during the first 8 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 Suspension—Students generally register for a quarter before grades for the first quarter are available. If such a student later finds that he has failed the first quarter, he will be given a full refund. It remains the student's responsibility to contact his Department to assure that the withdrawal form and refund are properly processed.

B. 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.

C. Partial Refund Schedule:

WITHDRAWAL % OF REFUND
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

The partial payment and other fees are not refundable. All withdrawals from courses must be made in writing; otherwise, the refund of tuition will not be given. The student should not consider himself "officially withdrawn" until he receives the student's copy of the Change of Record Form. The post-mark date of a letter to the dean or the date on which a change of record form is properly completed shall be the date of "official withdrawal" used to determine the refundable amount.

Students enrolled in chemistry laboratory classes must purchase Breakage Deposit Cards at $5.00 each. In most cases the total will not exceed $15.00 for the year. This requirement applies to students of all departments who are enrolled in chemistry courses.

FELLOWSHIPS

These are available through the respective departments offering graduate degrees. Interested applicants should write to the appropriate department chairman or dean, as shown in the Correspondence Directory.

OTHER

Fees for proficiency examination in the External Degree Program, Center for Community/Junior College Relations, are charged at the rate of $10.00 per credit hour covered by the examination. Such examinations will be both oral and written, and will be administered only to students registered in the External Degree Program. Arrangements for such examinations will be made with the Dean of the Center for Community/Junior College Relations.

The Wallace Memorial Library

The Wallace Memorial Library with a capacity of 250,000 volumes, is a true multi-media learning center, with expanded services and innovative procedures to increase its usefulness.

Particularly adapted to an institution of technology, the arts and sciences, the Wallace Library contains a great deal in addition to books. Its Audio-Visual department houses one of the finest art slide collections in the country, over 190 films, and a variety of other non-print media. This department shows between 300-400 films for students each quarter and has preview facilities which faculty and students are welcome to use. The library houses a phonograph record and tape cassette collection and a special listening room in which to use these materials. Located throughout the three floors of the library are over 800 student study stations. There are study carrels, group study rooms with TV sets and lounge areas. Also located in the library are computer terminals for use by students with academic requirements for this equipment.

The library contains a rapidly growing collection of materials on the deaf to serve the National Technical Institute for the Deaf and to support research by any who wish to pursue studies in the problems of deafness. Supplementing the main library are the graduate Chemistry Library, and the Melbert B. Cary, Jr. Collection containing rare items of printing.

Adjacent to, and supportive of the purposes of the library, is the RIT Television Center and the Media Design Center.

Student Affairs Division

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 on the second floor of the George Eastman Building, 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 and personnel selection services for industrial firms. Brochures describing the types of service and fees may be obtained by telephoning or writing the Counseling Center.

READING AND STUDY CLINIC **The Reading and Study Clinic 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 Clinic Center located on the second floor, north end, of the George Eastman Building.**

Those students having automobiles on campus will 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.

AUTOMOBILE REGISTRATION

Any emergency requiring immediate medical attention, fire fighting equipment or security officers' attention (when health or safety of any person is threatened), call Extension 3333. For other security matters, or assistance, call Extension 2853 or 2400.

EMERGENCIES

   All of the above extensions are attended on a 24-hour basis.

The function of the RIT Placement Service is to aid students in making appropriate contacts with employers and to provide career guidance.

PLACEMENT SERVICE

   The office acts in four principal areas as a liaison between employers and those students seeking positions. These areas include: part-time jobs on campus and within the community, summer work, cooperative employment, senior placement, and alumni placement. The office is located on the mezzanine of the College-Alumni Union and is open twelve months a year.

Two physicians and three nurses provide routine out-patient and emergency care at the Student Health Service from 8:30 to 4:30, Monday through Friday. From 4:30 to midnight, Monday—Friday, emergency care is provided in the Residence Halls by a nurse. At other times transportation to the emergency room of a local hospital will be provided as necessary. A consulting gynecologist is available at the Student Health Service one day a week.

HEALTH SERVICE

   The Student Health Service brochure, available at registration or on request from the Student Health Service, details benefits and limitations of services.

Graduate students may apply for a room in the Residence Halls if they desire. Married students may apply for on-campus apartments through the Married Student Housing Office, 113 Kimball Drive, Rochester, N.Y. 14623.

HOUSING

All graduate students are required to have an RIT Identification Card prior to Registration. Such cards may be obtained at RIT on the designated days of Registration.

GRADUATE STUDENT ID CARDS

Courses and programs at the Institute are approved for the education of veterans under P.L. 89-358 (Veterans Readjustment Benefits Act of 1966), P.L. 815 or P.L. 894 (Rehabilitation Acts), and P.L. 634 (War Orphans Act).

ENROLLMENT OF VETERANS

   To receive benefits, an eligible veteran must submit an application for the Certificate of Eligibility to the Veterans Administration Office in Buffalo, New York, well ahead of the beginning of classes. These application forms are available at the nearest Veterans Administration Office.

   A veteran who has been receiving educational assistance at another institution and wishes to transfer to and receive benefits at Rochester Institute of Technology should submit to the VA Form 21E-1995, "Request for Change of Program or School." This form may be obtained from the Veteran Affairs Office at the Institute or the nearest Veterans Administration Office.
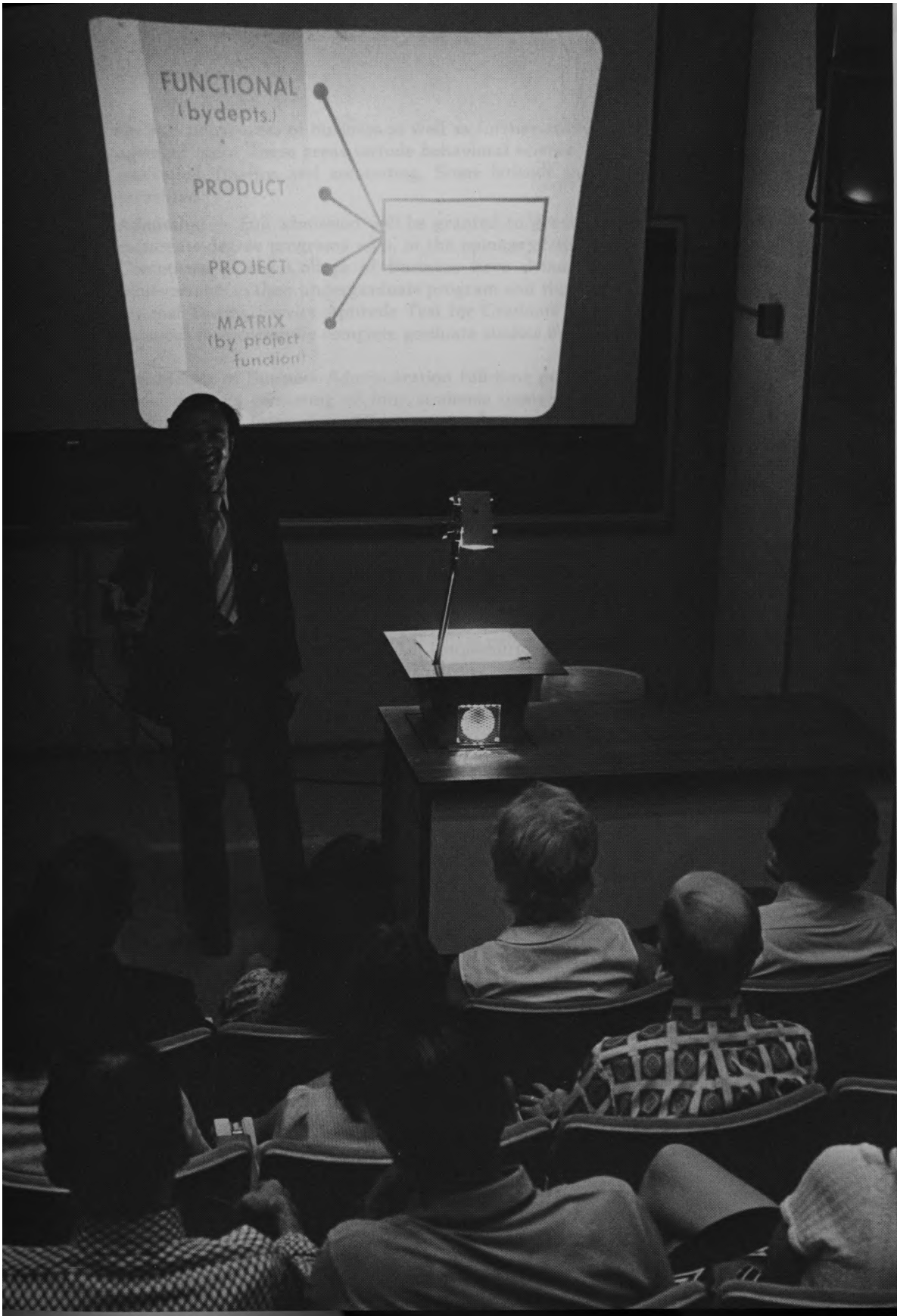
College of Business

EDWARD A. JOHNSON, *Dean*

MASTER OF
BUSINESS
ADMINISTRATION

This program is planned for professional management education at the graduate level. It is broad in nature, encompassing all of the management and business areas common to middle and upper-middle management. It is equally suitable for students with undergraduate degrees in business as well as non-business graduates. The program provides a balance between the behavioral and quantitative aspects of business management; matriculation may be either on a full or part-time basis.

The College of Business is housed in the Eastman Building on the main campus. The Library and the Institute Computer Center are conveniently located to the College of Business.

Objectives — The main purpose of this graduate program is to provide education for business leadership. Preparation for managerial responsibilities and opportunities, together with the development of the individual, is the primary educational objective. The program is professional in nature and is intended to acquaint the student with all aspects of business activity and to provide a competency in business management. To accomplish these objectives, the program will: 1) provide a core of business subjects covering the functional areas of accounting, marketing, finance, management, production, and personnel; 2) provide the basic tools needed by management in decision making; 3) provide opportunities to analyze business problems using the management tools and the knowledge acquired in the functional areas of business; 4) provide an opportunity to concentrate in depth on specific aspects of business and management through selection of electives in one of

the functional areas of business as well as further study in some of the management tools. These areas include behavioral science, quantitative methods, marketing, finance, and accounting. Some latitude in choice of electives is permitted.

Admission — Full admission will be granted to graduates of accredited baccalaureate degree programs who, in the opinion of the Graduate Admissions Committee of the College of Business have demonstrated, through their achievements in their undergraduate program and through the results of Educational Testing Service Aptitude Test for Graduate Study in Business, their potential to successfully complete graduate studies in business.

M.B.A. PROGRAM (Full-time)

The Master of Business Administration full-time program requires a total of seven quarters consisting of four academic quarters and three quarters of Administrative Internship. After an introduction to the functional areas of business in the first two academic quarters, the student spends one quarter (12 weeks) with a business concern in a corporate staff capacity. The student will be located in an area of his interest where he can become involved in the management process, as well as have an opportunity to observe the firm's total operation.

Upon completion of the quarter's internship, the student returns to campus for his third academic quarter. During this time, in conjunction with his course in Business Research Methods BBUB-770, he will propose a research project to be completed during the second and third quarters of his Administrative Internship. The faculty and the firm will work closely with the student on his project. In the student's final academic quarter, the results of the research will be reviewed by faculty and presented to the firm. During the three quarters of Administrative Internship, the participating firm will compensate the M.B.A. candidate in an amount commensurate with his background and experience.

This unique feature of combining management experience with education is only one of the methods used in this graduate program to insure that theory is constantly supported with actual application in business.

M.B.A. PROGRAM (Part-time)

In addition to full-time study, the M.B.A. program is available on a part-time basis, with courses offered evenings and Saturdays. Course requirements, faculty, and admissions procedures correspond to the full-time program; however, the Administrative Internship program is not required for part-time students who are currently full-time employees of area firms.

FULL-TIME CURRICULUM: MASTER OF BUSINESS ADMINISTRATION

	Required Courses		Hours
1st Qtr.	BBUM-761	Marketing Concepts	4
	BBUQ-781	Managerial Decision Making I	4
	BBUB-744	Behavioral Science in Management	4
	BBUA-713	Basic Financial and Managerial Accounting	4
			16
2nd Qtr.	BBUQ-782	Managerial Decision Making II	4
	BBUB-742	Legal & Social Environment of American Business	4
	BBUF-722	Financial Management	4
	BBUB-741	Administrative Theory	4
			16
3rd Qtr.		Administrative Internship	
4th Qtr.	BBUF-745	Economic Environment of American Business	4
	BBUB-770	Business Research Methods	4
		Approved Elective*	4
	BBUQ-783	Managerial Decision Making III	4
			16
5th Qtr.		Administrative Internship and	
	BBUB-771	Research Option	4
6th Qtr.		Administrative Internship and	
	BBUB-772	Research Option	4
7th Qtr.	BBUB-759	Integrated Business Analysis	4
		Approved Elective*	4
		Approved Elective*	4
	BBUB-743	Operations Management	4
			16

Total Hours Required — 72 Qtr. hrs. maximum, 48 Qtr. hrs. minimum

'Elective courses 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 Graduate Faculty of the College of Business. Applies to both full-time and part-time curriculum.

PART-TIME CURRICULUM: MASTER OF BUSINESS ADMINISTRATION

	Required Courses		Hours
1st Qtr.	BBUA-713	Basic Financial and Managerial Accounting	4
	BBUQ-781	Managerial Decision Making I	4
			8
2nd Qtr.	BBUB-744	Behavioral Science in Management	4
	BBUQ-782	Managerial Decision Making II	4
			8
3rd Qtr.	BBUM-761	Marketing Concepts	4
	BBUQ-783	Managerial Decision Making III	4
			8
4th Qtr.	BBUF-722	Financial Management	4
	BBUB-741	Administrative Theory	4
			8
5th Qtr.	BBUF-745	Economic Environment of American Business	4
	BBUB-743	Operations Management	4
			8
6th Qtr.	BBUB-770	Business Research Methods	4
	BBUB-742	Legal and Social Environment of American Business	4
			8
7th Qtr.		Approved Elective*	4
	BBUB-759	Integrated Business Analysis	4
			8
8th Qtr.		Approved Elective*	4
		Approved Elective* or	
	BBUB-771	Research Option	4
			8
9th Qtr.		Approved Elective*	4
		Approved Elective* or	
	BBUB-771	Research Option	4
			8

Total Hours Required —72 Qtr. hrs. maximum, 48 Qtr. hrs. minimum

GRADUATE PROGRAMS IN ACCOUNTANCY

The increasing demands on the professional accountant have produced a need for a more extensive and broader educational preparation. In recognition of this need, the College of Business offers graduate programs leading to the Master of Science in Accountancy, and the M.B.A. - Accounting Option.

These two programs are registered with the New York State Education Department, which means that graduates meet the educational requirements for the Certified Public Accountant Examination and thus reduce the experience requirement for the Certified Public Accountant Certificate by one year.

The M.S. in Accountancy is a 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. Students may pursue this program either on a full or part-time basis. The admission standards and procedure are the same as those for the M.B.A. program.

FULL-TIME CURRICULUM: MASTER OF SCIENCE IN ACCOUNTANCY

		Required Courses	*Hours*
1st Qtr.	BBUB-744	**Behavioral Science in Management**	4
	BBUQ-781	**Managerial Decision Making I**	4
	BBUF-745	**Economic Environment of American**	
		Businessf	4
		Approved Elective*	4
			16
2nd Qtr.	BBUB-741	**Administrative Theory**	4
	BBUQ-782	**Managerial Decision Making II**	4
	BBUF-722	**Financial Management or**	
		Approved Finance Elective	4
	BBUA-717	**Seminar in Taxation**	4
			16
3rd **Qtr.**	BBUQ-783	**Managerial Decision Making III**	4
	BBUA-716	**Advanced Public Accounting**	4
	BBUA-718	**Seminar in Advanced Accounting**	
		and Theory	4
		Approved Elective *	4
			16

  Total Quarter credit hours — 48

fOr approved Economic Elective

'Elective courses 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 Graduate Faculty of the College of Business.

PART-TIME CURRICULUM: MASTER OF SCIENCE IN ACCOUNTANCY

	Required Courses		Hours
1st Qtr.	BBUB-744	Behavioral Science in Management	4
	BBUQ-781	Managerial Decision Making I	4
			8
2nd Qtr.	BBUF-745	Economic Environment of American Business!	4
	BBUQ-782	Managerial Decision Making II	4
			8
3rd Qtr.	BBUQ-783	Managerial Decision Making III	4
	BBUF-722	Financial Management or Approved Finance Elective	4
			8
4th Qtr.	BBUB-741	Administrative Theory	4
		Approved Elective*	4
			8
5th Qtr.	BBUA-717	Seminar in Taxation	4
	BBUA-718	Seminar in Advanced Accounting and Theory	4
			8
6th Qtr.	BBUA-716	Advanced Public Accounting	4
		Approved Elective*	4
			8

Total Quarter credit hours—48

|Or approved Economics Elective

'Elective courses 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 Graduate Faculty of the College of Business.

**MASTER OF BUSINESS ADMINISTRATION:
ACCOUNTING OPTION**

The M.B.A., Accounting Option, enables the student to obtain a broad education encompassing those behavioral and quantitative aspects of management common to middle and upper-middle management, in addition to meeting the previously mentioned educational requirements for the Certified Public Accountant Certificate.

