UNDERGRADUATE DAY AND EVENING COURSES

1962 | 1963

JANUARY, 1962

DIRECTORY FOR CORRESPONDENCE

MAILING ADDRESS: 323 High Street, Newark 2, N. J.
TELEPHONE: MArket 4-2424.

MATTERS OF GENERAL COLLEGE INTEREST:
Address the President.

ADMISSIONS (UNDERGRADUATE OR GRADUATE):
For everything concerned with admissions, including requests for publications, and information on scholarships and student aid, advanced standing, tuition, and fees, address Dean of Admissions. Telephone: Ext. 257.

REGISTRATION:
Address the Registrar. Telephone: Ext. 369.

ALUMNI ACTIVITIES:
Address Alumni Secretary. Telephone: Ext. 364.

FINANCIAL MATTERS:
Address the Business Manager. Telephone: Ext. 218.

GRADUATE PROGRAM:
Address the Dean of Admissions. Telephone: Ext. 257.

SPECIAL COURSES ADMISSION OR PROGRAM:
For all information concerning special courses programs and admissions, etc., address the Director of Special Courses. Telephone: Ext. 366.

EMPLOYMENT OF SENIORS AND GRADUATES:
Address the Office of Industrial Relations. Telephone: Ext. 363.

COUNSELING:
Address the Counseling Center. Telephone: Ext. 263.

TRANSCRIPTS:
For transcripts and student grades, address the Recorder. Telephone: Ext. 314.

VETERANS:
For information on veteran status, address the Veterans' Coordinator. Telephone: Ext. 229.

RESEARCH FOUNDATION:
Address the Secretary. Telephone: Ext. 243.

PLANT, EQUIPMENT, AND UTILITIES:
Address the Plant Engineer. Telephone: Ext. 270.

The business and administrative offices of the College are open between the hours of 9:00 A.M. and 5:00 P.M. Monday through Friday during the school year. The Registrar's Office is also open evenings between the hours of 6:00 P.M. and 9:00 P.M. daily except Saturdays. During the summer program, the business and administrative offices remain open until 4:00 P.M., Monday through Friday, while the Registrar's Office is open between the hours of 6:00 P.M. and 9:00 P.M., Monday through Thursday.

NEWARK COLLEGE OF ENGINEERING

UNDERGRADUATE DAY AND EVENING COURSES

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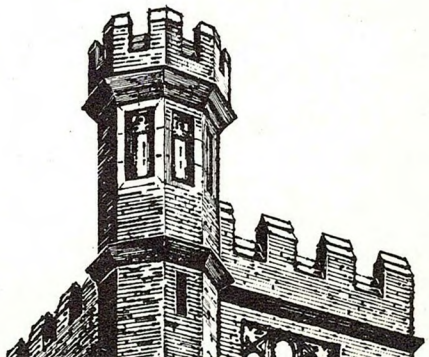


The BULLETIN
PUBLISHED BY
THE BOARD OF TRUSTEES
OF SCHOOLS FOR INDUSTRIAL EDUCATION
OF NEWARK, N. J.

GENERAL INFORMATION

Newark College of Engineering, instituted in 1919, is a development of the Newark Technical School founded in 1881 by the Board of Trade of Newark and civic-minded citizens. The College is a public institution supported by both the City of Newark and the State of New Jersey and is governed by a Board of Trustees appointed by the Governor of the State of New Jersey. The Governor and the Mayor of Newark are ex officio members.

The College is organized under four divisions: the Day Undergraduate Division, the Evening Undergraduate Division, the Graduate Division and the Special Courses Division. The first two offer courses leading to the degree of Bachelor of Science. The Graduate Division offers the degree of Master of Science in all fields of major study, and the degree of Doctor of Engineering Science in Chemical and Electrical Engineering only. The Special Courses Division offers a wide list of courses for the upgrading of industrial personnel, and cooperates with Newark Technical School in presenting certain of these courses tuition-free to residents of the City of Newark. The College also maintains a Counseling Center which cooperates with industry, with individuals requesting counseling, and with high school guidance departments.

The College is accredited by the Middle States Association of Colleges and Secondary Schools and the Engineers' Council for Professional Development.

The College's administrative offices are located at 323 High Street in the City of Newark, convenient to all transportation lines. The College has a predominantly commuting population.

Current enrollment figures show 3118 students enrolled in the undergraduate day and evening divisions of the College, and 706 students taking work leading to the master of science degree. The Special Courses Division numbers 1469 students.

CONTENTS

COLLEGE CALENDAR: 1962-1963

The College reserves the right to make changes in this calendar.

1962

Registration — Fall Semester.....In accordance with instructions to be issued.

Fall Semester Begins.....September 19

Midpoint of Semester.....November 13

Thanksgiving Holidays.....November 21 to 24 inclusive

Christmas Holidays .....December 20 to January 2 inclusive

1963

Fall Semester Ends.....January 26

Registration — Spring Semester.....In accordance with instructions to be issued.

Spring Semester Begins.....February 11

Washington's Birthday Holiday.....February 22

Midpoint of Semester, except for February Freshmen.....April 5

Spring Vacation.....April 8 to 13 inclusive

Good Friday.....April 12

Memorial Day Holiday.....May 30

Spring Semester Ends for February Freshmen.....June 1

Last Day of Attendance for Seniors.....June 3

Commencement (tentative) .....June 6

Registration for Summer Semester
—February Freshmen.....June 7

Spring Semester Ends for September
Freshmen, Sophomores
and Juniors.....June 8

Summer Semester Begins for
February Freshmen.....June 10

*Registration — Evening Under-
graduate Summer Session.....June 14

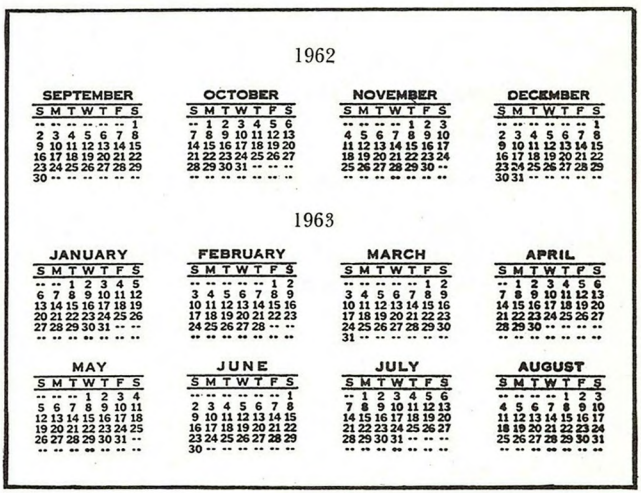
Evening Undergraduate Summer
Session Begins.....June 18

Independence Day Holiday.....July 4

Summer Semester Ends
for February Evening Freshmen....August 22
for February Day Freshmen.....August 23

Evening Undergraduate Summer
Session Ends.....August 29

*The Evening Undergraduate Summer Session Announcement will be available at the Office of the Registrar on or about April 1.



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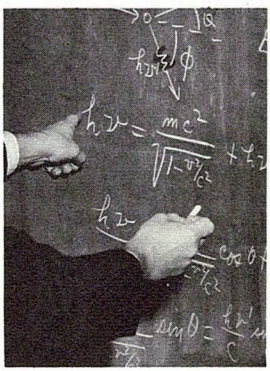

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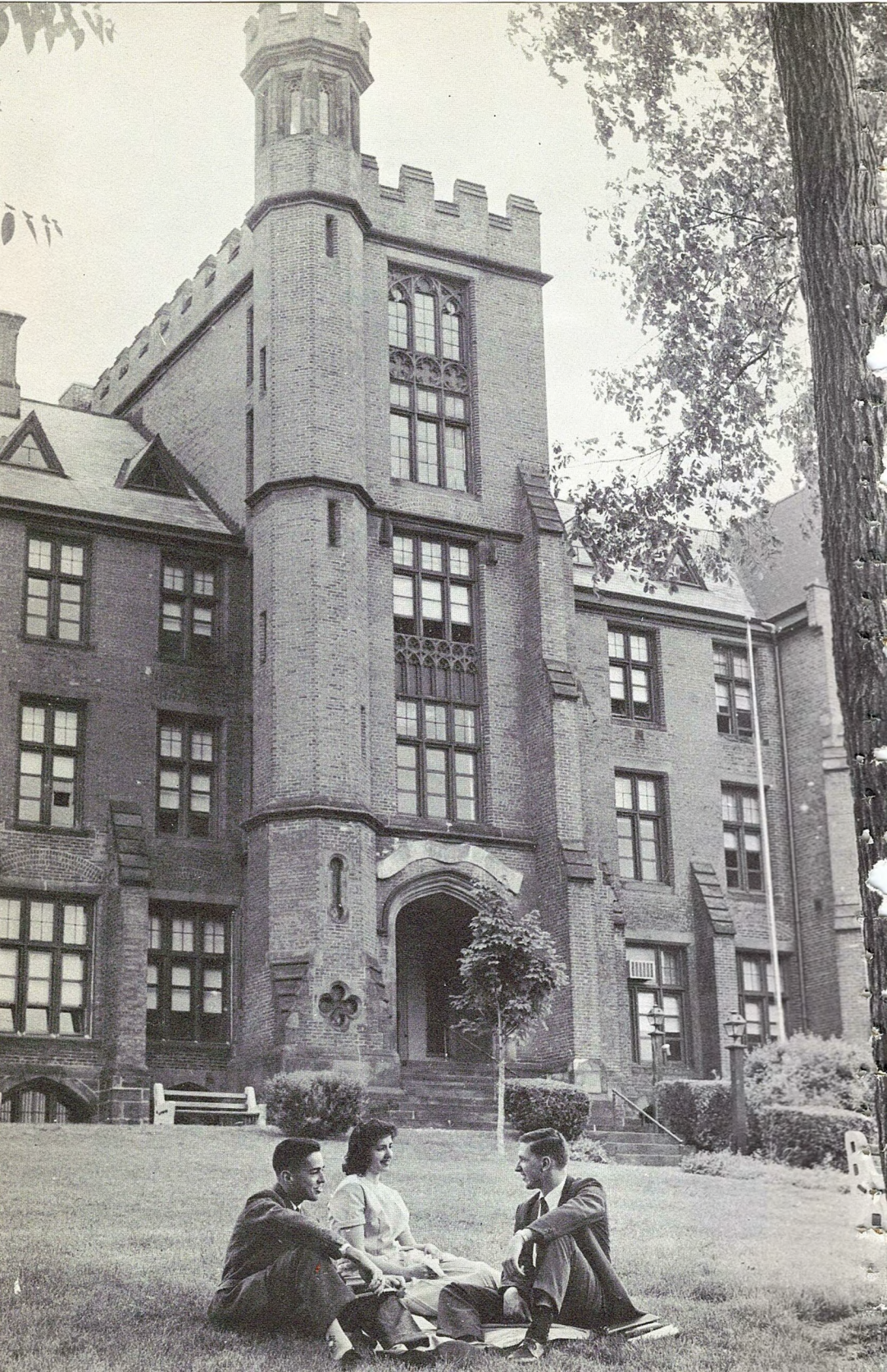


HISTORY OF NEWARK COLLEGE OF ENGINEERING

The years between 1878 and 1885 are historic ones for the Newark Technical School and Newark College of Engineering. During that period prominent citizens and public officials first discussed the establishment of a technical school and actually got it under way. Before the Civil War the Newark Mechanics' Institute had been in operation. As its name indicates, apprentices and mechanics from local concerns were given some theoretical and practical training in their own trades to help them in their everyday work, but the drain on manpower during the Civil War presumably forced the Institute to close.

By 1878 Newark had grown tremendously as a manufacturing center, and a definite need for a technical school had again risen. The Governor and other influential leaders and organizations, including the Newark Board of Trade, by committee work and investigation, looked into the matter. A bill sponsored by the Board of Trade passed the state legislature in 1881 and $5,000 per year was appropriated for the upkeep of a technical school in Newark, provided citizens would raise a similar amount by subscription or contributions. The citizens raised their share, and a building was secured at 21 West Park Street in Newark. Professor Charles A. Colton of Rose Polytechnic Institute, Terre Haute, Indiana, was named Director.

The first class, numbering 100 students, started courses of evening study which included work in drawing, mathematics, physics, and chemistry. Director Colton, a mining engineer, brought a wide educational vision to the newly formed institution, and constantly made changes and improvements in the courses to meet changing needs.

At this time all the students studied during the evening and were employees of local industries. Director Colton felt by 1912 that the time had come when work of college grade should be given during the daytime, and he took steps to initiate such work. The First World War delayed this procedure somewhat, and it was not until September, 1919 that the first day class matriculated for a degree program. This period also saw hundreds of disabled war veterans assigned to the School by the Veterans' Bureau for study and rehabilitation.

Allan R. Cullimore was appointed Director of the School and head of the College in 1920. Coming from the University of Delaware, the new Director brought with him many forthright ideas, and soon both Evening School and College were flourishing in numbers and in prestige.

There was evidence that a great many men engaged in industry during the daytime needed to further their education beyond the night technical school level, and in the middle

twenties the college instituted an evening program leading to the bachelor of science degree. The evening division of the college has continued to grow and is now an important factor in the industrial and professional advancement of many hundreds of young men and women in the New Jersey industrial areas. Side by side with the growth of the evening school has been the advancement of the Graduate Division of the College which offers both master of science and doctoral degrees.

The Second World War brought a number of changes in the operation of the college. An Engineering, Science and Management War Training program was instituted, and Newark College of Engineering became a leader among the professional colleges training men and women for essential positions in war industries. Approximately 10,000 residents of the area received training in critical war production work. So successful was the up-grading of this type of personnel that the college has continued a Special Courses Division which implements the experience received on the job by the individual worker. A wide field of subjects is offered by this division which grew from this one part of the College's contribution to the war effort.

Several of the teaching personnel of the college were called into the Armed Forces in their specialized capacities, while others served on scientific and industrial projects of secret nature. The student personnel through enlistments or selective service was cut sharply and this enabled the College to instruct assigned army personnel under the Army Specialized Training Program.

At the conclusion of the war, as in the case of World War I, the College played a leading part in the rehabilitation and retraining of men under the Veterans' Administration, and a Testing and Guidance Center was established, with highly trained personnel, which has now, as the NCE Counseling Center, become an integral part of the college.

Dr. Cullimore retired from the presidency in 1949, and was succeeded by Dr. Robert W. Van Houten, a graduate of the College, who continues as president today.

In reviewing the growth of Newark College of Engineering since its development from the original Newark Technical School, beginning in 1920, it is important to stress the major contributions made by Dr. Cullimore to the field of engineering education.

During the twenty-nine years of his presidency, he established the enviable record in opening new frontiers of engineering education that led, in 1951, to his receiving the Lamme Award of the American Society for Engineering Education, the highest national honor which that Society bestows.

He established the study of the humanities on an equal level with technical studies. He made major contributions to the field of guidance, particularly as they apply to engineering students, and was responsible for the excellent Counseling Center which exists at the College today. He based the ruling philosophy of the College on two principles: that engineering is a discipline, requiring the highest ideals of work and ethics, and that the engineer has a duty as a citizen perhaps even greater than do the members of other professions, because of his specialized training in both logical and creative thinking.

The latter emphasis finds expression today in the College's four-year program of orientation to industry and society, particularly, but not exclusively, within the curricula of the departments of English, Professional Development and Industrial Relations, and Industrial and Management Engineering.

In partial recognition of this record, the trustees of the College, shortly after his death in 1956, decided to name NCE's new 41-room classroom building Cullimore Hall. The dedicatory plaque at the building's entrance reads, "In honor of Allan Reginald Cullimore, President, 1920-1949. Engineer, soldier, teacher, administrator, citizen, constructive statesman in engineering education, consecrated to the cause of young engineers. He gave of himself without stint that this college might grow great and strong in the service of the community and the engineering profession."

FACILITIES

BUILDINGS

From its original modest building on West Park Street, Newark College of Engineering has now expanded to six edifices along High Street, Summit Street, Summit Place and Bleeker Street in the heart of Newark. The first of the buildings to be erected at the present site was a combination administration and classroom building, designated Weston Hall in honor of Dr. Edward Weston, one of the founders of the institution, which was torn down in 1958 to be replaced by a new Weston Hall, completed in 1960. The College soon outgrew the facilities of the original building and there was built on adjoining property a four story laboratory building now known as Colton Hall, which contained equipment used in the courses, and also provided classroom, lecture and drafting room space. The continued expansion of the College necessitated the construction of Campbell Hall in 1926 and a five story Campbell Hall annex in 1930.

Still greater work areas were found necessary immediately following the Second World War, and plans were formulated and construction started for a five story extension to Colton Hall which would house departmental offices as well as more modern scientific and technological equipment. The expansion of administrative and student facilities also occasioned the purchase of the former Newark Orphan Asylum property at the corner of Bleeker Street. This century old building was rehabilitated and named Eberhardt Hall in honor of Frederick L. Eberhardt, former chairman of the Board of Trustees of the College.

Additional facilities were completed in the Spring of 1958 with the opening of Cullimore Hall, a six story building at the rear of Eberhardt Hall, containing a new cafeteria, student commons, and 37 classrooms, as well as other offices and college services. With the completion of the new Weston Hall, a seven story building, 15 laboratory areas, an enlarged Library, and a 400-seat lecture hall were added to the College plant.

The College has also acquired a building situated at 240-250 High Street through the philanthropy of Mr. Martin F. Tiernan, which after extensive remodeling has been occupied by the departments of Chemical and Civil Engineering for laboratories, offices, and classrooms. This is the Martin F. Tiernan Laboratory Building.

As one of New Jersey's eight State-supported higher educational institutions, Newark College of Engineering has received $7,000,000 from a recent bond issue which will enable the College further to expand its facilities between now and 1965 in order to take care of the greatly increased need for opportunities in engineering education created by the State's expanding college-age population.

The present buildings house well-allocated classroom, lecture room, laboratory, and drawing room space, with modern equipment in the engineering and technological departments. There is also a well equipped bookstore for students' books and supplies. The Dining Hall is open from 10:00 A.M. until 7:00 P.M. Two gymnasiums, which are used for intramural sports as well as varsity games, and a well rounded physical education program, are an integral part of the College's educational plan. Administrative offices of the College and of the individual departments are located close to their major work areas.

COUNSELING CENTER

The Dean of Students and the advisers have at hand the facilities of the Counseling Center of the College. The Center is a complete unit organized for vocational and educational counseling, located in especially designed quarters in Eberhardt Hall. Its personnel includes trained and experienced counselors and a professional psychometrist for the administration of standard psychological and other diagnostic tests, with the necessary scoring and stenographic staff. It is arranged to give the privacy desirable for counseling and has facilities for individual or group testing. Modern apparatus is available for detection of possible vision deficiencies.

The organization has had extended experience in the counseling of more than 14,000 veterans referred for its service by the Veterans' Administration, and over 7,000 individuals from the College, industry, and other sources. It aims to assist the student, by conference and testing, in analyzing his strengths and weaknesses, so that in conjunction with the adviser, the path to improvement may be discovered. Similar assistance is offered to men who may be leaving college, to avoid, if possible, a severance without a plan for the immediate future.

The Center is a designated station for administration of the Miller Analogies Test and the Minnesota Engineering Analogies Test. The Center is approved by the American Board of Professional Standards in Vocational Counseling and by the American Board for Psychological Services as a counseling center.

Testing and counseling are available to the public and to business and industry at fees which express the approximate cost of the service. Aptitude testing for high school groups in cooperation with their guidance staffs is an established feature of its activities.

The Center is open from 9:00 a.m. to 5:00 p.m. Monday through Friday, 5:45 p.m. to 7:45 p.m. one evening each week, and by special appointment on occasional Saturday dates. While students may request conferences at any time the Center is open, all other persons should telephone or write for an appointment. (See inside front cover.)

LIBRARY

The College Library occupies the third floor of Weston Hall. The reading room has seating accommodations for two hundred students and provides an environment suitable for serious study. Display cases exhibiting the late Dr. Edward Weston's early electric equipment and inventions occupy a small portion of the room.

The book collection consists of over 35,500 bound volumes and a considerable number of unbound periodicals, government bulletins, and miscellaneous booklets. Over five hundred periodical titles are received regularly on subscription. Books and magazines are selected with special emphasis on the fields of study offered by the College; in addition, books and magazines are constantly being acquired in literary and cultural subjects. Students are encouraged to expand their scope of knowledge through extensive reading in all areas.

To augment the resources of the College Library, students have access to other excellent libraries: The Newark Public Library grants book-borrowing privileges to students attending the College; the Public Service Corporation Library is available for limited use; the libraries of the Engineering Societies and the Chemists' Club, and the New York Public Library all permit students to use their facilities.

Country-wide interlibrary loan relationships, together with the availability of microfilm and copying services further extend the volume of printed information for research and study.

Memorial gifts from the personal libraries of men formerly associated with the College have been received. Foremost among these gifts are books and periodicals from the collections of former Trustee Dr. Edward Weston and State Senator Roy V. Wright. The Society of Plastics Engineers, Newark Section, has established a library committee and a fund for the purpose of acquiring books and periodicals. This material has added greatly to the library's plastics engineering collection.

The Library is open for service on all days when classes are in session, between the hours 8:30 a.m. and 9:00 p.m. and on Saturday mornings from 9:00 a.m. to 12:00 noon. Holiday and recess period hours are posted on the bulletin board located at the Library entrance.

OBJECTIVES

The philosophy of Newark College of Engineering is simple and involves training along scientific, technological, and humanistic lines those young men and women who have interest and ability irrespective of financial situation. The College is in effect a community project. As a result, there has been developed here an institution which enjoys a well earned reputation for academic excellence. It has conceived that its function lies in the development of sound, well trained engineers and citizens at the lowest cost consistent with high technological quality.

The factors involving this democratic education available to young men and women of capacity are the simple American concepts of:

1. Character
2. Initiative
3. Hard work
4. Understanding human relations
5. A knowledge of fundamentals of applied science

The vision and foresight of its founders such as Edward Weston, George Phillips, ex-Governor Marcus Ward, ex-Senator William D. Kirk, Thomas B. Peddie and others have been amply evidenced in the service that the College has performed to supply the needs of ever-expanding industry for engineering personnel.

The College maintains close contact with industry in the area and passes on to each student the important and fundamental objectives of the industries and their attitudes toward modern engineering techniques. This is accomplished by lecturers from industry, by the Honors Option program and placement service which arranges to have qualified students placed in plants during their summer vacations for practical experience, and by the use of professors and instructors who in addition to their academic background have had extensive professional experience.

The College feels that the development of a sensitivity in the students on the importance of dress and good grooming is a part of the social, technical and professional disciplines which constitute engineering education. The College therefore requires that all male students shall wear the customary items of dress, including shirt, tie and coat in all places of assembly such as corridors, dining halls, and formal classes and that women students shall also be suitably attired. Certain concessions can be made during continuous warm weather and in laboratories, drafting rooms, and on field trips.

The College requires that every student shall conduct himself with decorum and shall constantly adhere to ethical and professional behavior. No student may use or give any unauthorized aid in any text, report, or assigned paper. All work offered as the student's own must be the work of the individual student. Instances of alleged unethical or unprofessional conduct will be brought to the attention of the appropriate College authorities for investigation and action.

PROGRAMS

DAY AND EVENING UNDERGRADUATE DIVISIONS

The College offers four-year undergraduate curriculums in Chemical, Civil, Electrical, Industrial and Mechanical Engineering.

Much of the subject matter in the undergraduate programs of study is common to all of them (although course titles may be different). These common courses represent the unity in all branches of engineering of basic sciences, mathematics, humanities, and engineering science.

The work of the first two years of the Day Division has been designated as the Junior Division. The work of the third and fourth years, being predominantly in the departments of Chemical, Civil, Electrical, Industrial and Mechanical Engineering, is known as the Senior Division.

The evening program of Newark College of Engineering is also divided into two sections. The first four years of work come under the heading of the Junior Division (Evening). This division has the same entrance standards and requirements as the day program, and the work taken during the evening hours parallels the subjects studied in the first two years of the undergraduate day division. The program of the Senior Division is five years in length if taken on a full evening schedule, and completion of these courses under the same standards as in the day third and fourth year programs will lead to the bachelor of science degree.

Courses for which less than fifteen students are enrolled may not be given. Students may not register for part of a subject.

For information concerning programs consult or write the Dean of Admissions.

GRADUATE DIVISION

Newark College of Engineering offers courses in the Graduate Division leading to the degree of Master of Science in the fields of Chemical, Civil, Electrical, Management, and Mechanical Engineering, and the degree of Master of Science without designation. Courses and research leading to the degree of Doctor of Engineering Science are also offered in the fields of Chemical and Electrical Engineering.

Admission to a course carrying graduate credit is generally restricted to graduates of accredited institutions in which satisfactory records were made in courses which provide a suitable preparation for a program of graduate study in engineering.

To be admitted to the graduate division of Newark College of Engineering as a Graduate Student, an applicant must have received a Bachelor's Degree, or an equivalent degree in engineering, science, or closely allied field, from an accredited college or university, and his academic record and credentials must be such as to indicate that he has the ability to pursue satisfactorily an approved program of graduate study. Application should be made to the Dean of Admissions.

Specially qualified seniors at Newark College of Engineering may take courses in the Graduate Division before graduation under certain specified conditions. Information as to these conditions may be obtained from the Chairman, Graduate Division.

Through the College and its Research Foundation, fellowships are available to graduate students to enable them to pursue a combined program of research, teaching and study leading to the master's degree. It normally takes two years to earn the degree under the fellowship program, and the fellowships are renewable for the second year. Inquiries and applications should be directed to the Vice-President.

All inquiries for information or for catalogues on the graduate program should be addressed to the Dean of Admissions.

NEWARK COLLEGE OF ENGINEERING RESEARCH FOUNDATION

The Newark College of Engineering Research Foundation, a privately incorporated and financed organization, serves as a coordinating agency for research activities at the College. One of the Foundation's major objectives is to offer the opportunity for professional development to graduate students and members of the teaching staff by providing for or obtaining support for research activities. The staff of the Foundation assists with the preparation of research proposals, solicitation of financial support, and administrative details involved in research programs.

COMPUTING CENTER

The Computing Center is an inter-departmental laboratory for the use of students and staff of all divisions of the College. The equipment consists of a modern high-speed digital computer and peripheral card-handling devices. The computer is capable of obtaining numerical solutions to a wide range of engineering and scientific problems as well as the processing of data for general business operations.

Instructions in computer programming and operation are given at various times during the school year as an integral part of the college curriculum and also through a number of special courses. Those who have taken these courses may, through their

instructors, reserve time on the computer for their problems. The staff of the Center is available for consultation in problems of programming and operation.