Specifically, the M.B.A., Accounting Option, is designed for students *with* or *without* an extensive background in accounting or business at the undergraduate level. The program normally requires the following sequence of accounting courses to be integrated as their approved electives into the regular 72 hours maximum M.B.A. program:

Courses	Hours
BBUA-714 Basic Accounting Theory*	4
BBUA-715 Accounting Controls*	4
BBUA-716 Advanced Public Accounting	4
BBUA-717 Seminar in Taxation	4
BBUA-718 Seminar in Advanced Accounting and Theory	4

*Can be waived with 28 to 32 undergraduate quarter credit hours in accounting. If waived, other approved electives must be taken.

"*You need not be a mathematical statistician to do good statistical work, but you will need the guidance of a first class mathematical statistician. A good engineer, or a good economist, or a good chemist, already has a good start, because the statistical method is only good science brought up to date by the recognition that all laws are subject to the variations which occur in nature. Your study of statistical methods will not displace any other knowledge that you have; rather, it will extend your knowledge of engineering, chemistry, or economics, and make it more useful.*" **—W. E. Deming**

College of Continuing Education

AUSTIN J. BONIS, *Chairman, Department of Statistics*

MASTER OF SCIENCE DEGREE IN APPLIED AND MATHEMATICAL STATISTICS

PROGRAM OF STUDY

The College of Continuing Education of Rochester Institute of Technology, through the Department of Statistics, offers a program of graduate study leading to the Master of Science degree in Applied and Mathematical Statistics. This program is conducted on a part-time evening basis and is intended primarily for full-time employees of business and industry. Students from other programs at RIT may also participate as may those without a degree objective who desire specialized training in particular statistical fields.

It will be possible for candidates to complete the requirements for the degree in a minimum of 8 quarters although a 10 to 12 quarter period often will be needed.

ADMISSION

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

Department of Statistics, be accepted provisionally, pending the completion of CASM-701 and one other course in the 700 series with the grade of at least "B" in each course.

GRADUATION
REQUIREMENTS

The basic requirement for the Master of Science in Applied and Mathematical Statistics is the satisfactory completion of 45 quarter credits of approved work. All courses in Applied and Mathematical Statistics are elective, but a minimum of 21 credits must be earned through courses in the 800 series.

In consultation with a departmental advisor, the candidate will determine a total program structured to achieve his individual professional objectives.

As many as 9 graduate quarter credit hours in science, engineering or advanced courses in mathematics may be accepted for degree credit, as approved by the Statistics Department Chairman.

A student may, with permission of the Department Chairman, elect one of three curricular plans. All candidates under all three plans, upon completion of course work, must pass a final comprehensive examination designed to assure professional competence as a statistician at the Master's level.

Under **Plan** A, the candidate completes 36 quarter credits, and must submit a satisfactory research project and thesis which counts as 9 quarter credits.

Under **Plan B,** the candidate completes 45 quarter credits of satisfactory course work.

Under **Plan** C—Independent Study for qualified students—the candidate is held responsible for his own rate of progress in subject matter achievement rather than pursuing a scheduled course-completion program. He will be assigned to a faculty advisor who will set subject matter goals, as approved by the Department Chairman, for the candidate to attain. The candidate will be free to attend as an *auditor,* and at his discretion, without the necessity of formal registration in the class, any part or all of any course in the program that he feels may be helpful to him. Registration as a candidate is required each quarter. As determined by the candidate and his advisor, he will periodically stand for both written and oral departmental examinations to measure progress in his achievement of assigned subject matter goals. The number of credits earned by the candidate each quarter will be reported for the record. He may elect at the end of any quarter to transfer to Plan A or Plan B, with attained quarter credits to be assigned at the point of transfer as determined by the Department Chairman.

Normally a minimum of six quarters of work under Plan C should be required to qualify for the M.S. degree, but no minimum is mandatory. The cumulative record will show 45 quarter credits before awarding the degree.

Transfer of a candidate from Plan A or Plan B to Plan C is also possible at the discretion of, and with credit determined by the Department Chairman, but this procedure is exceptional rather than common.

COURSES

All course offerings appear in the Course Descriptions section of this catalog, listed directory style under the prefix CASM.

Photo by A. J. Zelada

College of Engineering

RICHARD A. KENYON, *Dean*

MASTER OF ENGINEERING DEGREE

MASTER OF SCIENCE DEGREE IN ELECTRICAL OR MECHANICAL ENGINEERING

The College of Engineering offers graduate programs leading to the Master of Engineering degree, or the Master of Science degree in Electrical or Mechanical Engineering. Descriptions of these programs will be found in the following pages. 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 full-time in industry must obtain the permission of his advisor and the approval of the Department Head.

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

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

Full-Time Study — Even though the 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 regularly enroll full-time graduate students also. 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 internship. A full-time student can normally complete the degree requirements in one calendar year. A limited amount of financial aid is available to the full-time student. Details of such 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 num-

ber of courses for RIT credit are offered in selected industrial locations using a combination of video tapes, and in-person discussion sessions.

Any student who wishes to study at the graduate level must first be admitted to the graduate program.

ADMISSION TO THE GRADUATE PROGRAM

The prospective graduate student can be admitted in one of the following three categories: regular status, provisional status, or special status.

Regular Status — An applicant is admitted as a regular graduate student if he has received a bachelor's degree from an approved undergraduate school, and if an examination of the required documents indicates that he is qualified to undertake a graduate program.

Provisional Status — An applicant is admitted as a provisional graduate student if he does not meet all the requirements for regular status, but clearly possesses sufficient promise to warrant a trial period in graduate study. His academic performance is reviewed periodically until a maximum of 16 credit hours has been reached. At or prior to that time, his provisional status will be changed to regular or his admission rescinded, upon the recommendation of the faculty and approval of the Dean.

To be considered for admission as a *regular* or a *provisional* graduate student, it is necessary to file an Application for Admission to Graduate Study accompanied by the appropriate transcripts of previous undergraduate and graduate study, two letters of recommendation, and evaluation of Graduate Record Examination, if one has been taken.

Special Status — An applicant is permitted to take graduate courses as a special student if he has a bachelor's degree from an approved undergraduate school and the necessary background for the specific courses in which he wishes to enroll. The courses taken for credit on special status can usually be applied toward the Master of Science degree when the student is admitted to the regular status at a later date. However, the *maximum* number of credits which can be transferred to the degree program from courses taken as a special student is normally 16 credits.

To be admitted as a *special* student, the applicant must file an Application for Admission as a Special Student. For admission as a special student, there is usually no need to submit supporting documents of the type required with the application for admission as a regular or provisional student.

The College of Engineering does *not* require graduate applicants to take the Graduate Record Examination. When this has been taken, results may be submitted for evaluation.

GRADUATE RECORD EXAMINATION

PLAN OF STUDY

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 special, provisional, 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. 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 who is on a regular or provisional status. The faculty advisor supervises the progress of the student towards the Master's degree. Special students should direct their questions to either the Department Head or the Chairman of the department's Graduate Committee.

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." (Transfer credits from other institutions 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 fails in any required examination, his 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.

When a student writes a thesis, he must comply with the following regulations regarding its submission:

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 his 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 five years after the student's initial registration in graduate courses at the Institute as a regular, provisional, or special 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.

Detailed description of the courses will be found in the Course Description Section of this catalog under the individual Department headings.

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 B.S. 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 of an M.S. degree.

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 sixteen credits may be earned by the student from his internship experience. The internship position is selected to reflect each individual student's primary professional interest and is integrated with his curriculum.

   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 him meet his professional objectives. A maximum of sixteen credits can be taken by the student in courses outside the traditional areas of engineering and the sciences, subject to the approval of his advisor.

SPECIAL FEATURES OF THE PROGRAM

The requirements and general standards for admission and the selection procedure will be essentially similar to those for the M.S. degree programs. However, the number of *full-time* students admitted into the program will be limited by the number of internship positions available.

ADMISSION REQUIREMENTS

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

DEGREE REQUIREMENTS

Each student will be assigned a faculty advisor as soon as he is formally admitted to the program. In cases where the student's background warrants it, a committee of two advisors will be assigned to him. The faculty advisor will assist the student in preparing a meaningful plan of study. He 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.

FACULTY ADVISOR

ELECTRICAL ENGINEERING DEPARTMENT

WATSON F. WALKER, *Department Head*

MASTER OF SCIENCE DEGREE PROGRAM

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.

THESIS

The inclusion of a thesis as a formal part of the Master of Science degree program in Electrical Engineering is optional. Students who decide to write a thesis can earn a minimum of 6 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 his baccalaureate degree may be permitted to make an oral technical presentation on an engineering project he 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 Chairman 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 his 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 academic credits. The student must first consult a faculty member about a suitable topic for the paper and obtain his 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

None of the courses is specifically required of all graduate students. The student chooses courses according to his professional objectives, subject to the constraints placed by prerequisites and scheduling.

A maximum of twelve quarter credit hours can be chosen from graduate ELECTIVE COURSES 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.

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 section of this catalog on Course Descriptions but not included in the following calendar, are offered when there is sufficient student interest or on an independent study basis.

COURSE CALENDAR

Fall 1973 and every odd numbered year

'EEEE-707 Linear Systems
*EEEE-711 Integrated Circuit Operational
        Amplifiers
EEEE-718 Statistical Design of Control
        Systems
EEEE-736 Information Theory
*EEEE-750 Switching Circuits I

Fall 1974 and every even numbered year

*EEEE-707 Linear Systems
*EEEE-711 Integrated Circuit Operational
        Amplifiers
EEEE-719 Sampled Data Control Systems
EEEE-738 Physical Basis of Integrated
        Circuits
*EEEE-750 Switching Circuits I

Winter 1974 and every even numbered year

EEEE-702 Introduction to Random Vari-
        ables and Signals
EEEE-713 Modern Control Theory
EEEE-740 Digital Integrated Circuits
*EEEE-751 Switching Circuits II

Winter 1975 and every odd numbered year

EEEE-702 Introduction to Random Vari-
        ables and Signals
EEEE-713 Modern Control Theory
*EEEE-734 Communication Techniques
EEEE-740 Digital Integrated Circuits
'EEEE-751 Switching Circuits II

Spring 1974 and every even numbered year

EEEE-708 Active Filter Design
EEEE-720 Optimum Control Systems
EEEE-737 Random Signals and Noise
*EEEE-753 Logic Fault Diagnosis

Spring 1975 and every odd numbered year

EEEE-714 Introduction to Nonlinear Con-
        trol Systems
EEEE-716 Digital Signal Processing
EEEE-735 Digital Data Transmission
EEEE-752 Sequential Machines and
        Automata

'Courses marked above with an asterisk use a combination of videotapes and live discussion sessions.

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 insure 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 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 4 credits and a maximum of 12 credits. Under unusual circumstances the thesis requirement may be waived.

All Graduate students in the Mechanical Engineering Department are expected to have a mathematics background equivalent to SMAM-308, Engineering Mathematics. **Students not meeting this prerequisite will be expected to take** SMAM-308 **as soon as possible after enrolling. Graduate credit is not given for this course.**

CORE COURSES

   All Graduate students are required to complete EMEM-731, Introduction to Continuum Mechanics **and an 8 credit mathematics sequence to be selected from the following courses:**

Course Number	Course Title	Credits
EMEM-701	**Applied Engineering Analysis** I	4
EMEM-702	**Applied Engineering Analysis II**	4
EMEM-703	**Applied Engineering Analysis III**	4
EMEM-705	**Numerical Analysis**	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. Under unusual circumstances, up to 9 credits of upper level undergraduate electives in Mechanical Engineering may be included in the student's graduate program. All graduate student programs must be submitted to and approved by the Departmental Graduate Committee.

ASSISTANTSHIPS
AND FELLOWSHIPS

A number of 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 $2500 per academic year. Applicants for financial aid should write directly to the Department Head for details.

EXAMINATIONS

Examinations — Each student completing a thesis will be required to pass, as a minimum, an oral examination on the thesis subject. Each student in a non-thesis program will be required to pass a comprehensive examination in his major field. This examination will be taken near the end of the formal program of study, but in any case, no sooner than following completion of at least 30 **graduate credits.**

COURSE CALENDAR

Some of the graduate courses in Mechanical Engineering are offered in alternate years. The calendar below will be helpful in working out a program sequence.

Fall 1973
'EMEM-701 Applied Engineering Analysis I
'EMEM-705 Numerical Analysis
'EMEM-731 Introduction to Continuum
   Mechanics
EMEM-739 **Experimental Stress Analysis**
EMEM-743 **Applied Vibrations**
EMEM-751 **Automatic Control Engineer-
   ing I**

Winter 1974
*EMEM-702 **Applied Engineering
   Analysis** II
EMEM-711 **Heat Transfer** I
EMEM-717 **Thermodynamics**

EMEM-733 Analytical Mechanics
EMEM-737 Vibration Theory and
   Applications I
EMEM-795 Finite Elements 1

Spring 1974
*EMEM-703 **Applied Engineering
   Analysis III**
EMEM-712 **Heat Transfer II**
EMEM-715 **Fluid Dynamics**
EMEM-718 **Statistical Thermodynamics**
EMEM-738 **Vibration Theory and Applica-
   tions II**
EMEM-752 **Automatic Control Engineer-
   ing II**

'Courses marked above with an asterisk as well as the following courses will be offered during the 1974-75 academic year.

EMEM-713 Heat Transfer III
EMEM-735 Theory of Elasticity I
EMEM-736 Theory of Elasticity II
EMEM-732 Advanced Mechanics of
   Materials
EMEM-797 Finite Elements II

College of Fine and Applied Arts

College of Fine and Applied Arts

ROBERT H. JOHNSTON, *Dean*

MASTER OF SCIENCE IN TEACHING
MASTER OF FINE ARTS DEGREE

The College of Fine and Applied Arts, in its School for American Craftsmen, in the Industrial/Environmental Design, Communication Design, and Fine Arts programs of the School of Art and Design, has been preparing 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 has also prepared graduates to teach at colleges and at secondary levels.

The College of Fine and Applied Arts of Rochester Institute of Technology 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 the student to broaden his experience in the practice of art in areas other than his major, and also to increase his 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 Arts offers two graduate degrees: the Master of Science in Teaching (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 degree.

The M.S.T. degree may be earned normally in one academic year through the satisfactory completion of a minimum of 48 credit hours in course work; the M.F.A. 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.

The M.S.T. degree is arranged for the student holding the B.F.A. degree (or a B.A. degree with an art major) who wishes to earn teacher certification, or who holds Provisional Certification (with a B.S. or B.A. degree in Art or Industrial Arts Education) and seeks Permanent Certification. The M.S.T. degree may also be taken as concentrations in the studio areas, with supporting courses chosen on the basis of need and interest from graduate offerings in other schools and departments of the Institute.

The M.F.A. degree is designed as a professional degree for the practicing artist or designer and for those wishing to teach at the college or university level.

Those entering the M.S.T. program and who may wish to change to the M.F.A. program, must petition the Graduate Faculty for permission to change the degree objective. The petition should be presented to the Chairman. In view of the pronounced difference in entrance requirements, students requesting a transfer from the M.S.T. to the M.F.A. 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 M.S.T. course of study.

The M.F.A. and the M.S.T. programs are constituted to reflect the goals of Rochester Institute of Technology.

OBJECTIVES

They are designed to graduate artists and craftsmen who can meet the needs of the environmental condition through high standards of professional performance.

Admission to the M.S.T. 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 backgrounds should refer to the section on Special 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 B.A. or B.F.A. degree and seeks the M.S.T. 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 B.S. degree in Art Education and Provisional Certification the graduate concentration should be in the studio area, and the program must include a minimum of 15 quarter credit hours in the liberal studies or humanities.

REQUIREMENTS FOR ADMISSION

Admission to the M.F.A. Degree Programs — The applicant should hold the baccalaureate degree in a field of the arts or art 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 Special Students below.) The undergraduate degree should include 75 **quarter credit hours** (50 **semester hours) in studio courses.**

Students are admitted to graduate study only 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 9 quarter credit hours.

ACCEPTANCE FOR GRADUATE STUDY

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 programs a way of extending and improving his 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 content of the Master of Science in Teaching program.

ADMISSION AS
SPECIAL STUDENTS

Students who have a baccalaureate degree and who wish to take particular courses may be admitted as "Special 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 B.F.A., B.A., or B.S. degrees, and their academic record and portfolio indicate an ability to meet graduate standards. Any foreign student will receive individual evaluation and be considered for admission at the highest level commensurate with his preparation.

ADMISSION
PROCEDURE

To apply for admission to graduate study *a* **student must submit evidence of his baccalaureate degree, a portfolio* or other evidence of his creative work, a statement of purpose, and references.**

Transfer of Credit — Graduate work pursued in other schools, including the College of Continuing Education of RIT, is transferable to the extent of 9 quarter credits (6 semester hours) and 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.

ACCEPTANCE INTO
THE PROGRAM

A *Conditional Acceptance* **into the Graduate Program of the College of Fine and Applied Arts generally means that you have not completed the necessary undergraduate prerequisites. Such prerequisites must be satisfied as defined in the** *Letter of Acceptance* **which you will receive prior to your admission as a graduate student.**

A *Probationary Status* **refers to an acceptance that is changed after one quarter of involvement in the Program. It is a marginal acceptance that is resolved in one of three ways:**

1. A change to full graduate status with the previous quarter's work applying toward the degree.

*The portfolio is to consist of 20-24 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. Receipt of portfolios will be acknowledged. All correspondence and portfolios should be addressed to the *Graduate* Program, College of Fine and Applied Arts.

2. A change to full graduate status with the previous quarter's work defined as a necessary prerequisite for entrance into the Program and therefore not applying toward the degree.
3. Discontinuation in the Program.

Upon *Full Acceptance* into any of the Graduate Programs the student is considered qualified to pursue the degree. This status would be changed only by evidence of poor performance in the Program.

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. The College also reserves the right to select an example or examples for its permanent collection. In such cases, where work is selected for the permanent collection the material cost only will be paid by the College.

POLICY REGARDING STUDENT WORK

THE PROGRAMS OF GRADUATE STUDIES

The *Master of Fine Arts* program includes five categories of studies:

	Quarter Credil
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:	
(a) Ceramics and Ceramic Sculpture	
(b) Metalcrafts and Jewelry	
(c) Woodworking and Furniture Design	
(d) Weaving and Textile Design	
(e) Glassblowing	
(f) Design Applications	
(g) Communication Design	
(h) Fine Art (Painting, Printmaking)	
2. Minor Concentration*	15
From the above, to consist of studio and related electives, or internship.	
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.

The *Master of Science in Teaching* program requirements include two categories of studies:

1. Master of Science in Teaching in Art Education (for those holding the B.F.A. or B.A. [Art Major] Degrees and seeking the Graduate Degree and Permanent Certification).

	Quarter Credit Hours
The degree offers a concentration consisting of background courses in Education:	20
(a) Development Psychology	
(b) History of American Educational Thought and Practice	
(c) Educational Psychology	
(d) Educational Sociology	
Art Education Concentration:	22
(e) Methods and Materials in Art Education	
(f) Seminar in Art Education	
(g) Practice Teaching	
Studio Elective	6
Total	48

2. Master of Science in Teaching in Studio Art (for those holding the B.S. Degree in Art Education or Industrial Arts Education, who hold Provisional Certification and desire Permanent Certificates, or for the B.A. or B.F.A. 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:	24
(a) Studio Art, or Crafts	
(b) Art History and Humanities	10-15
Minor Concentration and Electives:	9-14
(c) From a or b above	_____
Total	48

College of Graphic Arts and Photography

College of Graphic Arts and Photography

LOTHAR K. ENGELMANN, *Dean*

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.

Several faculty groups are active in research within the department 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.

The Department 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 department the opportunity to obtain both the Bachelor of Science and Master of Science Degrees simultaneously after five years of study. Admission into this program may 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 Catalog. Persons interested in this program should request information through the coordinator of the departmental graduate program.

2. Master of Science in Photographic Science and Instrumentation for Full-time Students.

This program is designed for persons holding a Bachelor of Science degree in physics, chemistry, or engineering.

Before admission to candidacy and beginning 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 PPHS-700, Principles of Photographic Science. This course begins in June and runs for ten 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 termination of the experimental work on the thesis and for the preparation of the report. Hence full-time students should plan on five quarters of residence, beginning with the summer quarter.

3. Master of Science in Photographic Science and Instrumentation for

Part-time Students.

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 PPHS-701, 702, 703, Principles of Photographic Science, which is equivalent to **PPHS-700** in content. The PPHS-701, 702, 703 sequence is offered during the evening, with Saturday laboratory sessions.

Part-time students must plan to complete the requirements within seven years from registration. 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 departmental graduate program coordinator.

ADMISSION

Admission to the full-time or part-time programs will be granted to qualified graduates of accredited degree-granting institutions whose under-graduate studies have included at least the following courses in the major areas of study:

1. Mathematics through calculus;
2. A full-year, college-level course in physics, with laboratory;
3. A similar course in chemistry.

Applicants must demonstrate to the Graduate Committee (M.S.) 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 under-graduate 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. These must include the courses shown in the table on next page, the submission of an acceptable thesis, and an oral examination.

PROGRAM

Course		Quarter Credit Hours		
Number	Course Title	F	W	S
PPHS-700 *or* PPHS-701, 702, 703*	Principles of Photographic Science	No Graduate Creditt		
PPHS-711,712,713	Theory of the Photographic Process	3	3	3
PPHS-721, 722**	Mathematics/Statistics for Photographic Systems	4	4	
PPHS-731,732, 733	Principles of Instrumental and Photographic Optics	3	3	3
PPHS-741,742, 743	Photographic and Optical System Analysis and Evaluation	4	3	3
PPHS-890	Research and Thesis Guidance	1	1	7

* The three quarters are covering respectively, photographic chemistry, radiation and color, and sensitometry and tone reproduction. Candidates with appropriate preparation may take examinations in place of any of these quarters. See course descriptions,

f Each quarter carries 5 undergraduate credits, PPHS-700, a total of 15.

** Students with previous course work or experience in statistics may replace this course with technical electives.

The thesis is to be based on experimental evidence obtained by the candidate in an appropriate field as arranged between the candidate and his advisor. The minimum number of thesis credits re.quired is 9. The thesis requirement may be fulfilled by experiments in the Institute laboratory. 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, and the thesis must be based on his independent, original work, as it would be if the work were done in the Institute laboratories. The work shall not have started prior to the assignment of the advisor.
3. In exceptional cases, it may be possible that the candidate is able to present published results of original work which can be accepted in lieu of a thesis or that he can present non-classified work done outside of RIT, and essentially fulfilling the requirements for a completed thesis. Then, the thesis requirement may be waived, and the credits may be acquired by elective courses.

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". Research and Thesis guidance do not carry a letter grade and, hence, are not included in the average.

MASTER OF FINE ARTS DEGREE IN PHOTOGRAPHY

The M.F.A. is the highest appropriate degree available to the creative photographer. It is the degree needed by photographic artists who also wish to teach at the college level.

THE DEGREE

The offering of this degree is made possible by the presence at RIT of one of the largest photographic faculties available in one school. Their skills in the full spectrum of photography are supplemented by an equally comprehensive faculty in the related area of printing.

Programs, courses and faculty of the College of Fine and Applied Arts are available to broaden the experience and skills of the photographic M.F.A. student in art history, theory, design and visual media. Properly advised selections of this work can be used as a minor, or it can be supplemental to the photographic major.

The M.F.A. program is intended to give individuals an opportunity to build on their undergraduate and personal backgrounds, expanding their knowledge, skills and aesthetic sensitivities.

Applicants should be baccalaureate graduates of accredited degree granting institutions, or have appropriate demonstrable equivalent experience. If there is insufficient undergraduate preparation, the applicant will be advised that appropriate undergraduate credit course work will be required. The M.F.A. Committee will make this determination based upon:

ADMISSION

(1) Official transcripts and other submitted materials,

(2) A portfolio, and

(3) An interview if required.

The Office of Admissions will furnish an itemized list of the materials to be submitted.

Applicants are accepted with diverse educational backgrounds:

(1) Graduates of photographic schools having B.F.A., B.A., or B.S. degrees, or the equivalent, are admitted to majors in Still Photography, Film Making, or Museum Practice.

(2) Graduates of schools of art with B.F.A. or B.A. degrees are admitted to majors in Still Photography or Film Making. In exceptional cases, Museum Practice may be available to them as a major.

(3) Graduates of schools of journalism or in the humanities, with B.A. or B.S. degrees, who have become interested and functional in Photography, are accepted to major in Still Photography or in Film Making.

Conditional acceptance refers to any changes in an individual's program which are required to be met before he or she will be accepted into the M.F.A. program. These conditions are stated in the letter of acceptance.

TERMS OF ACCEPTANCE

Additional prerequisite course work may be required:

(1) Those with insufficient photographic background will ordinarily be required to take a summer M.F.A. preparation program.

(2)   History and Aesthetics of Photography will be required unless an equivalent course is of record.

(3)   Other course work—The conditions of acceptance may also include acceptance of previous work for direct transfer or by specification of the areas open for a major or minor.

MATRICULANT STATUS

Probationary Status refers to the fact that the School of Photographic Arts and Sciences M.F.A. applicant is not automatically admitted to candidacy for the degree. After the student has completed one full quarter of graduate work, his advisor will review what has been done, and submit this information to the M.F.A. Committee for consideration.

The Committee may accept or reject the student as a matriculant. If rejected, the student's status will be reviewed after the second quarter. If matriculant status cannot be awarded, a hearing will be held to determine whether the student will be allowed to continue, and under what conditions.

TRANSFER OF CREDIT

Up to 9 quarter-hours (6 semester-hours) of graduate work is transferrable toward the degree on application to, and approval by, the M.F.A. committee. Work taken prior to admission to the program should be submitted for approval no later than the time the student applies for matriculant status. Work to be credited subsequent to this time must receive approval prior to the student registering for the course.

ADVISORS

The M.F.A. coordinator is the advisor for all entering candidates. At the time matriculant status is requested (after a full-quarter of graduate work), the student and the coordinator will determine a permanent advisor for the remainder of the program. The thesis advisor is determined separately. (See under "Thesis Board").

THESIS BOARD

This is essentially an ad-hoc faculty committee formed to service the Thesis proposal of an individual student. During, or before, the fourth quarter of the student's program, the student should submit a Thesis proposal naming a three-man Thesis Board. One member of this board is to be designated by the proposal as Thesis Advisor.

The Thesis Board membership should include:

(1)   One member of the School of Photographic Arts and Sciences M.F.A. faculty;

(2)   One faculty member from the School;

(3)   One other person, not necessarily from the School or the Institute, who can serve the student in the context of the Thesis.

The M.F.A. Coordinator receives all proposals and forwards them to the M.F.A. Committee for their recognition and comment.

The Thesis Board may determine that the student has to take more than the minimum 9 quarter hours thesis credit. The Board is also responsible for setting time limits on completion of the thesis.

Thesis hours are usually taken over several quarters. Only the letter "r" is recorded, indicating a thesis in process. No letter grade is assigned. The entire Thesis Board accepts or rejects the thesis.

The thesis is an original body of work appropriate to the major commitment of the degree candidate. A thesis of record shall be prepared for inclusion in the Library. Specific directions are available from the M.F.A. coordinator on the preparation of this item.

THESIS

It is intended that this program will give competent individuals an opportunity to build on their undergraduate and personal backgrounds so that they can operate professionally with visual tools.

As part of this process, the program is intended to extend their knowledge and application of technical information which may be missing from their experience.

Technically competent individuals will be given an emphasis on aesthetic controls in order to provide the balance needed by a professional individual.

THE   OBJECTIVES

The M.F.A. degree in Photography normally requires a minimum of two years of full-time resident graduate study. A minimum of 72 quarter hours of graduate work is outlined below. These minimums may be exceeded through the intent of the candidate or as a result of a necessity to cover certain areas of study.

DEGREE
REQUIREMENTS

The 72 hours do *not* include undergraduate work required by action of the M.F.A. admissions committee in accepting a particular applicant, or under-graduate course prerequisites which may exist for desirable graduate courses.

Major concentration	30 Qtr. Hrs.
Minor concentration	18 Qtr. Hrs.
Electives (Humanities)	15 Qtr. Hrs.
Thesis	9 Qtr. Hrs.

Distribution of work within these guidelines is subject to modification based upon the candidate's background, abilities, and interests. An individ-ualized course of study will be prepared with the help of an advisor. Modifications in this prescribed program thereafter must be approved by the M.F.A. coordinator and made a matter of record.

MAJOR AND MINOR AREAS

The major and minor requirements are defined as areas of concentration. Because the program accepts applicants as individuals, each with a distinc-tive background, there is only a core of common instruction. At least one half of the course work is taken outside of this core. Roughly three major areas are defined: Still Photography, Film Making; and Museum Practice. Still Photography and Film Making can be blended with each other and/or with Design, Aesthetics, or some other subject-area combination having relevance for an individual student. There are more rigid limits placed on Museum Practice, but this-area can also be flexible according to the prepara-tion or interests of the person concerned.

A minor may be created from abridged parts of either Still Photography or Film Making. Museum Practice is not ordinarily available as a minor. Minors can be taken in various phases of printing or in appropriate areas of the College of Fine and Applied Arts. Minors external to the School of Photo-graphic Arts and Sciences must be arranged through the M.F.A. coordinator and appropriate administrative channels.

ELECTIVES

The elective courses as specified are humanities courses given in the College of General Studies. These elective hours may be released, on application through the M.F.A. coordinator, for students having a broad background and high achievement in humanities courses taken on the undergraduate level.

If these hours become available in this fashion, the student can either explore an additional area, or can improve his involvement in either his major or his minor field.

GRADES AND TIME LIMIT

The average of all grades for graduate courses taken at the Institute must be at least a "B." The M.F.A. committee will determine whether courses lower than "B" can be included in the hours counting toward graduation, regardless of the overall grade average.

Course work submitted for graduation must have been completed within the previous five full years, unless accepted by the M.F.A. committee.

MASTER OF SCIENCE DEGREE IN PRINTING:
PRINTING TECHNOLOGY OR PRINTING EDUCATION

The curriculum leading to a Master of Science degree in the School of Print-
ing 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 apprecia-
tion of particular problems in special areas at an advanced level. This can
normally be completed in six academic quarters.

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 illustra-
tion, papermaking, and other aspects of the graphic arts. The Frederic W.
Goudy—Howard W. Googeshall 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.

SPECIAL   LIBRARIES

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 special-
ists in related fields.

THE MAJORS

The printing education major offers two options, related to certification.
The printing education major emphasizing teacher preparation for the sec-
ondary 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. This program culminates in a Master of Science in Teaching
degree. Students wishing to pursue the M.S.T. 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 M.S. degree.

Those teachers within the secondary school system who already hold per-
manent certification will normally follow a program leading to the M.S.
degree.

Using IGT Pick Tester to determine properties of printing surface for accepting certain inks.

It is desirable for students entering the education major programs to have taken basic courses in psychology and sociology at the undergraduate level. 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.

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. The printing education programs, on the other hand, 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.

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" level or higher. Normally, all applicants are required to take the Graduate Record Examination. An on-campus interview is encouraged for all applicants.

DEGREE REQUIREMENTS AND TRANSFER CREDIT

The Master of Science degree program in printing requires the completion of 70 quarter 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 needs, interests, and educational-industrial experience. A typical distribution of credits might be:

Core to the Program...22 Quarter Credit Hours
Core to the Major .... 16 Quarter Credit Hours
Electives ....24 Quarter Credit Hours
Thesis .... 8 Quarter Credit Hours

CORE COURSES: PRINTING GRADUATE PROGRAMS

REQUIRED FOR ALL MAJORS AND PROGRAMS	PPRM-701	**Computers in the Graphic Arts**
	PPRT-701	**Research Methods in the Graphic Arts**
	PPRT-702	**Graphic Reproduction Theory**
	PPRT-703	**Statistical Inference**
	PPRT-704	**Design of Experiments**
TECHNOLOGY MAJOR: Undergraduate Degree in Printing	PPRT-705, 706, 707	**Application of Mechanics and Electronics to Materials, Machine Design, and Processes in Printing**
	PPRT-708	**Introduction to Systems Analysis**
TECHNOLOGY MAJOR: Undergraduate Degree Other than Printing	PPRT-709	**History of Printing Technology**
	PPRT-710	**Ink and Substrates**
	PPRT-711	**Tone and Color Analysis**
EDUCATION MAJOR: Required for all Education Programs	PPRE-701	**Introduction to Graphic Arts Education**
EDUCATION MAJOR: Undergraduate Degree in Education (M.S. Degree)	PPRE-713	**Typographical Procedures**
	PPRE-714	**Photographic Reproduction Technology**
	PPRE-715	**Printing Plate Technology**
	PPRE-716	**Printing Press Technology**
EDUCATION MAJOR: Undergraduate Degree (M.S.T. Degree)	PPRE-702	**Teaching Methods in Graphic Arts Education**
	PPRE-860	**Practice Teaching in the Graphic Arts (Secondary Level)**
	PPRT-709	**History of Printing Technology**
	GSHH-701	**History of American Educational Thought and Practice**
	GSSP-702	**Educational Psychology**
	GSSS-701	**Educational Sociology**
EDUCATION MAJOR: Undergraduate Degree Other than Printing or Education (M.S.T. Degree)	PPRE-702	**Teaching Methods in the Graphic Arts**
	PPRE-713	**Typographical Procedures**
	PPRE-714	**Photographic Reproduction Technology**
	PPRE-715	**Printing Plate Technology**
	PPRE-716	**Printing Press Technology**
	PPRE-860	**Practice Teaching in the Graphic Arts (Secondary Level)**
	PPRT-709	**History of Printing Technology**
	GSHH-701	**History of American Educational Thought and Practice**
	GSSP-702	**Educational Psychology**
	GSSS-701	**Educational Sociology**

TWO-YEAR COLLEGE	AFDG-701	The Two-Year College
EDUCATION MAJOR:	AFDG-702	The Student in the Two-Year College
Undergraduate Degree	AFDG-703	Instructional Techniques in the Two-Year
in Printing		College
	AFDG-840	Teaching Internship (2-Year College)
TWO-YEAR COLLEGE	PPRE-713	Typographical Procedures
EDUCATION MAJOR:	PPRE-714	Photographic Reproduction Technology
Undergraduate Degree	PPRE-715	Printing Plate Technology
Other than Printing	PPRE-716	Printing Press Technology
	AFDG-701	The Two-Year College
	AFDG-702	The Student in the Two-Year College
	AFDG-840	Teaching Internship (2-Year College)

Courses with initial prefix letter "G" are offered by the College of General Studies; those with initial prefix "A" by the School of Applied Science (Center for Community College Faculty Development). All others are offered by the School of Printing.