SPECIAL COURSES DIVISION

This Division offers terminal programs, individual courses, conferences and seminars in technical subject matter for men and women in industry who wish to further their scientific, technical, and mathematical training, but are not concerned with credits toward a degree. The Division operates on a quarter term basis with its major offerings in the fall, winter, and spring terms. Approximately 150 courses are offered under the supervision of the various departments of the College, and these are conducted during the evening hours or on Saturdays. They generally run 12 weeks, and a modest tuition charge is set on each course. Certain courses are tuition-free to residents of Newark, New Jersey. A list of these courses is published in brochure form and may be obtained from the Director of Special Courses. Twelve certificate programs of two or three years duration in certain specific fields are available.

CRITERIA FOR GRADUATION

DEGREES

Newark College of Engineering reports to and receives the right to grant degrees from the New Jersey State Board of Education.

Candidates for graduation who satisfactorily complete a regular undergraduate course of study and the examinations required receive the degree of Bachelor of Science (B.S.) in the course pursued.

While passing marks are required as a minimum in all subjects undertaken, barely passing marks alone do not insure graduation.

To be eligible for graduation, a student must attain a grade point average of 2.00 in all the courses listed in the Bulletin as being required in the third and fourth years of the professional department in which he desires to earn a Bachelor of Science degree.

The Bulletin of the Graduate Division states the requirements for the degrees of Master of Science (M.S.) and Doctor of Engineering Science (Engr. Sc. D.).

Each degree is certified by a diploma bearing the seal and the signatures of officers of this institution.

Each prospective candidate for any degree must file an Application for Candidacy prior to the opening of the spring semester of the year in which the candidate expects to graduate.

Candidates for any degree granted by the College shall appear in person upon the appointed commencement day to receive the degree, unless excused by the faculty.

GRADES

Grades used in the College and their general significance are as listed below:

GRADE	SIGNIFICANCE
4	Outstanding or exceptional work
3	Above average work
2	Average work
1	Below average work, but not far enough below to require repetition
O	Failure, requiring repetition of the course

INC "Grade deferred"—given in *rare* instance for students who would normally complete work, but because of special circumstances *could* not. If this grade is not removed within the next regular semester, a grade of O will result.

R Resigned

W Withdrawn

ADMISSIONS

APPLICATION

Candidates for the Freshman Class must submit an application for admission and a certified secondary school record on forms provided by the Office of Admissions. Forms normally employed for that purpose by the secondary school submitting the record may also be used for the scholastic record. A $5.00 application fee must accompany the application.

SCHOLASTIC RECORD

The certified record must include the date of graduation; or if the record is submitted prior to graduation, a certificate of graduation must be submitted before final acceptance can be granted.

Failure on the part of the applicant or the secondary school to provide complete information may delay consideration of the application.

In lieu of a certificate of graduation from an approved secondary school, a candidate may offer a high school equivalency certificate as issued by the New Jersey State Board of Education.

REQUIREMENTS

Engineering requires more than mere technical ability. Graduates of engineering colleges are expected to be well versed not only in mathematics and science but also in English and social studies. The curriculums in accredited engineering colleges are designed with this goal in mind, and experience has proved that applicants for admission need an all-inclusive secondary school background.

That they may be adequately prepared for the course of study which they are to undertake, applicants must have attained sixteen units of secondary school work apportioned as follows:

SUBJECTS REQUIRED FOR ADMISSION

English	4 units
College preparatory mathematics, including algebra, geometry, and plane trigonometry	4 units
Physics	1 unit
Chemistry	1 unit

A minimum of 6 additional units will be required, as follows:

Foreign Language	2 to 5 units
Social Studies	1 to 5 units
Science (other than physics or chemistry)	1 to 3 units
Any other subject having a value of one full unit	1 unit

In selecting applicants for admission from among those who meet the entrance requirements listed above, preference will be given to those who submit two or more units in one foreign language.

In addition to evidence of proper secondary school preparation, *all candidates must submit official records of their scores on the Scholastic Aptitude Test.* Applications and information on fees and dates of examinations can be obtained from the College Entrance Examination Board, Box 592, Princeton, New Jersey.

Since increasing enrollments are causing existing facilities to be used to the utmost, legal residents of the State of New Jersey will be given preference in acceptance. A limited number of non-residents of New Jersey may be accepted for admission.

ADMISSION BY TRANSFER

Students who have pursued studies at accredited colleges or universities offering comparable programs and who have demonstrated by their previous records that they are capable of doing academic work of the high caliber which would enable them to earn a degree at Newark College of Engineering may be admitted with advanced standing. Credit may be given for completed courses that are equivalent to those in the curriculum for which the applicant is accepted, and in which he has earned final grades higher than the lowest passing grade.

Candidates who have previously attended another institution giving courses above the secondary school level must comply with all the regulations set forth for candidates for the first year class, including the scores earned on the Scholastic Aptitude Test of the College Entrance Examination Board and, in addition, submit official transcripts and statements of honorable dismissal from all institutions which they have previously attended. Applicants in this category must submit a transcript evaluation fee of five dollars with their applications. This fee covers a service which is necessary to evaluate transcripts for studies completed at other institutions. This fee is not returnable regardless of whether or not the applicant is admitted to the College.

SPECIAL STUDENTS

NON-MATRICULATED STUDENTS

Although the College usually recommends a program of studies leading to a degree, applicants who fulfill all the admission requirements may, with the approval of the Admissions Office, choose courses without following a degree program. Official transcripts of record for non-matriculated students will list subjects completed, grades earned, and the credits which will be granted if the student matriculates.

AUDITOR

Permission to enroll as an auditor may be granted by the Admissions Office to mature students who cannot meet the admission requirements but who can demonstrate that by virtue of their

professional experience they are qualified to take and profit from the courses for which they desire to register. Auditors receive no grade or academic credit but may receive a statement of their attendance in the course.

ENROLLMENT

Those who wish to be considered for enrollment as Special Students may receive instructions as to the procedure to be followed by writing to the Office of Admissions.

Special Students approved for enrollment will be permitted to register for courses in which there is still room available after all degree candidates have completed their registration.

PRE-COLLEGE GUIDANCE

Since students of Newark College of Engineering are in the main graduates of secondary schools located in the northeastern part of New Jersey, personal communication with those likely to be candidates for admission is readily maintained. Members of the Admissions Staff make scheduled visits to all the schools in the area and in addition make every effort to accept invitations to participate in guidance programs or to talk informally with groups of students. A class characteristics study of the most recently admitted class and a follow-up report of their graduates already enrolled are sent annually to all high schools in the area.

High school and junior high school students are encouraged to visit the Admissions Office for an interview or to be escorted on tours of the buildings. Members of Alpha Phi Omega, national college service fraternity, act as guides for these tours. Arrangements can be made for guided tours by telephoning the Admissions Office, MA 4-2424, Ext. 257.

The Counseling Center also participates in pre-college guidance. For details, refer to the section "Facilities."

INTERVIEWS

An interview may be required of any candidate to assist in determining his probable fitness to do engineering college work. The date and time of the interview will be arranged by the Dean of Admissions.

EXPENSES

TUITION AND FEES

DAY DIVISION

As a public institution receiving support from the State of New Jersey and the City of Newark, and having no general endowment funds, it is incumbent upon Newark College of Engineering to establish its tuition and fees at a level which will maintain the proper relationship between the responsibilities of the State, the City, and the direct beneficiary, the student.

To preserve the equities of all interested parties, it is necessary for the College to adjust its tuition charges from time to time as educational costs become affected by changing economic conditions.

	Residents of New Jersey
TUITION	$155.00 per semester
REGULAR FEES	
Registration	7.50 per semester
*General Fee	53.00 per semester
Total Tuition and Regular Fees	$215.50 per semester

*The General Fee includes the laboratory fee and charges for services other than instruction, such as library, publications, counseling, placement, student-life facilities and activities, etc., but does not cover the breakage or loss of College property.

As the College receives State aid, the New Jersey State Board of Education requires that the tuition charge for nonresidents of New Jersey be double that for residents of the State.

Tuition charges are somewhat higher for special programs of study differing from those shown in this catalog.

APPLICATION, MATRICULATION AND SPECIAL FEES

DAY DIVISION

Each candidate for admission to the College must pay an application fee of $5.00 at the time the application for admission is submitted. The fee is not returnable, regardless of whether or not the applicant is admitted to the College. This fee covers service which is necessary to evaluate applications for admission.

Any applicant for readmission to Newark College of Engineering must pay an application fee of $5.00 at the time the Application for Readmission form is submitted. (See section "Readmission," page 44.) This fee is not returnable, regardless of whether or not the student is readmitted to the College. This fee

covers service which is necessary to evaluate applications for readmission.

A fee of $5.00 will be charged for the evaluation of official college transcripts submitted in accordance with the instructions set forth on page 40 of this catalog under the heading "Admission by Transfer." This fee is *in addition* to the application fee of $5.00 which *all* applicants must pay and covers service which is necessary to evaluate transcripts of study completed at other institutions of higher education. It is not returnable, regardless of whether or not the applicant is admitted to the College.

Prospective students are charged a fee of $7.00 if they are required to take admission tests other than the required College Entrance Examination Board tests.

All students entering the College for the first time as candidates for a degree are charged a matriculation fee of $5.00.

Registration is required for each semester. An extra registration fee of $5.00 is required of those who register late.

A fee of $2.00 is charged for the physical examination.

Students registering for the professional work of any semester in the Chemical Engineering Department are charged a special laboratory fee of $10.00 a semester if residents of New Jersey, or $20.00 a semester if nonresidents.

A fee of $1.00 is charged for the removal of a grade of "INC."

For special examinations, taken at times other than those regularly scheduled, a fee of $5.00 is charged.

A graduation fee of $20.00 is required of all candidates for the Bachelor's degree; and a graduation fee of $25.00 for advanced degrees. The graduation fee includes cost of rental of academic dress.

Students are advised to defer expenditures for books until the official list of textbooks has been posted at the College Bookstore.

For the first semester of the freshman year, books cost approximately $75.00 with an additional $45.00 covering the cost of a slide rule, drawing instruments and general supplies for that semester. Books and supplies for the second semester of the freshman year will cost approximately $30.00.

The College is not responsible for loss of property by fire or theft in its buildings and grounds.

EVENING DIVISION

Information concerning expenses for the Evening Division will be found on page 72*ff*.

PROCEDURES

REGISTRATION

Prospective students will be informed of registration procedures by the Registrar, after the latter has received certification of acceptance from the Dean of Admissions.

Students entering the College for the first time are required to submit before registration a *completed physical examination form* which will be furnished by the Registrar. The form must be prepared by a physician within a thirty-day period preceding registration for the first semester. Each examination will be reviewed by the College physician.

Currently enrolled students will be informed of registration procedures (during July for the Fall Semester and during January for the Spring Semester) by the Registrar.

Former students (not currently enrolled), after being readmitted by the Dean of Students, will be informed of registration procedures by the Registrar.

Failure to complete registration by the close of the registration period will make the student subject to payment of a late fee. (See page 43.)

CHANGE OF PROGRAM

A student who adds a course, or courses, to his program will be charged the full tuition and fee for the course, or courses, added, regardless of the date on which the addition takes place. If, *within the first two weeks of the semester,* a student drops a course, or courses, he must fill out a set of authorized schedule change forms and see to it that they are properly authorized. His charges will then be recalculated, and if he is entitled to a refund or financial credit, such refund or credit will be made.

READMISSION

Any applicant for readmission to Newark College of Engineering must submit an Application for Readmission to the Dean of Students. A statement of acceptance is necessary from this office before registration will be permitted. (See Application, Matriculation, and Special Fees.)

Applicants for readmission who have been dismissed for academic reasons are not eligible to apply until one semester has elapsed since dismissal. The results of a recent series of aptitude tests (which can be arranged at no cost to the applicant) must be on file at the Counseling Center. This is mandatory to both Day and Evening undergraduate students.

TRANSCRIPT OF GRADES

A transcript of grades is issued to the student by the Registrar at the end of each semester. Students who wish to have a Transcript of Record issued in their behalf must submit a request in writing to the Recorder. Grades are discussed fully in the section "Criteria for Graduation."

WITHDRAWALS AND REFUNDS

WITHDRAWAL PROCEDURE

Registration for a course places a definite responsibility upon the student to carry the course through to conclusion and to receive the grade he has earned. However, it is recognized that in exceptional cases it may be impossible for the student to continue in attendance. If a student wishes to withdraw from a course, or courses, or from college, he should notify the Dean of Students in writing, using a form to be obtained from his office or from the Registrar.

A student may resign from any subject during the first eight weeks of the term, or equivalent, and receive an "R" in any subject from which he resigns. After the first eight weeks, or equivalent, when an instructor has reason to believe that a student is no longer in attendance and if the student's class standing at the time of last attendance is 2.00 or better, the instructor will report a grade of "W": if below a 2.00, the instructor will report a grade of "O", except that if the withdrawal comes within the last four weeks, or equivalent, of the semester, the student will be given the grade earned as of the end of the semester.

Should a student be forced to withdraw due to causes beyond his control, the matter should be promptly referred to the Dean of Students for consideration.

The receipt of the notice by the Dean of Students will be considered as the date of the withdrawal.

Students withdrawing from a course, or courses, or from college, should adhere strictly to the general regulations as stated above.

WITHDRAWALS FROM COLLEGE—SELECTIVE SERVICE

Any student who is forced to withdraw from college because of induction by selective service is entitled to a pro rata refund as of the date of his induction. If his induction occurs after the middle of a semester, certain options are available to the student, and he is advised to confer with the Dean of Students concerning particulars. In order to obtain a refund in a case of induction, a student should submit a copy of his notice of induction with the notice of withdrawal.

WITHDRAWALS FROM COLLEGE—GENERAL

A student who is forced to withdraw from college for reasons other than induction by selective service may, if the reasons are beyond his control, apply to the Business Manager for a refund. The application should state fully the reasons for the withdrawal and should include necessary verification such as, in the case of illness, a doctor's certificate. Refunds are based on the date on which the application is received. If the Committee on Refunds, to which the Business Manager will refer the application, approves it, a refund will be recommended to the Board of Trustees for consideration.

Matriculation fees, registration fees, and all other fees except laboratory and service fees, are under no condition returnable.

REFUNDS

If a refund is approved by the Board of Trustees, the percentage of tuition and general fee refunded will be based on the following table:

Date of Receipt of Application	*Percentage Refund*
During the first week of the term	80%
During the second week of the term	80%
During the third week of the term	60%
During the fourth week of the term	40%
During the fifth week of the term	20%
During the remainder of the term	0%

The above schedule applies only to the regular fall and spring semesters but will also be used as a guide to compute comparable percentage refunds for short terms, such as during a summer session.

SCHOLARSHIPS, AWARDS AND STUDENT AID

SCHOLARSHIPS AND AWARDS

Through the years the College has received applications from students who have shown a definite need for financial assistance in meeting their college expenses. For such needy young men who also possess the ability to carry on engineering study satisfactorily, certain scholarships are available.

Most of the following scholarships are available to full time students registered in the Day Division. It is expected that since evening students will be engaged during the day in income-producing occupations, there will be few cases where scholarship assistance is actually required.

Alcoa Foundation Scholarships

Four scholarships of $250 a year have been established by the Aluminum Company of America for junior and senior students who stand high scholastically in their class and show a potential of becoming successful engineers in their particular field.

American Institute of Chemical Engineers Scholarship

Each year a scholarship is awarded to a senior chemical engineering student. The award will be announced upon completion of the student's junior year. The recipient must be of outstanding scholarship, good character, and in need of financial assistance.

American Society of Tool Engineers Scholarship

A scholarship is awarded by Chapter 14, A.S.T.E. every four years to a freshman student of sound scholastic ability who has a need for financial assistance. The payment of $150 will be made each year for four years, provided the recipient maintains his scholastic average. The student must elect those courses in the Mechanical Engineering curriculum which are specific to the Tool Engineering field. In addition to the monetary award, there will be provided a free student membership in A.S.T.E. for the four year period.

Bendix Corporation Scholarship

The Bendix Corporation Scholarship is awarded annually to a third-year student in the Electrical Engineering Department. The award is the amount of tuition and fees for the senior year and is made on the basis of academic achievement.

Board of Trustees Scholarships

A limited number of scholarships in the amount of $100 each are made available each fall and spring semester by the College Board of Trustees.

Blonder-Tongue Foundation Award

A scholarship of $250 has been established for award to a senior in electrical engineering in recognition of high scholastic attainment and the demonstration of outstanding potential in the fields of radio and television (electronics).

The recipient of the award is to be selected during the latter half of the junior year by the faculty of the electrical engineering department, who may consider the need of the student in making the determination. The proceeds of the award are to be applied against tuition and fees for the senior year.

Boy Scout Scholarships

The Board of Trustees has granted two scholarships, the recipients of which are to be chosen from scouts in Newark, Belleville and Irvington by the Robert Treat Council of Boy Scouts of America.

Arthur Silverman Boy Scout Scholarship

Commencing with the year 1954-1955 a scholarship was established for a first year student of the college who is a member of Robert Treat Council of the Boy Scouts of America. This scholarship of $350 to be applied to tuition and fees, has been made possible by Arthur Silverman NCE '39. The recipient for the first year will automatically become a candidate for this award in his subsequent years at the college. A committee for Robert Treat Council will recommend candidates for this award and a committee at the college will make the final selection of the recipient.

Business and Professional Women's Club of Newark Scholarship

The Business and Professional Women's Club of Newark awards a two-year scholarship to an outstanding woman student who has completed her first year at NCE.

Eva Cohn Scholarships

By the will of Eva Cohn a few scholarships are available for worthy and capable students in financial need.

Colton Memorial Scholarship

A Colton Memorial Scholarship, established in memory of Dr. Charles A. Colton, first director of the Newark Technical School, is awarded each year by the Scholarship Fund Trustees of the Newark College of Engineering Alumni Association, in the amount of $400, to a member of the freshman class. Applicants will be considered on the basis of high school record, College Board scores, and need.

Allan R. Cullimore Memorial Scholarship

A scholarship in memory of the late Dr. Allan R. Cullimore, former president of the College, is awarded annually by the Scholarship Fund Trustees of the Newark College of Engineering Alumni Association. This scholarship, in the amount of $400, will be awarded in the Spring semester to the Junior Class member having the highest grade-point average in the Class during the first five semesters at NCE.

John Christopher Denman Scholarship Fund

This fund has been established to provide a scholarship for an evening school student who wishes to take professional work at NCE.

Damon G. Douglas Company Scholarships

Each year the Damon G. Douglas Company of Newark makes available one $310 freshman scholarship. Every four years the Company provides a $310 scholarship renewable for a maximum of four years provided the recipient continues to maintain a high level of academic excellence. Scholarship applications for these awards must be filed with the College by March 1 preceding the September admission date.

Essex County Engineering Society Scholarships

The Society will provide one or more scholarships in the amount of $200.00 annually, divided equally between two successive semesters. The student must have maintained a satisfactory academic record through one or more years at this institution and must need financial assistance.

Other things being equal, the son or daughter of a professional engineer will be given preference. The student must be willing to take such tests as may be requested by the college committee appointed to select the recipient. The recipient will automatically become the nominee for the same award for the next year unless he no longer requires financial assistance, in which case the award will be made to another qualified student. The final selection of each candidate will be made by a committee of the faculty of the college.

General Motors Corporation Scholarships

One General Motors Corporation Scholarship to Newark College of Engineering is awarded each year to an entering freshman. The amount of the award is flexible, depending upon the need of the individual for financial assistance, and ranges from an honorary award of $200 up to $2000 per year. The scholarship is renewable for four years providing the recipient maintains a high academic record.

Herbert P. Gleason Scholarships

By the will of Herbert P. Gleason several scholarships are available from time to time for young men of character and ability.

The Irvington Optimist Club Scholarship

The Optimist Club of Irvington offers annually a $350 scholarship at Newark College of Engineering to a senior boy in one of the high schools in Irvington, New Jersey.

A committee of school personnel determines the winner and an alternate on the basis of need, scholarship, College Board scores, marks, especially in English, mathematics, and science, personality ratings, and extra curricular activities. The winner must already have been accepted at Newark College of Engineering and determination made that he will definitely attend Newark College of Engineering.

Junior Achievement Scholarship

The college Board of Trustees annually awards a scholarship of $200.00 to be used to pay part of the first year's tuition expenses for a Junior Achiever. Candidates are selected by the National Scholarship Committee of Junior Achievement.

New Jersey Society of Professional Engineers Scholarship Awards

Each year the New Jersey Society of Professional Engineers awards one or more scholarships to regular daytime students who are in the last year of candidacy for the Bachelor's Degree in a curriculum accredited by the Engineers Council for Professional Development. Students of Newark College of Engineering and three other engineering colleges in New Jersey are eligible for consideration. Each scholarship is in the amount of $500.00 with final selection determined by the scholarship committee of the college.

John A. Schieck Memorial Fund

By the will of Caroline D. Schieck, a scholarship fund has been established in the name of her brother, John A. Schieck. From time to time several scholarships will be available from this fund.

William L. Schoonover Scholarships

By the will of William L. Schoonover several scholarships are available from time to time for worthy and capable students in financial need.

Union Carbide Engineering Scholarship

One scholarship is awarded each year to an entering freshman who intends to specialize in either Chemical or Mechanical Engineering. The scholarship is renewable each year, provided the student maintains a high grade point average.

United States Rubber Company Foundation Scholarships

Funds for a limited number of annual scholarships have been granted to Newark College of Engineering to assist junior and senior year students of proven ability who lack personal financial resources.

The Paul G. Kayser and George Snell Award

The Paul G. Kayser and George Snell Award in Personnel Relations is made annually to the senior who is judged to have the greatest promise in his understanding of personnel and labor-management problems.

Materials Handling Prize

The Silent Hoist and Crane Company Materials Handling Award is presented annually for the best papers on the subject of materials handling. The award is made from proceeds from a trust established by the Wunsch Foundation, Inc., of Brooklyn.

STUDENT AID

The College participates in the National Defense Student Loan Program of the Federal Government whereby outstanding full-time students at the College may secure loans to meet the cost of attending the College and make repayment after graduation or leaving the College.

The College also administers several loan funds from which loans may be made to a limited number of students. These funds include the Continental Electric Company Student Loan Fund, the Sanford L. Kahn Loan Fund, Morris County Association of Professional Engineers and Land Surveyors Loan Fund, Newark College of Engineering Scholarship Fund, the Abraham Rothschild Loan Fund, and the David Steinman Foundation Loan Fund.

Some part time positions in the college during hours when classes are not in session, or in the evening or during holiday periods, are also available to students who can qualify for such positions. Students interested in obtaining such part-time positions should consult the Dean of Students.

Applications for any form of student aid should be made to the Dean of Students.

INFORMATION FOR VETERANS

All of the programs of the College are available under Public Law 550.

A newly-accepted student who is eligible for, and wishes to take his college program under V.A. benefits should, without delay, apply to the Veterans Administration Regional Office, Newark, N. J., for a Certificate for Education and Training. Once certified by the Veterans Administration, it is the responsibility of each veteran to see the Veterans' Coordinator of the College at each registration.

Veterans' Administration regulations state that any course which has been completed satisfactorily may be repeated only at the veteran's own expense.

Veterans eligible for training under Public Law 550 should be prepared to meet their financial obligations to the College at each registration.

WAR ORPHANS ACT

Public Law 634 provides education and training at higher institutions to all children of servicemen who died as a result of a disability or disease incurred in line of duty during World War I, II, or the Korean War. Any applicant or student between the ages of 18 and 23 who believes he is eligible under this bill should contact the Veterans Administration Regional Office, Newark, New Jersey.

PLACEMENT

RELATIONS WITH INDUSTRY

The aims and purposes of the college program are directed toward properly preparing the student for his place in industry. Under the guidance and supervision of the professional departments he has been trained in the fundamentals of engineering principles. He has further received instruction in the human relations problems of industry in the courses of the Department of Professional Development and Industrial Relations. It is the function of the Department to culminate that training by helping place the individual student in the type of work for which he has demonstrated interest and ability.

HONORS OPTION

Those who have completed the Sophomore or Junior year in the Day Division and who have achieved a scholastic rank in the upper part of the class are eligible for the Honors Option Program. Participants are given first consideration for placement in cooperative industrial work during the summer. For years, many companies in this area and in other sections of the country have given our students the opportunity to obtain pre-engineering work experience. This type of experience supplements theoretical classroom work, makes it more meaningful and provides a better understanding of industrial personnel problems. While students are at work, the Department of Professional Development and Industrial Relations maintains contact with employers regarding their progress.

This industrial experience can be of real value when it is shared with students in Personnel Relations and Labor Relations class discussions. Recognition is given when the student meets the requirements of maintaining a high academic standing, and satisfactory progress on the job, together with assistance in class discussions. Recognition also includes a special citation on the diploma at graduation which signifies that the student has satisfactorily completed all requirements of the Honors Option Program for a period of two years.

PLACEMENT

Modern industry, with its activity in research, design, development, production, and management, recognizes academic achievement as only one of its criteria for selection. The criteria for advancement, in addition to the academic, are initiative, industry, and leadership. It is for this reason that the Department coordinates its efforts in placement with the Counseling Center and the professional departments with the single aim of making the recruiting period as efficient as possible for both the students and company representatives.

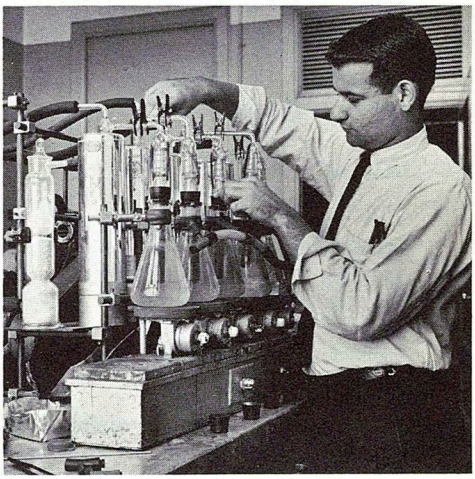
Each candidate for graduation is provided with a printed schedule of company recruiting dates, and arrangements may be made through the placement office for interviews with representatives of companies who regularly recruit at the college. An up-to-date Relations With Industry file of company information is available to make the students' preparation a thorough one.

Recognizing the importance of the placement interview, both to the student and the company representatives, the College has made available modern and comfortable interviewing facilities.

For use during his stay at the College, each company representative is supplied a folder on each student he will see which contains a transcript, grade point averages, and a personal summary which has been prepared by the student for this purpose. In the case of the Honors Option participants, there will also be included Summer Employment Work Evaluation Forms.

The department maintains a file of all job openings received for candidates for graduation as well as for alumni. The placement office is open all year during business hours and on designated evenings as a service to students and to industry.

During the undergraduate period, part-time openings are available for students as technical assistants in the various departments of the College and in industry. Since the best interest of the student requires unqualified attention to his course of study, the Department of Professional Development and Industrial Relations supervises such placements and feels that outside activity should be limited to the ability of the individual student.



STUDENT LIFE

Student life, through its guidance and extracurricular programs, plays an important role in preparing NCE students for their eventual careers in industry, education and government. Membership in the College's various clubs and athletic organizations, in professional and honor societies, and in student government councils provides excellent training for eventual participation in similar activities beyond college. The guidance resources of NCE provide additional aids for students in academic, vocational and personal decision-making.

GUIDANCE

The guidance services of the College are coordinated by the Office of the Dean of Students. Help with academic, vocational or social problems is available from the Counseling Center, the Dean of Students and the Assistant Dean of Students. The faculty advisers and the instructional staff give special assistance in the area of academic advisement. An additional guidance aid is an orientation course of the Department of Professional Development and Industrial Relations, aimed at solutions of the individual adjustment problems of the incoming freshman. Although the choice of specific student activities in which the individual will participate lies with the student himself, guidance in this area is available from the Assistant Dean of Students in the Student Activities Office.

STUDENT GOVERNMENT

A Student Council, acting with the Assistant Dean of Students as the adviser, constitutes the basic form of student government. This group is composed of officers who are elected by the student body and of representatives from various special-interest areas. The Council also coordinates the overall Student Activity Program. The Freshman, Sophomore, Junior and Senior classes are organized further to meet the needs of these student groups.

SOCIAL ACTIVITIES

Social gatherings range from dinner meetings and lectures conducted by student professional societies to class or fraternity-sponsored dances and outings. In all cases, the group sponsoring a social event is responsible for the conduct of those attending, including that of members and guests. Further, each student is expected always to conduct himself on the basis of high professional standards.

Seven social fraternities offer the student desiring this type of affiliation a choice of the fraternity in which he may wish to

participate. Representatives of these fraternities to the Interfraternity Council coordinate various unified programs of the group.

SPECIAL INTEREST ORGANIZATIONS

The development of individual interests is fostered by the opportunity for participation in a number of organizations. Those students wishing to develop spiritually may participate in the Christian Fellowship or in Newman Club activities. In addition, there are club activities in physical recreation, such as skiing, rod and gun, yachting and golf. The Audio, Bridge, Chess, Dance, Motor, Photo and Radio Clubs, and a number of others, offer additional opportunities for students with special interests.

COEDUCATIONAL ACTIVITIES

The coeds of the College participate actively in student government, clubs and social organizations, and in professional and honor societies. Sigma Chi Epsilon, a recently established sorority, promotes social and intellectual activities of special significance to women students.

STUDENT PUBLICATIONS

A newspaper, *The Vector,* is operated and published entirely by student staff members. There is a yearbook, *Nucleus,* published by each Senior Class. *Log NCE,* the handbook for freshmen, as well as professional, departmental, and other publications, are also edited by students.

HONOR SOCIETIES

Freshmen who rank in the upper 20 percent of their class are considered for membership in Phi Eta Sigma, national scholarship society for freshmen. The College is also among the leading engineering colleges of the United States having a chapter of Tau Beta Pi, the honorary engineering society. Membership in this distinguished organization is open, by election, to junior and senior students of high scholarship and exemplary character, of unselfish activity and breadth of interest in technical and nontechnical fields.

There are also several other national honor societies. Omicron Delta Kappa, leadership society, recognizes students on the basis of character and specific eligibility in scholarship and extracurricular activity. Faculty and alumni members are chosen for similar qualities. Four national honor societies are associated with particular professional departments, all of them open only to juniors and seniors: Omega Chi Epsilon, Chemical Engineering; Pi Tau Sigma, Mechanical Engineering; Eta Kappa Nu, Electrical Engineering; and Chi Epsilon, Civil Engineering.

The Arnold Air Society is the honor society of the Air Force Reserve Officers Training Corps. Its purpose is to further the mission, tradition, and concept of the Air Force as a means of defense, to promote American citizenship, and to create a closer and more efficient relationship among the students. Membership is limited to advanced students who qualify academically, show an interest in the Air Force ROTC program, and are considered favorably in voting sessions of the active members of the squadron.

PROFESSIONAL SOCIETIES

National professional engineering societies sponsor student branches at the College. The societies represented are the American Chemical Society, American Institute of Chemical Engineers, American Society of Civil Engineers, American Institute of Electrical Engineers, American Institute of Industrial Engineers, American Society of Mechanical Engineers, Institute of Radio Engineers, and Society for the Advancement of Management.

The faculty encourages student participation in the activities of the student branches of these societies as an important phase of their engineering education.

ATHLETICS

The Director of Health, Physical Education, and Athletics, assisted by the joint Student-Faculty Athletic Committee, directs an extensive and varied program in athletic activities which reflects the interests and capabilities of the engineering student and provides him with opportunities for participation.

Intercollegiate competition is usually provided in soccer, basketball, baseball, bowling, tennis, golf, fencing, and riflery. On an intramural level, competition is college-wide in the form of tournaments in basketball, bowling, softball, table tennis, volleyball, and badminton.

Students are encouraged to participate in a wide range of activities on a purely amateur basis. Interested members of the faculty participate voluntarily in the capacity of coach or adviser.

CURRICULUMS

DAY DIVISION

The Faculty has approved a revision of curriculums. This revision began with the class entering in September, 1960. Each year following will bring revision of the next year's curriculum (i.e., September, 1961—revision of the Second Year, etc.). The complete new curriculums are available on request.

Note that the Sophomore Year requires a choice of department of major study. Much of the curriculum is common to all departments; but to provide the proper sequence of courses, certain differences appear in each departmental program. The courses common to all departments are listed first, followed by those peculiar to each department.

The numbers following the course title under the headings "1st Semester" and "2nd Semester" represent, in order: class hours per week, laboratory hours per week, and credits for the semester. All courses in the first three years are one-semester courses; currently, in the fourth year, they may be either one- or two-semester courses.

Students taking the Air Force ROTC program will find the necessary course substitutions listed for each year under the heading "Air Science Option," which are to be taken in lieu of courses indicated by an asterisk.

FIRST YEAR

COMMON TO ALL CURRICULUMS

COURSE NUMBER		TITLE	1ST SEMESTER		2ND SEMESTER	
(Chem 15)	(Chem 16)	General Chemistry	4-3	4½	4-3	4½
(EG 1)	(EG 2)	Engineering Graphics	2-3	2½	2-3	2½
(Eng 11)	(Eng 12)	Composition and Literature	4-0	3	4-0	3
(Math 10)		Mathematics	4-0	4	-	
	(Math 15)	Differential Calculus	-		4-0	4
(Phys 1)	(Phys 2)	Physics I & II	3-2	3½	3-2	3½
(IR 21)*		Psychology	1-0	½	-	
	(IR 22)*	Preface to the Engineering Profession	-		1-0	½
		Physical Education	0-1	0	0-1	0
*AIR SCIENCE OPTION:						
(IR 31)		Psychology of Personal Adjustment	2-0	1	-	
(AS 1)	(AS 1)	First Year Basic Course	†0-1	½	2-1	1½

† A six-hour orientation program will be given.

CHEMICAL ENGINEERING

B.S. (Ch. E.)

FIRST YEAR

The subjects offered in the first year will be found on page 59.

SECOND YEAR

Course Number		Title	1st Semester		2nd Semester	
(Eng 21)		English Literature	3-0	2	-	
	(Eng 22)	American Literature	-		3-0	2
(Math 20)		Integral Calculus	4-0	4	-	
	(Math 25)	Intermediate Analysis	-		4-0	4
(Phys 3)	(Phys 4)	Physics III & IV	3-3	3½	3-3	3½
(Mech 1)	(Mech 2)	Mechanics I & II	3-0	2	3-0	2
(IE 23)		Economics	3-0	2½	-	
(IR 23)*	(IR 24)*	Elements of Industrial Growth	2-0	1	2-0	1
(Chem 25)		Principles of Engineering Materials	3-0	2½	-	
(Hist 21)	(Hist 22)	Development of the Modern World	3-0	2½	3-0	2½
	(Chem 28)	Quantitative Analysis	-		1-4	2
*AIR SCIENCE OPTION:						
	(IR 34)	Elements of Industrial Growth	-		3-0	2
(AS 2)	(AS 2)	Second Year Basic Course	2-1	1½	0-1	0

THIRD YEAR

(Beginning September, 1962)

(ChE 27)		Chemical Engineering Problems	3-0	2	-	
	(ChE 28)	Unit Processes I	-		3-0	2
(ChE 32)	(ChE 35)	Physical Chemistry I & II	3-0	2	3-3	4
(ChE 41)	(ChE 42)	Organic Chemistry I & II	3-3	3½	3-3	3
(ChE 43)	(ChE 44)	Unit Operations I & II	3-0	3½	3-0	3
	(Math 30)	Mathematics for Engineers I	-		3-0	2
(EE 92)		Electrical Engineering	3-3	3	-	
(IR 25)*	(IR 26)*	Personnel Relations	2-0	1½	2-0	1½
		Elective (Humanities)†	3-0	2½	3-0	2½
*AIR SCIENCE OPTION:						
(AS 3)	(AS 3)	First Year Advanced Course	4-1	2½	4-1	2½

† The humanities elective program is outlined on page 70.

FOURTH YEAR
(1962-63 only)

Course Number		Title	1st Semester		2nd Semester	
(ChE 40)	(ChE 40)	Chemical Engineering Thermodynamics	3-0	2½	3-0	2½
(ChE 48)		Industrial Organic Chem.	3-3	3	-	
(ChE 50)	(ChE 50)	Physical Chemistry Lab.	0-3	2½	0-3	2
(ChE 51)	(ChE 51)	Chemical Engineering	2-3	3	2-3	4
(ChE 52)*	(ChE 52)*	Process and Plant Design	1-3	2½	1-3	4
(IndE 31)		Economics	3-0	3	-	
	(Mech 3)	Strength of Materials (Recitation)	-		4-0	2½
	(Mech 4)	Strength of Materials (Laboratory)	-		0-3	1½
(PR 14)*	(PR 14)*	Staff Control	3-0	1½	3-0	1½

*AIR SCIENCE OPTION:

(ChE 53)	(ChE 53)	Process and Plant Design	1-3	2½	1-3	2
(AS 4)	(AS 4)	Second Year Advanced Course	4-1	2½	4-1	2½

Senior students with superior scholastic standing may be given permission by the Department of Chemical Engineering to take Math 30 and Math 35 in addition to the above required courses.

CIVIL ENGINEERING

B.S. (C.E.)

FIRST YEAR

The subjects offered in the first year will be found on page 59.

SECOND YEAR

Course Number		Title	1st Semester		2nd Semester	
(Eng 21)		English Literature	3-0	2	-	
	(Eng 22)	American Literature	-		3-0	2
(Math 20)		Integral Calculus	4-0	4	-	
	(Math 25)	Intermediate Analysis	-		4-0	4
(Phys 3)	(Phys 4)	Physics III & IV	3-3	3½	3-3	3½
(Mech 1)	(Mech 2)	Mechanics I & II	3-0	2	3-0	2
(IE 23)		Economics	3-0	2½	-	
(IR 23)*	(IR 24)*	Elements of Industrial Growth	2-0	1	2-0	1
(Chem 25)		Principles of Engineering Materials	3-0	2½	-	
	(CE 1)	Surveying	-		4-3	5
*AIR SCIENCE OPTION:						
	(IR 34)	Elements of Industrial Growth	-		3-0	2
(AS 2)	(AS 2)	Second Year Basic Course	2-1	1½	0-1	0

THIRD YEAR

(Beginning September, 1962)

(CE 44)		Fluid Mechanics	3-0	2½	-	
(CE 2)		Surveying	2-3	3	-	
(CE 42)		Environmental Sanitation	2-0	2	-	
(CE 21)	(CE 22)	Strength of Materials	2-3	3½	3-0	2½
(Hist 21)	(Hist 22)	Development of the Modern World	3-0	2½	3-0	2½
(EE 90)		Electrical Engineering	3-3	3	-	
(IR 25)*	(IR 26)*	Personnel Relations	2-0	1½	2-0	1½
	(CE 11)	Geotectonics	-		1-2	2
	(CE 62)	Electronic Computations	-		3-0	2½
	(ME 71)	Thermodynamic Principles I	-		3-0	2½
	(IE 90)	Enterprise Management	-		6-0	5½
*AIR SCIENCE OPTION:						
(AS 3)	(AS 3)	First Year Advanced Course	4-1	2½	4-1	2½

FOURTH YEAR
(1962-63 only)

Course Number		Title	1st Semester		2nd Semester	
(CE 56)		Construction Planning & Plant	3-0	2	-	
(CE 80)		Reinforced Concrete	3-0	3	-	
(CE 83)		Soil Mechanics & Foundations	2-3	2½	-	
(Eng 41)		Engineering Report Writing	3-0	1½	-	
(IndE 51)*		Business Law	1-0	1	-	
	(ME 57)	Mechanical Engineering	-		3-0	2
	(ME 58)*	Mechanical & Hydraulic (Laboratory)	-		0-3	1½
(Phys 60)		Thermodynamics	3-0	2	-	
(PR 14)	(PR 14)	Staff Control	3-0	1½	3-0	1½
(CE 15)		Hydrology	2-0	1½	-	
(CE 16)		Water Supply & Purification	2-0	1½	-	
	(CE 18)	Hydraulic & Sanitary Design	-		0-3‡	1½
	(CE 19)	Sewerage & Sewage Treatment	-		2-0	1½
	(CE 78)	Structural Design	-		0-6‡	3½
		Electives (Humanities)*†	2-0	1½	2-0	1½
		Elective (Technical):				
	(CE 24)	Transportation Engineering	-		4-3‡	5
		or				
	(Chem 48)	Sanitary Chemistry & Bacteriology	-		4-3	5

*AIR SCIENCE OPTION:

(AS 4)	(AS 4)	Second Year Advanced Course	4-1	2½	4-1	2½

† The electives available are outlined on page 70.
‡ In this course, the laboratory hours refer to hours of design.

ELECTRICAL ENGINEERING
B.S. (E.E.)

FIRST YEAR

The subjects offered in the first year will be found on page 59.

SECOND YEAR

Course Number		Title	1st Semester		2nd Semester	
(Eng 21)		English Literature	3-0	2	-	
	(Eng 22)	American Literature	-		3-0	2
(Math 20)		Integral Calculus	4-0	4	-	
	Math 25)	Intermediate Analysis	-		4-0	4
(Phys 3)	(Phys 4)	Physics III & IV	3-3	3½	3-3	3½
(Mech 1)	(Mech 2)	Mechanics I & II	3-0	2	3-0	2
(IE 23)		Economics	3-0	2½	-	
(IR 23)*	(IR 24)*	Elements of Industrial Growth	2-0	1	2-0	1
(Hist 21)	(Hist 22)	Development of the Modern World	3-0	2½	3-0	2½
(Chem 25)		Principles of Engineering Materials	3-0	2½	-	
	(EE 10)	Electric Circuits and Measurements	-		3-2	3
*AIR SCIENCE OPTION:						
	(IR 34)	Elements of Industrial Growth	-		3-0	2
(AS 2)	(AS 2)	Second Year Basic Course	2-1	1½	0-1	0

THIRD YEAR

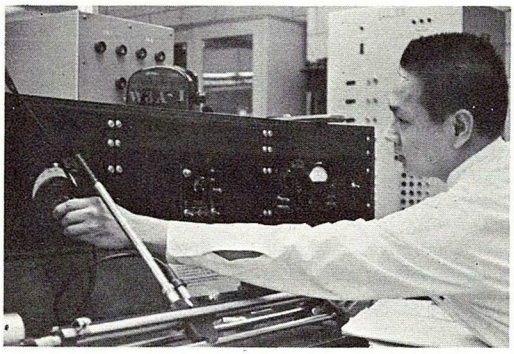
(Beginning September, 1962)

(EE 20)		Passive Circuits	5-0	4	-	
(Phys 5)		Electronic Physics	3-0	2	-	
(EE 60)		Electromagnetics	4-3	4	-	
(Math 30)	(Math 35)	Mathematics for Engineers I & II	3-0	2	3-0	2
	(EE 42)	Active Circuits I	-		3-3	3½
	(EE 62)	Electrokinetics I	-		3-0	2½
(ME 72)	(ME 78)	Introduction to Engineering Thermodynamics I & II	3-0	2	3-0	2
(IR 25)*	(IR 26)*	Personnel Relations	2-0	1½	2-0	1½
	(Mech 5)	Strength of Materials	-		4½-1½	4
		Electives (Humanities)†	3-0	2½	3-0	2½
*AIR SCIENCE OPTION:						
(AS 3)	(AS 3)	First Year Advanced Course	4-1	2½	4-1	2½

† The humanities elective program is outlined on page 70.

FOURTH YEAR
(1962-63 only)

Course Number		Title	1st Semester		2nd Semester	
(EE 15)		Electric Transmission Circuits	3-0	2	-	
(EE 17)		Advanced Circuit Measurements	2-3	2½	-	
	(EE 24)	Electromagnetic Fields	-		3-0	2
	(EE 38)	Electron Tube Circuits II	-		2-3	3
(EE 55)	(EE 57)	Electric Machines II & III	2-3	3	3-3	3½
(EE 93)		Electron Tube Circuits I	4-0	1½	-	
	(EE 94)	General Applications	-		0-3	1½
	(IndE 22)*	Industrial Management	-		3-0	3
(IndE 31)		Economics	3-0	3	-	
	(IndE 44)	Engineering Cost Analysis	-		3-0	2
(IndE 51)*		Business Law	1-0	1	-	
(ME 57)		Mechanical Engineering	3-0	2	-	
(ME 61)		Mechanical Engineering Laboratory	0-3	1½	-	
(PR 14)*	(PR 14)*	Staff Control	3-0	1½	3-0	1½
	(Phys 71)	Engineering Physics	-		3-0	2½
*AIR SCIENCE OPTION:						
(PR 19)	(PR 19)	Staff Control	2-0	1½	3-0	1½
(AS 4)	(AS 4)	Second Year Advanced Course	4-1	2½	4-1	2½



INDUSTRIAL ENGINEERING

B.S. (I.E.)

FIRST YEAR

The subjects offered in the first year will be found on page 59.

SECOND YEAR

Course Number		Title	1st Semester		2nd Semester	
(Eng 21)		English Literature	3-0	2	-	
	(Eng 22)	American Literature	3-0	2	3-0	2
(Math 20)		Integral Calculus	4-0	4	-	
	(Math 25)	Intermediate Analysis	-		4-0	4
(Phys 3)	(Phys 4)	Physics III & IV	3-3	3½	3-3	3½
(Mech 1)	(Mech 2)	Mechanics I & II	3-0	2	3-0	2
(IE 23)		Economics	3-0	2½	-	
(IR 23)*	(IR 24)*	Elements of Industrial Growth	2-0	1	2-0	1
(Chem 25)		Principles of Engineering Materials	3-0	2½	-	
(IE 25)		Logic and Scientific Method	2-0	2	-	
	(IE 24)	Production Process Design	-		2-3	3
	(IE 26)	Introduction to Industrial Engineering	-		3-0	2
*AIR SCIENCE OPTION:						
	(IR 34)	Elements of Industrial Growth	-		3-0	2
(AS 2)	(AS 2)	Second Year Basic Course	2-1	1½	0-1	0

THIRD YEAR

(Beginning September, 1962)

(Math 33)		Theory of Probability and Statistics	3-0	2½	-	
	(Math 34)	Applications of Probability and Statistics	-		3-0	2½
(Hist 21)	(Hist 22)	Development of the Modern World	3-0	2½	3-0	2½
(IR 25)*	(IR 26)*	Personnel Relations	2-0	1½	2-0	1½
(Mech 3)		Strength of Materials	4-0	2½	-	
(Mech 4)		Strength of Materials (Laboratory)	0-3	1½	-	
(EE 96)	(EE 97)	Electrical Engineering	3-3	3½	3-3	3½
(ME 71)	(ME 73)	Thermodynamic Principles I & II	3-0	2½	3-0	2
(IE 33)		Methods and Fixture Design	2-1	2	-	
	(IE 34)	Work Measurement	-		2-2	2
	(IE 45)	Plant Layout and Materials Handling	-		2-1	2
	(IE 47)	Engineering Cost Analysis	-		3-1	3
*AIR SCIENCE OPTION:						
(AS 3)	(AS 3)	First Year Advanced Course	4-1	2½	4-1	2½

FOURTH YEAR
(Beginning September, 1963)

Course Number		Title	1st Semester		2nd Semester	
(IE 41)		Production Planning & Control	3-0	2½	-	
(IE 95)		Engineering Economy	3-0	2	-	
(IE 43)	(IE 44)	Systems Analysis & Design	3-2	3	3-3	4
(ME 75)		Principles of Fluids	3-0	2	-	
(ME 76)		Power & Fluids Laboratory	0-3	1½	-	
(IR 27)*	(IR 28)*	Labor Relations	3-0	1½	3-0	1½
	(IE 40)	Industrial Economics	-		1-2	1½
	(IE 46)	Distribution	-		3-0	2
	(IE 42)	Law	-		6-0	4
		Electives (Humanities)†	3-0	2½	3-0	2½
		Electives (Technical)‡	2-0	2	2-0	2
*AIR SCIENCE OPTION:						
(IR 36)		Personnel Relations	2-0	1	-	
	(IR 38)	Labor Relations	-		2-0	1
(AS 4)	(AS 4)	Second Year Advanced Course	4-1	2½	4-1	2½

† The humanities elective program is outlined on page 70.
‡ The technical elective offerings will be published in the 1963-64 edition of this catalog.

MECHANICAL ENGINEERING
B.S. (M.E.)

FIRST YEAR

The subjects offered in the first year will be found on page 59.

SECOND YEAR

Course Number		Title	1st Semester		2nd Semester	
(Eng 21)		English Literature	3-0	2	-	
	(Eng 22)	American Literature	-		3-0	2
(Math 20)		Integral Calculus	4-0	4	-	
	(Math 25)	Intermediate Analysis	-		4-0	4
(Phys 3)	(Phys 4)	Physics III & IV	3-3	3½	3-3	3½
(Mech 1)	(Mech 2)	Mechanics I & II	3-0	2	3-0	2
(IE 23)		Economics	3-0	2½	-	
(IR 23)*	(IR 24)*	Elements of Industrial Growth	2-0	1	2-0	1
(Hist 21)	(Hist 22)	Development of the Modern World	3-0	2½	3-0	2½
	(Chem 25)	Principles of Engineering Materials	-		3-0	2½
*AIR SCIENCE OPTION:						
	(IR 34)	Elements of Industrial Growth			3-0	2
(AS 2)	(AS 2)	Second Year Basic Course	2-1	1½	0-1	0

THIRD YEAR

(Beginning September, 1962)

(ME 10)		Manufacturing Processes	1-3	2	-	
(ME 41)	(ME 42)	Thermodynamics I & II	3-0	3	3-0	3
(ME 14)		Metallurgy	3-0	2½	-	
	(ME 15)	Metallography	-		0-3	1½
	(ME 31)	Mechanisms	-		4-0	3
	(ME 44)	Fluid Mechanics	-		3-0	2½
	(ME 43)	Mechanical Laboratory I	-		0-3	2
	(Math 30)	Mathematics for Engineers I	-		3-0	2
(IE 92)		Enterprise Management	4-0	3	-	
(Mech 3)		Strength of Materials	4-0	2½	-	
(Mech 4)		Strength of Materials (Laboratory)	0-3	1½		
(IR 25)*	(IR 26)*	Personnel Relations	2-0	1½	2-0	1½
		Electives (Humanities)†	3-0	2½	3-0	2½
*AIR SCIENCE OPTION:						
(AS 3)	(AS 3)	First Year Advanced Course	4-1	2½	4-1	2½

† The humanities elective program is outlined on page 70.

FOURTH YEAR
(1962-63 only)

Course Number		Title	1st Semester		2nd Semester	
(ME 13)		Vibration Analysis	4-0	3	-	
(ME 16)	(ME 17)	Machine Design I & II	5-0	3	5-0	3
	(ME 19)	Stress Analysis	-		4-0	2
(ME 20)		Metallurgy	3-0	2	-	
	(ME 22)	Metallography	-		0-3	1½
(ME 35)	(ME 38)	Applied Heat Power	4-0	3½	4-0	3
(ME 51)	(ME 52)	Mechanical Laboratory I & II	0-3	2½	0-3	2½
(IndE 21)*	(IndE 21)*	Industrial Management	3-0	2½	2-0	1½
	(IndE 44)	Engineering Cost Analysis	-		3-0	2
	(IndE 51)*	Business Law	-		1-0	1
(Math 36)†		Theory of Measurements	1-0	1	-	
(PR 14)*	(PR 14)*	Staff Control	3-0	1½	3-0	1½
*AIR SCIENCE OPTION:						
(PR 19)	(PR 19)	Staff Control	2-0	1½	3-0	1½
(AS 4)	(AS 4)	Second Year Advanced Course	4-1	2½	4-1	2½

Engineering Management Option
(1962-63 only)

(ME 11)	(ME 12)	Elements of Machine Design I & II	4-0	2½	4-0	2½
(ME 20)		Metallurgy	3-0	2	-	
(EM 56)*	(EM 56)*	Selection, Supervision and Control of Staff II	3-0	1½	3-0	1½
(EM 58)	(EM 58)	Industrial Relations Legislation Seminar	3-0	1½	3-0	2½
(EM 64)	(EM 64)	Motion and Time Study	1-2	2	1-2	2
	(EM 65)*	Plant Visitations and Reports	-		0-3	1½
(EM 68)	(EM 68)	Management of Production and Distribution	3-0	2	3-0	2
(EM 71)	(EM 71)	Accounting and Cost Accounting	2-1	2	2-1	2
	(EM 74)	Engineering Economy	-		3-0	2½
(EM 75)		Industrial Statistical Methods	3-0	3	-	
		Electives‡	3-0	2½	3-0	2½
*AIR SCIENCE OPTION:						
(PR 14)	(PR 14)	Staff Control	3-0	1½	3-0	1½
(AS 4)	(AS 4)	Second Year Advanced Course	4-1	2½	4-1	2½

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† Math 36 is optional, but recommended for students who contemplate graduate work.