Students who do not have a background in printing and who elect the technology major, normally should complete their printing electives prior to taking the core courses. Education courses should also be completed prior to student teaching, and candidates in the two-year college education program should be similarly prepared prior to serving their teaching internships. Selection of electives is subject to the approval of a faculty advisor.

PROGRAM PLANNING

All candidates are expected to maintain at least a "B" average in order to complete the program. Students dropped for academic reasons may petition the Graduate Admissions Committee for reinstatement. A student, however, may not be reinstated for more than one quarter.

A student may transfer a maximum of nine approved graduate credits. Normally, a student may carry a maximum of 18 quarter credits of course work per quarter.

Prerequisite courses must normally be completed prior to undertaking any graduate courses. In special cases, a graduate course may be taken simultaneously with a prerequisite course.

Additional information on courses and majors may be obtained by contacting the graduate program coordinator.

The student should select a thesis advisor and make a proposal by the time he completes his second quarter of work. This proposal is to be made to the Graduate Thesis Committee. This committee will, upon completion of the thesis, conduct an oral examination.

THESIS

A rough draft of the thesis must be submitted at least three weeks prior to the convocation in which the student expects to graduate. The finished thesis must be submitted one week prior to that convocation.

College of Science

THOMAS P. WALLACE, *Dean*

ROBERT E. GILMAN, *Department Head, Chemistry*

MASTER OF SCIENCE DEGREE IN CHEMISTRY

The College of Science 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 objective of the program is, 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 own initiative with a minimum of supervision.**

Four program options are available to cover the differing needs of graduate chemists.

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 the full-time graduate student to carry on a program of independent study which will develop his 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.

TWO-YEAR 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.

PART-TIME STUDY **The College of Science 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 M.S. program does not require a research thesis, and it is possible for a student to obtain the M.S. degree in two academic years (or six quarters) by taking courses in late afternoons or early evenings only.

INTERNSHIP OPTION

The College of Science, 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.

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 M.S. degree, he must have experience equivalent to a full year's course in each of the following: Analytical Chemistry, Organic Chemistry, Physical Chemistry, Physics, and Calculus.

He must further demonstrate his mastery of the first three of these in qualifying examinations administered by the RIT Chemistry Department.

PROGRAM

Each student, will, with his advisor, arrange a program best suited to his interests and needs. This program will be subject to the approval of the Department Head and the Chairman of the Graduate Committee.

A deliberate effort will be made to strengthen any areas of weakness indicated by the student's undergraduate record and/or the qualifying examinations.

In order to qualify for the M.S. 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-500 and SCH-600 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-551, SCHA-511, SCHO-522, and SCHP-531. As part of the required credits, each student must have one or two quarter hours in seminar, SCHC-640, and six quarter hours in upper division courses from related departments.

2. **A minimum of nine quarter 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. More information may be obtained by contacting the Graduate Advisor, Department of Chemistry, or by phoning** (716) 464-2497.
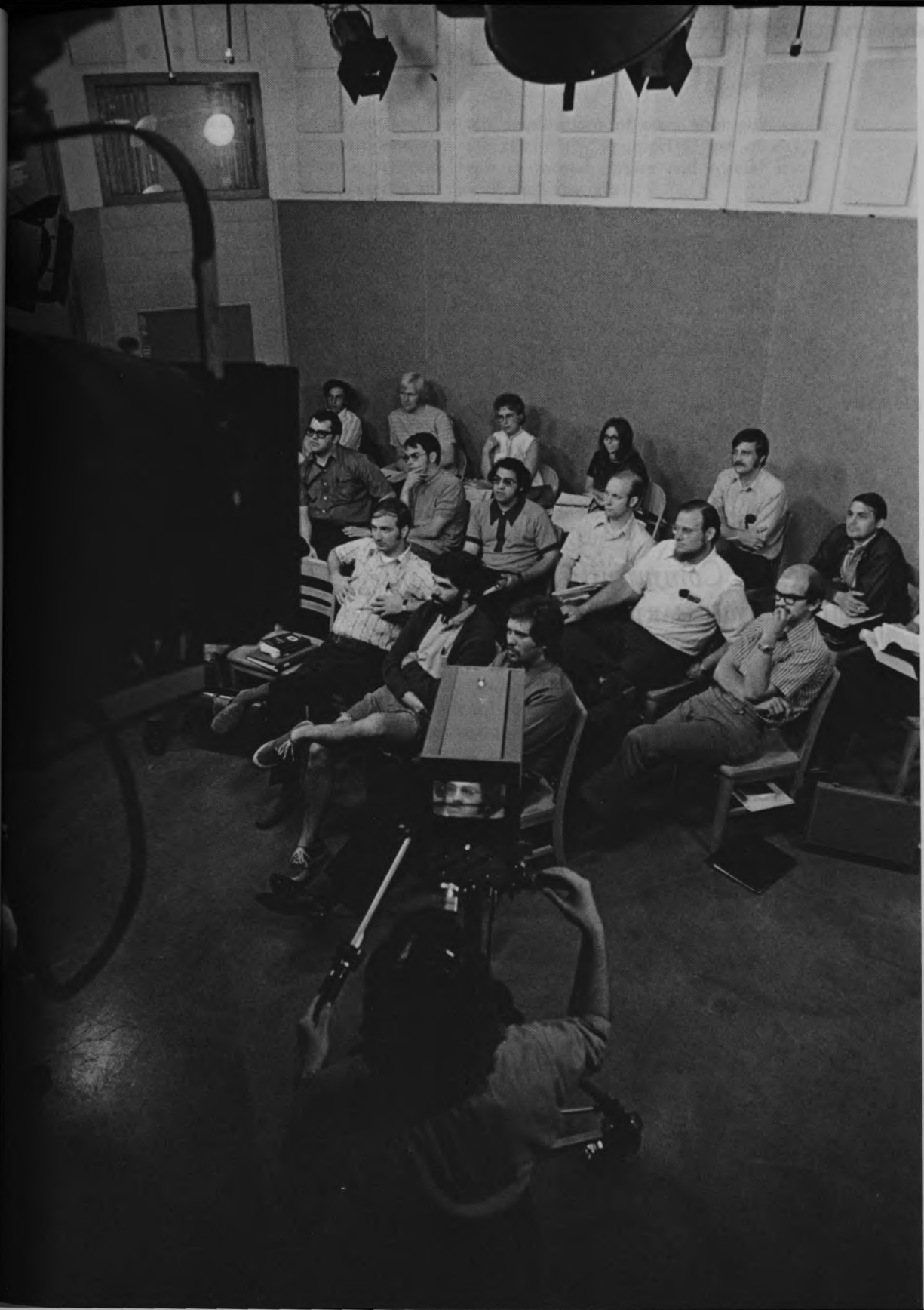
School of Applied Science

ROY I. SATRE, *Dean*

Center for Community / Junior College Relations

RICHARD L. RINEHART, *Director*

Office of Faculty Development

GENERAL The Center was established in 1969 for the purpose of serving the specialized
OBJECTIVES training needs of both potential and currently employed two-year college
faculty. The Center's objectives are accomplished through several unique
Master's degree programs in addition to seminars, workshops, and con-
ferences.

1. To achieve mastery through graduate study in the selected discipline sufficient to be able to teach the discipline in Associate degree and Certificate programs, and to function as a professional faculty member in two-year colleges.

2. To develop the ability to define and believe in the philosophy, goals, and spirit of community junior colleges and technical institutes; analyze and understand the implications of the various organizational patterns of such colleges within different states and differing collegial organizations; comprehend the financing aspects of such colleges including the preparation of budgets, and the implications of various revenue patterns, and to understand the governance and decision making systems including the faculty role in such systems.

3. To become an effective and proficient faculty advisor, and know what to expect and require from counselors; to diagnose the different learning styles of individuals, stimulate appropriate motivations and enthusiasm

for learning, and understand the real implications of open door policies for faculty and for students; to understand the appropriate use of developmental education activities both in formal classes and special arrangements, and to prescribe the use of such specialists.

4.   To demonstrate the ability to apply full systems of curriculum planning which include appropriate and effective rationale, objectives, cognitive styles, learning techniques, evaluation, and provisions for revision.

5.   To be able to devise and use a wide variety of basic instructional techniques, have had some experience in other more specialized instructional techniques, and to become a recognized artist-specialist in some combination of teaching-learning techniques that match one's personality.

DEGREES OFFERED

At the present time, graduate work may be completed leading to the M.S. degree (Engineering Technology) and M.S. degree (Business Technology) through the CCJCR on a full-time or part-time basis. The External degree, M.S. (Engineering Technology) is constructed to meet individual situations. A new program, leading to the M.S. degree (Instructional Technology), is now being offered. Certain courses will be available in September, 1973, with full implementation of the program in the Winter Quarter (January 1974).

Related Degrees in Other Colleges:

Special options in the following additional fields are available for those planning to teach such disciplines in community colleges:

CHEMISTRY, Master of Science
   See: College of Science

FINE ARTS, Master of Science in Teaching
   See: College of Fine and Applied Arts

PRINTING, Master of Science, Printing Education
   See: College of Graphic Arts and Photography

Degree candidates in these fields include community college core courses in their programs, and have other special experiences in common with the student in other fields of community college teaching.

ADMISSION

Graduates of accredited baccalaureate degree programs may be admitted to study at the graduate level only after completion of the application for admission and submittal of (1) transcripts for previous undergraduate and graduate study, (2) recommendations, (3) a statement of the candidate's objectives and goals, including his evaluation of how the program for community college faculty will aid in obtaining them; and (4) other evidence that can be considered to determine the probability of success of the individual applicant. Initial acceptance will be granted on either a regular or provisional status. Candidates for the M.S. in Business Technology program will normally be required to take the admissions test for graduate study in Business.

COMMON REQUIREMENTS:

M.S. degree for Community College Faculty

A minimum of 48 quarter credits beyond the baccalaureate degree, distributed as follows:

1. A minimum of 24 quarter credits in the field of specialization.

2. A minimum of 12 quarter credits in an allied field.

3. A minimum of 10 quarter credits in the Community/Junior College course series: The Two-Year Colleges, The Students, Management of Learning, Instructional Techniques.

4. An internship for those not having sufficient experience, or an occupational internship for those not having sufficient related work experience. When an internship is required, it will carry 3 to 6 quarter credits which may be applied to the field of specialization requirements.

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

MASTER OF SCIENCE (ENGINEERING TECHNOLOGY) PROGRAM

The M.S. (Engineering Technology) program is specifically structured for candidates wishing to teach in the Electrical, Mechanical, or Electromechanical Technology area.

The objectives of developing professional teaching competence, flexible teaching abilities, and knowledge in the specialization and allied fields may be met by fulfilling the requirements of the Community College Course Series and the Internship, and by selected courses from the graduate offerings of the College of Engineering as well as the following:

Course Number	Course Title	Quarter Credits
Electrical Specialization		
AFDE-711	Microelectronics	3
AFDE-718	Applications of Linear Integrated Circuits	3
AFDE-719	Communication Theory	3
AFDE-721	Digital Fundamentals	3
AFDE-722	Digital Integrated Circuits	3
AFDE-728	Active Filter Design	3
AFDE-730	Electric Power Transmission	3
Mechanical Specialization		
AFDE-705	Mechanical Engineering Concepts	4
AFDE-707	Engineering Concepts (Solid Body Mechanics)	4
AFDE-710	Science and Technology of Materials	3
AFDE-717	Electrical Measurements	3
AFDE-725	Numerically Controlled Machines	3
AFDE-731	Mechanical Systems Design	3
Either Specialization		
AFDE-708	Engineering Technology Analysis	3
AFDE-713	Computers in Engineering Technology I	4
AFDE-714	Computers in Engineering Technology II	4
AFDE-715	Electromechanical Systems I	3
AFDE-716	Electromechanical Systems II	3
AFDE-720	Integrated Physics	4
AFDE-727	Advanced Electrical Measurements	3
AFDE-732	Manufacturing Organization and Management	3
AFDE-750	Seminar	2
AFDE-751	Advanced Engineering Technology Seminar	1
AFDG-840	Teaching Internship	3 to 6
AFDE-850	Special Projects	1 to 6

MASTER OF SCIENCE (BUSINESS TECHNOLOGY) PROGRAM

This program of graduate study encompasses the functional areas of business and provides the candidate with advanced proficiency in a technical specialty of his choosing and is supplemented with a closely allied field.

In addition to the general objectives of the Center for Community/Junior College Relations, the M.S. (Business Technology) program will provide the candidates with:

1. A knowledge of the functional areas of Business—Accounting, Marketing, Finance, Personnel, and Production.

2. The basic tools needed to understand the changing environment of Business. Courses in Business Statistics, Legal and Social Environment, and Economics are offered to fulfill this objective.

3. An opportunity to study in depth in the technical area which the candidate intends to teach, and to supplement this with appropriate study in an allied field.

4. Selective workshops to relate technical specialities to the unique problems associated with two-year college business programs.

5. Completion of a teaching internship for prospective faculty lacking classroom experience.

DEGREE
REQUIREMENTS

From the maximum requirement of 65 quarter credits, students who have completed previous graduate or undergraduate work in Business can waive from 12 to 16 quarter credits from the program. Business courses in this program are offered by the College of Business.

Course Number	Course Title	Quarter Credits
1.	**Functional Areas of Business**	
BBUA-713	Basic Financial and Managerial Accounting	4
BBUF-722	Financial Management	4
BBUB-744	Behavioral Science in Management	4
BBUM-761	Marketing Concepts	4
2.	**Basic Core Courses in Business**	
BBUB-742	Legal & Social Environment of American Business	4
BBUF-745	Economic Environment of American Business	4
BBUQ-781, 782	Managerial Decision Making I, II	4 and 4

3. **Courses in Technical Area of Specialization**
   12 quarter credits from one of the following areas:
   Accounting, Management, Marketing.

4. Allied Field in Business Technology
   8 quarter credits from the fields listed in 3 above.

5. **Common Requirements** of the Internship and the Community
   College Course Series.

MASTER OF SCIENCE (INSTRUCTIONAL TECHNOLOGY) PROGRAM

This is a generalist Master of Science program for those holding a baccalaureate degree related to the field (such as Photography, Audio Visual Communications, Graphic Arts), or in other fields where individual aptitudes and experiences would qualify the person for required courses.

The general goals are:

1. **To prepare such individuals for professional positions as instructional technologists in Associate Degree granting institutions.**

2. **To further qualify the graduates of the program to be able to teach in some individually appropriate area such as Audio Visual Technology, Photography, etc.**

3. **To qualify individuals as managers in instructional technology.**

4. **To provide the graduate with a sufficient perspective on various media and learning processes research in order to assist the college faculty in choosing appropriate instructional techniques for the most effective and efficient learning without bias.**

The Basic M.S. Program

On the assumption that entering students will hold an appropriate baccalaureate degree, there will be 48 quarter credit hours of graduate instruction as below:

The four courses of the Community College Course Series 14
and the following specialized courses—

Course Course Number Title	Quarter Credits
AFDG-715 Instructional Television	5
AFDG-760 Management and Personnel in I.T.	3
AFDG-761 Fiscal Analysis and Accounting in I.T.	3
AFDG-763 Library-Media Organization	2
AFDG-765 Individual Learning Style Analysis	3
AFDG-766 Behavioral Science Applications to I.T.	3
AFDG-767 Instructional Technique Comparisons	2
AFDG-768 Learning Systems and Planning	2
AFDG-840 Internship	6
AFDE -745 Electro-Mechanical-Optical Systems	3
AFDE -750 Seminar	2
Total Basic Program	48 cr.

**EXTERNAL DEGREE-MASTER OF SCIENCE
(ENGINEERING TECHNOLOGY)**

The purpose of the new external degree is to make available to those persons teaching, or industrially employed in technical areas, a unique graduate level program that will make use of their various job-related experiences and post-baccalaureate education.

Salient features of the program include:

1. **Cooperation with other selected institutions of higher education.**

2. **Degree candidacy while remaining fully employed.**

3. **Credit given by proficiency examinations.**

4. **Internship in a community college as a part of the teaching faculty.**

Credit may be given for such things as attendance at summer institutes (NSF, VEA, etc.), workshops and seminars, other post-baccalaureate courses taken, and measurable knowledge gained through work-related experience (by examination). Some specific courses may be taken at institutions other than RIT. In the case of an out-of-state student, or one far distant from Rochester, up to thirty (30) quarter credit hours may be gained from other institutions.

ADMISSION

1. **Possession of a baccalaureate degree in the areas of electrical or mechanical engineering or engineering technology, or in a field of physical science or mathematics that relates to technical employment.**

2. **Experience teaching in recognized technology programs and/or industrial experience directly related to the undergraduate preparation.**

3. **Establishment of a "curriculum contract" between the student and the Evaluation Committee.**

Inherent, also, is the willingness and desire of the external degree candidate to either continue teaching in technical programs or to seek such a position at the end of the program.

DURATION OF
PROGRAM

The external degree candidate has from three to five years (or less) to complete his Master of Science program. This determination is made on the basis of the entering credit allowed.

Previous credits earned	Completion time limited to
Less than 12 quarter credits	5 years
13 to 24 credits	4 years
25 **to** 30 **credits**	3 **years**

1. Completion of at least 48 quarter credit hours of work with a grade point average of *"B"* or better and also technical proficiency proven through evaluation by a faculty committee or through proficiency examinations.

2. *At least 12* quarter credit hours (25 percent of program) will be taken in technical subject areas in the School of Applied Science.

3. *At least* six quarter credit hours will be taken in the field of community college education.