‡ The humanities elective program is outlined on page 70. Engineering Management Option Seniors will choose a minimum of one elective in either semester.

HUMANITIES ELECTIVE PROGRAM†

ARTS

Course Number		Title	1st Semester		2nd Semester	
(Arts 51)		Appreciation of Music	3-0	2½	-	
	(Arts 52)	Style and Medium in Music	-		3-0	2½
(Arts 53)		Appreciation of Visual Arts	3-0	2½	-	
	(Arts 54)	Style and Medium in Visual Arts	-		3-0	2½

HISTORY

(Hist 51)		Aspects of Classical Civilization	3-0	2½	-	
(Hist 52)		Aspects of British Civilization	3-0	2½	-	
	(Hist 53)	Aspects of American Civilization	-		3-0	2½
	(Hist 54)	Introduction to Modern Russian Civilization	-		3-0	2½

LITERATURE

(Lit 51)		A Literary Era	3-0	2½	-	
	(Lit 52)	A Literary Form	-		3-0	2½
(Lit 53)		A Literary Theme	3-0	2½	-	
	(Lit 54)	Principal Work of One Writer	-		3-0	2½

PHILOSOPHY

(Phil 51)		Principles of Philosophy	3-0	2½	-	
	(Phil 52)	Representative Philosophers	-		3-0	2½
(Phil 53)		Revolution of Psychological Theories and Systems	3-0	2½	-	
	(Phil 54)	History of Economic Thought	-		3-0	2½

(CE 8)‡		Physical Geography	2-0	1½	-	
	(CE 9)‡	Economic Geography	-		2-0	1½
(CE 53)‡		Local Planning Administration	2-0	1½	-	
	(CE 54)‡	Municipal Public Works Administration	-		2-0	1½
(Chem 50)‡	(Chem 51)‡	Biology	2-0	1½	2-0	1½

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† The program and courses are described in detail on page 107.
‡ Offered 1962-63 only and available only to Civil Engineering students.

EVENING DIVISION

OBJECTIVES

The objectives of Newark College of Engineering, as described on page 33, do not vary with the time of day at which courses are given. For students in the Evening Division, however, time is an important consideration.

The available evening hours per week, when related to the curriculums as taken by Day students provides a ready means to determine the length of time necessary for the Evening curriculums if the two are to be identical. Time also affects slightly the sequence of courses.

The overall time necessary to complete the work required for a degree may be reduced by summer study. A list of courses available for summer study is published each Spring.

FACILITIES

The facilities and services of the College are available to students of both the Day and Evening Division. The College recognizes, however, that limitations of time and circumstances sometimes prevent evening students from taking full advantage of all areas of activity. The College has therefore provided evening hour coverage for those areas that are most important to the academic advancement of Evening students. A complete description of College facilities appears on page 30*ff*.

STUDENT ACTIVITIES

Activities concerned with student life, while usually scheduled during the daytime period, are also available to Evening Division students. Students interested in these extracurricular activities, which are described in the section "Student Life," are advised to consult the Dean of Students for additional information.

Inquiries regarding information about scholarships and loan funds available to Evening students should be directed to the Dean of Students.

The Air Force ROTC program is not available to students registered in the Evening Division.

EXPENSES

TUITION AND FEES

JUNOR DIVISION (EVENING)

During 1962-1963, the tuition and regular fees per semester for students taking regular programs of study in the Junior Division (Evening) and Newark Technical School will be as follows:

TUITION	$ 82.00 per semester
REGULAR FEES	
Registration	5.00 per semester
*General Fee	18.00 per semester
Total Tuition and Regular Fees	$105.00 per semester

* The General Fee includes the laboratory fee and charges for services other than instruction, such as library, publications, counseling, placement, student-life facilities, etc., but does not cover the breakage or loss of College property.

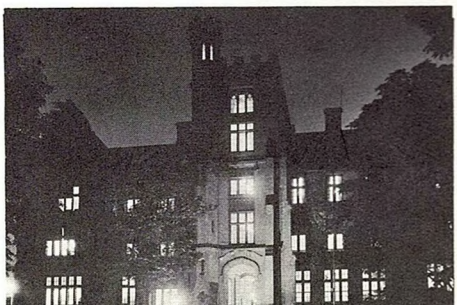
Tuition charges are somewhat higher for special programs of study differing from those shown in this catalog.

TUITION AND FEES

SENIOR DIVISION (EVENING)

It is necessary for the College to adjust its tuition charges in the Senior Division (Evening) in accordance with the individual Block programs contained therein. These charges vary somewhat in accordance with the number of hours offered under each Block. There are certain fixed fees due and payable at each registration period in addition to these tuition fees. As in the case of the Junior Division (Evening) and the Day Division, every effort has been made to establish these fees at a level which will maintain the proper relation between the State, the City, and the direct beneficiary, the student.

Students taking complete Block programs, exactly as published in this catalog, are charged tuition at the rate of $9.50 per contact hour per semester. Students taking programs which differ from the Block schedule, are charged at the rate of $12.00 per contact hour per semester.



APPLICATION, MATRICULATION AND SPECIAL FEES

JUNOR DIVISION (EVENING)

Registration is required for each semester. An extra registration fee of $5.00 is required of those who register late.

For the first semester of the first year, books cost approximately $40.00 with an additional $35.00 covering the cost of a slide rule and general supplies for that semester. Books and supplies for the second semester of the first year cost approximately $20.00.

A graduation fee of $5.00 is required of all candidates for graduation from the Junior Division (Evening).

SENIOR DIVISION (EVENING)

A registration fee of $5.00 per semester is charged for each semester. An extra registration fee of $5.00 is required of those who register late.

A General Fee of $23.00 per semester is charged. The General Fee includes the laboratory fee and charges for services other than instruction, such as library, publications, counseling, placement, student-life facilities, etc., but does not cover the breakage or loss of College property.

Students registering for the professional work of any semester in the Chemical Engineering Department, are charged a special laboratory fee of $10.00 a semester, if residents of New Jersey, or $20.00 a semester if non-residents.

A graduation fee of $20.00 is required of all candidates for the Bachelor's Degree. The graduation fee includes the cost of rental of academic dress.

JUNIOR AND SENIOR DIVISIONS (EVENING)

Each candidate for admission to the College must pay an application fee of $5.00 at the time the application for admission is submitted. The fee is not returnable, regardless of whether or not the applicant is admitted to the College. This fee covers service which is necessary to evaluate applications for admission.

Any applicant for readmission to Newark College of Engineering must pay an application fee of $5.00 at the time the Application for Readmission form is submitted. See section "Readmission," page 44.) This fee is not returnable, regardless of whether or not the student is readmitted to the College. This fee covers service which is necessary to evaluate applications for readmission.

A fee of $5.00 will be charged for the evaluation of official college transcripts submitted in accordance with the instructions

set forth on page 40 of this catalog under the heading "Admission by Transfer." This is *in addition* to the application fee of $5.00 which all applicants must pay and covers service which is necessary to evaluate transcripts of study completed at other institutions of higher education. It is not returnable, regardless of whether or not the applicant is admitted to the College.

Prospective students are charged a fee of $7.00 if they are required to take admission tests other than the required College Entrance Examination Board tests.

All students entering the College for the first time as candidates for a degree are charged a matriculation fee of $5.00.

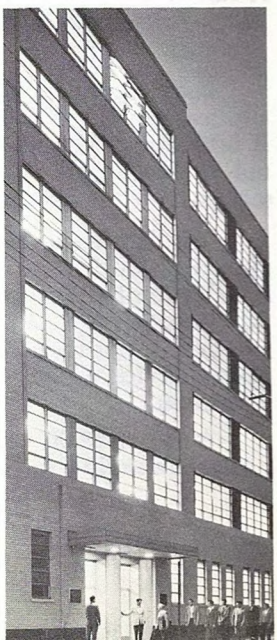
A fee of $2.00 is charged if, at the discretion of the College, is seems advisable for the student to be given a physical examination.

A fee of $1.00 is charged for the removal of a grade of "INC."

For special examinations, taken at times other than those regularly scheduled, a fee of $5.00 is charged.

Students are advised to defer expenditures for books until the official list of text books has been posted at the College Bookstore.

The College is not responsible for loss of property by fire or theft in its buildings and grounds.



CURRICULUMS
EVENING DIVISION

The Faculty has approved a revision of curriculums. This revision began with the class entering in September, 1960. Each year following will bring further revisions to introduce the new curriculums as rapidly as possible.

The numbers following the course title under the heading "1st Semester" and "2nd Semester" represent, in order: class hours per week, laboratory hours per week, and credits for the semester.

FIRST YEAR

COMMON TO ALL CURRICULUMS

COURSE NUMBER		TITLE	1ST SEMESTER		2ND SEMESTER	
(Eng 11A)	(Eng 12A)	Composition and Literature	3-0	2	3-0	2
(Math 10A)		Basic Mathematics	3-0	2½	-	
	(Math 10B)	Analytic Geometry	-		3-0	2½
(EG 1)	(EG 2)	Engineering Graphics	2-3	2½	2-3	2½
(IR 21)		Psychology	1-0	½	-	
	(IR 22)	Preface to the Engineering Profession	-		1-0	½

SECOND YEAR

COMMON TO ALL CURRICULUMS

(Eng 21A)	(Eng 21B)	English Literature	2-0	1½	2-0	1½
(Math 15A)	(Math 15B)	Calculus I & II	3-0	2½	3-0	2½
(Chem 15)	(Chem 16)	General Chemistry	4-3	4½	4-3	4½

THIRD YEAR

COMMON TO ALL CURRICULUMS

(Eng 22A)	(Eng 22B)	American Literature	2-0	1½	2-0	1½
(Math 25A)	(Math 25B)	Calculus III & IV	3-0	3	3-0	3
(Phys 1)	(Phys 2)	Physics I & II	3-2	3½	3-2	3½
(IR 23)	(IR 24)	Elements of Industrial Growth	2-0	1	2-0	1

CHEMICAL ENGINEERING
B.S. (Ch.E.)

FIRST, SECOND AND THIRD YEARS

The subjects offered in the first three years will be found on page 75.

FOURTH YEAR

Course Number		Title	1st Semester		2nd Semester	
(540)	(540)	History of Industrial Civilization	1-0	½	1-0	½
(742)	(742)	Quantitative Analysis	2-4	4	0-3	2
	(840)	Economics	-		3-0	3
(841)		Principles of Engineering	3-0	2	-	
(943)	(943)	Statics	2-0	1½	2-0	1½
	(947)	Electricity	-		3-0	2

FIFTH YEAR (Block 41 ChE)*

(ChE 30)		Inorganic Chemical Technology	3-0	2½	-	
(ChE 31)	(ChE 31)	Physical Chemistry	3-0	2	3-0	2
(EE 7)	(EE 84)	Applied Electricity	3-0	2	1-3	2½
(ME 59)		Fuel & Instrument Laboratory	0-3	1½	-	
	(IndE 31)	Economics	-		3-0	3
		Electives†	2-0	1½	2-0	1½

SIXTH YEAR (Block 42 ChE)*

(ChE 38B)	(ChE 38B)	Organic Chemistry	3-3	3	3-6	5
(Phys 37)		Strength of Materials	4-0	3	-	
(Mech 4)		Strength of Materials (Laboratory)	0-3	1½	-	
		Electives†	2-0	1½	2-0	1½

SEVENTH YEAR (Block 43 ChE)

(ChE 48)		Industrial Organic Chemistry	3-3	3	-	
(ChE 50)	(ChE 50)	Physical Chemistry (Laboratory)	0-3	2	0-3	2½
	(ChE 51-1B)	Chemical Engineering	-		4-0	4
(Eng 20)	(Eng 20)	English and American Literature	3-0	1½	3-0	1½
(PR 13)	(PR 14)	Staff Control	3-0	3	3-0	3

EIGHTH YEAR (Block 44 ChE)*

(ChE 40)	(ChE 40)	Chemical Engineering Thermodynamics	3-0	2½	3-0	2½
(ChE 51-2A)	(ChE 51-2A)	Chemical Engineering	3-3	4	2-3	3
(ChE 52A)	(ChE 52A)	Process and Plant Design	1-3	2½	1-3	3½

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* 1962-63 only. Revised program will be published in the 1963-64 edition of this catalog.

† The elective offerings are listed on page 82.

CIVIL ENGINEERING
B.S. (C.E.)

FIRST, SECOND AND THIRD YEARS

The subjects offered in the first three years will be found on page 75.

FOURTH YEAR
(1962-63 only)

Course Number		Title	1st Semester		2nd Semester	
(140)*	(140)*	Engineering Surveys	3-3	5	3-3	5
(540)	(540)	History of Industrial Civilization	1-0	½	1-0	½
(943)	(943)	Statics	2-0	1½	2-0	1½
(947)	(948)	Electricity	3-0	2	3-0	2

* Eight six-hour Saturday field or laboratory periods to be arranged, each semester. No field work will be scheduled on the first Saturday of the Fall Semester.

FIFTH YEAR (Block 41 CE)

(1962-63 only. To be taken by those students who complete Block 42 CE in 1961-62.)

(CE 7)		Engineering Geology	2-0	1	-	
	(CE 14)	Public Health Engineering	-		1-0	1
	(CE 32)	Materials of Construction	-		1-0	1
(CE 41)		Hydraulics	2-0	2	-	
(Eng 70)	(Eng 70)	History of Industrial Civilization	1-0	½	1-0	½
	(ME 57)	Mechanical Engineering	-		2-0	2
	(ME 58)	Mechanical and Hydraulic Laboratory	-		0-3	1½
(Phys 22)	(Phys 22)	Kinematics and Kinetics	2-0	1½	2-0	1½
(Phys 60)		Thermodynamics	3-0	2	-	
		Electives†	2-0	1½	2-0	1½

FIFTH YEAR

(1962-63 only. To be taken by those students who complete the Fourth Year in 1961-62.)

(Chem 25)		Principles of Engineering Materials	3-0	2½	-	
	(IE 23)	Economics	-		3-0	2½
(Eng 20)	(Eng 20)	English and American Literature	3-0	1½	3-0	1½
	(Phys 24)	Kinematics and Kinetics	-		3-0	3
(PR 12A)		Principles of Engineering	3-0	2	-	
(Eng 70)	(Eng 70)	History of Industrial Civilization	1-0	½	1-0	½
		Electives†	2-0	1½	2-0	1½

† The elective offerings are listed on page 82.

SIXTH YEAR (Block 42 CE)

(Not offered in 1962-63. Revised program will be published in the 1963-64 edition of this catalog.)

SEVENTH YEAR (Block 43 CE)

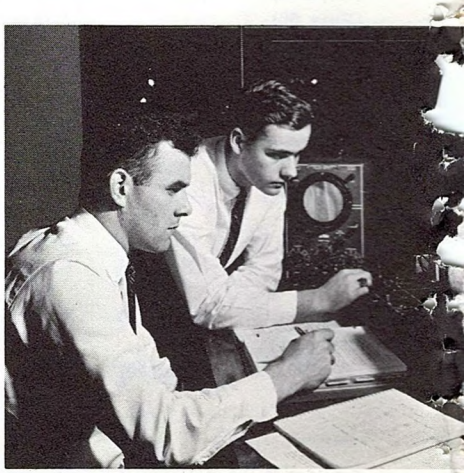
(CE 16)		Water Supply and Purification	2-0	1½	-	
	(CE 18)	Hydraulic and Sanitary Design	-		0-2‡	1½
	(CE 19)	Sewerage and Sewage Treatment	-		2-0	1½
(Eng 20)	(Eng 20)	English and American Literature	3-0	1½	3-0	1½
(IndE 51)		Business Law	1-0	1	-	
(PR 13)	(PR 14)	Staff Control	3-0	3	3-0	3
		Electives†	2-0	1½	2-0	1½

EIGHTH YEAR (Block 44 CE)

(Not offered in 1962-63)

(CE 24)	(CE 24)	Transportation Engineering	3-0	2	0-3‡	3
(CE 56)		Construction Planning and Plant	3-0	2	-	
(CE 77)		Structural Theory	4-0	3½	-	
	(CE 78)	Structural Design	-		0-6‡	3½
	(CE 80)	Reinforced Concrete	-		3-0	3
(Eng 82)		Engineering Report Writing	2-0	1½	-	

† The elective offerings are listed on page 82.
‡ In this course, the laboratory hours refer to hours of design.



ELECTRICAL ENGINEERING
B.S. (E.E.)

FIRST, SECOND AND THIRD YEARS

The subjects offered in the first three years will be found on page 75.

FOURTH YEAR

Course Number		Title	1st Semester		2nd Semester	
(840)		Economics	3-0	3	-	
	(841)	Principles of Engineering	-		3-0	2
(943	(943)	Statics	2-0	1½	2-0	1½
(946)		Electricity	6-0	4	-	
(540)	(540)	History of Industrial Civilization	1-0	½	1-0	½
	(EE 10)	Circuits and Measurements	-		3-2	3

FIFTH YEAR (Block 41E)*

(Mech 5)		Strength of Materials	4½-1½	4	-	
	(PR 12A)	Principles of Engineering	-		3-0	2
(Phys 24)		Kinematics and Kinetics	3-0	3	-	
	(ME 72)	Introduction to Engineering Thermodynamics I	-		3-0	2
(Eng 70)	(Eng 70)	History of Industrial Civilization	1-0	½	1-0	½
	(EE 14)	Transients	-		3-0	2
(Math 30)	(Math 35)	Mathematics for Engineers I & II	3-0	2	3-0	2

SIXTH YEAR (Block 42E)*

	(PR 12A)	Principles of Engineering	-		3-0	2
	(Eng 20A)	English and American Literature	-		3-0	1½
(EE 22)		Transmission Circuits	4-0	3	-	
(EE 44)		Active Circuits II	3-3	4	-	
	(EE 60A)	Electromagnetics	-		5-0	3
(ME 72)		Introduction to Engineering Thermodynamics I	3-0	2	-	

SEVENTH YEAR (Block 43E)*

(EE 57)		Electric Machines III	2-3	3½	-	
	(EE 15)	Electric Transmission Circuits	-		3-0	2
(Eng 20)	(Eng 20)	English and American Literature	3-0	1½	3-0	1½
(IndE 51)		Business Law	1-0	1	-	
	(IndE 44)	Engineering Cost Analysis	-		3-0	2
(PR 13)	(PR 14)	Staff Control	3-0	3	3-0	3

EIGHTH YEAR (Block 44E)*

(EE 17A)		Advanced Circuit Measurements	2-3	3	-	
	(EE 23)	Electromagnetic Fields	-		2-0	1½
(EE 93A)	(EE 38A)	Electron Tube Circuits I & II	4-0	3½	2-3	3½
	(ME 57)	Mechanical Engineering	-		2-0	2
	(ME 61)	Mechanical Engineering Laboratory	-		0-3	1½
(IndE 22)		Industrial Management	3-0	3	-	

* 1962-63 only. Revised program will be published in the 1963-64 edition of this catalog.

MECHANICAL ENGINEERING
B.S. (M.E.)

FIRST, SECOND AND THIRD YEARS

The subjects offered in the first three years will be found on page 75.

FOURTH YEAR*

Course Number		Title	1st Semester		2nd Semester	
(441)		Thermodynamics	3-0	2½	-	
	(442)	Fluid Mechanics	-		3-0	2½
(443)		Machine Tool Laboratory	0-3	1½	-	
	(642)	Differential Equations	-		3-0	3
	(841)	Principles of Engineering	-		3-0	2
(944)		Statics	3-0	3	-	
(947)	(948)	Electricity	3-0	2	3-0	2

FIFTH YEAR (Block 41M)*

(Eng 60)	(Eng 60)	History of Industrial Civilization	1-0	½	1-0	½
	(IndE 31)	Economics	-		3-0	3
	(IndE 44)	Engineering Cost Analysis	-		3-0	2
(ME 1)		Mechanisms	3-0	3	-	
	(ME 20)	Metallurgy	-		3-0	2
(ME 32)		Heat Power	3-0	2	-	
(ME 49)		Heat Power Laboratory	0-3	2	-	
(Phys 22)	(Phys 22)	Kinematics and Kinetics	2-0	1½	2-0	1½

SIXTH YEAR (Block 42M)*

(Eng 71)		History of Industrial Civilization	2-0	1	-	
	(IndE 21A)	Industrial Management	-		3-2	4
(ME 22)		Metallography	0-3	1½	-	
(ME 35)	(ME 38)	Applied Heat Power	3-0	3½	3-0	3
(Phys 37)	(Mech 4)	Strength of Materials	4-0	3	0-3	1½

SEVENTH YEAR (Block 43M)*

(EE 88A)	(EE 89A)	Applied Electricity I & II	2-3	3½	3-3	4½
(Eng 20)	(Eng 20)	English and American Literature	3-0	1½	3-0	1½
(IndE 51)		Business Law	1-0	1	-	
(ME 51A)	(ME 52A)	Mechanical Laboratory I & II	0-3	3	0-3	3

EIGHTH YEAR (Block 44M)*

(ME 13)		Vibration Analysis	3-0	3	-	
(ME 16)	(ME 17A)	Machine Design I & II	5-0	3	5-0	3½
	(ME 19A)	Stress Analysis	-		3-0	2½
(PR 13)	(PR 14)	Staff Control	3-0	3	3-0	3

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* 1962-63 only. Revised program will be published in the 1963-64 edition of this catalog.

MECHANICAL ENGINEERING
ENGINEERING MANAGEMENT OPTION
B.S. (M.E.)

FIRST, SECOND AND THIRD YEARS

The subjects offered in the first three years will be found on page 75.

FOURTH YEAR*

Course Number		Title	1st Semester		2nd Semester	
(441)		Thermodynamics	3-0	2½	-	
	(445)	Machine Tools and Laboratory	-		0-3	2
(541)	(541)	English	3-0	1½	3-0	1½
	(841)	Principles of Engineering	-		3-0	2
(944)		Statics	3-0	3	-	
(947)	(948)	Electricity	3-0	2	3-0	2

FIFTH YEAR (Block 41 MO)*

	(Eng 66)	History of Industrial Civilization	-		2-0	1
	(ME 20)	Metallurgy	-		3-0	2
(ME 49)		Heat Power Laboratory	0-3	2	-	
(ME 57)		Mechanical Engineering	3-0	2	-	
	(EM 57)	Industrial Relations Legislation	-		3-0	2
(EM 67)	(EM 67)	Economics	2-0	2	2-0	2
(EM 69A)		Law	2-0	2	-	
		Electives†	2-0	1½	2-0	1½

SIXTH YEAR (Block 42 MO)*

(Phys 37)		Strength of Materials	4-0	3	-	
	(Mech 4)	Strength of Materials Laboratory	-		0-3	1½
(Eng 71)		History of Industrial Civilization	2-0	1	-	
(EM 58A)	(EM 58A)	Industrial Relations Legislation Seminar	2-0	2	2-0	2
	(EM 74A)	Engineering Economy	-		3-0	3
(EM 75A)	(EM 75A)	Industrial Statistical Methods	2-0	1½	2-0	1½
		Electives†	2-0	1½	2-0	1½

SEVENTH YEAR (Block 43 MO)*

(EE 88A)	(EE 89A)	Applied Electricity I & II	2-3	3½	3-3	4½
(ME 11A)	(ME 12A)	Elements of Machine Design I & II	3-0	3	3-0	3
(EM 55A)	(EM 55A)	Selection, Supervision and Control of Staff I	2-0	2	2-0	2
(EM 62A)		Engineering Management & Operation	2-0	1½	-	

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* 1962-63 only. Revised program will be published in the 1963-64 edition of this catalog.

† The elective offerings are listed on page 82.

EIGHTH YEAR (Block 44 MO)*

Course Number		Title	1st Semester		2nd Semester	
(EM 56A)	(EM 56A)	Eelection, Supervision & Control of Staff II	3-0	2	3-0	2
(EM 64A)	(EM 64A)	Motion and Time Study	1-2	2½	1-2	2½
(EM 68)	(EM 68)	Management of Production and Distribution	3-0	2	3-0	2
(EM 71A)	(EM 71A)	Accounting and Cost Accounting	2-0	2	3-0	2½

* 1962-63 only. Revised program will be published in the 1963-64 edition of this catalog.

ELECTIVES

Course Number		Title	1st Semester		2nd Semester	
(CE 8)*		Physical Geography	2-0	1½	-	
	(CE 9)*	Economic Geography	-		2-0	1½
(CE 53)*		Local Planning Administration	2-0	1½	-	
	(CE 54)*	Municipal Public Works Administration	-		2-0	1½
(Chem 50)†	(Chem 51)†	Biology	2-0	1½	2-0	1½
(Eng 72)		Contemporary English and American Literature	2-0	1½	-	
	(Eng 73)	Modern Drama	-		2-0	1½
(Eng 74)		Modern United States History	2-0	1½	-	
	(Eng 75)	International Relations	-		2-0	1½
(Eng 76)		Public Speaking	2-0	1½	-	
	(Eng 77)	Debating	-		2-0	1½
(Eng 78)		Music Appreciation	2-0	1½	-	
	(Eng 79)	The Fine Arts	-		2-0	1½
(Eng 80)	(Eng 80)	Modern Foreign Language	2-0	1½	2-0	1½
(Eng 82)**		Engineering Report Writing	2-0	1½	-	
(PR 15)		Psychology	2-0	1½	-	
	(PR 16)	Sociology	-		2-0	1½
(PR 17)		Principles of Philosophy	2-0	1½	-	
	(PR 18)	Representative Philosophers	-		2-0	1½

* Available to Civil Engineering students only.
† Available to Chemical and Civil Engineering students only.
** Available to Engineering Management Option students only.

In general, the course taken during the first semester of any year should be followed in sequence by the parallel course of the second semester.

DEPARTMENTS AND COURSES OF INSTRUCTION

DEPARTMENTS OF MAJOR STUDY

Departments granting degrees at Newark College of Engineering include the fields of Chemical Engineering, Civil Engineering, Electrical Engineering, Mechanical Engineering, and Industrial and Management Engineering. The last named department offers the B. S. in Industrial Engineering and the M. S. in Management Engineering.

The Department of Air Science offers Day Undergraduate students the opportunity to take the Air Force ROTC program leading to a commission as a Second Lieutenant in the U. S. Air Force Reserve.

BASIC SCIENCE DEPARTMENTS

Departments providing NCE students with a common background in mathematics and science, especially in the early years of their training are the departments of Chemistry, Engineering Graphics, Mathematics, and Physics and Mechanics. Known as the Technological Group, they also conduct advanced courses on both the undergraduate and graduate level.