4. The remaining 30 quarter credit hours may be gained through whatever means the student and his evaluation committee deem admissible and proper for the program. These may include, but are not limited to, summer institutes, post-graduate courses, and partial programs planned with other institutions. A *minimum* of three semester credit hours will be taken at another approved institution (or substantially more if the student desires).

All courses in the technical area are currently offered in the resident Master of Science (Engineering Technology) degree program.

Courses in community college education are offered by Rochester Institute of Technology and at some other institutions. For the most part, all courses are offered periodically throughout the total academic year and summers, and in both day and evening (depending on student demand).

The Center for Community College Faculty Development cooperates with other Colleges of RIT in providing additional degree programs teaching other specialized areas in community colleges. These include the following degrees that are described within the appropriate sections of this Bulletin:

Master of Science in Printing Education in Graphic Arts;
Master of Fine Arts in Fine and Applied Arts

A variety of special services are organized each year in conjunction with community and junior colleges. These workshops, seminars, demonstrations, and in-service activities are initiated and sponsored by consortia as well as individual colleges.

A brief statement of topics to be studied is provided in the section on course descriptions for the Center for Community College Faculty Development (call letters AFDE and AFDG). A more detailed summary of the general and specific objectives and prerequisite knowledge may be obtained by writing the Center for Community College Faculty Development Graduate Office.

CREDIT DISTRIBUTION AND REQUIREMENTS
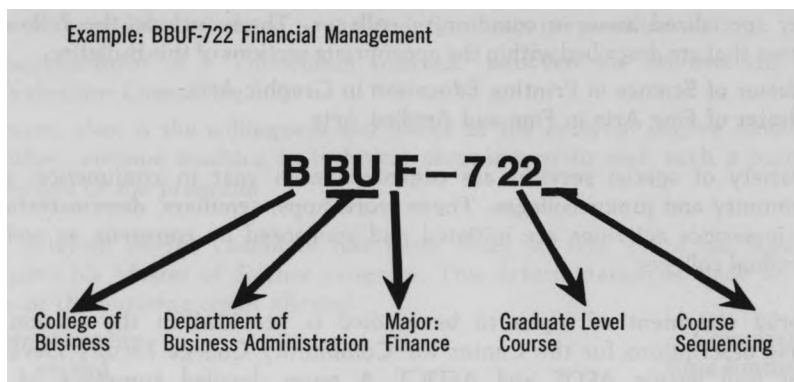
RELATED PROGRAMS

SPECIAL ACTIVITIES

COURSE DESCRIPTIONS

RIT Universal Course Numbering System

In addition to its title, each academic course offered by RIT is identified by a specific four letter and three digit number. This new system has been adopted to:

1. Make it easier to find a given course, directory style, in whatever college, school or department it is offered;

2. Make it easier, especially in choosing electives, to develop individualized programs through the several colleges of RIT;

3. Make record keeping and retrieval more efficient.

As shown in the example below, each letter and digit has significance:

First letter:	College offering the course
Second and Third letters:	School or Department of that college
Fourth letter:	Major field of interest
First number:	Course level (0 = Non-credit, 1=Diploma; 2 or 3 = Lower Level Degree Courses; 4 and 5 = Upper Level Undergraduate Degree Courses; 6, 7, or 8=Courses for Graduate Credit)
Second and Third numbers:	Course differentiation and sequencing

Example: BBUF-722 Financial Management

B BU F — 7 22

College of Business · Department of Business Administration · Major: Finance · Graduate Level Course · Course Sequencing

Course Descriptions

All Course Descriptions will be found in this section of the catalog. They are arranged for convenient use, directory style by colleges, schools and major departments. Any course shown in the Program Outlines of the several colleges can be found by its alphabetical sequence (and within this alphabetical order, by its numerical sequence) in the Course Description section.

Center for Community / Junior College Relations

Course Descriptions

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

AFDB-705   Design and Development of Computer Mediated Instruction

A course to increase competence in the utilization and development of CMI materials, to develop such knowledge relating to the selection or upgrading of computing systems to support CMI, and to provide greater orientation and awareness to the potential and recent developments in instructional technology.

Credit 6

AFDB-706 CMI for Business Subject Instruction
CMI: Computer as a Medium of Instruction

To make participant aware of wide use of computers as applied in their instructional area, to present the various tools available to the faculty member for his classroom utilization and to give the participant sufficient background for defining, designing and implementing various computer oriented problems in his subject area.

Prerequisite: AFDB-705.

Credit 6

AFDE-705   Mechanical Engineering Concepts

The first and second laws of thermodynamics are applied to fundamental problems in mechanical engineering technology.

Credit 4

AFDE-707   Engineering Concepts (Solid Body Mechanics)

A special graduate level course to update knowledge in solid body mechanics. Statics of rigid bodies, statics of deformable bodies, dynamics of rigid bodies, and dynamics of deformable bodies are reviewed and extended, using modern mathematical techniques; i.e., vectors, matrices, and Cartesian tensors in three dimensions. Mathematical models are constructed and integrated with laboratory exercises and/or projects using analog and digital computers as aids in obtaining effects on systems by varying the parameters.

Credit 4

AFDE-708   Engineering Technology Analysis

The fusion of three significant elements: 1) the historical base, 2) which led to the development of certain areas of mathematics, 3) and how this mathematics is used in engineering design. This course also develops the knowledge in selected mathematics topics necessary for teaching engineering technology. Instructional topics are selected on the basis of pre-assessment of the understandings of the course participants.

Credit 3

AFDE-710 Science and Technology of Materials

The intent of the course is to develop in the student an understanding of the properties of crystalline and non-crystalline materials (metals, alloys, polymers, ceramics, and glass) based on their micro and macro structures.

Credit 3

AFDE-711   Microelectronics

Principles of physical basis of solid state active and passive devices. Manufacturing processes of assembly of passive circuit elements and active solid state devices into unified circuit package. Discussion of thick, thin film circuit techniques, hybrid circuit assembly, and integrated circuit techniques. Design concepts of solid state design.

Credit 3

AFDE-713   Computers in Engineering
                                      Technology I

Introduction to digital computers and application to solution of technical problems. FORTRAN programming methods, solution of equations, and numerical methods. Simultaneous linear equations, finite differences, method of least squares, numerical integration, solution of ordinary differential equations.

Prerequisite: College Mathematics through Calculus or equivalent.

Credit 4

AFDE-714   Computers in Engineering
                                      Technology II

Continuation of study of use of digital computers, computer applications, and numerical methods of solution to equations. Additional programming languages and programming techniques, finite difference, methods of solution to ordinary and partial differential equations, iterative methods for linear systems, numerical analysis and application of computers to engineering problems.

Credit 4

AFDE-71S   Electromechanical Systems I

Principles and concepts of electromechanical systems and controls. Electromechanical, electricity-electronics, mechanisms, interface problems with applications to computers and control systems. Concentration on the specifications, characteristics, and proper usage of commonly used electromechanical systems. Electromagnetic devices, electromechanical amplifiers, sensors, feeders, actuators, controls (open and closed loop), counters, switches, timers, digital logic, simulation, transducers, and electromechanical analogies.

Credit 3

AFDE-716   Electromechanical Systems II

To study the major components and subsystems required for the operation of numerically controlled machines, and other current industrial applications involving the synthesis, as opposed to the addition, of electromechanical technology. The course leads to the development of a curriculum plan for electromechanical engineering technology.

Credit 3

AFDE-717   Electrical Measurements

To present the various electrical measuring devices, instruments, and transducers which the mechanical engineer is likely to encounter. Basic principles and applications are stressed.

Credit 3

AFDE-718   Applications of Linear
                                      Integrated Circuits

1) Review of the advantages and disadvantages of integrated circuits. 2) Familiarity with integrated circuits specs and circuits for obtaining these specs. 3) Ability to design circuits using integrated circuits. 4) Familiarity with the many types of circuits using op-amps.

Credit 3

AFDE-719   Communication Theory

To provide the student with the basic principles of communication theory and applications in system design.

Credit 3

AFDE-720   Integrated Physics

The course objectives include the synthesis and integration of a wide variety of physics topics that are the basis of electrical, mechanical, and optical technology, and the understanding of their common concepts, structures, and terminology.

Credit 4

AFDE-721   Digital Fundamentals

Boolean Algebra with extensive applications to digital systems.

Credit 3

AFDE-722   Digital Integrated Circuits

A comprehensive review of the design, manufacture, application, and evaluations of integrated digital circuits, with the major emphasis put on the uses of the circuits, and related laboratory work.

Credit 3

AFDE-725   Numerically Controlled Machines

Basic principles and capabilities of N/C; N/C machine and its controls; increment and absolute

systems, point to point and continuous path systems, manual programming; use of computers and programs for N *1C;* N/C turning; design criteria and managing of N/C; nonmachining applications.
Credit 3

AFDE-727 Advanced Electrical Measurements

A continuation of Electrical Measurements (717) stressing current industrial applications, electronic instrumentation, and trouble shooting. Bio-medical applications will be included.
Credit 3

AFDE-728   Active Filter Design

This course deals with modern approaches to the design of frequency selective filters. Concepts of transfer functions, poles and zeros, and graphical evaluation of frequency response are discussed. Following this, the classical filter approximations (e.g., Butterworth, Chebyshev, and Elliptic) are developed for low pass, band pass, and high pass passive designs. The final portion of the course includes the design of active R-C filters using operational amplifiers.
Credit 3

AFDE-730   Electric Power Transmission

A survey of modern power systems including symmetric components, transmission line constants, relaying and control techniques, system stability and economic operation. The impact of large power solid state electronics and ecological studies will be discussed.
Credit 3

AFDE-731   Mechanical Systems Design

To provide a comprehensive introduction to the analytical and graphical techniques required for the design of mechanism and machine parts.
Credit 3

AFDE-732   Manufacturing Organization
                                                    and Management

To study the principles of manufacturing organization and management as they would be related to teaching the material in the two-year college.
Credit 3

AFDE-745   Electro-Mechanical-Optical
                                                    Systems

The course purpose is to prepare individuals to design, install, and maintain instructional technology systems. This would include the technical aspects of circuits, controls and devices involved in multiple projector uses, multi-media arrangements, television systems, and related technical theories.
Credit 3

AFDE-750   Seminar

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

AFDE-751   Advanced Engineering
                                                    Technology Seminar

A seminar for advanced students and faculty in appropriate engineering technology programs. The particular topics will be selected, by the participants, prior to the Seminar. Examples of proposed topics could include: Large Scale Integration, Compatible Metal Oxide Semi Conductors, Electromechanical Systems, Applications in Industry, and current developments in Computing.
Credit 1

AFDG-701   The Two-Year Colleges

The complex of philosophies, organizations, developments, finance, goals, curricula, and spirit of the colleges.
Credit 3

AFDG-702   The Students

Advising-counseling relationships, learning styles, student activities, motivations, developmental education, and the implications of the "open door" policies.
Credit 3

AFDG-703   Management of Learning

Systems of curriculum planning, and cognitive styles, goals, objectives, evaluation, measurement, and productivity, as they relate to the account-ability of faculty, students, and administration.
Credit 4

AFDG-704   Instructional Techniques

To develop professional competence in direct applications and uses of various learning styles, including television, special audio-visuals, pre-pared lectures, seminars, computer assisted instruction, programmed learning.
Credit 4

AFDG-715   Instructional Television

The capabilities and limitations of television as an instructional medium will be studied and ex-perienced. Included will be an overview of tele-vision in the communication process and the components necessary to the television product: pre-production planning; script writing; perceptual principles; television graphics; producing and directing; lighting; techniques for performing; methods for evaluating the instructional effective-ness of programs and cataloging and storing of video tapes.

Production equipment and existing video tape formats, including video cassettes, will be utilized in providing hands-on experience for the student. Faculty for the course will be drawn from several disciplines.
Credit 5

AFDG-760   Management and Personnel
                            in Instructional Technology

The participant will learn the necessary abilities for supervision and management of instructional technology efforts including the capabilities for the supervision of technicians and staff, personnel relationships, management by objectives, planning and scheduling activities.
Credit 3

AFDG-761   Fiscal Analysis & Accounting
                in Instructional Technology

Basic accounting as used by a department within a college, budget preparation and use as a manage-ment tool, cost estimating for instructional tech-

niques, and the ability to make cost benefits analyses are to be learned by the participant.
Credit 3

AFDG-763   Library-Media College
                            Organization

This course leads to the understanding of learning and media center organizations and operations well enough for the participant to be an effective manager in the related activities, insuring the efficiency necessary for maximum learning in differing organizational patterns. Special topics include: information storage and retrieval, dis-semination systems, micro forms, copyright laws, and the functions of library staff members.
Prerequisite: AFDG-701
Credit 2

AFDG-765   Individual Learning Style
                            Analyses

The student will learn how to map or measure individual cognitive styles, and to make recom-mendations to teaching faculty and college ad-ministrators regarding these learning styles.
Prerequisites: AFDG-702 and AFDG-703 or equiv-alent studies.
Credit 3

AFDG-766   Behavioral Science Applications
                     to Instructional Technology

A review and clear understanding of appropriate research and developmental activities for be-havioral science knowledge, and the capability to follow such research throughout a career are the principal objectives for this course. Closely re-lated is the objective of knowing the history and current status of promising experiments in educa-tion and the administration of learning as being conducted in related industry, universities, and in professional organizations.
Prerequisites: AFDG-704 or Educational Psy-chology, or the approval of the department.
Credit 3

AFDG-767   Instructional Techniques
                            Comparisons

Presuming the accomplishment of competence in several instructional technology specializations, the course provides the opportunity to develop

a perspective on various competing techniques. The goal of such perspective is the resolution of apparently conflicting research and the understanding of various constraints such as faculty abilities and personalities, scheduling, cost, and facility or equipment limitations.

Credit 2

AFDG-768   Learning Systems and Planning

This in-depth course will enable the candidate to be able to conduct research and development in instructional technology for a college, and to assist faculty members in their planning and efficient utilization of learning systems. These abilities will include working with teachers in preparing various objectives, goals, plans for evaluation, modifications, rationales, and their relationships. The appropriate use of all inputs to planning, (e.g., committees, standards, consultants, research, outside agencies, etc.), and output measures, (e.g., accomplishments, program planning and budgets, data, etc.), are to be studied in sufficient depth to implement accountabilities.

Prerequisite: AFDG-703.

Credit 2

AFDG-840   Internship

An individual arrangement with an appropriate community or junior college will be made for those persons not having teaching 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.

Credits 3 to 6

AFDG-850   Special Projects

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

Credits 1 to 6

College of Business

Course Descriptions

GRADUATE BUSINESS ADMINISTRATION DEPARTMENT

ACCOUNTING GROUP

BBUA-713   Basic Financial and Managerial Accounting

Managerial Accounting considers accounting as part of a total company information system emphasizing responsibility accounting. Accounting information is shown to be source material for decision making. The use and limitations of this information for managerial control and performance evaluation are discussed.

Credit 4

BBUA-714   Basic Accounting Theory

A treatment of basic accounting theory and concepts and an analysis of the special problems that arise in applying these underlying concepts to financial accounting. Valuation of assets, liabilities and capital. Adjustments for price level changes. Analysis of financial statements for credit, investment, and managerial purposes. Pronouncements of the American Institute of Certified Public Accountants.

Prerequisite: BBUA-713

Credit 4

BBUA-715 **Accounting Controls**

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.

Prerequisite: BBUA-713

Credit 4

BBUA-716 Advanced Public Accounting

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.

Prerequisite: BBUA-714 or admission to M.S. in Accountancy program.

Credit 4

BBUA-717 **Seminar in Taxation**

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.

Prerequisite: BBUA-713 or admission to M.S. in Accountancy program.

Credit 4

BBUA-718 Seminar in Advanced Accounting **and Theory**

Analysis and evaluation of current accounting thought relating to the nature, measurement and reporting of business income and financial position. Concepts of income. Attention to special areas relating to consolidated statement, partnerships, consignments and installment sales.

Prerequisite: BBUA-714 or admission to M.S. in Accountancy program.

Credit 4

BUSINESS GROUP

/ BBUB-741 Administrative Theory

This course stresses the development of effective skills in interpersonal relations in organizations, with emphasis on decision making. Use of the behavioral sciences in problem solving is stressed. Problem areas include communication, influence, control, and managing for innovation and change.

Prerequisite: BBUB-744

Credit 4

BBUB-742 Legal and Social Environment of American Business

A study of the legal and social influences which govern business conduct and their impact on business decisions and policy. Social and legal aspects of competition, pricing, advertising, and employment will be discussed.

Credit 4

BBUB-743 Operations Management

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 the basic tools used in problem solution.

Prerequisite: BBUQ-783

Credit 4

BBUB-744 Behavioral Science in Management

The implications of studies from the fields of psychology, sociology and anthropology to management 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

BBU8-746 Seminar in Management Development

Concepts of individual development. Overview of present individual and group procedures. Implica-

tions of current technological development for training, replacement, and advancement.

Prerequisite: BBUB-741

Credit 4

BBUB-747   Systems Administration

Analysis of basic character of industrial operations, their measurement, and criteria for their efficiency. Design and administrative problems in management of processes and systems.

Prerequisite: BBUB-741

Credit 4

BBUB-748   Labor/Management Problems

Economic problems in labor/management relations at the plant and industry level as they influence managerial decision making. Though the focus of the approach is economic, the analysis is developed within the relevant institutional context. Topics include composition of the labor force participation; relative importance of market forces and unionism in shaping wage levels, and wage structure; consideration of the role of wages on costs, prices, and profits, the relationship between labor cost and technology; conflicts and agreements between labor and management; and the impact of unemployment, and inflation on labor/management disputes.