HUMANISTIC-SOCIAL DEPARTMENTS

Since engineering education also requires that students receive a thorough grounding in the humanities, two additional departments have a prominent place in the curriculum: the Department of English and Humanistic Studies and the Department of Professional Development and Industrial Relations. Beside basic courses in English, Psychology, and Personnel Relations, these two departments offer a series of elective courses designed to provide students with opportunities for specialized studies in Arts, History, Literature, Philosophy, Sociology and other courses typical of the liberal arts tradition.

DIVISION OF HEALTH, PHYSICAL EDUCATION AND ATHLETICS

Common to the education of all Day Undergraduate students at NCE is a strong emphasis on health and physical activity. For this reason, Health, Physical Education and Athletics has been established as a separate, functional division of the College, gearing its programs to the needs and abilities of all students, and supervising a wide range of activities from formal gymnasium instruction to intramural and informal sports.

DEPARTMENT OF AIR SCIENCE

Chairman: COLONEL MAURICE A. BERRY.
Executive Associate: MAJOR CARROL HAMENT.

Professor: BERRY; *Assistant Professors:* FOSTER, GIRARD, HAMENT, LUCAS, RAFF, STOLLE, WOJCIEHOSKI; *Instructors:* FRYER, KENNEDY, PERRY, SCHULZ, WILLIAMS.

The Department of Air Science offers qualified students a four year course leading to a commission as a Second Lieutenant, United States Air Force. The course includes sufficient practical and theoretical instruction so that the student can be quickly integrated into the Air Force organization with a minimum of additional training in the event of active military service. Emphasis is placed upon leadership training and in preparing the student to serve as an officer in the United States Air Force.

The first two years are devoted to the basic course and the last two years are devoted to the advanced course.

Classes in Air Science are not offered, other than six Introduction to AFROTC lectures, in the first term of the first year or the second term of the second year. In lieu thereof the satisfactory completion during these two terms of appropriate courses, of two or more semester credits, in the areas of mathematics, physical or natural sciences, the humanities or social sciences, will be accepted as satisfying the first and fourth term academic requirements of AFROTC. At registration, students will be advised as to specific courses which may be designated for this purpose.

Enrollment is voluntary. It is open to all regularly enrolled day session students who are citizens of the United States, possess good moral character, are physically qualified, are not less than fourteen years of age, and are approved by the President of the College and the Professor of Air Science. Entrance into the advanced course is on a selective basis. Selection is based upon composite scores derived from Air Force Officer Qualifying Tests, Air Force ROTC grades, academic grades, and instructors' and Advanced Course Selection Committee Members' estimate of the cadet's potential officer qualities and leadership ability. In addition, an applicant for enrollment in the advanced course will not be eligible unless he will be less than 28 years of age at the time of graduation, if enrolling in Categories II, III, or IV, or less than 26½ years of age at time of graduation, if enrolling in Categories IP or IN. Choice of category is made at time of application for enrollment in the advanced course. The categories to choose from are as follows:

CATEGORY IP. In this category are those cadets who express a desire to enter pilot training after graduation and who meet the mental and physical standards for this type of training. The active duty obligation is five years.

CATEGORY IN. In this category are those cadets who express a desire to enter navigation training after graduation and who meet the mental and physical standards for this type of training. The active duty obligation is five years.

CATEGORY II. In this category are those cadets who are pursuing Electrical, Mechanical, and Civil Engineering and other scientific and technical fields, and who meet the mental and physical standards for an Air Force commission. The active duty obligation is four years.

CATEGORY II (Meteorology). In this category are those cadets who are pursuing courses leading to a degree in Meteorology or who will complete the following: Any degree, providing the cadet will agree, in writing, to take college Math, thru Integral Calculus, with at least a "C" average and a mandatory minimum grade of "C" in the Differential and Integral Calculus courses, 6 semester hours or quarter hours equivalent of College Physics with at least a "C" average and a mandatory minimum grade of "C" in the last Physics course completed. The active duty obligation is four years.

CATEGORY III (Any Degree). In this category are those cadets who are pursuing courses leading to degrees in Liberal Arts and Sciences or Chaplain candidates, and who meet the mental and physical standards for an Air Force commission. The active duty obligation is four years.

CATEGORY IV. In this category are veterans of the armed forces who can meet the mental and physical standards for an Air Force commission. They have no mandatory active duty obligation.

CATEGORY V. Is reserved for cadets enrolled in Category IP and IN who, after enrollment in the advanced course, become physically disqualified for flying or, in the case of Category IP cadets, are eliminated from the Flight Instruction Program for aptitudinal reasons, provided the cadet is physically qualified for commission and elects to continue in the Air Force ROTC. Category V cadets will be called to active duty for 6 months or 4 years, depending upon the needs of the service at the time.

The inclusion of Air Science courses in the student's program does not materially increase his workload, as these courses receive comparable credits and may be substituted for certain courses in the standard curriculum.

Uniforms and textbooks are furnished without cost by the United States Air Force and advanced students receive a subsistence allowance of 90 cents a day or approximately $27 per month. Each student enrolled in the freshman and sophomore year will be required to pay a $15.00 uniform deposit.

Advanced students will normally attend summer training between the Junior and Senior years. While attending summer training, students receive approximately $75.00 per month, transportation to and from training, medical attention, subsistence, quarters and uniforms.

Credit for Air Science 1 is granted only upon the successful completion of Air Science 2, unless approved by the Professor of Air Science and proper college officials. No partial credit for any work completed in Air Science 1 or 2 will be given without the consent of the Professor of Air Science and the Dean of the College.

COURSES OF INSTRUCTION

INTRODUCTION TO AFROTC. *No credit.*

An introduction to the Air Force ROTC program. Purposes, policies, curriculum content, and related activities of the program are presented. Required of all freshmen registered for AFROTC. One lecture per week for the first six weeks of the freshman year.

AS 1. FIRST YEAR BASIC COURSE. 2 *credits per year.*

A general survey of aerospace power to include: Fundamentals of air power, military air power of the world, military research and development, principles of operation of aircraft, space vehicles, and organization and function of the Department of Defense. One period of laboratory per week each semester, two lectures per week during the spring semester.

AS 2. SECOND YEAR BASIC COURSE. 1½ *credits per year.*

Prerequisites: AS 1 or 6 months' active military service. An introduction to aerospace missiles and aircraft; their propulsion systems; aerospace defense; modern targeting and electronic warfare; high explosive, nuclear, chemical, and biological warheads; aerospace strategic and tactical organizations, and military implications of present and future space operations. One period of laboratory per week each semester, two lectures per week during the fall semester.

AS 3. FIRST YEAR ADVANCED COURSE. 5 *credits per year.*

Prerequisites: AS 2 or one year's active military service. Staff organization and funcition, oral and written communication, individual and group problem solving, basic psychological and sociological principles of leadership and their application to leadership practice and problems. Four lectures and one period of laboratory per week each semester.

AS 4. SECOND YEAR ADVANCED COURSE. 5 *credits per year.*

Prerequisite: AS 3. A study of global relationships of special concern to the Air Force Officer with attention to such aspects as weather, navigation, geography, and international relations. The course is subdivided into the following blocks of study: Weather, navigation, international relations, military aspects of world political geography and the Air Force Officer. Four lectures and one period of laboratory per week each semester.

DEPARTMENT OF CHEMICAL ENGINEERING

Chairman: CHARLES L. MANTELL.
Executive Associate: GEORGE C. KEEFFE.

Professors: BRADLEY, JOFFE, KEEFFE, KREPS, MANTELL, SALAMONE; *Associate Professors:* CARLSON, FREDERICK; *Instructor:* CASCIANO; *Assistant Instructor:* BARBAZ; *Adjunct Instructing Staff:* CANTY, KAUFMANN, WOLKSTEIN.

The Chemical Engineering curriculum is designed to give the student a thorough background in the fundamental sciences and engineering subjects. It prepares the student for a professional career in chemical engineering in the process industries involving the development of practices in chemical manufacture and related operations, the design and operation of plants, as well as chemical and engineering application in non-chemical organizations.

To this end, the organic, industrial organic, unit operations, unit process and specialized laboratories are so equipped that the student may follow a particular process from test tube scale to semi-commercial scale and allow estimation of large scale production. The equipment in the unit operations and process laboratories is, for the most part, of modern design. This equipment has been adapted to the teaching of basic scientific principles and for quantitative and economic evaluation. The Physical Chemistry Laboratory is equipped for control and instrumentation studies for general and fundamental training in the physico-chemical field. The course in Process and Plant Design coordinates and utilizes all of the engineering work in the chemical engineering curriculum. All equipment with associated design rooms, research laboratories and specialized areas is located in the Tiernan laboratories at 240 High Street.

The department encourages active participation of its students in the Student Chapters of the American Institute of Chemical Engineers and of the American Chemical Society. These student groups arrange for guest speakers from industry and for plant trips, both of which are important in orienting professional interest and attitude.

In addition to the one day trips arranged by the student chapters, the senior chemical engineering students with the cooperation of the department visit industries outside the Newark area. These extended trips are usually taken during one of the regular college vacation periods.

COURSES OF INSTRUCTION

ChE 27. CHEMICAL ENGINEERING PROBLEMS. 2 *credits.*

Prerequisites: Math 25, Phys 4, Chem 28. A course in the application of the principles of physics and chemistry to, and the quantitative solution of industrial chemical process problems. Emphasis is placed on material and heat balance of complex chemical reactions.

ChE 28. UNIT PROCESSES I. 2 *credits.*

Prerequisite: ChE 27. A study of selected chemical processes emphasizing mass and energy requirements, equipment and economics considerations. There will be a three hour problem period devoted to computational and analytical methods, including interpretation of engineering data, experimental design and optimization. Formulation and solution of problems will be undertaken in differential material and energy balances, process kinetics, heat and mass transfer, reactor design and process control.

ChE 30. INORGANIC CHEMICAL TECHNOLOGY. 2½ *credits.*

Prerequisite: ChE 39* *or* 340. A study of various inorganic chemical processes giving consideration to raw materials, chemical reactions, energy relationships and equipment.

ChE 31. PHYSICAL CHEMISTRY. 4 *credits, two semesters.*

Prerequisites: 630,* 742, 933.* The main topics considered in this course are: the gaseous, liquid, and solid states of matter, thermodynamics, thermo chemistry, ideal and nonideal solutions, homogeneous and heterogeneous equilibria, chemical kinetics, electrochemistry, atomic and molecular structure. Attention is also given to experimental methods and the precision of measurements.

ChE 32. PHYSICAL CHEMISTRY I. 2 *credits.*

Prerequisites: Math 25, Phys 4, Chem 28. The topics covered in lecture are the properties of ideal and non-ideal gases, liquids, solids and solutions, thermochemistry and elementary thermodynamics. Relationship between physical properties and molecular structure is shown.

ChE 35. PHYSICAL CHEMISTRY II. 4 *credits.*

Prerequisite: ChE 32. The topics covered in lecture are homogeneous and heterogeneous equilibria, phase rule, electrolytic transference and conductance, ionic equilibria, electromotive force and kinetics. Experiments are done which illustrate principles covered in lecture. Laboratory reports include an analysis of experimental errors and a quantitative calculation of the reliability of calculated results.

ChE 38B. ORGANIC CHEMISTRY. 8 *credits, two semesters.*

Prerequisite: 742. This is a course in principles and practices of organic chemistry. In the lectures and recitations a systematic study of the aliphatic and aromatic compounds is undertaken. In the laboratory certain selected experiments in the analysis and synthesis of organic compounds are carried out as well as exercises in the study of the chemical properties of various classes of compounds.

ChE 40. CHEMICAL ENGINEERING THERMODYNAMICS. 5 *credits, two semesters.*

Prerequisites: ChE 31 *and* ChE 39* or 340.* The thermal properties of matter are studied and interpreted in terms of the fundamental concepts and laws of thermodynamics. Applications are made to batch and flow processes, compressors, heat engines, and refrigeration. The effects of high pressures on chemical equilibrium are considered.

ChE 41. ORGANIC CHEMISTRY I. 3½ *credits.*

Prerequisite: Chem 28. Lectures, problems, and laboratory exercises in the principles and practice of organic chemistry presenting an integrated study of aliphatic, aromatic and heterocyclic compounds. Modern concepts of structure and mechanism are considered.

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* This prerequisite not offered after 1961-62.

ChE 42. ORGANIC CHEMISTRY II. 3 *credits.*

Prerequisite: ChE 41. Continuation of the integrated study of organic chemistry. Laboratory work will emphasize more advanced analytic and synthetic procedures.

ChE 43. UNIT OPERATIONS I. 3½ *credits.*

Prerequisites: Math 25, Phys 4. A lecture-problem course in fluid and particle mechanics embracing Newtonian and Non-Newtonian fluids. The unit operations covered will include fluid flow, size reduction, solids handling, mixing and mechanical separations.

ChE 44. UNIT OPERATIONS II. 3 *credits.*

Prerequisite: ChE 43. A lecture-problem course in heat transmission. The unit operation of evaporation will be included. Newtonian, Non-Newtonian and multi-phase systems will be treated. Emphasis will be placed on mathematical correlations for film coefficients of heat transfer.

ChE 48. INDUSTRIAL ORGANIC CHEMISTRY. 3 *credits.*

Prerequisite: ChE 38,* *or* ChE 38B. This course will include advanced and critical studies of organic synthesis with special emphasis on commercial methods. The laboratory work is intended to develop techniques preliminary to large scale laboratory operations.

ChE 50. PHYSICAL CHEMISTRY LABORATORY. 4½ *credits, two semesters.*

Prerequisite: ChE 31. This course consists of laboratory experimentation, in the course of which the student applies and extends the basic knowledge of physical chemistry acquired in the junior year. Laboratory reports are expected to include the analyasis of experimental errors and a quantitative discussion of the reliability of calculated results.

ChE 51. CHEMICAL ENGINEERING. 7 *credits, two semesters.*

Prerequisites: ChE 31, 36.* The portion of the course devoted to lecture and recitation will cover those unit operations not covered in ChE 36, such as evaporation, distillation, absorption and extraction, drying, etc. In the laboratory the student will attempt to correlate theoretical and actual performance in the various unit operations.

ChE 51-1B. CHEMICAL ENGINEERING. 4 *credits.*

Prerequisites: 340,* ChE 31. A lecture problem course in fluid mechanics and heat transfer for embracing Newtonian and Non-Newtonian fluids. The Unit Operations covered will include fluid flow, heat flow, evaporation, size reduction and solids handling.

ChE 51-2A. CHEMICAL ENGINEERING. 7 *credits, two semesters.*

Prerequisite: ChE 51-1A.* This course is a continuation of ChE 51-1A. The portion of the course devoted to lecture and recitation will cover Unit Operations such as size reduction, solids handling, mechanical separations, mixing, absorption, extraction, distillation, and drying. In the laboratory the student will attempt to correlate theoretical and actual performance in the various Unit Operations.

ChE 52. PROCESS AND PLANT DESIGN. 6½ *credits, two semesters.*

Prerequisites: ChE 30, 31, 36,* 38,* 39.* In this course students coordinate and apply knowledge gained in other courses to the initiation, design, and operation of an industrial chemical process. An intensive study is made of the economic factors involved. Laboratory time is devoted to

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* This prerequisite not offered after 1961-62.

literature search, experimental work, design calculations, specification and selection of equipment, plant layout, and cost studies. There will be a visitation during the period between semesters to process industry plants and chemical engineering industries over a three to four day period. All expenses are to be paid by the individual student. Required for all chemical engineering seniors.

ChE 52A. PROCESS AND PLANT DESIGN. 6 *credits, two semesters.*

Prerequisites: 340* or ChE 39* *and* ChE 30, 31, 38B, 51-1A.* This course is described under ChE 52, above.

ChE 53. PROCESS AND PLANT DESIGN. 4½ *credits, two semesters.*

Prerequisites: ChE 30, 31, 36,* 38,* 39.* This course for AFROTC students applies knowledge gained in prerequisite courses to the planning and operation of an industrial chemical process. Laboratory time is devoted to investigation, experiment, design, specification and selection of equipment, plant layout and cost analysis. There will be a visitation during the period between semesters to process industry plants and chemical engineering industries over a three to four day period. All expenses are to be paid by the individual student. Required for all chemical engineering seniors.

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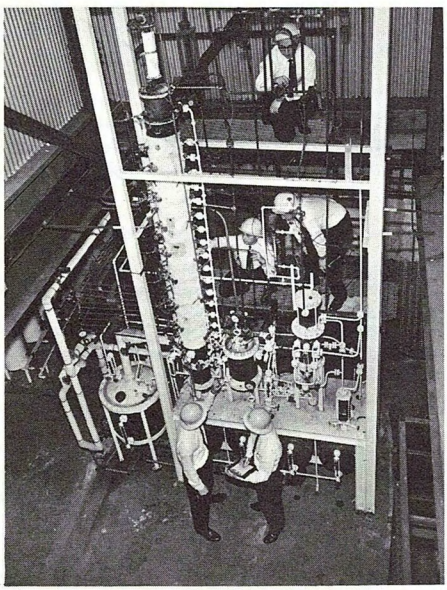
* This prerequisite not offered after 1961-62.



DEPARTMENT OF CHEMISTRY

Chair*man:* M. LELYN BRANIN.
Executive Associate: JOSEPH M. FITZGERALD.
Assistant Executive Associate: FREDERICK W. BAUDER.

Professors: BAUDER, BISHOP, BRANIN; *Associate Professors:* FITZGERALD, RAM; *Assistant Professors:* CAGNATI, KWEI, POETZ, *Instructors:* HU, LI, MYTELKA, PANDYA, REILLY; *Assistant Instructors:* PERSURANCE, ZEGEL; *Adjunct Instructing Staff:* COOPER, MULLIGAN, ROEDER, SIBILIA.

The increasing awareness of the importance of science and engineering in our national economy has been taken cognizance of in planning the various courses presently being offered by the Department of Chemistry. Since the responsibility of establishing a solid foundation for the student's engineering education rests largely with those departments teaching the physical sciences and mathematics, the chemistry courses have been designed to develop the student's understanding of fundamentals by placing maximum emphasis on the principles and the methods of science. Both in the classroom and in the laboratory, the emphasis generally is directed to the quantitative more than to the qualitative aspects of the subject. Frequent references also are made to the relationships existing between fundamental principles and their application to the solution of engineering problems.

A second important objective is the establishment of an adequate scientific foundation upon which the student may build after graduation from college and during the course of his subsequent professional career.

The Department of Chemistry offers courses in general college chemistry, including some analytical chemistry, quantitative analysis, and principles of engineering materials. In addition to these, certain special courses, such as biology and sanitary chemistry and bacteriology, are offered as technical options for students majoring in Chemical or Civil Engineering.

COURSES OF INSTRUCTION

Chem 15. GENERAL CHEMISTRY. 4½ *credits.*

Fundamental chemistry, including general inorganic, analytical, and some organic and nuclear chemistry, with particular emphasis on those concepts which are basic to an engineering education. Both the pace and content of the course presuppose a full year of high school chemistry prior to entering college.

Chem 16. GENERAL CHEMISTRY. 4½ *credits.*

Prerequisite: Chem 15. A continuation of Chem 15.

Chem 25. PRINCIPLES OF ENGINEERING MATERIALS. 2½ *credits.*

Prerequisites: Chem 15, 16, *or* 715,* 716.* A study of the basic principles which underlie the behavior of materials. The influence of structure and bonding forces on properties is emphasized.

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* This prequisite not offered after 1961-62.

Chem 28. INTRODUCTION TO QUANTITATIVE ANALYSIS. 2 *credits.*

Prerequisites: Chem 15, 16, *or* 715,* 716.* A brief course in which the student is introduced to the methods of volumetric and gravimetric analysis. Emphasis is placed upon errors which are common to all types of analysis.

Chem 48. SANITARY CHEMISTRY AND BACTERIOLOGY. 5 *credits.*

Prerequisites: Chem 15, 16, *or* 715,* 716.* A lecture and laboratory course covering the chemistry and bacteriology of water and sewage. Types and distribution of bacteria in water, sewage and certain foodstuffs such as milk and shellfish are examined and studied in relation to problems of sanitation and public health. Chemical treatment and purification methods are included.

Chem 50 and 51. BIOLOGY. 3 *credits, two semesters.*

This course is broad in its coverage and an effort is made to bring the student in contact with the newer concepts of biology. The first semester is devoted largely to establishing a foundation knowledge. During the second semester the emphasis is on man and the biological problems which confront him.

742. QUANTITATIVE ANALYSIS. 6 *credits, two semesters,*

Prerequisite: 730.* This course is offered for fourth year students majoring in chemical engineering. It includes both theory and practice of inorganic quantitative analysis. In the laboratory, training is given in volumetric and gravimetric analysis. The classwork covers theories and methods of analytical chemistry, with special attention to calculations and the errors of measurement.

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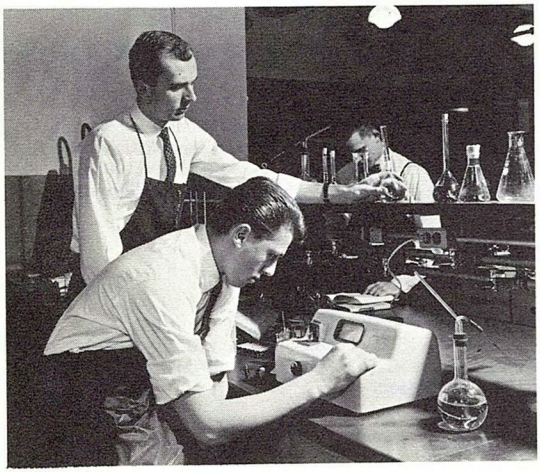
* This prerequisite not offered after 1961-62.



DEPARTMENT OF CIVIL ENGINEERING

Chairman: WILLIAM S. LA LONDE, JR.
Executive Associate: JAMES M. ROBBINS.

Professors: LA LONDE, LEHMAN, ROBBINS; *Associate Professor:* MANGASARIAN; *Assistant Professor:* METZGER; *Instructor:* MONAHAN; *Assistant Instructors:* DISKO, HOFFMAN; *Adjunct Instructing Staff:* SALM, SETTEDUCATO.

Modern civil engineering includes within its scope the economic planning, design, construction, operation, and maintenance of the fixed structures and works required by our present industrial civilization. Its coordinated subdivisions comprise: structural engineering, which provides bridges, dams, industrial plants, foundations, buildings, tunnels, and other important stationary structures; transportation engineering, which provides highways, railroads, airways, inland waterways and the terminal facilities requisite thereto; hydraulic engineering, covering the development of water supplies, irrigation, drainage, hydro-electric power, flood control and shore protection; sanitary engineering, which provides potable water supplies, treatment and disposal facilities for sewage and industrial wastes, and measures incident to the engineering control of communicable disease; and surveying, which furnishes the engineering surveys required by all construction operations, the proper delineation of property, and the base maps of the nation.

A field so varied requires that the academic training of those who enter it have breadth as well as depth. Rigorous education in the basic sciences is fundamental. Economics and finance are of the essence in this field. Knowledge of the properties of engineering materials is essential not only in design but in research. A rational approach to personnel problems is vital. Chemistry, biology, and bacteriology are required by the sanitarian. The operation of highly mechanized construction plants requires basic training in mechanical and electrical engineering. The ability to write clearly and to speak convincingly must be inculcated. Liberal training must be provided in the humanities if the student is to develop to take his proper part, as engineer and citizen, in the community. Integrated with, and built upon, this broad foundation we have the applications of the engineering method to the professional work of the field.

To provide for breadth of training in a four-year undergraduate program, the hours devoted to courses which are primarily vocational in character have been reduced to a minimum. Highly specialized instruction of an advanced character has been definitely placed in the graduate program.

The Department maintains a fully equipped soil mechanics laboratory, apparatus required for model analysis, and a surveying instrument room supplied with the instruments required for all types of surveys.

COURSES OF INSTRUCTION

CE 1. SURVEYING. 5 *credits.*

Theory, fieldwork, drafting and computations dealing with plane, cadastral, topographic, hydrographic, route, photogrammetric and geodetic surveys.

CE 2. SURVEYING. 3 *credits.*

Prerequisite: CE 1. The theory of engineering astronomy is considered in class. The fieldwork and drafting embrace further experience in the types of engineering surveys considered in CE 1 and field observations are made on the sun and stars for the determination of latitude, longitude, time and azimuth.

CE 7. ENGINEERING GEOLOGY. 1 *credit.*

A study of basic physical geology and physiography with particular emphasis placed on the practical application of the material considered to Civil Engineering work.

CE 8. PHYSICAL GEOGRAPHY. 1½ *credits.*

A study of the climatic and physiographic regions of the earth and of the effects of climate, land forms, and natural resources upon the development of civilization and upon the progress of mankind.

CE 9. ECONOMIC GEOGRAPHY. 1½ *credits.*

A study of the world distribution of natural resources, of their development and utilization, and of their influence upon productive employment and population growth. Particular attention is given to those occupations and industries concerned with the conversion of the riches of nature to the use of mankind.

CE 11. GEOTECTONICS. 2 *credits.*

A study of basic geology with emphasis on engineering projects. Basic concepts of field control and inspection of materials are also considered.

CE 14. PUBLIC HEALTH ENGINEERING. 1 *credit.*

A study of the engineering control of communicable disease through the proper collection, treatment, and disposal of wastes; the provision of potable water supplies; milk and food sanitation; the control of rodents and insects; the sanitation of public buildings; the construction of proper housing; and industrial hygiene.

CE 15. HYDROLOGY. 1½ *credits.*

Prerequisite: Satisfactory Senior Standing. A study of the occurence, distribution, and utilization of water and of the analyses required for the design of regulatory works for water supply, hydro-electric plants, irrigation, flood control, erosion control, and inland navigation.

CE 16. WATER SUPPLY AND PURIFICATION. 1½ *credits.*

Prerequisite: Satisfactory Senior Standing. A study of the problems involved in the procurement, treatment, and distribution of municipal and industrial water supply.

CE 18. HYDRAULIC AND SANITARY DESIGN. 1½ *credits.*

Prerequisites: CE 15, 16. Design problems dealing with the development of a surface water supply and with the provision of sewerage for a community.

CE 19. SEWERAGE AND SEWAGE TREATMENT. 1½ *credits.*

Prerequisites: CE 15, 16. A study of the principles of design, construction, and maintenance of sanitary sewers and storm-water drains and of works for the treatment of sewage and industrial wastes.

CE 21. STRENGTH OF MATERIALS. 3½ *credits.*

Prerequisite: Mech 1. A consideration of the relations between external forces acting on engineering structures and the resulting internal forces and stresses, and the relations between external forces and strains. Many practical problems are worked out illustrating the use of the derived principles. In the laboratory, tests are conducted to investigate some of the physical characteristics of materials and to verify the assumptions used in theoretical analysis. The results of each test are summarized in an engineering report.

CE 22. STRENGTH OF MATERIALS. 2½ *credits.*

Prerequisite: CE 21. A continuation of the stress-strain relations begun in CE 21. There is no laboratory verification.

CE 24. TRANSPORTATION ENGINEERING. 5 *credits.* (*Two semesters, Evening Division only.*)

Prerequisite: Satisfactory Senior Standing. A study of the principles of transportation engineering including the location, design, and construction of urban and rural streets and highways, and appurtenant structures. Attention is devoted to planning, finance, organization, economics, administration, and traffic control. In addition, highway design problems are worked out in the drafting room.

CE 32. MATERIALS OF CONSTRUCTION. 1 *credit.*

A study of the more important engineering materials used in construction and manufacturing with particular emphasis on the physical and chemical properties that would govern the selection of the proper material in design work.

CE 41. HYDRAULICS. 2 *credits.*

A textbook and problem course treating with hydrostatics and hydrokinetics. Constant emphasis is placed on the degree of precision obtainable, in practice, by the use of available experimentally determined constants to modify idealized computations to meet actual conditions.

CE 42. ENVIRONMENTAL SANITATION. 2 *credits.*

A study of engineering control of man's environment through: the proper collection, treatment, and disposal of domestic and industrial wastes; the provision of potable water supplies; milk and food sanitation; the control of rodents and insects; the sanitation of public buildings; swimming pool sanitation; the construction of proper housing; air pollution control; radiological sanitation; and industrial hygiene. Water purification and waste water treatment, are dealt with in detail.

CE 44. FLUID MECHANICS. 2½ *credits.*

Prerequisite: Mech 2. A problem course treating the static and dynamic behavior of fluids with a majority of applications dealing with the flow of water and other incompressible fluids. Emphasis is placed on the understanding of fundamental laws and the equations derived from them. The semi-empirical approach is also presented as a practical method.

CE 53. LOCAL PLANNING ADMINISTRATION. 1½ *credits.*

Local planning problems will be approached from the point of view of those who are charged with the responsibility for developing and administering planning programs. Both principles and procedures will be illustrated by examples selected from the best practices developed by leading city planners.

CE 54. MUNICIPAL PUBLIC WORKS ADMINISTRATION. 1½ *credits.*

Prerequisite: CE 53. Municipal problems will be approached from the point of view of such top-level administrators as city managers, department heads, and their principal aides. The emphasis will be on the actual workings of municipal administration with an analysis of the duties and the responsibilities of the administrator.

CE 56. CONSTRUCTION PLANNING AND PLANT. 2 *credits.*

Prerequisite: CE 81* *or* CE 81A,* CE 82A.* A study of the problems involved in planning the economical design and construction of engineering works covering preliminary planning, the selection of the construction method, the arrangement of the construction plant, and the management of the construction program.

CE 62. ELECTRONIC COMPUTATIONS. 2½ *credits.*

Prerequisite: Math 25. A study of the two numerical areas of interest to the engineer—the numerical solution of engineering problems and the statistical treatment of data. Both analogue and digital computers are discussed. Problems are prepared in forms suitable for carrying out the actual operations. Coding the computer is treated from a logical basis and applications are made to a real computer. Statistical methods are applied to analysis and the reliability of engineering data derived from various types of measurements. Applications in the fields of testing, traffic, and hydrology will be considered.

CE 77. STRUCTURAL THEORY. 3½ *credits.*

Prerequisite: 943.* A course in the theory of statically determinate and statically indeterminate structures. It involves some graphic statics and a thorough drill and computations for finding moments and shears in beams and stresses in structural members and trusses. The use of influence lines and the positioning of moving loads for maximum effectiveness are studied. The use of elastic energy and slope deflection equations and moment distribution in the solution of a variety of problems in statically indeterminate structures is studied.

CE 78. STRUCTURAL DESIGN. 3½ *credits.*

Prerequisite: Satisfactory Senior Standing, *or* CE 77. Bridge and building structures form the medium for designs using riveted and welded construction and reinforced concrete and modern timber framing. Orderly computational procedures and familiarity with design codes are required. Only enough of the designs are detailed to familiarize the student with basic requirements.

CE 80. REINFORCED CONCRETE. 3 *credits.*

Prerequisite: Satisfactory Senior Standing, *or* CE 81A,* CE 82A.* The fundamentals of reinforced concrete as applied to the design of buildings and other civil engineering structures. Emphasis is given to continuity of members and the relationship of the members to the structure as a whole. Limited attention will be given to prestressed concrete.

CE 83. SOIL MECHANICS AND FOUNDATIONS. 2½ *credits.*

Prerequisite: Satisfactory Senior Standing. A study of all soil types and properties; the significance of soil tests; the methods of compaction, consolidation, and settlement; bearing capacity and pile tests and formulas; slope stability, lateral pressures; frost heaving; soil stabilization; and problems relating to the proper design of soil-supported foundations for engineering structures. The theoretical study is supplemented by experimental work in the soil mechanics laboratory.

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* This prerequisite not offered after 1961-62.

140 ENGINEERING SURVEYS. 10 *credits, two semesters.*

Prerequisite: Satisfactory Fourth Year Standing. A study of the theory and practice of surveying including plane, topographic, cadastral, route, hydrographic, and geodetic surveys, spherical trigonometry and engineering astronomy. The field work covers the use of modern surveying instruments in executing surveys of the above types. The student plots a topographic map from field data.

DEPARTMENT OF ELECTRICAL ENGINEERING

Chairman: FREDERICK A. RUSSELL.
Executive Associate: ROBERT E. ANDERSON.

Professors: ANDERSON, FISHMAN, JORDAN, RUSSELL; *Associate Professors:* DICKEY, MEOLA, PADALINO, RIPS, ROSE, WINSTON; *Assistant Professors:* CARLUCCIO, MOHSEN, REDMON, YEH; *Instructors:* AYOUB, CHOW, STRANO, TSCHANG; *Assistant Instructors:* D'ADDARIO, EISENBERG, FRIEND, MATULA, RICCI; *Special Instructing Staff:* CURTIS, TULCHIN; *Adjunct Instructing Staff:* ABATE, ALACCHI, BIGLEY, CALL, B. COHEN, H. COHEN, HOLLINGSWORTH, KIHN, KURLAND, LYONS, MAGID, RANSOM, SAFRAN, SCHRAMM, P. SMITH, VARETONI, WOERNER, YAWORSKY.

The Electrical Engineering curriculum provides a broad, basic engineering education. A student will have completed his preparatory education in mathematics, the physical sciences, English, and the humanities during the first half of his college curriculum. During the final years his education is broadened into associated fields of engineering and includes increased specialization in his chosen field, electrical engineering.

The electrical engineering courses emphasize basic principles, concepts, and their interrelations upon which the design and operation of electrical devices of our present electrical age depend.

The aim is to educate an electrical engineer who can think analytically and creatively, work efficiently, and convey the results of his work effectively to others. He is prepared for responsibilities as a professional engineer and citizen in a democracy by his experiences within the group of fellow students and laboratory co-workers.

His electrical engineering education is as broad as possible so that employment opportunities upon graduation will not be restricted. His education is adequate for further advanced study in his chosen field if his interest lies in research or development. However, the curriculum can serve as a terminal engineering program leading to industrial work or activity as an engineer dealing with production, operation, or service.

Branches of the American Institute of Electrical Engineers, the Institute of Radio Engineers and Eta Kappa Nu are active and stimulate interest in the practical and professional aspects of electrical engineering.

COURSES OF INSTRUCTION

EE 7. APPLIED ELECTRICITY. 2 *credits.*

Prerequisites: 630,* 947. For chemical engineering students, this initial study of alternating currents opens with the quantitative description of sinusoids and their mathematical manipulation. The concepts of impedance and admittance are then introduced, with the processes for combining them in the usual ways and converting from one to the other. Complex quantities are used extensively. The computation of power in single phase and multi-phase circuits is included.

EE 10. ELECTRIC CIRCUITS AND MEASUREMENTS. 3 *credits.*

Prerequisites: Phys 3, Math 20. A class and laboratory introductory course in Electrical Engineering. Definitions of electric circuit parameters, Kirchhoff's rules for instantaneous values in differential equation form, and special solutions to these using complex quantities. Mesh and nodal analysis, resonance, and balanced polyphase circuits. The laboratory work covers electrical measurements over a wide range of frequencies. The class work features problem solving, and the laboratory work will stress the correct use of a laboratory notebook.

EE 14. ELECTRIC CIRCUITS (TRANSIENTS). 2 *credits.*

Prerequisites: 241,* Math 103.* Transient variations of current, voltage, and energy in lumped-constant electric circuits are studied in this course. Elementary operational methods are employed and switching transients are stressed. Two hours of problem computation are included.

EE 15. ELECTRIC TRANSMISSION CIRCUITS. 2 *credits.*

Prerequisite: EE 12,* *or* 241.* This course extends the work of courses EE 12 and 241 into the field of propagation at variable frequency in the general linear four-terminal network. The lumped-circuit applications include attenuators and filter circuits, and the distributed-constant systems treated include power transmission, audio-frequency communication, radio-frequency and ultra-high frequency lines.

EE 17. ADVANCED CIRCUIT MEASUREMENTS. 2½ *credits.*

Prerequisites: EE 5,* 14, 42. Advanced techniques in circuit measurements with multiple-frequency signals are studied including a-c bridge measurements, filters, harmonic analysis, resonance measurements and square-wave testing, transients in circuits, very-high and ultra-high frequency measurements, and field plotting.

EE 17A. ADVANCED CIRCUIT MEASUREMENTS. 3 *credits.*

Prerequisites: 240,* EE 14, 42. This course is described under EE 17, above.

EE 20. PASSIVE CIRCUITS. 4 *credits.*

Prerequisite: EE 10; Corequisite: Math 30. A course in electric circuit analysis from the pole-zero viewpoint. Laplace transform, transfer functions, real and complex frequencies, transient and steady state frequency response. Network analysis, circuit theorems, matrix manipulation. Unbalanced three-phase systems at power frequencies are included in this course.

EE 22. TRANSMISSION CIRCUITS. 3 *credits.*

Prerequisite: EE 20. A course in four-terminal networks with linear passive circuit elements. General theorems, tuned circuits, image impedance parameter analysis of inductance-capacatance filters including propagation, insertion loss, and hyperbolic trigonometry. Transmission lines at power, audio, and radio frequencies. Derivation of distributed parameters for conductors in simple configurations. Circle diagrams, including Smith chart. Introduction to transient response of uniform transmission lines.

EE 23. ELECTROMAGNETIC FIELDS. 1½ *credits.*

Prerequisite: Math 104.* This is a foundation course, designed to lay a basis for advanced work in television, radar, and ultra-high frequency techniques. The basic principles of electromagnetic field theory, including Maxwell's field equations, are developed. The modern engineering point of view is maintained throughout, and advanced methods of analysis are introduced as needed.

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* This prerequisite not offered after 1961-62.

EE 24. ELECTROMAGNETIC FIELDS. 2 *credits.*

Prerequisite: Math 104.* This is a foundation course, designed to lay a basis for advanced work in television, radar, and ultra-high frequency techniques. The basic principles of electromagnetic field theory, including Maxwell's field equations, are developed. The modern engineering point of view is maintained throughout, and advanced methods of analysis are introduced as needed.

EE 38. ELECTRON TUBE CIRCUITS II. 3 *credits.*

Prerequisites: EE 17, 93. As a complement to the previous electronics courses, this course deals with the theory and laboratory performance of the previously studied circuits and more advanced circuits, including wave-shaping circuits.

EE 38A. ELECTRON TUBE CIRCUITS II. 3½ *credits.*

Prerequisites: EE 17A, EE 93A. As a complement to previous electronics courses, this course deals with the performance of advanced circuits in which electron tubes are component parts. Laboratory projects include various forms of rectifiers, oscillators, modulators, and demodulators. Also included are various types of wave-shaping circuits.

EE 42. ACTIVE CIRCUITS I. 3½ *credits.*

Prerequisites: EE 20, Phys 5. This class and laboratory course covers four areas of communication theory. Two-terminal nonlinear circuit elements, with continuous and discontinuous signals: vacuum, gas, and semiconductor diode circuits. Basic theorems of transconductance circuits: transistor, vacuum triode and pentode equivalent circuits. Active linear circuits: transistor and vacuum-tube small-signal amplifiers. Active quasi-linear circuits: audio power single-ended and push-pull amplifiers.

EE 44. ACTIVE CIRCUITS II. 4 *credits.*

Prerequisite: EE 42. This course extends the work of the preceding course into the area of active nonlinear circuits, including class B and C amplifiers and oscillators; coding, transmission, and decoding of information, including amplitude, frequency, and pulse modulation and demodulation.

The course includes class and laboratory work in the above areas.

EE 55. ELECTRIC MACHINES II. 3 *credits.*

Prerequisite: EE 53.* Basic rotating machine principles are applied in a study of polyphase induction machines and synchronous machines. Emphasis is on analysis, operation and application.

EE 57. ELECTRIC MACHINES III. 3½ *credits.*

Prerequisite: EE 55, *or* EE 55A.* A continuation of EE 55 and EE 55A, with discussion extended to include single-phase motors, special types of machines, and control.

EE 60. ELECTROMAGNETICS. 4 *credits.*

Prerequisites: EE 10, Math 25. This course consists of a class and laboratory study of the theory of magnetic circuits, magnetic materials, and electromagnetic devices. It includes magnetic circuit calculations, losses, saturable reactors, transformers at all frequencies, frequency characteristic of inductively coupled circuits, three-phase transformer connections, phase transformation, effects of harmonics. Theory of force, torque and voltage generation, in relays, loudspeakers, meters and rotating machines.

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* This prerequisite not offered after 1961-62.

EE 60A. ELECTROMAGNETICS. 3 *credits.*

Prerequisites: EE 51,* 240.* This is an interim course, similar in content to EE 60, above.

EE 62. ELECTROKINETICS I. 2½ *credits.*

Prerequisite: EE 60. A course in the theory of rotating electromechanical energy converting devices. Basic concepts of rotating electrical machine analysis and performance. Analysis and applications of direct-current machines.

EE 84. APPLIED ELECTRICITY. 2½ *credits.*

Prerequisites: EE 7 *and* 630* or Math 25. This is essentially a laboratory course involving electrical measurements of special interest to the chemical engineer. A brief study is made of direct-current and alternating-current circuits and machines, electron tube characteristics and elementary electron tube circuits.

EE 88A. APPLIED ELECTRICITY I. 3½ *credits.*

Prerequisites: 630,* 948. For Mechanical Engineering students. A study of the application of the fundamental principles of electricity to direct-current and alternating-current circuits, machines, and electronic appliances.

EE 89A. APPLIED ELECTRICITY II. 4½ *credits.*

Prerequisite: EE 88A. A continuation of EE 88A, involving study and operation of various alternating-current motors commonly used in industry.

EE 90. ELECTRICAL ENGINEERING FOR CIVIL ENGINEERS. 3 *credits.*

Prerequisites: Phys 4, Math 25. A class and laboratory course in the basic principles of electrical engineering theory and practice. The course begins with the study of a-c circuits, including polyphase circuits. Magnetics, transformers, direct-current and alternating-current machines are covered with an emphasis on significant operating characteristics and ratings. Basic electronics is included, with applications of electron tubes and transistors to rectification and amplification. Measurement techniques, including the use of vacuum-tube voltmeters and the oscilloscope, is part of the laboratory work.

EE 92. ELECTRICAL ENGINEERING FOR CHEMICAL ENGINEERS. 3 *credits.*

Prerequisites: Phys 4, Math 25. A class and laboratory course for chemical engineers, similar to EE 90, above.

EE 93. ELECTRON TUBE CIRCUITS I. 1½ *credits.*

Prerequisites: EE 14, 42. A continuation of EE 42 involving more advanced electronic circuit theory. Included are such topics as tuned amplifiers, oscillators, rectifiers, modulators and demodulators.

EE 93A. ELECTRON TUBE CIRCUITS I. 3½ *credits.*

Prerequisites: EE 14, 42. This course presents advanced electronic circuit theory. Included are such topics as tuned amplifiers, oscillators, rectifiers, modulators and demodulators.

EE 94. GENERAL APPLICATIONS. 1½ *credits.*

Prerequisites: Full Senior Standing, Attendance at Student E.E. Professional Society Meetings during Preceding Semester. A synthesis and focusing of all the student's previous experience, in college and out, upon a

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* This prerequisite not offered after 1961-62.

series of electrical engineering problems. Design, construction and testing are usually involved. Class members are in touch with all the projects through seminar discussions. Projects are available in optional fields of power and communications. Attendance at student E.E. Professional Society meetings will be required.

EE 96. ELECTRICAL ENGINEERING FOR MECHANICAL AND INDUSTRIAL ENGINEERS I. 3½ *credits.*

Prerequisites: Phys 3, Math 25. This is a comprehensive laboratory and class course surveying broadly the fields of electrical engineering. Basic a-c circuits, three-phase circuits, power and reactive power, resonance, steady-state frequency-response, and elementary transients. Included are basic principles of thermionic vacuum tubes, transistors, gas-filled thermionic tubes; and applications to rectifier and amplifier circuits, cathode-ray, photoelectronic and other special electronic devices and their applications are considered.

EE 97. ELECTRICAL ENGINEERING FOR MECHANICAL AND INDUSTRIAL ENGINEERS II. 3½ *credits.*

Prerequisite: EE 96. A continuation of EE 96, above, this course considers the theory and applications of transformers and goes then into the area of rotating machines, stressing applications of the various types. Introduction to the physical aspects of rotating machines, including the generation of voltage and torque follows. Performance and characteristics of d-c and a-c machines. The course concludes with an elementary study of electronic control of motors and processes, both open and closed-cycle systems, including servomechanisms.

DEPARTMENT OF ENGINEERING GRAPHICS

Chairman: FRANCIS J. BURNS.
Executive Associate: ROBERT G. SALAMON.

Professor: BURNS; *Associate Professor:* SALAMON; *Assistant Professors:* DUJETS, HANUS, RIGHTS; *Instructors:* GOLDEN, KETZNER; *Special Instructing Staff:* O'HARA; *Adjunct Instructing Staff:* J. SALAMON.

The Graphics courses, through application of a carefully considered system of disciplines, aim at preparing our beginning students for those engineering experiences which are to follow. Chief among these lessons is a development of the abilities to read carefully and to follow instructions meticulously since the professional engineer cannot leave himself open to misinterpretation. We try to teach Graphics, then, as a professional addition to the students' verbal and mathematical languages and from the present point of view of the profession that engineers are less and less likely to be engaged in the actual production of detail drawings in the future. A wide understanding of the geometries of construction, plus extensive drill in freehand sketching, is stressed so as to lay a sound foundation for the professional design work to follow.

COURSES OF INSTRUCTION

EG 1. ENGINEERING GRAPHICS. 2½ *credits.*

This course consists chiefly of work in descriptive geometry, plus freehand sketching and lettering exercises. Studies cover basic orthographic theory, coordinate systems, planes, lines, orientations, auxiliaries, normals, axials, obliques, directed views, solids, rotations, spheres, convolutes, cylinders, cylindroids, helices, etc. Homework is minimal, requiring about two and one-half hours per week. It consists of a simple freehand sketch, a brief lettering exercise, and the reading of several assigned pages of text for each class. A one-hour lecture is given each week.

EG 2. ENGINEERING GRAPHICS. 2½ *credits.*

Prerequisite: EG 1. This course consists of combined drawing and problem solving. Standards of annotation and dimensioning, special scales, sections and conventions, limits, threads, etc., are briefly introduced; the balance of the term deals with engineering curves and graphs, steel truss details, concrete detailing, perspective, axonometrics, vectors and centros, areas (Simpson's rule or planimeter), templates, ASA standards, piping, circuits, topography, and others. Homework continues and, as in the first term, consists of a freehand sketch, a brief lettering exercise, and for each class the reading of certain assigned pages of text, except that in this term the complexities of the sketches are considerably increased. Lectures also are given in the classes by the individual instructors as each different phase of the program is arrived at. In addition, a one-hour lecture is given each week.

DEPARTMENT OF ENGLISH AND HUMANISTIC STUDIES

Chairman: SAMUEL K. WORKMAN.
Executive Associate: HERMAN A. ESTRIN.

Professors: ESTRIN, FELMLY, WORKMAN; *Associate Professors:* CRATER, FERNSLER, KEABLES, NAPIER, SHAWCROSS; *Assistant Professors:* JOHNSON, STEINBERG, WACKER, WINTERS, WISE; *Instructors:* DRUKS, GEORGE, ZIRNITE; *Assistant Instructor:* GROVER; *Special Instructing Staff:* CHABROWE; *Adjunct Instructing Staff:* BUCHAREST, DRABBLE, GRAHAM, HECK, HENDLER, HESSE, KIANESE, KRUEGER, REZETKO, SCHECTMAN, STEPHANS, TEMES, TUMIN, WEISS.

An engineering college makes special demands upon its English Department. An engineer has to write down his ideas and directives efficiently. In both technical and non-technical reading he must be rapid and accurate. In all areas of his professional activity he will want his speech not merely to be correct but to come from him easily and naturally. Calling on a less tangible skill, many of his professional judgments will involve imponderables for which his perception is best cultivated by experience with the imaginative verbal expression of others, usually writers.

His career and his personal desires will take him more and more often into areas outside his immediate profession. He will want a sympathetic understanding, and a sense of judgment and taste, for the varied interests and activities of widely various people. Literature and other arts do much to develop such faculties, and so does the study of cultural history, a study largely carried out through reading.

The English Department provides all these areas of study, and is a principal participant in the broader program of electives in humanistic-social studies.

COURSES OF INSTRUCTION

Eng 11. COMPOSITION AND LITERATURE. 3 *credits.*

A course to develop the skills of reading, writing, and speaking. The writing is expository, of various types. The reading includes the principal literary forms.

Eng 11A. COMPOSITION AND LITERATURE. 2 *credits.*

This course is similar in content to Eng 11, above.

Eng 12. COMPOSITION AND LITERATURE. 3 *credits.*

Prerequisite: Eng 11. A continuation of Eng 11.

Eng 12A. COMPOSITION AND LITERATURE. 2 *credits.*

Prerequisite: Eng 11A. A continuation of Eng 11A.

Eng 20. ENGLISH AND AMERICAN LITERATURE. 3 *credits, two semesters.*

Prerequisite: Eng 12A, *or* 502.* This course is similar to Eng 21 and Eng 22, below.

Eng 20A. ENGLISH AND AMERICAN LITERATURE. 1½ *credits.*

This course is similar to the second semester of Eng 20.

Eng 21. ENGLISH LITERATURE. 2 *credits.*

Prerequisite: Eng 12. A study of significant literary figures of England which introduces these writers as individuals and as participants in historical and intellectual movements. The students will prepare oral and written assignments related to the reading.

Eng 21A. ENGLISH LITERATURE. 1½ *credits.*

Prerequisite: Eng 12A. This course is similar to the first part of Eng 21.

Eng 21B. ENGLISH LITERATURE. 1½ *credits.*

Prerequisite: Eng 21A. Similar to the second part of Eng 21.

Eng 22. AMERICAN LITERATURE. 2 *credits.*

Prerequisite: Eng 21. A study of significant literary figures of America which introduces these writers as individuals and as participants in historical and intellectual movements. The students will prepare oral and written assignments related to the reading.

Eng 22A. AMERICAN LITERATURE. 1½ *credits.*

Prerequisite: Eng 21B. This course is similar to the first part of Eng 22.

Eng 22B. AMERICAN LITERATURE. 1½ *credits.*

Prerequisite: Eng 22A. Similar to the second part of Eng 22.

Eng 41. ENGINEERING REPORT WRITING. 1½ *credits.*

Prerequisite: Eng 12, *or* 12A. The principles of report writing are studied, with careful attention to models of sound technical writing. Instead of preparing unmotivated practice reports, the student is guided in fulfilling actual assignments of reports for his professional department. Finished work is judged by professional standards. Required for Civil Engineering students.

Eng 60. HISTORY OF INDUSTRIAL CIVILIZATION. 1 *credit, two semesters.*

This course is designed to provide students with a broad picture of both the social and political aspects of our cultural history and to lay particular stress upon science and technology. It is designed to be followed by Eng 70 or Eng 71.

Eng 66. HISTORY OF INDUSTRIAL CIVILIZATION. 1 *credit.*

This course for Management Engineering Option students is described under Eng 60, above.

Eng 70. HISTORY OF INDUSTRIAL CIVILIZATION. 1 *credit, two semesters.*

A continuation of Eng 60, Eng 66, or 540.

Eng 71. HISTORY OF INDUSTRIAL CIVILIZATION. 1 *credit.*

This course for Management Engineering Option students is described under Eng 70, above.

Eng 72. CONTEMPORARY ENGLISH AND AMERICAN LITERATURE. 1½ *credits.*

Selections of important literature since 1920 are read and discussed, with emphasis on writers who most characteristically express our civilization.

Eng 73. MODERN DRAMA. 1½ *credits.*

Important plays are read and discussed, with the purpose of gaining some understanding of how dramatists, in both subject matter and technique, reflect the spirit of our times.

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* This prerequisite not offered after 1961-62.

Eng 74. Modern United States History. 1½ *credits.*

The principal events of modern United States history are studied, with particular emphasis upon the development of our present governmental, social, and industrial system.

Eng 75. International Relations. 1½ *credits.*

This course includes a study of the political, social, economic, technological, and geographical factors in international relations, and correlates them with current affairs and the evolution of the United Nations.

Eng 76. Public Speaking. 1½ *credits.*

This advanced course in the art of presenting facts and ideas to an audience trains the student to adapt his material and manner to the great variety of situations arising in professional life.

Eng 77. Debating. 1½ *credits.*

This course makes practical application of the fundamental principles of argumentation and persuasive speech, of public-speaking methods, and of audience psychology.

Eng 78. Music Appreciation. 1½ *credits.*

This course is designed to train the ear and the mind to enjoy great music. The principles of musical structure and technique are presented in lectures, illustrated by recordings of representative artists and composers.

Eng 79. The Fine Arts. 1½ *credits.*

This course is designed to impart appreciation of sculpture, painting, and architecture. By illustrated lectures, by visits to local museums and galleries, and by actual practice in class, the student becomes familiar with the nature of art.