Prerequisite: BBUB-741

BBUB-749   Organizational Simulation

This course attempts to increase the learner's familiarity and understanding of several organizational concepts including formal organization, supervision, personnel management, decision-making, interviewing techniques, and contract negotiations. It utilizes the use of role play in simulated business problems under gaming conditions.

Prerequisites: BBUB-741, BBUB-742, and BBUB-744.

Credit 4

BBUB-759   Integrated Business Analysis

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.

Prerequisites: BBUA-713, BBUB-741, BBUB-743, BBUF-722, BBUM-761.

Credit 4

BBUB-770   Business Research Methods

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.

Credit 4

BBUB-771, 772   Research Option

A thesis course requiring the student to confront a real business problem. Requirements include steps from design to completed management report.

Credit 8

BBUB-790   Information Systems

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 and dissemination of information, and the economics of information.

Prerequisites: BBUB-741, BBUQ-783.

Credit 4

FINANCE GROUP

BBUF-722   Financial Management

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.

Prerequisite: BBUA-713

Credit 4

BBUF-723   Theory of Finance

This course involves a study of the current litera-ture and most recent developments relating to the theories of investment and valuation, cost of capi-tal, risk and dividend policy. Also considered are specific areas of application and the policy impli-cations of the theories studied.

Prerequisite: BBUF-722

Credit 4

BBUF-724   Problems in Financial
Management

This course is designed to give the student greater depth in the basic concepts of financial manage-ment 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, secur-ity valuation, methods of financing and dividend policy, among others.

Prerequisite: BBUF-722

Credit 4

BBUF-725   Securities and Investment
Analysis

Study of securities and various investment media and their markets. Analysis of investment values based on financial and other data. Considers fac-tors such as return, growth, and risk.

Prerequisite: BBUF-722

Credit 4

BBUF-745   Economic Environment
of American Business

Nature of business firm. Theory of demand, costs, and prices. Competition and monopoly. Production function and the marginal productivity theory of distribution. Saving and investment; the determi-nation of the level of income. Federal Reserve operations; fiscal and monetary policies.

Credit 4

BBUF-765   Business Economics and
Applied Econometrics

The course stresses model building, with emphasis on the economic foundations of the models. Econo-metric techniques are employed in the develop-ment and testing of aggregate, industry, and company models, with attention given to the feed-back relationship from the aggregate (macro) model to the industry and company models. Fore-casting and analysis of the industry and company models are employed. Simulation of the models under alternative policy assumptions is performed. Bank data, model-tools, and computer programs are supplied.

Prerequisites: BBUF-745, BBUQ-781, 782.

Credit 4

MARKETING GROUP

BBUM-761   Marketing Concepts

Critical examination of the marketing system as a whole; functional relationships performed by vari-ous institutions such as manufacturers, brokers, wholesalers, retailers, etc. Analysis of costs, strate-gies and techniques related to the marketing sys-tem. Both behavioral and quantitative aspects of marketing considered.

Credit 4

BBUM-762 Advanced Marketing Management

A depth study of selected problems which face marketing managers concerned with promotion, place, price, and product. Material centers on staff marketing functions. Research topics are covered and are those unique to the field of marketing.

Prerequisite: BBUM-761

Credit 4

BBUM-763   Seminar in Consumer Behavior

A study of the market in terms of the psychologi-cal and socio-economic determinants of the buyer's behavior, including current trends in purchasing power and population movements.

Prerequisite: BBUM-761

Credit 4

BBUM-764   Marketing Logistics

The study of an integrated system for the distribu-tion of products from producer to consumer. The emphasis is on the physical flow of goods both between marketing institutions as well as within marketing institutions. Specific topics covered are unit geographic location, internal product flow, inter-unit transportation, and warehousing.

Prerequisites: BBUQ-783, BBUM-761.

Credit 4

QUANTITATIVE GROUP

BBUQ-781 Managerial Decision Making I

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

BBUQ-782 Managerial Decision Making II

A continuation of topics from classical statistics including interval estimation, nonparametric tests, analysis of variance, regression and correlation analysis, time series, and index numbers.

Prerequisite: BBUQ-781

Credit 4

BBUQ-783 Managerial Decision Making III

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.

Prerequisite: BBUQ-782

Credit 4

BBUQ-784 Decision Theory

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.

Prerequisite: BBUQ-783

Credit 4

BBUQ-786, 787 Introduction to Operations Research I and II

An introduction to the application of operations research techniques to business decision making. Specific topics covered are linear programming, inventory models, dynamic programming, queuing theory, network analysis, and game theory.

Prerequisite: BBUQ-783

Credit 8

BBUQ-788 Multivariate Analysis

An introduction to the primary multivariate statistical techniques available for business and economic research. Chi-square contingency table tests, the analysis of variance, and multiple regression and correlation analysis are examined.

Prerequisite: BBUQ-783

Credit 4

BBUQ-789 Simulation

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.

Prerequisites: BBUQ-783, BBUQ-741.

Credit 4

BBUQ-792 Concepts in Computer Utilization

An introduction to the use of computers in problem solving. Students will be exposed to Fortran IV and basic programming languages. Application programs will also be introduced for a wide variety of business problems.

Credit 4

College of Continuing Education

Course Descriptions

GRADUATE COURSES IN APPLIED
AND MATHEMATICAL STATISTICS

CASM-701   Basic Statistical Mathematics

Refresher training in the mathematical tools needed for work in statistics courses.

Topics: Algebra, calculus, and matrices.

(Required of all candidates accepted on condition. May be taken as an elective by any student in the program.)

Credit 3

CASM-71X   Fundamentals of Statistics I

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

Topics: Probability; random variables; distributions; statistical investigations and sampling; hypothesis testing and control of error. (All standard statistical tests.)

Prerequisite: Consent of the department.

Credit 3

CASM-712   Fundamentals of Statistics II

Continuation of CASM-711.

How to estimate, analyze data, and predict with statistics.

Topics: Review and extension of statistical inference; estimation; goodness-of-fit tests and tests of independence; introduction to analysis of variance with applications; regression and correlation analysis; nonparametric tests.

Prerequisite: CASM-711 or equivalent.

Credit 3

CASM-721   Quality Control: Control Charts

A 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; tolerance, specification and process capability studies; basic concepts of total quality control; management of the quality control function.

Prerequisite: Consent of the department.

Credit 3

**CASM-731   Quality Control: Acceptance
                                            Sampling**

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.

Prerequisite: Consent of the department.

Credit 3

**CASM-741   Techniques for Investigational
                                            Analysis**

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, probit analysis; sensitivity testing; order statistics with applications; analysis of means; special plotting techniques; applications of statistics to real problems.

Prerequisite: CASM-712 or equivalent.

Credit 3

CASM-751   Introduction to Decision
                                              Processes

A first course in statistical decision theory featuring concrete situations and realistic problems. (When to use statistics, what size sample, and how to evaluate risks.)

Topics: The structure of the decision making problem; criteria of choice; decision diagrams; decision making using prior and sample information; devising optimal strategies; sequential decision making procedures; comparing older methods.

Prerequisite: Consent of the department.

Credit 3

CASM-761   Reliability

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.

Prerequisite: CASM-712 or equivalent.

Credit 3

CASM-801   Design of Experiments I

A methods course in the planning, execution, and interpretation of comparative experiments.

Topics: Linear statistical models; fundamental principles of designs; inference making; analysis of variance.

Prerequisite: CASM-712 or equivalent.

Credit 3

CASM-802   Design of Experiments II

Continuation of CASM-801.

Topics: Seeking a maximum or minimum response (method of steepest ascent, EVOP); fractional factorial experiments and incomplete block designs; random models; nested sampling experiments; estimation of and tests on variance components; mixed models; randomized blocks; split-plot designs.

Prerequisite: CASM-801 or equivalent.

Credit 3

CASM-811   Probability Theory and
                                              Applications I

How to handle processes that have some chance element in their structure.

Topics: Review of basic concepts of mathematical theory; Markov sequences; Poisson processes; discrete parameter random processes; applications.

Prerequisite: CASM-822 or equivalent.

Credit 3

CASM-812   Probability Theory and
                                              Applications II

Continuation of CASM-811. More on stochastic processes.

Topics: Algebraic methods useful for solving Markov chains; nonfinite and continuous Markov chains; limiting distributions; an introduction to queuing theory.

Prerequisite: CASM-811 or equivalent.

Credit 3

CASM-821-822-823   Theory of Statistics
                                              I-II-III

This sequence of courses seeks to develop an understanding of the analytic structure of statistics and its applications. Covered here is what the practicing statistician needs to know to work at his best in his profession and keep up with new developments.

CASM-821   Theory of Statistics I

Topics: Probability distributions; mathematical expectation; sums of random variables; using theory in applications.

Prerequisite: Consent of the department.

Credit 3

CASM-822   Theory of Statistics II

Continuation of 821.

Topics: Theory and applications of sampling distributions; estimation; hypothesis testing.

Prerequisite: CASM-821

Credit 3

CASM-823   Theory of Statistics III

Continuation of 822.

Topics: Multivariate models and linear hypotheses with reference to applications in analysis of variance and regression analysis.

Prerequisite: CASM-822

Credit 3

CASM-841   Regression Analysis I

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.

Prerequisite: CASM-802 or equivalent.

Credit 3

CASM-842   Regression Analysis II

A continuation of CASM-841.

Topics: Selection of best linear models; regression applied to analysis of variance problems; non-linear estimation and model building.

Prerequisite: CASM-841 or equivalent.

Credit 3

CASM-851   Nonparametric Statistics

Distribution-free testing and estimation techniques with emphasis on applications. For applied research workers.

Topics: Sign tests; goodness-of-fit tests; run tests; rank tests; contingency tests; rank correlation; tests of two or more samples.

Prerequisite: CASM-712 or equivalent.

CASM-853   Managerial Decision Making

Statistical decision analysis for management.

Topics: Review of principles of decision making; decisions prior to sampling; many action problems; revisions of probability distributions; optimal sample size; utility and decision diagrams; replacement policies.

Prerequisite: CASM-712 or equivalent.

Credit 3

CASM-871   Sampling Theory, Applications

A study of the strategies and supporting theory applicable to survey sampling, inventory control, sampling for auditing and accounting, and bulk sampling of raw materials.

Prerequisite: CASM 712 or equivalent.

Credit 3

CASM-891   Special Topics in Applied
                                      Statistics

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.

Prerequisite: Consent of the department.

Credit 3

CASM-895   Independent Study

This course or sequence of courses, provides for one or more quarters of independent study and research activity by students other than those in the Plan C option. 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.

Prerequisite: Consent of all departments involved.

Credit 3

CASM-896, 897, 898   Thesis

For students working for the M.S. degree in Math Statistics under Plan A.

Prerequisite: Consent of the department.

Credit 3/Qtr.

CASM-899   Individual Achievement Program

For students accepted under the Plan C Option. The program to be followed will permit either:

(a) satisfactory achievement in the same subject matter the student would select under Plan A or Plan B; or

(b) satisfactory achievement through independent studies in the student's particular field of professional interest in statistics, such as mathematics, engineering, quality control, or business.

Prerequisite: Consent of the department.

Credit: 45 quarter hours to be earned and recorded in quarter hour segments as the candidate progresses in the plan of independent study set up with him.

College of Engineering

Course Descriptions

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

EENG-790 Engineering Internship

This course number is used by the students in the *Master of Engineering* degree program for earning internship credits. The actual number of credits is to be determined by the student's faculty advisor and subject to approval of the Graduate Committee of the College of Engineering.

Credit Variable

GRADUATE COURSES IN ELECTRICAL ENGINEERING

EEEE-702 Introduction to Random Variables and Signals

Random events, random variables, histograms. Probability density functions. Functions of a random variable. Moments. Multi-variate topics. Random processes. Power spectrum and auto-correlation. Transmission of random signals through linear filters.

(Graduate standing or departmental approval)

Credit 4

EEEE-704 Electromagnetic Fields

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.

Prerequisites: EEEE-571, 572

Credit 4

EEEE-705 Electromagnetic Waves

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.

Prerequisites: EEEE-571, 572

Credit 4

EEEE-706 Special Topics in Electromagnetics

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.

Prerequisites: EEEE-704, 705

Credit 4

EEEE-707 Linear Systems

Linearity, superposition, impulse response, convolution. Fourier series and Fourier transform. LaPlace transform. Z transform. Matrices and linear equations. Solution of homogeneous equations, eigenvalues and eigenvectors. Functions of a matrix.

Credit 4

EEEE-708 Active Filter Design

Network analysis (review). Classical frequency domain filters. 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 two-zero sections. Realization of n-pole filters using 2-pole sections. Sensitivity analysis. Tuning of filters. Effect of non-ideal Op amp characteristics on filter performance. Design examples and demonstrations.

Credit 4

EEEE-709   Active Network Synthesis

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 networks 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.

(Instructor's approval)

Credit 4

EEEE-711   Integrated Circuit Operational Amplifiers

Differential amplifier shall signal characteristics. Stages of an operational amplifier. Multistage operational amplifier. Phase compensation. Linear circuit applications. Operational amplifiers in non-linear circuits. Analog/digital, digital/analog and sampling networks. Waveform generators. Modulation and demodulation. The emphasis will be on the practical aspects.

(Graduate standing or departmental approval)

Credit 4

EEEE-712   Control System Fundamentals

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 and compensation of single and multiple-loop systems.

Prerequisite: Elementary knowledge of Laplace Transforms. (This course is intended for graduate students who have not had a formal course in control systems in their undergraduate program. This course is not open to those who have already had an introductory control systems course.)

Credit 4

EEEE-713   Modern Control Theory

The development of the analytical techniques of modern theory as applied to linear control systems. Topics include vector spaces, state space, and state variables, matrices and matrix functions, controllability, observability and stability theory.

Prerequisite: EEEE-611

Credit 4

EEEE-714   Introduction to Nonlinear Control Systems

An introduction to the physical nature and mathematical theory of nonlinear control systems' behavior using Phase Plane techniques, Liapounov Theory, Describing Function techniques and Popov's criterion. These are applied to both piece-wise-linear and analytical nonlinear systems.

Prerequisite EEEE 713

Credit 4

EEEE-715   Analysis of Nonlinear Control Systems

Further development of Liapounov Theory including Aizerman's method, Variable Gradient methods and the Lur'e Forms. Perturbation methods, Variational techniques, Kryloff and Bogoliuboff method. Analysis of switching and relays.

Prerequisite EEEE 714

Credit 4

EEEE-716   Digital Signal Processing

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.

Prerequisite: EEEE-707

Credit 4

EEEE-718 Statistical Design of Control Systems

Brief review of probability. Statistical description of random processes. Mean square error analysis. Design of optimum linear control system for minimizing the mean square error with stationary random inputs with or without additive noise. Design with constraints.

Credit 4

EEEE-719   Sampled Data Control Systems

Brief review of the theory of sampling and quantizing. Modified Z transform properties and application. Design and compensation techniques for sampled data control systems. Stability criteria. Synthesis of digital controllers. Multirate sampled data control systems. Computer control theory.

Prerequisites: EEEE-713

Credit 4

EEEE-720   Optimum Control Systems

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.

Prerequisite: EEEE-713

Credit 4

EEEE-734   Communication Techniques

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.

Prerequisite: EEEE-707

Credit 4

EEEE-735   Digital Data Transmission

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.

Prerequisites: EEEE 702, 734

Credit 4

EEEE-736   Information Theory

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.

Prerequisite: EEEE-702

Credit 4

EEEE-737   Random Signals and Noise

Random processes. Correlation functions. Spectrum of periodic functions and periodic random processes. Orthogonal series for a random process. Spectral densities. The gaussian random process. Noise through a linear system. Physical sources of noise. Noise figure. Statistical decision theory.

Prerequisite: EEEE-702

Credit 4

EEEE-738 Physical Basis of Integrated Circuits
(Formerly "Physical Electronics I")

A study of semiconductor physics to develop an understanding of the operation of various devices such as bipolar transistors and MOS transistors. The emphasis will be on the development of models useful in circuit analysis and design. Fabrication and characteristics of integrated circuits will be discussed.

(Departmental approval)

Credit 4

EEEE-740   Digital Integrated Circuits

Monolithic IC fabrication process. Components, properties, models and equations. Different types of digital IC's. Applications of digital IC's to circuits as well as systems. Emphasis will be on the TTL family and problems most often faced by the practicing designer.

Prerequisites: EEEE-650 or EEEE-750, 751. (751 may be taken concurrently)

Credit 4

EEEE-742   Computer Methods in Electrical
                                              Engineering

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.

Prerequisite: SMAM-611

Credit 4

EEEE-743   Minicomputer Fundamentals

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

EEEE-750   Switching Circuits I

A study of combinational logic circuits and related topics. Switching algebra. Minimization of switching functions using algebraic, Karnaugh map, and Quine-McCluskey methods. Multiple output minimization. NAND circuits. Design examples. Decomposition of switching functions. Threshold logic circuits.

Credit 4

EEEE-75I   Switching Circuits II

A study of sequential logic circuits and applications. Iterative networks. Analysis and synthesis of synchronous and asynchronous, fundamental and pulse mode, sequential circuits. Application of sequential circuits to shift registers, and counters.

Prerequisite: EEEE-750

Credit 4

EEEE-752 Sequential Machines and Automata

An introduction to the study of automata with special emphasis on finite state sequential machines. State tables and diagrams, combination of sequential machines, decomposition of sequential machines. Experiments: identification of states and machine identification. Regular expressions and regular sets. Kleene's Theorem. Brief introduction to Turing machines.

Prerequisite: EEEE-650 or 751

Credit 4

EEEE-753   Logic Fault Diagnosis

Generation, selection and verification of tests for the detection and diagnosis of logical faults in combinational and sequential circuits and iterative logic arrays. Fault simulation and fault dictionaries. Design techniques.

Prerequisite: EEEE-650 or 751

Credit 4

EEEE-772, 773, 774   Special Topics in
                                            Electrical 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)

EEEE-800, 801   Graduate Paper

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

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)

GRADUATE COURSES IN
INDUSTRIAL ENGINEERING

EIEI-601   Value Analysis

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

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

Application of non-linear programming techniques. Classical optimization techniques; quadratic, stochastic, integer programming and dynamic programming. Applications to industry.

Prerequisite: EIEI-701

Credit 4

EIEI-705   Survey of Operations Research

A survey course designed to introduce the student to such topics as waiting line analysis, inventory, scheduling, replacement, and simulation. This course is intended to present an integrated view of the field of Operations Research to students who will take more specialized courses as well as those in other disciplines desiring only a limited exposure to the field.

Credit 4

EIEI-710   Systems Simulation

Methods of modeling and simulating man-machine systems with emphasis on model validation, design of simulation experiments, variance reduction techniques, random number generation, distribution generation.

Credit 4

EIEI-715, 716   Statistical Analysis for Engineers I and II

A basic two-quarter course in probability and statistics designed to give the student a foundation for further study in areas such as Design of Experiments, Stochastic Systems, Simulation, etc.

EIEI-720   Production Control

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-730   Biotechnology and Human Factors I

Basic functional anatomy and physiology. Human body systems. Anthropometry. Applications on the design for man and man-machine systems. Work physiology. Industrial biomechanics.

Credit 4

EIEI-731 Biotechnology and Human Factors II

Effect of mechanical and physical environment on: physiology, behavior, performance of man. Design considerations to protect man against such environmental effects (e.g. thermal environment, noise, vibration, acceleration, light, altitude).

Credit 4

EIEI-732 Biotechnology and Human Factors III

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

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

Systems safety engineering. Accident study of the human component in occupational systems. Product systems safety analysis. Approaches in accident prevention.

Credit 4

GRADUATE COURSES IN MECHANICAL ENGINEERING

EENG-707   Engineering Hydrology

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

EENG-742   **Solid** Wastes Engineering

A study of the collection, processing, disposal and re-use 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-652 Fluid Mechanics of Turbomachinery

A fundamental course in turbomachinery presuming background in elementary fluid mechanics and thermodynamics. The course begins with a comprehensive review of those portions of fluid mechanics appropriate to the study of turbomachinery. Topics covered include: dimensional analysis, energy transfer between rotor and fluid, radial flow pumps and compressors, axial flow pumps and compressors, radial flow turbines, and axial flow turbines.

Credit 4

EMEM-692   Analysis for Engineers

Partial differentiation, chain rule and total differential. Multiple integration and manipulation of multiple integrals. Linear constant coefficient ordinary differential equations. Matrices and solutions of systems of equations. Vector algebra and differentiation of vectors or complex variables.

Credit 4

EMEM-693   Theory of Thermo Fluid Systems

Thermodynamic properties and processes, ideal and real gas, vapors and gases. Laws of thermodynamics and selected power cycles. Fluid statics. Control volume and conservation of mass, momentum and energy. Bernoulli's equation. Viscosity, loss of heat due to friction (flow through pipes), concept of boundary layer. Flow of compressible fluid through convergent-divergent nozzle. Basic laws of conduction, convection, and radiation.

Credit 4

EMEM-694   Stress Analysis

Topics to be covered include: two and three dimensional stress-strain relations, Mohr's circle, elasticity theory, experimental techniques, yield theories, introduction to plasticity, fracture mechanics,

design approaches, vibrational principles, and extensive coverage of Castigliano's Theorem.

Prerequisite for EMEM-795.

EMEM-701   Applied Engineering Analysis I

Solutions to boundary value problems related to the theory of elasticity, heat transfer, vibrations and fluid flow by methods of separation of variables, LaPlace transforms and Fourier transforms.

Prerequisite: SMAM-308

Credit 4

EMEM-702   Applied Engineering Analysis II

Classification of second order partial differential equations related to fluid mechanics, vibrations and theory of elasticity. Green's method for solving LaPlace's equation and its application to fluid mechanics and electrostatics. Theory of characteristics and its applications to supersonic flow. Riemann's method for solving hyperbolic equations and its application to fluid mechanics.

Prerequisite: EMEM-701

Credit 4

EMEM-703   Applied Engineering Analysis III

Topics chosen from Conformal Mappings, Complex Inversion of Transform Integrals, Calculus of Variations and Integral Equations with applications to mechanical engineering problems.

Prerequisite: EMEM-702

Credit 4

EMEM-705   Numerical Analysis

Roots of algebraic and transcendental equations. Finite difference solutions of ordinary and partial differential equations, solutions of simultaneous linear equations. Error and Convergence Analysis. Extensive use of computer is anticipated.

(Graduate standing)

Credit 4

EMEM-711   Heat Transfer I

The formulation of conduction heat transfer problems. Solutions to steady state and unsteady state problems by separation of variables. LaPlace transforms and numerical methods.

(Graduate standing or departmental approval)

Credit 4

EMEM-712   Heat Transfer II

Thermal radiation, radiation properties of surfaces, radiant interchange among surfaces separated by radiatively nonparticipating media, radiant energy transfer through absorbing, emitting and scattering media.

(Graduate standing or departmental approval)

Credit 4

EMEM-713   Heat Transfer III

Principles of natural and forced convection. Fluid stresses and flux laws. The differential and integral equations of hydrodynamic and thermal boundary layers, heat transfer in flow inside smooth surfaces, heat transfer for flow over external surfaces.

(Graduate standing or departmental approval)

Credit 4

EMEM-715   Fluid Dynamics

Selected topics from compressible flows, viscous flow, hydrodynamic instability and turbulence, depending on the interests of the students.

Prerequisite: EMEM-415

Credit 4

EMEM-717   Thermodynamics

This course provides a general, postulative approach to classical macroscopic thermodynamics through a mathematical formalism developed from basic postulates concerning equilibrium and stability. Applications of the formalism to chemical, electric and magnetic, and stressed solid systems are considered. The course concludes with an introduction to the theory of fluctuations, and the concepts of irreversible thermodynamics.

Prerequisite: EMEM-413

Credit 4

EMEM-718   Statistical Thermodynamics

This course develops the fundamentals of thermodynamics from the standpoint of a statistical model of a system of discrete particles. Topics covered include kinetic theory, elementary transport parameters, classical Maxwell-Botzmann statistics. Fermi-Dirac and Bose-Einstein quantum statistics with applications to gases, vapors, compressed gases and liquids.

Credit 4

EMEM-730 Nature and Properties of Materials

A study of the nature of solids including metals, ceramics, polymers, glasses and composites. Also considered are thermal, electrical, magnetic, and optical properties.

Prerequisite: EMEM-344

Credit 4

EMEM-731   Introduction to Continuum
                                         Mechanics

Stress, deformation and flow in a continuous medium. Applications in the area of linear elasticity and fluid mechanics.

Prerequisite: SMAM-308

Credit 4

EMEM-732 Advanced Mechanics of Materials

Theory of failure. Stress analysis of thick cylinders, plates, curved beams, and beams on elastic foundations.

(Graduate standing or departmental approval)

Credit 4

EMEM-733   Analytical Mechanics I

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-734   Analytical Mechanics II

Transmission of waves, variational calculus, variational dynamics, and some relativity.

Prerequisite: EMEM-733

Credit 4

EMEM-735   Theory of Elasticity I

Formulation of problems in elasticity; bending and torsion of beams, plain strain and plain stress problems. Different methods of solutions such as stress functions, complex variables.

Prerequisite: EMEM-731

Credit 4

EMEM-736   Theory of Elasticity II

Solution of three-dimensional problems in elasticity, contact stresses. Variational methods. Introduction to wave propagation in elastic bodies.

Prerequisite: EMEM-735

Credit 4

EMEM-737 Vibration Theory and Applications I

Vibrations of a particle, theory of damped free and forced vibrations of systems with several degrees of freedom.

Prerequisite: EMEM-702

Credit 4

EMEM-738   Vibration Theory and
                                              Applications II

Vibration of elastic bodies, structures and approximation methods using matrix methods.

Prerequisite: EMEM-737

Credit 4

EMEM-739   Experimental Stress Analysis

Mechanical methods of analysis of structural and machine members, including photoelastic method, strain gages, the membrane; hydrodynamical and electrical analogs. Laboratory tests of models.

Prerequisite: EMEM-732

Credit 4

EMEM-741   Advanced Mechanical Systems
                                                           Design

Optimization of system response to deterministic inputs. Various mechanical systems in use will be analyzed and studies will be made to improve them. Both the analog and the digital computer are used.

Prerequisites: EMEM-705 and 751

Credit 4

EMEM-743   Applied Vibrations

Nature of various types of vibration problems, and procedures for assessing their significance. Diagnosis of selected practical problems, including experimental techniques such as strain gages, displacement sensors, and an introduction to holography. The development of meaningful analytical models, based on either test data for problem diagnosis, or on layout drawings for design analy-

sis. Prediction of natural frequencies, mode shapes, and vibration response amplitudes for discrete mass systems using Newton's Law of Motion, and introduction to problems associated with continuum systems of bars, plates and shells. Practical problem-solving workshop sessions will consolidate the above topics.

Credit 4

EMEM-751   Automatic Control Engineering I

Development of the transfer functions and block diagrams to describe components and systems; rootlocus, Bode, and polar plots are used. The analog computer is used throughout the course to simulate systems.

Prerequisite: EMEM-702

Credit 4

EMEM-752 Automatic Control Engineering II

An advanced study of feedback systems covering the areas of compensation, complex control systems, and non-linear systems.

Prerequisite: EMEM-751

Credit 4

EMEM-772, 773, 774   Special Topics in
                                              Mechanical Engineering

An opportunity for the advanced student to undertake an independent investigation in a mechanical engineering field of his own choice. 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-795   Finite Elements I

Development of theory from variational principles. Two-dimensional applications to elastic continua, considering plain stress, plain 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-796   Applied Vibrations II

Analysis of vibrations of linear continuous systems, involving beams, frames, plates, and shells. Solution by classical methods or by approximate methods, as expedient. Finite-element analysis of vibration and stability problems. System analysis techniques such as mobility and receptance methods. Applications of methods discussed to important practical problems. Problem-solving workshop.

Credit 4

EMEM-797   Finite Elements II

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.

EMEM-890   Research and Thesis Guidance

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)

College of Fine and Applied Arts

Course Descriptions

Courses for the Education concentration of the M.S.T. 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 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

FADA-820   Seminar in Art Education

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

FADA-860   Practice Teaching in Art

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

Credit 9

COMMUNICATION DESIGN

FADC-780 (MFA) FADC-750 (MST)

Communication Design Studio

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. Media Center facility available for extension of studio problems.

Lab. 9-27
Credit 3-9

INDUSTRIAL/ENVIRONMENTAL DESIGN

FADE-780 (MFA) FADE-750 (MST)   Design Applications

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.

Lab. 9-27
Credit 3-9

PAINTING

FADP-780 (MFA) FADP-750 (MST)   Painting

The pursuit of the pertinent, the ecstatic, the beautiful, by a small group of those dedicated to the art.

Lab. 9-27
Credit 3-9

PRINTMAKING

FADR-780 (MFA) FADR-750 (MST)

Printmaking

Advanced techniques in etching, lithography and woodcutting, as well as in many experimental areas including color processes, photo-etching, photo-lithography, vacuum-forming, combination printing and calligraphy. 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. 9-27
Credit 3-9

THESIS

FAD(C, E, P, orR)-890   Research and Thesis Guidance

The development of a thesis project instigated by the student and approved by a faculty committee and the Graduate Faculty Chairman. Primarily creative production, the thesis must also include a written report.

Credit 12

SCHOOL FOR AMERICAN CRAFTSMEN

Design, Techniques and Research Problems

A program structured on the basis of individual needs, interests, and background as they may be determined through faculty counseling. This sequence of courses will lead to the production of a thesis project, suggested by the student and approved by the faculty. This applies to all craft areas.

Lab. 9-27
Credit 3-9

FSCC-780 (MFA) FSCC-750 (MST) Ceramics

FSCM-780 (MFA) FSCM-750 (MST)

Metalcrafts and Jewelry

FSCT-780 (MFA) FSCT-750(MST) Weaving and Textile Design

FSCW-780 (MFA) FSCW-750 (MST)

Woodworking and Furniture Design

FSC(C, M, T or W)-890   Research and Thesis Guidance

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

College of General Studies

Course Descriptions

EDUCATION SERVICE COURSES FOR GRADUATE PROGRAMS OF OTHER RIT COLLEGES

GSHH-701   History of American Educational Thought and Practice

A study of the intellectual ideas and social forces that have shaped American education from the colonial period to the present.

Credit 5

GSSP-702   Educational Psychology

A study of psychological research as it applies to the problems of learning and teaching. Consideration will be given to Pavlovian and operant conditioning, perceptual learning, motivation, individual differences, and other factors related to efficiency in learning. Evaluation will be studied to the degree that it is useful in teaching. Lectures, readings, and seminar-type projects will be used to develop the various phases of the course.

Credit 5

GSSS-701   Educational Sociology

The development of sociological and socio-psychological types of knowledge that have relevancy for, or logical connections to, educational practices. This course will be based on substantive material about social phenomena making up the social order in which the educational systems are operating and by which they are influenced.

Credit 5

College of Graphic Arts and Photography

Course Descriptions

SCHOOL OF PHOTOGRAPHIC ARTS AND SCIENCES

MASTER OF SCIENCE IN PHOTOGRAPHIC SCIENCE

PPHS-700   Principles of Photographic Science

A course intended for students who have completed their undergraduate programs in engineering or the sciences and now wish to prepare themselves for entry into the graduate program in Photographic Science and Instrumentation. It is an intensive course, assuming working knowledge of mathematics, physics, and chemistry, and includes: radiation theory and radiometry, properties of radiation-sensitive materials, chemistry and kinetics of photographic processing, sensitometry, tone reproduction, principles of color measurement, and color photographic systems.

Summer only. Credit 15. Not applicable to 45 required graduate credits.

PPHS-701,702,703   Principles of Photographic Science

Equivalent to PPHS-700, but offered in the evening and Saturdays during the regular Fall, Winter, and Spring quarters.

Credit 15. Not applicable to the 45 required graduate credits.

PPHS-711,712,713 — Theory of the Photographic Process

Chemical and physical properties of silver halides and gelatin, physical structure and optical properties of the silver halide emulsion and their relations to the characteristic curve; chemistry and preparation of emulsions; extensive treatment of theory ol sensitivity and latent image formation; chemistry and kinetics of processing, including color processing; theory of color reproduction; chemistry and physics of selected non-silver processes.

Credit 3/Qtr.

PPHS-721,722 — Mathematics and Statistics 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 5/Qtr.

PPHS-731,732,733 — Principles of Instrumental and Photographic Optics

The principles of geometrical and physical optics with application to photographic instrumentation systems. Geometrical optics—general laws, first order imaging, aberrations and geometrical image evaluation, mirror and prism systems, the eye and vision characteristics, radiometry of optical images, basic instrument systems. Physical optics—Maxwell's equations, electromagnetic waves, polarization, interference and interferometers, coherence, Kirchoff integral and Huygen's principle, Fraunhofer and Fresnel diffraction, Fourier-transform formulation of diffraction, transfer-function description of imaging system performance.

Credit 3/Qtr.

PPHS-741,742,743 — Photographic and Optical System Analysis and Evaluation

Complex variables and Fourier analysis with application to the evaluation of imaging systems. Properties of optical images, structure of photographic images. Photo-optical system evaluation.

Fall: Class 2, Lab 6, Credit 4

Winter, Spring: Class 3, Credit 3

PPHS-751,752,753 — Special Topics in 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 Chairman of the Photographic Science Graduate Program.)

PPHS-890 — Research and Thesis Guidance

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

Hours arranged. Credit 9, minimum for M.S.

MASTER OF FINE ARTS
IN PHOTOGRAPHY

PPHG-700 — Fundamentals of Photographic Communication

A summer course for students entering the graduate program with insufficient undergraduate credits in photography. 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. Credits not applicable to M.F.A. requirements.

PPHG-701,702,703 — History and Aesthetics of Photography

Covering the "History and Aesthetics of Photography" from 1839 to the present, with special emphasis on the development of photographic seeing, and its related effect on other media. A survey of the numerous processes and how their development affected the image-making of their particular period, i.e. daguerreotypes, callitypes, ambrotypes, etc. Student projects designed to illuminate phases of photographic history best understood by personal visual exploration.

Credit 3/Qtr.

PPHG-720   Photography (Still)

Photographic communications workshop. Individually planned studies in photographic visual communication as determined by faculty-student consultation based on the student's personal objectives. Research, group critiques, seminars, studio and laboratory practice, field trips.

Credit 1-9

PPHG-730   Cinematography

Film making workshop. Individually planned studies in cinematography, as determined by faculty-student consultation, group critiques, seminars, studio and laboratory practice, field trips.