Eng 80. Modern Foreign Language. 3 *credits, two semesters.*

Prerequisite: A Minimum of 2 Units of High School Credit in the Subject—Except for Russian. A year of advanced study of French, German, Italian, Spanish, or Russian, or an introduction to Russian, as may be elected by the student. Sections will be instituted in those subjects for which a sufficient number of students register.

Eng 82. Engineering Report Writing. 1½ *credits.*

Prerequisite: English 12 *or* 12A. This course is described under Eng 41, above.

540. History of Industrial Civilization. 1 *credit, two semesters.*

This course is equivalent to Eng 60 or Eng 66.

541. English and American Literature. 3 *credits, two semesters.*

Prerequisite: Eng 12A, *or* 502.* This course is similar to Eng 21 and Eng 22.

Hist 21. Development of the Modern World. 2½ *credits.*

A study of the growth of political, economic, and cultural institutions and ideas from the late Middle Ages to the present day, with special attention paid to the significant features and events of each period.

Hist 22. Development of the Modern World. 2½ *credits.*

Prerequisite: Hu 25.* A continuation of Hist 21.

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* This prerequisite not offered after 1961-62.

THE HUMANITIES ELECTIVE PROGRAM

Broadly understood, the humanities might include any interests growing out of the sensitivities and capacities that lie in the nature of human beings. Traditionally, they include only those interests that involve not only knowledge and logic but non-tangible relationships, and interests that have been cultivated not for direct practical application but for the pleasure, the expressiveness, and the wisdom felt to be inherent in them. The most frequently developed of these interests are thought of as arts, literature, philosophy, and history.

While several courses are offered in each of these principal fields, all of them have certain broad purposes in common: to sharpen perceptiveness in a non-tangible area of interest and to increase the realization of how taste and discrimination are formed in such an area. From that, one can develop greater capacity to enjoy and to assimilate other things of a similar kind when they are later met, and greater confidence in one's own judgment.

The particular subject-matter of each course is to be thought of for its typicality as a humanistic interest, not for its absolute importance as a body of knowledge. No course offered in the first semester will be planned for a sequel in the same subject or field, and none in the second semester will be built on any preceding. A student may elect any course from any field in either semester.

Arts

Courses in Music and the Fine Arts are of two kinds: the general, usually termed Music or Art Appreciation, and the specific, intended for exploration of a particular group of works—works by one painter or composer, for instance, or from one period, or in a special medium. But the considerations applied in courses of both kinds are those fundamental to all art and to the medium under study. The purpose is to achieve a meaningful acquaintance with the arts through planned steps leading toward an understanding of basic elements and their use and toward a fuller knowledge of other significant aspects of the several arts. Lectures, recordings, visits to museums and galleries, and class participation in creative activity are aids to the methods used in these courses.

Arts 51. Appreciation of Music. 2½ *credits.*

The purpose of this course is to develop creative listening through perception and appreciation of the basic materials of melody, harmony, rhythm, dynamics, tonality, tone, color, form, style, texture, and design. The course is not concerned with the history of the art of music, but with the elements of its structure and content, and does not assume previous training in music.

Arts 52. STYLE AND MEDIUM IN MUSIC. 2½ *credits.*

Representative Music of the Main Eras of Western Music. The purpose of this course is to develop creative listening to carefully programmed representative forms, styles, and schools of all the main eras of the historical development of Western music down to and including the "New Music."

Arts 53. APPRECIATION OF VISUAL ARTS. 2½ *credits.*

Examples from historic and modern painting and sculpture, and from some actual design problems in class, illustrate visual fundamentals and the significance of the principal styles.

Arts 54. STYLE AND MEDIUM IN THE VISUAL ARTS. 2½ *credits.*

New Concepts in Architecture. Examples of Twentieth Century building are used to illustrate, on the one hand, the place in architecture of fundamentals in all visual arts, and, on the other hand, the relation between available materials and architectural expression. Buildings examined, from photographs or from visit to the site, include examples by Wright, Mies van der Rohe, Le Corbusier, Saarinen, Nervi, and many others.

HISTORY

From the earliest civilizations, engineering has evolved in interaction with the arts, the sciences, and the philosophies that comprise, in one sense, the cultural content of civilization. For engineers, the historical study of cultures should therefore have a practical meaning; but it also has a deeper meaning. It can develop the ability to perceive a general character in the varied activities of a civilization, and a desire to safeguard and advance the truly sensitive, creative, and civilized works of man over the centuries. Some of the courses offered deal with the more direct lines of American cultural heritage, the Classical, the British, and the American itself. At least one course deals with a culture or a cultural problem or a cultural institution that lies outside, or across, those traditional lines. All of the courses, however, involve the considerations which must be applied in assimilating any aspect of a civilization in historical perspective.

Hist 51. ASPECTS OF CLASSICAL CIVILIZATION. 2½ *credits.*

The Legacy of the Ancient World. A survey of the ancient world of men and their ways as it appears to great historians, writers, and artists. The aim is to provide a well-articulated framework within which the legacy of ancient Greece and Rome can be realized. Lectures, discussions, and assigned readings are supplemented by the use of visual aids.

Hist 52. ASPECTS OF BRITISH CIVILIZATION. 2½ *credits.*

English Roles in the Evolution of the Modern World. Taking crucial periods from the Scientific through the Industrial "Revolutions" (1660-1850), this course will present the richness and variety of English cultural activity by examining focal personalities and their significance: Newton, Locke, and Mill; Charles II and Victoria; Hogarth; Addison and Steele; Johnson and his circle; Lord Byron.

Hist 53. ASPECTS OF AMERICAN CIVILIZATION. 2½ *credits.*

Twentieth Century Political Economy in the United States. A study of politico-economic developments of the Twentieth Century as they have affected social change in the United States: The Square Deal, the New Freedom, the New Deal, the Fair Deal, and their consequences. Readings in materials contemporary with the events, and interpretative lectures and discussions.

Hist 54. INTRODUCTION TO MODERN RUSSIAN CIVILIZATION. 2½ *credits.*

The literary and philosophical works, social theories, and political movements which have shaped Tsarist and Soviet Russian society from the time of Pushkin and the Decembrists to the Five Year Plans of the 1930's.

LITERATURE

The courses in literature represent four frequent types of literary interest. Each can develop an important kind of insight into literature: the wide sharing, yet the individual expression, of ideas and attitudes in one literary era; the various effects possible among different masters of the same literary form; the relation between a writer's time and his treatment of a long-recurrent literary theme; the range and yet the underlying unity and distinction among many various works by one writer, and the union between a man and his style. In all courses, the development of insight will tend to come indirectly, while attention goes to the characters and other images, to the conflicts, and to the ways of taking life that the writings set forth.

Lit 51. A LITERARY ERA. 2½ *credits.*

Twentieth Century British and American Literature. An examination of some of the more provocative Twentieth Century British and American works in fiction, drama, and poetry. The student acquires critical criteria whereby he is able to distinguish between popular forms and literature.

Lit 52. A LITERARY FORM. 2½ *credits.*

Landmarks in Fiction. A substantial number of important novels and short stories, principally European, of the nineteenth and twentieth centuries, are read and carefully discussed. Critical papers will draw upon the student's understanding and appreciation of such writers as Stendhal, Flaubert, Dostoyevsky, Tolstoy, Joyce, Mann, Faulkner, Camus.

Lit 53. A LITERARY THEME. 2½ *credits.*

Heroes and Heroism in Western Civilization. A survey of representative myths and semi-historical writings, as well as fiction and drama, in which varying images of the hero appear, reflecting the concepts of heroism held by the culture which acclaimed the writing. The survey begins with the ancient Greek and Biblical periods and selects five others, including the modern.

Lit 54. THE PRINCIPAL WORK OF ONE WRITER. 2½ *credits.*

Shakespeare. The reading will include about ten plays from the histories, comedies, and tragedies, and some short poems, chosen to typify the various facets of this writer. There will be attention to Shakespeare's times and to the basis for his distinction among dramatists.

Philosophy

These courses look at the world of man through the eye of the philosopher. They seek to understand its nature by studying the concepts and systems of thought which explain it or have produced it; and they examine critically the claims of present-day thinkers who would state the important problems of our generation and would propose solutions. The readings are chosen from a wide field—from general philosophy, law, economics, politics, sociology, psychology, and religion—for they are intended to help the student examine ideas and formulate his own coherent statement of philosophy in the areas which are of the greatest concern to him.

Phil 51. Principles of Philosophy. 2½ *credits.*

An examination of problems of a social, ethical, aesthetic, religious, and scientific nature and a study of the related principles and methods of philosophy. Particular attention is given to the application of these principles in everyday living.

Phil 52. Representative Philosophers. 2½ *credits.*

A study of the ideals of important philosophers from the time of the Greeks to the present day. This course does not attempt a survey of philosophy but concentrates on the work of a few great thinkers so that the student may perceive at first hand how these men once accelerated intellectual progress and how their work may still contribute to the solution of modern problems.

Phil 53. The Evolution of Psychological Theories and Systems. 2½ *credits.*

This course traces the evolution of contemporary theoretical concepts in psychology from their historical origins in philosophy and the natural sciences. It stresses the relation between a theory and the general interests and beliefs of the cultural area in which it appears, with particular attention to the empirical tradition which gave rise to the dominant experimental psychology of the contemporary American scene.

Phil 54. The History of Economic Thought. 2½ *credits.*

The historical evolution of man's intellectual efforts to understand economic phenomena, and the effect of the particular cultural environments which influenced thought. Theories and schools thus considered include Mercantilist, Cameralist, Physiocrat, Classical, Historical, Austrian, Dissenter, and the present-day Keynesian.

DEPARTMENT OF INDUSTRIAL AND MANAGEMENT ENGINEERING

Chairman: OLIVER J. SIZELOVE.
Executive Associate: IRVING R. GOLDSTEIN.

Professors: JAFFE, RICH, SIZELOVE; *Associate Professors:* GOLDSTEIN, RIGASSIO; *Assistant Professors:* LA VERDA, MIHALSKY; *Instructors:* GORDAN, WOLF, ZIMMERMAN; *Assistant Instructor:* WIERZBICKI; *Special Instructing Staff:* PAULES; *Adjunct Instructing Staff:* BLOU, KOPF, MATAS, MCGLEW, ROTH.

The curriculums of the department meet the needs of industry for engineers who are not only competent in the areas of mathematics, the physical and engineering sciences, and engineering analysis and design, but who are equally well qualified to apply the fundamentals of these areas to the design, improvement, and installation of integrated systems of men, materials, and equipment. Individuals thus trained—Industrial Engineers—solve the problems that arise in the management of an enterprise and make these solutions available for administrative decision within the functional areas of research, design and development, manufacture, personnel, and distribution.

Currently, two curriculums, and a series of service courses in Economics, Law, Engineering Cost Analysis, and Industrial Management for the other four professional engineering departments, are in operation. The Engineering Management Option in the Mechanical Engineering curriculum, jointly administered by the Department of Mechanical Engineering and the Department of Industrial and Management Engineering, will terminate with the class of 1963 and will be replaced by the Bachelor of Science in Industrial Engineering curriculum, whose first graduates will be members of the class of 1964. Thus, both curriculums for the appropriate years appear in this catalog: the Engineering Management Option on page 69, and the new Industrial Engineering curriculum on pages 66-67. The IE program has not yet been introduced in the Evening Division.

The new modern laboratories of the Department include a Work Methods and Measurement Laboratory and adjacent Experimental Shops, an Accounting and Statistics Laboratory, and a Plant Design Laboratory. In addition, the facilities of the new NCE Computing Center will replace current use of off-campus electronic computers in applicable courses.

For early indoctrination in professional development, Day Division students in the department become affiliated with the NCE Student Chapters of the American Institute of Industrial Engineers (AIIE) and the Society for Advancement of Management (SAM). In addition to their local college meetings and plant visitations, the student members attend the meetings and conferences of the parent sponsoring chapters; the North Jersey Chapter of AIIE and the Northern New Jersey Chapter of SAM.

IE 23. ECONOMICS. 2½ *credits.*

This course is designed to combine the classical and contemporary approaches to economics and serves as a springboard for future study. It presents basic principles which form the groundwork for analysis and discussions of contemporary problems. The American economic system vs. communism, fascism, and socialism is also discussed.

IE 24. PRODUCTION PROCESS DESIGN. 3 *credits.*

Introduction to the design of manufacturing processes and producibility. Includes metals, non-ferrous, glass, plastic, rubber, ceramics, electronics, woodworking, and chemical processes, control and methods of measurement and application. Selection of the best and most economical process to meet design specifications is stressed. This course treats such subjects as: (1) Milling, shaping, grinding, honing, lapping, turning, drilling, hot-working and cold-working metals processing; (2) Glass and ceramic forming, etching and sealing; (3) Electronic cutting, drilling, welding; (4) Plastics moulding, extruding and vacuum forming; (5) Welding—spot, seam resistance, and butt; (6) Brazing and soldering; (7) Fasteners—rivets, staples, nuts and bolts, pins, sealing; (8) Casting—sand, die, investment, centrifugal; (9) Measurement and gauging; (10) Interchangeable manufacture. In addition to lecture and discussion of these processes, the student will observe them in the laboratory, by means of films, or by plant visitation.

IE 25. LOGIC AND THE SCIENTIFIC METHOD. 2 *credits.*

This course is designed as an introduction to the logical systems and methods currently used in decision making, experimentation, and symbolic reasoning in modern management principles and procedures. The basic concepts to be discussed are inductive and deductive logic, syllogistic reasoning, symbolism, logical operations, probability, measurement, statistical methods, experimentation, etc.

IE 26. INTRODUCTION TO INDUSTRIAL ENGINEERING. 3 *credits.*

Prerequisite: IE 23. A course which surveys the elements of Industrial Engineering in the industrial enterprise. The integration of the various techniques for organizing, operating and controlling an industrial enterprise is stressed. Topics treated include the background of scientific management, organization, plant location and layout, materials handling, production planning and control, standardization, quality control and methods of wage payment.

IE 33. METHODS AND FIXTURE DESIGN. 2 *credits.*

Prerequisites: IE 24, 26. A course stressing the principles of finding the best way to evaluate and improve industrial operation. Attention is given to the basic techniques of motion and time study. Topics treated include charting techniques for process and man-machine systems, micro-motion study, principles of motion economy, simultaneous motion chart, and film analysis. Assigned problems and projects stress both design and construction of improved procedures for doing work.

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* The courses prefixed by IE represent the offerings in the new curriculum. The courses prefixed by EM are offered in the Engineering Management Option. These courses will be discontinued by June, 1963. The courses prefixed by IndE are service courses now being offered by the Department to students in other professional departments.

IE 34. WORK MEASUREMENT. 2 *credits.*

Prerequisite: IE 33. The philosophy, principles and methods of work measurement, of both direct and indirect labor. Treated are stopwatch study, predetermined times, work sampling, and standard data as means of determining work standards. Specific application of standards to wage incentive plans is included.

IE 45. PLANT LAYOUT AND MATERIALS HANDLING. 2 *credits.*

Design of optimum groupings of fabricating and processing machinery, bulk and unit load moving equipment and service functions in mass production and job lot manufacturing. Use of flow charts, templates and models. Evaluation of change decisions by comparison with measures of efficiency. Planning and control for minimum disruption of continuous operation.

IE 47. ENGINEERING COST ANALYSIS. 3 *credits.*

This course is devoted to a study of the accounting cycle, worksheets, valuation, depreciation and depletion, development of financial statements, accounting for manufacturing, job order, process, and standard costs systems, and statement analysis.

IE 90. ENTERPRISE MANAGEMENT. 5½ *credits.*

Prerequisite: IE 23. A survey course for civil engineering students including sources of investment funds: organizational structure; administration of public projects; financing and evaluation of Civil Engineering projects; the legal aspects of contracts, agency, sales and bailment; and the operations management of private public works.

IE 92. ENTERPRISE MANAGEMENT. 3 *credits.*

Prerequisite: IE 23. A survey course for Mechanical Engineering students which includes sources of investment funds; organizational structure; product development and distribution; production management; estimating, collecting, analyzing and control of enterprise costs; and the legal aspects of contracts, agency, and patents. Emphasis is on the operational management problems with orientation to the overall planning, organization, and control of the enterprise.

EM 55A. SELECTION, SUPERVISION, AND CONTROL OF STAFF I. 4 *credits, two semesters.*

Prerequisite: 841. The elements of selection, supervision, and control are first considered individually and then collectively. Under selection, the techniques of interviewing, job description, job evaluation, methods of selection, and the follow-up of placement are considered. Under supervision, the modern techniques as they apply to the engineer-supervisor are stressed. The control aspect is stressed particularly in EM 56A.

EM 56. SELECTION, SUPERVISION, AND CONTROL OF STAFF II. 3 *credits, two semesters.*

Prerequisite: EM 55.* A continuation of the Junior course of the same title, stressing the control aspect by the application of the previous treatment to practical situations, through student reports presented in seminar.

EM 56A. SELECTION, SUPERVISION, AND CONTROL OF STAFF II. 4 *credits, two semesters.*

Prerequisite: EM 55A. This course is described under EM 56, above.

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* This prerequisite not offered after 1961-62.

EM 57. INDUSTRIAL RELATIONS LEGISLATION. 2 *credits.*

Prerequisite: EM 69,* *or* EM 69A. The course deals with the history of labor in this country, supplemented by a detailed description and analysis of existing labor legislation. It treats the history of management in this country as well as a complete analysis of both the restrictive and non-restrictive legislation affecting management. The problem of maintaining high productivity through capitalistic initiative with government restrictions and controls is discussed.

EM 58. INDUSTRIAL RELATIONS LEGISLATION SEMINAR. 4 *credits, two semesters.*

Prerequisite: EM 57.* In this course the theory and background material of Industrial Relations Legislation is applied to existing, specific management-labor-government problems. The facts of typical mangement-labor and management-government problems are placed before the student by men from business and industry who have encountered them. With his training as a background, the student will attempt solution. Discrepancies, if they exist, between the student's solution and the one found in industry will be thoroughly discussed.

EM 58A. INDUSTRIAL RELATIONS LEGISLATION SEMINAR. 4 *credits, two semesters.*

Prerequisite: EM 57. This course is described under EM 58, above.

EM 62A. ENGINEERING MANAGEMENT AND OPERATION. 1½ *credits.*

A survey course which considers the problems of the management of research, design and development, the management of production, and the management of distribution. The profit motive is used as the key to the integration of phases.

EM 64. MOTION AND TIME STUDY. 4 *credits, two semesters.*

Prerequisites: EM 62,* 67,* and EM 75 for Second Semester. The charting and micromotion techniques of the Gilbreths, project work including design and construction of improved methods. Stop watch techniques, element analysis, rating and leveling, practice studies of hand and machine operations, elemental times and standard data.

EM 64A. MOTION AND TIME STUDY. 5 *credits, two semesters.*

Prerequisites: EM 62A, 67; and EM 75A for Second Semester. This course is described under EM 64, above.

EM 65. PLANT VISITATION AND REPORTS. 1½ *credits.*

Prerequisites: EM 62,* 67,* First Semester of EM 68. The purpose of the course is two-fold: one, to give the student a general picture of the industries represented; and two, to give the student specific information. The latter is obtained through discussion with a delegated plant executive.

EM 67. ECONOMICS. 4 *credits, two semesters.*

Essentially this is a course in both pure and applied economics. Although it develops the theoretical principles of economics along classical lines, it also considers some more recent developments of economic theory. In addition, it pays considerable attention to contemporary economic problems of basic industries such as steel, chemical, textile, metal fabricating, etc.

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* This prerequisite not offered after 1961-62.

EM 68. MANAGEMENT OF PRODUCTION AND DISTRIBUTION. 4 *credits, two semesters.*

Prerequisites: EM 62,* 67,* *or* EM 62A, 67. The objective of this course is to present the modern techniques of progressive management in the fields of production and distribution. It includes plant location and layout, material handling, production planning and control, standardization, wage plans, traffic control, warehousing, sales, and marketing. The lecture-project method is utilized to demonstrate existing management techniques.

EM 69A. LAW. 2 *credits.*

This course is planned to acquaint the Management Engineering student with the basic principles of common and statutory law to be encountered during normal business relations and places special emphasis on legal cases and judicial decisions.

EM 71. ACCOUNTING AND COST ACCOUNTING. 4 *credits, two semesters.*

This course treats both general and cost accounting. It includes a study of the accounting cycle, basic books, worksheets, subsidiary ledgers, valuation, depreciation and depletion, development and analysis of financial statements, costing methods and classifications, material and inventory costs, overhead accumulations and distribution, job order, process, and standard cost systems, and budgets.

EM 71A. ACCOUNTING AND COST ACCOUNTING. 4½ *credits, two semesters.*

This course is described under EM 71, above.

EM 74. ENGINEERING ECONOMY. 2½ *credits.*

Prerequisite: EM 67.* "Hunch" decisions vs. decisions based upon costs, the time element in economy, capital recovery, prospective rate of returns, increment and sunk costs, replacement costs, depreciation, break-even and minimum-cost points, and cost estimating are the subjects covered.

EM 74A. ENGINEERING ECONOMY. 3 *credits.*

Prerequisite: EM 67. This course is described under EM 74, above.

EM 75. INDUSTRIAL STATISTICAL METHODS. 3 *credits.*

Prerequisite: Math 25. This course presents statistical methods together with their applications. The subjects treated include: selection, analysis, and interpretation of engineering and other data, charts, frequency distribution, central tendency, dispersion, skewness, curve fitting. Poisson distribution, significant differences, variance, correlation, and trend analysis. Special emphasis is placed on the application to industrial fields.

EM 75A. INDUSTRIAL STATISTICAL METHODS. 3 *credits, two semesters.*

Prerequisite; 630.* This course is described under EM 75, above.

IndE 21. INDUSTRIAL MANAGEMENT. 4 *credits, two semesters.*

Prerequisite: IndE 31. This course for Mechanical Engineering students presents some of the important techniques underlying modern management methods. It includes a study of plant layout and equipment, organization, production control, standardization, statistics and quality control. The second semester is devoted mainly to the techniques of motion and time study.

IndE 21A. INDUSTRIAL MANAGEMENT. 4 *credits.*

Prerequisite: IndE 31. This course is described under IndE 21, above.

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* This prerequisite not offered after 1961-62.

IndE 22. INDUSTRIAL MANAGEMENT. 3 *credits.*

Prerequisite: IndE 31. This course is for Electrical Engineering students. Its content is similar to that of IndE 21 except that motion and time study are covered in considerably less detail.

IndE 31. ECONOMICS. 3 *credits.*

This course is designed to combine the classical and contemporary approaches to economics and serves as a springboard for future study. It presents basic principles which form the groundwork for analysis and discussions of contemporary problems of economic life. The challenge to American capitalism is also discussed.

IndE 44. ENGINEERING COST ANALYSIS. 2 *credits.*

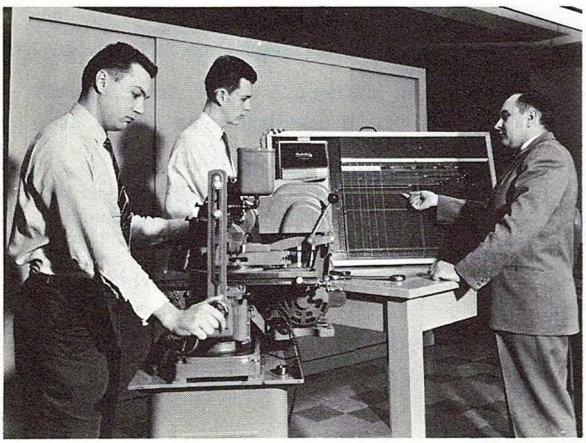
This course is designed for Electrical and Mechanical engineering students and combines engineering economics with accounting and cost principles.

IndE 51. BUSINESS LAW FOR ENGINEERS. 1 *credit.*

This course acquaints the engineering student with the basic philosophy and principles of common and statutory law as applied to the engineer in his business relations. It treats contracts, agency, sales, bailments, negotiable instruments, patents, copyrights and trademarks, master and servant, damages, evidence, and business criminal offenses.

840. ECONOMICS. 3 *credits.*

This course is designed to combine the classical and contemporary approaches to economics and serves as a springboard for future study. It presents basic principles which form the groundwork for analysis and discussions of contemporary problems. The American economic system vs. communism, fascism, and socialism is also discussed.



DEPARTMENT OF MATHEMATICS

Chairman: HENRY ZATZKIS.
Executive Associate: POMPEY MAINARDI.

Professors: BARKAN, FITHIAN, MAINARDI, VIRENE, ZATZKIS; *Adjunct Professor:* MOLINA; *Associate Professors:* FOSTER, KONOVE, KOREN, WASSON; *Assistant Professors:* BROWER, LIONE; *Instructor:* MARX; *Assistant Instructors;* DUNNINGER, FISCHER, LIEB, VAN MEERBEKE; *Adjunct Instructing Staff:* BALL, FEENEY, GODDERZ, GOUSS, LOUISELL, MEGIBOW, MOSKOWITZ, ROCHE, SCHLOSSER, TRACHTENBERG.

The principal aim of the various courses offered by this department is to impart a knowledge of mathematics which will be useful to students during their study of science and which will also be of use to them later, in actual engineering practice. In keeping with the trend for greater emphasis on the humanities in engineering education, other aspects of mathematics relative to philosophical and cultural values are considered whenever opportunities arise.

COURSES OF INSTRUCTION

Math 10. MATHEMATICS. 4 *credits.*

This course includes certain topics in college algebra and a unit on the algebra of mathematical systems. It is primarily a course in analytic geometry.

Math 10A. BASIC MATHEMATICS. 2½ *credits.*

This course covers the algebra of the first part of Math 10, described above, and some trigonometry.

Math 10B. ANALYTIC GEOMETRY. 2½ *credits.*

Prerequisite: Math 10A. This course covers the subject matter included in the second part of Math 10 described above.

Math 15. DIFFERENTIAL CALCULUS. 4 *credits.*

Prerequisite: Math 10. The theories and techniques of the differential calculus are developed in this course. Applications to both physical and geometrical problems are considered throughout.

Math 15A. CALCULUS I. 2½ *credits.*

Prerequisite: Math 10B *or* 612.* This course covers the subject matter included in the first part of Math 15, described above.

Math 15B. CALCULUS II. 2½ *credits.*

Prerequisite: Math 15A. This course covers the subject matter included in the second part of Math 15, described above, and the first part of Math 20, described below.

Math 20. INTEGRAL CALCULUS. 4 *credits.*

Prerequisite: Math 15. This is a course in integral calculus. Considerable emphasis is placed on physical applications of the theories and techniques in order to more fully develop the analytical power of the student.