Credit 3-9

PPHG-740   Photographic Museum Practice

Museum internship workshop. 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 6-14

PPHG-753   Photographic Workshop for
                                                    Teachers

A course especially designed for the High School or Junior College teacher, counselor, or advisor involved in instruction or career guidance in photography.

The theory and principles of practical black and white and color photography are presented and applied in actual picture making experiences. Both the aesthetic and technical aspects of photography are stressed. Teaching methods concepts and development of visual-aids are discussed, and ideas in visual communications are examined. Career opportunities in professional photography will be explored.

This course is being jointly sponsored by RIT and the Winona School of Professional Photography, which is the educational division of the Professional Photographers of America, Inc. Practicing professional photographers from the staff at Winona will join the RIT faculty one day each week. The Photographic Arts and Science Foundation is encouraging participation by granting $200 toward the tuition of the twenty students accepted. *Summer only.*

Credit 9

PPHG-799   Independent Project

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 Coordinator and the Director of the School.

Credit 1-9

PPHG-890   Research and Thesis Guidance

Research, execution of a creative project and presentation of an acceptable exhibition with emphasis on technique, design, and communication. The candidate will select his thesis subject with the approval of the graduate committee and will deposit a suitable report and record of the thesis with the Institute. Museum majors will plan, assemble and take full responsibility for mounting a major photographic exhibit under the sponsorship of Rochester Institute of Technology, or a major museum or educational institution. The announcement, catalog, reviews and a satisfactory illustrated report of the project must be deposited with the Institute.

Credit to be arranged.

Note: Some courses listed above are presently under review.

SCHOOL OF PRINTING

MASTER OF SCIENCE IN PRINTING

PRINTING EDUCATION COURSES

PPRE-701   Introduction to Graphic Arts Education

A prerequisite course required of all students work-ing in the printing education major. A study of historical trends along with the development and overview of philosophy and methodology. Also includes a survey of current industrial education teaching problems.

Credit 4

PPRE-702 Teaching Methods in Graphic Arts Education

The study of the criteria necessary for selecting the methods, procedures, and materials relevant to planning and executing an effective lecture or dem-onstration lesson.

Credit 4

PPRE-713   Typographical Procedures

Theory and practice of type composition by hand and machine. Monotype, Linotype, and Intertype. Phototypesetting. Use of perforated tape in auto-mated typesetting.

Credit 4

PPRE-714   Photographic Reproduction Technology

Study and production of negatives or film positives for the major printing processes. Student gains an understanding of photography and the various printing processes so as to be able to introduce this area into an existing graphic arts program at the high school or college level.

Credit 6

PPRE-715   Printing Plate Technology

The theory and practice of the methods of relief, planographic, and intaglio platemaking processes and procedures. Imposition and stripping opera-tions. Lockup. Register problems. The study of electronics in present-day platemaking techniques.

Credit 6

PPRE-716   Printing Press Technolog)

Theory and practice of the methods of relief, planographic, flexographic, and intaglio processes Experiments in printing on different surfaces.

Credit 6

PPRE-720   Photographic Reproduction Technology

The fundamental principles, procedures, tech-niques, and applications of the photographic proc-ess as it is related to the production of negatives for the major printing processes. An independent graduate research project is required.

Credit 4

PPRE-860   Practice Teaching in the Graphic Arts

A 10-week teaching experience in a school offering an appropriate exposure for the student teacher in the areas of student relationships and understand-ing; development of teaching methods and pro-cedures; and a supervised involvement in the duties of the cooperating teacher. A one-hour, weekly seminar is provided for the discussion of overall student teacher progress.

Credit 12

PRINTING MANAGEMENT COURSES

PPRM-701   Computers in the Graphic Arts

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 re-quired.

Credit 4

PPRM-702   Computers in Management

Discussion of printing requirements in relation to computer system configurations. Applications of computers to management and production control problems. Investigation of computer-oriented pro-duction control techniques.

Prerequisite: PPRM-701

Credit 4

PRINTING TECHNOLOGY COURSES

PPRT-701　　　　Research Methods in Graphic Arts

Methods common to most types of experimental and survey research and how they may be applied to research in the graphic arts.

Credit 4

PPRT-702　　　　Graphic Reproduction Theory

Orientation in the interpersonal, man-machine, and machine relationships inherent in the management role. Areas of investigation include aspects of behavioral and mechanistic theory as it pertains to various aspects of the graphic arts industry. Distinguished speakers contribute to breadth.

Credit 4

PPRT-703　　　　Statistical Inference

Hypothesis testing, confidence intervals, and sample size for variables. Introduction to analysis of variance and regression analysis.

Credit 5

PPRT-704　　　　Design of Experiments

Basic designs for experiments, objectives, conclusions, error estimation, data analysis. Continuation of analysis of variance and regression analysis. Response surfaces and factorials.
Prerequisite: PPRT-703

Credit 5

PPRT-705,706,707　　　　Application of Mechanics
　　　　and Electronics to Materials, Machine
　　　　Design, and Processes in Printing

Force systems, elementary dynamics. Work, power, and energy. Relation to stress and strain, 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.

PPRT-708　　　　Introduction to Systems Analysis

Problems of systems analysis in printing operations for the highest quality product at the minimal cost including optimal floor designs and methods study.
Prerequisite: PPRM-701

Credit 4

PPRT-7(0　　　　History of Printing Technology

A study of the forces which have influenced the development of printing, with emphasis upon the technological factors involved. Examinations of the relationships of esthetics and craft concepts to modern industrial techniques.

Credit 4

PPRT-710　　　　Ink and Substrates

The study of ink components by process and their relationship to "printability" on various substrates. Ink receptivity. Ink and substrate compatibility to meet process requirements. Printing demands for various stubstrates; paper, polyethylenes, polypropylenes, foils, and plastics.

Credit 4

PPRT-711　　　　Tone and Color Analysis

Methods and instrumentation necessary for the evaluation of printed tone and color and the photographic intermediate images required for their production by the photomechanical process.

Credit 4

PPRT-712　　　　Printing Plate Methodology

Elements of platemaking procedures for letterpress, flexographic, and lithographic plates; gravure cylinders, and electronically engraved plates. Theoretical study plus practical involvement in making of various plates. An independent graduate research project is required.

Credit 4

PPRT-713　　　　Lithographic Press Methodology

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

PPRT-714　　　　Relief Press Methodology

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. Pre-press preparation of various

plates for printing. Introduction to flexographic printing. An independent graduate research project is required.

Credit 4

PPRT-715   Gravure and Screen Printing
Methodology
Survey of gravure and screen printing incorporating lectures and laboratory sessions. The study of techniques, equipment, materials, and supplies necessary to arrive at a finished product by either process. An independent graduate research project is required.

Credit 4

PPRT-716   Layout and Printing Design

Historical analysis of letter forms. Essential requirements and principles of layout and printing design as applied to commercial printing and advertising. Practical application of theory in solving printing design problems. An independent graduate research project is required.

Credit 4

PPRT-717   Copy Preparation

Preparation of copy for camera. Working from layouts, making analysis of requirements. Paste-up techniques, methods of preseparation 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 research project is required.

Credit 4

PPRT-718 Imposition and Finishing Procedures

Theory and practice of imposition of various kinds of forms. Imposition planning as related to and governed by folding and other finishing operations. Imposition and lockup principles and procedures for letterpress forms. An independent graduate research project is required.

Credit 4

PPRT-719   Machine Composition Technology

Emphasis on use of perforated tape in automated operation of composing machines. Introduction to use of computers in printing. Operation and application of photocomposition and cold type processes. Practice on specialized equipment. Participation in field trips required. An independent graduate research project is required.

Credit 4

PPRT-850   Research Projects

Individual research projects in which independent data are collected by the student, followed by analysis and evaluation. A comprehensive written report is required. Consent of adviser required.

Credit variable.

PPRT-890   Research and Thesis Guidance

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

Credit variable.

College of Science
Course Descriptions

MASTER OF SCIENCE
IN CHEMISTRY

SCHA-511,512 — Instrumental Analysis

Theory, applications and limitations of instrumental methods for qualitative and quantitative analysis; Spectroscopic and electrochemical techniques studied in detail. Laboratory experience in spectro-photometry, NMR, atomic absorption, fluorometry, potentiometry, coulometry, polarography, and radio-chemical methods.
Prerequisite: SCHA-313

Class 3, Lab 3, Credit 4/Qtr.

SCHA-611 — Advanced Analytical Chemistry

Theories behind analytical methods; compleximetry with applications to separations and masking; Theory of electrode processes, specific ion electrodes; non-aqueous methodology; new analytical techniques.
Prerequisite: SCHA-511

Class 3, Credit 3

SCHC-555,556 — Biochemistry

Introduction to modern biological chemistry, physiological and physical-chemical aspects of energy metabolism, intermediary metabolism, biosynthesis of biopolymers, and metabolic regulation. Structure and function of proteins and nucleic acids as an introduction to enzymology, molecular biology, and molecular genetics.
Prerequisites: SCHO-433 and SCHP-442

Class 3, Credit 3/Qtr.

SCHC-639 — Topics in Chemistry

Current chemical topics which are not among the regular courses will be presented periodically or on a one-time basis. Course offerings will be in response to student and faculty interest in the topics to be presented.
Class 3, Credit 3

SCHC-640 — Chemistry Seminar

Credit 1

SCHC-691 — Research and Thesis Guidance

Hours and credits to be arranged. Chemical research in a field chosen by the candidate, subject to approval of the Department Head and advisor.
Credit Variable

SCHI-551, 552 — Inorganic Chemistry

The properties and structures of the elements and their compounds in relation to electronic and stereochemical principles; inorganic laboratory techniques.
Prerequisites: SCHO-433 and SCHP-443

Class 3, Lab (Optional) 3, Credit 3 or 4/Qtr.

SCHI-601 — Advanced Inorganic Chemistry

Theories of molecular geometry; Hard-soft, Acid-Base Theory; transition metal chemistry, crystal and ligand field theories, spectroscopic interpretation; reaction mechanisms.
Prerequisite: SCHI-551

Class 3, Credit 3

SCHO-521 — Advanced Organic Chemistry

Several of the following advanced topics in organic chemistry are covered; polyfunctional compounds, modern synthetic methods, stereochemistry, conformational analysis, free radical reactions; natural and synthetic polymers.
Prerequisite: SCHO-433

Class 3, Credit 3

SCHO-522 — Advanced Organic Chemistry

Topics include activation parameters, kinetic and non-kinetic treatment of mechanism elucidation, linear free energy concepts, quantitative analysis of conformational and electronic effects, simple Huckel Molecular Orbital Theory, electrocyclic reactions, acidity functions and primary and secondary isotope effects.
Prerequisites: SCHO-433 and SCHP-443. (Note: SCHO-521 is recommended but not required)

Class 3, Credit 3

SCHO-525 — Qualitative Organic Chemistry

A combination of chemical and spectroscopic techniques is used to identify the structure of "unknown" organic compounds.
Prerequisite: SCHO-433

Class 2, Lab 6, Credit 4

SCHO-621   Physical Organic Chemistry

A theoretical treatment of the basic tools used in mechanism elucidation. Interpretation of kinetic, stereochemical, and spectral data emphasized.

Prerequisites: SCHO-433 and SCHP-443
(Note: SCHO-521 recommended but not required)

Class 3, Credit 3

SCHO-622   Stereochemistry

Advanced treatment of steric relationships and stereoisomerism in organic compounds.
Prerequisite: SCHO-522

Class 3, Credit 3

SCHO-623   Heterocyclic Chemistry

The preparation, properties, and reactions of heterocyclic systems, especially for small rings.

Prerequisite: SCHO-433

Class 3, Credit 3

SCHO-624   Natural Products

Introduction to the major classes of natural products. Emphasis is on recent total synthesis of representative natural products of current interest.
Prerequisite: SCHO-521

Class 3, Credit 3

SCHO-625   Organic Chemistry of Polymers

Introduction to the chemistry of synthetic, high molecular weight polymers and a survey of their diverse structures and properties. Mechanisms of condensation, free radical and ionic polymerization.
Prerequisite: SCHO-433

Class 3, Credit 3

SCHP-531   Chemical Thermodynamics

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.
Prerequisites: SCHP-443 and SMAM-307

Class 3, Credit 3

SCHP-533   Principles of Magnetic Resonance

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.
Prerequisite: SCHP-443

Class 3, Credit 3

SCHP-536   Radiochemistry

Radioactive decay from statistical and differential approaches. Nature of nuclear emissions. Interactions with matter. Counting techniques and statistics. Chemical tracers. Chemical applications of nuclear reactions. Shielding. Health hazards. Laboratory: counting techniques; sample preparation and handling; use of tracers in analysis, structural studies, equilibrium studies, kinetic studies.
Prerequisite: SCHP-443

Class 3, Lab (Optional) 3, Credit 3 or 4

SCHP-626   Physical Chemistry of Polymers

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.
Prerequisite: SCHP-443

Class 3, Credit 3

SCHP-634   Quantum Mechanics

The Schrodinger equation, variational and perturbational methods, the Heisenberg uncertainty relations, free particles, particles in boxes and in wells, tunneling, the rigid rotator, the harmonic oscillator, the hydrogen atom, the helium atom, electron spin, Pauli exclusion principles.
Prerequisite: SCHP-443

Class 3, Credit 3

SCHP-635   Quantum Chemistry

The application of quantum mechanics to the covalent bond, diatomic molecules, resonance and complex molecules. Molecular spectroscopy. Elements of quantum statistical mechanics.
Prerequisite: SCHP-634

Class 3, Credit 3

SCHP-637   Chemical Kinetics

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.
Prerequisite: SCHP-443

Class 3, Credit 3

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JOHN L. PABRINKIS, M.S., Rochester, Statistics

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JASPER E. SHEALY, Ph.D., Buffalo—Assistant Professor, Human Factors

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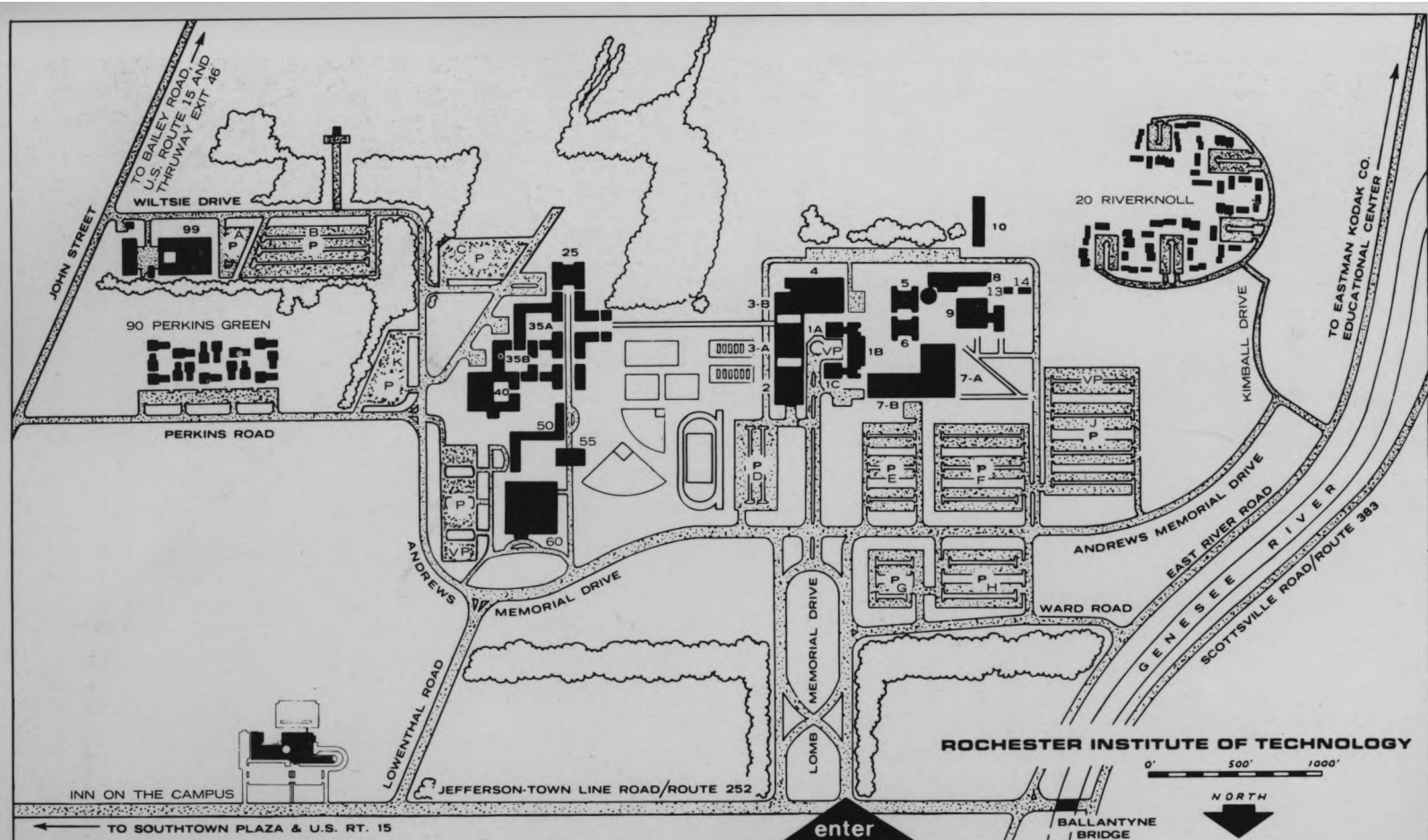**ROY I. SATRE, Ph.D., Syracuse** — *Professor and Dean*

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