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* This prerequisite not offered after 1961-62.

Math 25. INTERMEDIATE ANALYSIS. 4 *credits.*

Prerequisite: Math 20. This course consists of additional topics in calculus (multiple integrals, infinite series) and an introduction to differential equations through linear equations of first order. Fourier Series and hyperbolic functions are also introduced.

Math 25A. CALCULUS III. 3 *credits.*

Prerequisite: Math 15B *or* 622.* This course covers the subject matter included in the second part of Math 20 and the first part of Math 25, described above.

Math 25B. CALCULUS IV. 3 *credits.*

Prerequisite: Math 25A. This course covers the subject matter included in the second part of Math 25, described above.

Math 30. MATHEMATICS FOR ENGINEERS I. 2 *credits.*

Prerequisite: Math 25. This is a practical course in ordinary differential equations. Topics include equations of first and second order, linear equations with constant coefficients, systems of equations and solutions in series. It applies the methods developed to the solution of various engineering problems.

Math 33. THEORY OF PROBABILITY AND STATISTICS. 2½ *credits.*

Prerequisite: Math 25. This is an introductory course in probability and statistical theory. Topics included are basic theorems of probability, distribution theory, descriptive statistics, estimation of parameters, and statistical inference.

Math 34. APPLICATIONS OF PROBABILITY AND STATISTICS. 2½ *credits.*

Prerequisite: Math 33. This course specifically treats those problems in industrial engineering that are amenable to mathematical and/or statistical analysis. These include problems in statistical quality iontrol, inventory management, production planning, market analyses, consumer surveys, transportation, and allocation of resources.

Math 35. MATHEMATICS FOR ENGINEERS II. 2 *credits.*

Prerequisite: Math 25. This course includes the algebra and calculus of three-dimensional vectors; vector differential operators; line, surface, and volume integrals. Various applications from physics are considered with special attention being given to electrical and heat-flow problems.

Math 36. THEORY OF MEASUREMENTS. 1 *credit.*

Prerequisite: Math 25. A study of the reliability of results obtained from physical measurements, based on least squares and probability theory; curve fitting; empirical equations; interpolation by finite differences, and applications to specific problems from various technical fields.

642. DIFFERENTIAL EQUATIONS. 3 *credits.*

Prerequisite: 630.* This is a practical course in ordinary differential equations. It studies the usual equations of first and second order, linear equations with constant coefficients of any order, systems of equations and solutions in series and applies the methods developed to the solution of various engineering problems.

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* This prerequisite not offered after 1961-62.

DEPARTMENT OF MECHANICAL ENGINEERING

Chairman: GEORGE B. THOM.
Executive Associate: JEROME L. POLANER.
Assistant Executive Associate: EDWARD MILLER.

Professors: MILLER, POLANER, SMITHBERG, THOM; *Associate Professors:* BANNON, HSIEH, JACOBS, LEVY, MICHELS, PREDALE, SCHNEIDER, STAMPER; *Assistant Professor:* WILSON; *Instructors:* JAFFE, PEARCE, PREUSSE; *Assistant Instructors:* COYLE, DROUGHTON, SHEPHERD; *Special Instructing Staff:* R. MILLER; *Adjunct Instructing Staff:* ELIADES, GAAL, PASQUINE, POSS, WEISMAN, WILNER.

Mechanical Engineering is concerned with the design, development, manufacture and operation of a wide variety of machines and apparatus devoted to the creation, conversion or use of power.

Practicing mechanical engineers may perform one or more of the above functions in such technological areas as aircraft engines and structures, including gas and gasoline engines, rockets and missiles; large scale power plants such as steam, hydraulic, gas and nuclear plants; materials of engineering construction; automatic control systems; production methods; and in the creation, design and use of equipment to accomplish these ends.

For the first two years the curriculum centers on the basic sciences of mathematics, physics, chemistry and mechanics. Supplementing this core of science courses are service courses in English, engineering graphics, electricity, materials of engineering, an introduction to the humanities and a program of orientation toward engineering and the problems of engineers.

During the third and fourth years, major emphasis is directed toward the establishment of a thorough grounding in the sciences of thermodynamics, fluid mechanics and heat transfer; in metallurgy and the properties of engineering materials; and in stress and vibration analysis. These are implemented through a study of manufacturing processes and through application courses in the areas of machine design and applied thermodynamics. The courses are supplemented by laboratory work, where appropriate, to develop an understanding of and a respect for testing procedures. Courses in the humanities and in the business side of the profession are continued, and various terminal courses are provided to give the student an insight into the methods available for applying theory to practice.

The undergraduate curriculum is designed to prepare the student for professional work in his field of major interest. It does more than this, however, for by virtue of the abundance of training in the basic and engineering sciences it provides the student with the background needed for continued study at the graduate level.

The Department feels strongly that a professional attitude should be developed early in an engineering career and that

professional and honorary engineering societies provide substantial encouragement in its development. The Department has a student section of the American Society of Mechanical Engineers and a chapter of Pi Tau Sigma, the honorary mechanical engineering society. Students are encouraged to meet the requirements for membership in both organizations.

COURSES OF INSTRUCTION

ME 1. MECHANISMS. 3 *credits.*

Prerequisites 630,* 933,* 944. (Formerly ME 9.) This course is described under ME 31, below.

ME 10. MANUFACTURING PROCESSES. 2 *credits.*

A combined lecture and laboratory course covering such topics as small tools, cutting angles and forces, casting processes, welding, forging, stamping, gages, and jigs and fixtures. Theory is supplemented with practice and visits to nearby industrial plants.

ME 11. ELEMENTS OF MACHINE DESIGN I. 2½ *credits.*

Prerequisites: EG 2, Math 25, Phys 38.* A class and laboratory course designed to apply the elements of mechanisms and the properties of common engineering materials to the analysis and design of simple machine members, such as cams, gears, screw fastenings and riveted joints.

ME 11A. ELEMENTS OF MACHINE DESIGN I. 3 *credits.*

Prerequisites: 831,* 630,* Phys 38. This course is described under ME 11, above.

ME 12. ELEMENTS OF MACHINE DESIGN II. 2½ *credits.*

Prerequisite: ME 11. Continuation of ME 11 with emphasis on the design of belts, shafts, couplings, bearings and springs. Introduction to vibration and its isolation.

ME 12A. ELEMENTS OF MACHINE DESIGN II. 3 *credits.*

Prerequisite: ME 11A. Continuation of ME 11A. This course is described under ME 12, above.

ME 13. VIBRATION ANALYSIS. 3 *credits*

Prerequisites: Math 31* or 642, *and* Phys 22. The basic theory of systems with single and multiple degrees of freedom is developed and applied to the solution of pertinent problems. Damped vibrations and vibration isolation are investigated through the solution of appropriate problems.

ME 14. METALLURGY. 2½ *credits.*

Prerequisite: Chem 25. A course designed to acquaint the student with the nature of a metal and the characteristics of the various types of alloys. Plastic deformation, phase-change interruption, and precipitation-hardening are emphasized. These are illustrated by frequent reference to such common commercial metals as brass, steel and aluminum alloys.

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* This prerequisite not offered after 1961-62.

ME 15. METALLOGRAPHY. 1½ *credits.*

Prerequisite: ME 14. A laboratory course wherein the principles discussed in ME 14 are illustrated. Both ferrous and non-ferrous alloys are subjected to various physical and thermal treatments and the results studied by means of the microscope and other laboratory procedures.

ME 16. MACHINE DESIGN I. 3 *credits.*

Prerequisites: EG 2 or 831, *and* ME 1, Phys 38.* Principles of mechanics, strength of materials and mechanisms are applied to the design of machine elements such as riveted joints, keys, shafting, belts and wire rope drives. Fatigue and stress concentration are considered in some detail.

ME 17. MACHINE DESIGN II. 3 *credits.*

Prerequisite: ME 16. A continuation of ME 16 devoted to consideration of strength and wear of gear teeth, lubrication, bearings, springs, clutches, brakes and flywheels. Theory is correlated with practice through the use of design projects in the drawing room.

ME 17A. MACHINE DESIGN II. 3½ *credits.*

Prerequisite: ME 16. This course is described under ME 17, above.

ME 19. STRESS ANALYSIS. 2 *credits.*

Prerequisite: Phys 38.* A course designed to acquaint mechanical engineering students with the fundamentals of structural analysis. Consideration is given to such topics as moving loads, deflections, beams and columns, members and connections for both steel and reinforced concrete structures. Methods for graphical and analytical solution are developed.

ME 19A. STRESS ANALYSIS. 2½ *credits.*

Prerequisite: Phys 38.* This course is described under ME 19, above.

ME 20. METALLURGY. 2 *credits.*

Prerequisite: Chem 25, *or* 716.* This course is described under ME 14, above.

ME 22. METALLOGRAPHY. 1½ *credits.*

Prerequisite: ME 20. This course is described under ME 15, above.

ME 31. MECHANISMS 3 *credits.*

Prerequisites: Math 25, Phys 1, Mech 2. This course includes an extended treatment of velocity and acceleration; analysis of linkages; a kinematic study of gear teeth and gear trains; a detailed analysis of the motion of cams; and investigations of miscellaneous mechanisms. The recitations are supplemented by problem work.

ME 32. HEAT POWER. 2 *credits.*

Prerequisite: ME 29,* *or* 441. This course is described under ME 42, below.

ME 35. APPLIED HEAT POWER. 3½ *credits.*

Prerequisites: ME 32,* 70,* *or* ME 32, 442. A course for senior mechanical engineering students dealing with the principles of heat transfer as an engineering science. The subject matter includes steady and non steady state conduction in one and two dimensions, fundamentals of convection including boundary layer concepts, experimental correlations based on dimensional analysis, radiation and heat transfer during phase change. These are applied to the design and analysis of heat exchangers.

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* This prerequisite not offered after 1961-62.

ME 38. APPLIED HEAT POWER. 3 *credits.*

Prerequisites: ME 32,* 70,* *or* ME 32, 442. A course for senior mechanical engineering students that applies the principles of thermodynamics, fluid mechanics and heat transfer to the design and analysis of components of fluid handling and thermal equipment.

ME 41. THERMODYNAMICS I. 3 *credits.*

Prerequisites: Math 25, Phys 2. A course in thermodynamic fundamentals. Among those principles introduced are the first and second laws of thermodynamics, physical properties of pure substances including real and ideal gases, entropy and availability.

ME 42. THERMODYNAMICS II. 3 *credits.*

A continuation of ME 41 including a study of gas-vapor mixtures, combustion, thermodynamic aspects of fluid flow. The principles are applied to analyses of gas power cycle, vapor power cycles, refrigeration cycles and air conditioning systems.

ME 43. MECHANICAL LABORATORY I. 2 *credits.*

Prerequisite: ME 41. A course for mechanical engineering students in their junior year. The course provides fundamental instruction in mechanical engineering laboratory instrumentation and testing. The course emphasizes instrument study and calibration, fuel calorimetry, fluid flow measurements and engine studies.

ME 44. FLUID MECHANICS. 2½ *credits.*

Prerequisite. ME 41. A course for mechanical engineering students in the fundamentals of fluid mechanics treating the principles of fluid statics, one dimensional incompressible flow, dimensional analysis, dynamic similarity, laminar and turbulent flow, and an introduction to two dimensional flow of an ideal fluid.

ME 49. HEAT POWER LABORATORY. 2 *credits.*

Prerequisite: ME 29,* *or* 441. This course is described under ME 43, above.

ME 51. MECHANICAL LABORATORY I. 2½ *credits.*

Prerequisites: ME 32,* 49.* A laboratory course for senior mechanical engineering students, applying the principles of thermodynamics and fluid mechanics to the testing of power plant equipment. Tests are conducted on boilers, pumps, steam engines, condensers and steam and hydraulic turbines. Heat transfer and fluid flow phenomena are investigated.

ME 51A. MECHANICAL LABORATORY I. 3 *credits.*

Prerequisites: ME 32, 49. This course is described under ME 51, above.

ME 52. MECHANICAL LABORATORY II. 2½ *credits.*

Prerequisites: ME 32,* 49.* A laboratory course for senior mechanical engineering students applying the principles of thermodynamics and fluid mechanics to the testing of fuels and lubricants, gasoline and diesel engines and refrigeration and air conditioning equipment. Compressible fluid flow is studied by means of fans, blowers and a model wind tunnel.

ME 52A. MECHANICAL LABORATORY II. 3 *credits.*

Prerequisites: ME 32, 49. This course is described under ME 52, above.

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* This prerequisite not offered after 1961-62.

ME 57. MECHANICAL ENGINEERING. 2 *credits.*

Prerequisite: Phys 60. Lectures, discussion, and problems in applied thermodynamics and heat engines for students not majoring in mechanical engineering. The course covers the study of fuels, combustion, boilers, feedwater, heat transfer, steam engines and turbines, pumps, internal combustion engines, air compressors, and refrigeration.

ME 58. MECHANICAL AND HYDRAULIC LABORATORY. 1½ *credits.*

Prerequisite: Phys 60. A laboratory course covering tests on steam engines and turbines, gasoline and diesel engines, pumps and other hydraulic machinery and equipment; and experimental work in fuel calorimetry, exhaust gas analysis, and the flow characteristics of conduits and hydraulic measuring devices carrying liquids of varying degrees of viscosity.

ME 59. FUEL AND INSTRUMENT LABORATORY. 1½ *credits.*

Prerequisite: Junior Year Standing in Chemical Engineering. Experimental studies of fuels and oils; physical testing of liquid and solid fuels; combustion and lubricating studies. Study and calibration of instruments and their proper uses in experimental analysis.

ME 61. MECHANICAL ENGINEERING LABORATORY. 1½ *credits.*

Prerequisite: Phys 60. This course in heat power engineering laboratory is for students in electrical engineering. The experimental work in the laboratory includes tests on steam engines and turbines; gasoline and diesel engines; pumps and hydraulic equipment; fuel calorimetry and exhaust gas analysis.

ME 71. THERMODYNAMIC PRINCIPLES I. 2½ *credits.*

Prerequisites: Math 25, Phys 2. A course for civil and industrial engineering students in the fundamentals of thermodynamics, the first and second laws of thermodynamics, properties of pure substances, tables of properties, availability and reversibility are studied.

ME 72. INTRODUCTION TO ENGINEERING THERMODYNAMICS I. 2 *credits.*

Prerequisites: Math 25, Phys 2. A course for electrical engineering students in the fundamentals of thermodynamics. Subject matter includes the first and second laws, properties of pure substances and power cycle analysis. The theoretical aspects are rigorously developed and engineering applications are introduced to illustrate and evaluate the theory.

ME 73. THERMODYNAMIC PRINCIPLES II. 2 *credits.*

Prerequisite: ME 71. A continuation of ME 71, for civil and industrial engineering students. The principles of thermodynamics are applied to combustion processes, air conditioning, gas power and vapor power cycles and compression processes. The fundamentals of heat transfer are introduced.

ME 78. INTRODUCTION TO ENGINEERING THERMODYNAMICS II. 2 *credits.*

Prerequisite: ME 72. A continuation of ME 72. The subject matter includes an introduction to fluid mechanics with fluids in static equilibrium, energy, continuity, Bernouilli's equation, momentum equations, heat transfer including conduction, convection and radiation and an introduction to direct energy conversion devices.

441. THERMODYNAMICS. 2½ *credits.*

Prerequisites: 630,* 933.* This course is described under ME 41, above.

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* This prerequisite not offered after 1961-62.

442. Fluid Mechanics. 2½ *credits.*

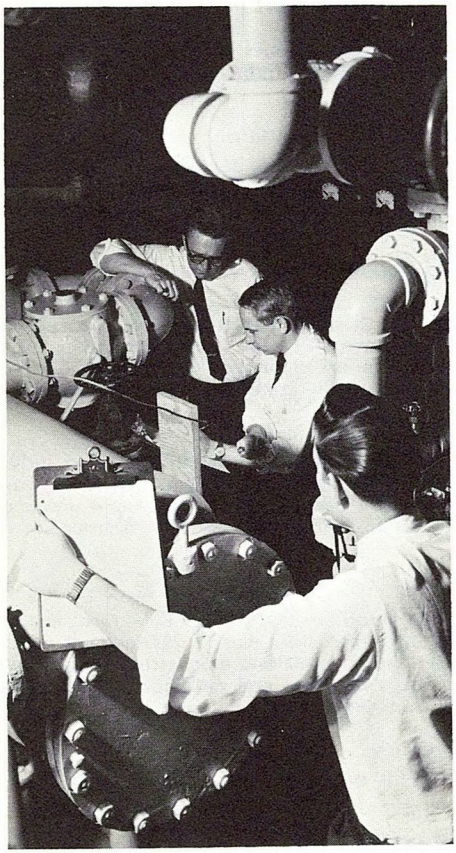
Prerequisite: 441. This course is described under ME 44, above.

443. Machine Tool Laboratory. 1½ *credits.*

This course is described under ME 10, above.

445. Machine Tools and Laboratory. 2 *credits.*

A lecture and laboratory course, supplemented with visits to nearby industrial plants, designed to furnish a general background in metal shaping and finishing; the theory of power-driven machine tools, and the principles underlying machine shop measuring instruments, feeds, speeds, tolerances and classes of fits.



DEPARTMENT OF PHYSICS AND MECHANICS

Chairman: PAUL O. HOFFMANN.
Executive Associates: ACHILLE CAPECELATRO, PAUL E. NIELSEN.
Assistant Executive Associates: CHARLES H. DUURSEMA, GEORGE L. WILLIAMS.

Professors: BERTSCH, CAPECELATRO, HOFFMANN, M. MAINARDI, NIELSON, ORENS, RAMBERG, SMITH; *Associate Professors:* DUURSEMA, MONACK, REFF, SAGURTON, WELLER, WILLIAMS; *Assistant Professors:* GRANIK, KINGERY, KUHARETZ, LOVERIDGE, SALZARULO, TOWFIK; *Instructors:* CIESLA, CLEMENTS, LANDSMAN, REIZISS, SHUKUR, TAYLOR, WITTES; *Assistant Instructors;* GIORDANO, MCGURN, SAVIN; *Special Instructing Staff:* SCHWEIZER; *Adjunct Instructing Staff:* BAZAZ, DE BUSKE, DI LORENZO, DOOLIN, GERHARD, GROSSMAN, MESSINA, NATAPOFF, OBERDING, REINMAN, RYCHARSKI, VERNER, WEI, E. WILLIAMS, ZUSMAN.

The Department of Physics and Mechanics has arranged the content of its courses to give the engineering student a sound background in physics and engineering mechanics. It is the aim of the department to have the student realize that physics and engineering mechanics serves as the foundation upon which his engineering knowledge must be based. Emphasis is placed upon the fact that the fundamental principles of those sciences must be applied in later professional studies.

The schedule of instruction includes a rather small amount of formal lecturing with a large number of informal recitations, problem work and demonstration periods, together with laboratory work in General Physics and Strength of Materials. The Department of Physics and Mechanics is supplied with four General Physics laboratories completely equipped to enable the student to perform experiments in mechanics, electricity, heat, sound and light. The Strength of Materials laboratories have equipment approximating industrial laboratories, and the performance of experiments is carried out in such manner as to verify the theory studied in the classroom.

COURSES OF INSTRUCTION

Mech 1. MECHANICS I. 2 *credits.*

Prerequisites: Phys 1, Math 20 (or concurrently). Mech 1 is devoted entirely to statics. Topics included in this course are vector composition, two and three dimensional resolution of force systems, moment of a force, couples, force and a couple, resultant of force systems, equilibrium, friction, moments of inertia of areas and of masses, engineering application of statics, and flexible cables. The emphasis in this course is on engineering mechanics in which a maximum use is made of the free body diagram approach. Emphasis is placed on an understanding of the principles employed in the solution of problems.

Mech 2. MECHANICS II. 2 *credits.*

Prerequisites: Mech 1, Math 25 (or concurrently). Mech 2 covers kinematics and kinetics. The topics of instruction are rectilinear and angular motion, curvilinear motion, motion of rigid bodies including relative motion, Newton's laws of motion for particles, plane motion of rigid bodies subjected to unbalanced forces, principles of work and energy, and principles of impulse and momentum. The student is made aware of the fact that rest (statics) is only a special case of motion. The free body diagram approach is used in kinetics, and elementary vector analysis methods are introduced and employed.

Mech 3. STRENGTH OF MATERIALS (RECITATION). 2½ *credits.*

Prerequisites: Mech 1, Math 25. A study of the stress and strain analysis of some of the elements of which structures and mechanical devices are composed such as flexural, torsional, and axial members. Sufficient study of properties of materials and of design problems is included to enable the student to apply the theoretical study to practical problems.

Mech 4. STRENGTH OF MATERIALS (LABORATORY). 1½ *credits.*

Prerequisite: Mech 3 (or concurrently), *or* Phys 37 (or concurrently). A series of experiments and problems designed to investigate the properties of materials and to verify the theory of stress and strain analysis.

Mech 5. STRENGTH OF MATERIALS (RECITATION AND LABORATORY). 4 *credits.*

Prerequisite: Mech 2. This course is similar to Mech 3 and Mech 4 combined, but includes some more advanced theoretical topics and fewer laboratory experiments.

Phys 1. PHYSICS I. 3½ *credits.*

This course deals with the study of elementary mechanics. Emphasis is placed on the fundamental concepts and laws of mechanics, especially the conservation laws. Topics discussed are: scalar and vector quantities of mechanics; rectilinear, circular and simple harmonic motion; equilibrium and Newton's laws of motion; work, energy, momentum, and the conservation laws. Correlated experiments and computations run concurrently with lectures and recitations.

Phys 2. PHYSICS II. 3½ *credits.*

Elements of heat, sound, and light form the contents of this course. The concept of wave motion and the transfer of energy by means of wave motion is emphasized. The First Law of Thermodynamics serves as a further example of the conservation laws. In the study of light the principles of geometric optics are applied to lenses and optical instruments. Correlated experiments and computations run concurrently with lectures and recitations.

Phys 3. PHYSICS III. 3½ *credits.*

Prerequisites: Phys 1, 2. Electricity and magnetism are presented from the point of view of the field concept and the conservation laws. The study of the electric field and the magnetic field culminates in the important relationships between electric and magnetic concepts which can be used in later courses as foundations upon which Maxwell's equations can be built. The laws of conservation of charge, mass and energy are used throughout the course, particularly in the study of capacitors, direct currents and alternating currents. Correlated experiments and computations run concurrently with lectures and recitations.

Phys 4. PHYSICS IV. 3½ *credits.*

Prerequisites: Phys 1, 2. The ideas of Modern Physics are taken up in this course. The wave and particle duality of nature is emphasized and made plausible by an examination of the important experiments and theories which lead to the modern concepts of matter and radiation. The conservation laws are now broadened to include the law of equivalence of mass and energy. Elements of solid state and nuclear physics are introduced. Correlated experiments and computations run concurrently with lectures and recitations.

Phys 5. ELECTRONIC PHYSICS. 2 *credits.*

Prerequisites: Phys 3, 4. In this course the fundamental physical laws which determine the behavior of the electron in a vacuum, in a gaseous material and in solids are examined and applied to problems of interest

to the electrical engineer. This involves the study of atomic structure, the elements of quantum mechanics, semiconductors, junction effects, photoelectric phenomena and gaseous conduction. These concepts are applied to vacuum and gas electron tubes, photoelectric devices and transistors.

Phys 22. KINEMATICS AND KINETICS. 3 *credits, two semesters.*

Prerequisites: Mech 1, Math 25 *or* 630,* 943 or 944. Kinematics: linear and angular displacement, velocity, and accelerations; rectilinear and curvilinear motion: relative motion; motion of rigid bodies; instantaneous center. Kinetics: Newton's laws; motion of mass-center; translation, rotations and plane motion of a rigid body; work, power, energy; impulse and momentum with applications to special types of motion of rigid bodies.

Phys 24. KINEMATICS AND KINETICS. 3 *credits.*

Prerequisites: Mech 1, Math 25, *or* 630,* 943 or 944. The content of this course for Electrical Engineering students is similar to that of Phys 22, except that vector analysis methods are also used.

Phys 37. STRENGTH OF MATERIALS (RECITATION). 3 *credits.*

Prerequisites: Mech 1, Math 25 *or* 630,* 943 or 944. A study of the stress and strain analysis of some of the elements of which machines and structures are composed, such as shafts, beams and tension and compression members. Sufficient study of properties of materials and of design problems is included to enable the student to apply the theoretical study to practical problems.

Phys 60. THERMODYNAMICS. 2 *credits.*

Prerequisites: Math 25, Phys 2, 4 *or* 630,* 933.* A Junior Course for electrical and civil engineering students. The thermodynamic theory of gases and vapors is studied. The subject matter includes the theory and application of the first and second laws of thermodynamics, properties of gases and vapors, energy changes during expansions and compressions, the conversion of heat into work, and the general theory of fluid flow.

Phys 71. ENGINEERING PHYSICS. 2½ *credits.*

Prerequisites; Phys 37, Math 104.* The first half of the course takes up the concept of a field as applied to elastic media, fluid media and heat flow. The general principles of fluid dynamics will be examined together with the solution of La Place's equation. The second half of the course begins with an introduction to neutron physics and its applications to nuclear reactor design. This is followed by a discussion of the water boiler reactor, reactor startup, and radiation hazards and shielding.

943. STATICS. 3 *credits, two semesters.*

Prerequisite: Phys 1. The course is designed to provide the prospective engineer with a thorough training in the fundamentals of statics, which form an indispensable background for the study of engineering subjects of a more specialized character. The principal topics covered in this course are: composition and resolution of forces and couples; equilibrium equations; analysis of simple frameworks; flexible cables; the laws of friction with general applications; virtual work and virtual displacement; stability; center of gravity and moment of inertia of masses and areas.

944. STATICS. 3 *credits.*

Prerequisite: Phys 1. This course is described under 943, above.

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* This prerequisite not offered after 1961-62.

946. ELECTRICITY. 4 *credits.*

Prerequisites: 630,* Phys 3. An introduction to the direct current principles of electrical energy and power. Practical units and networks are first considered, followed by a treatment of the magnetic effects of such currents. Field theory and a brief discussion of transients. Impedance and admittance with their components, as found in series, parallel, and series-parallel circuits, having resistance, inductance or capacitance, or any combination thereof, are treated extensively, using analytical and graphical methods. The computation of power in single- and multi-phase circuits receives appropriate consideration.

947. ELECTRICITY. 2 *credits.*

Prerequisite: Phys 3. This is an introduction to the direct current principles of electrical energy and power. Practical units and networks are first considered, followed by a treatment of the magnetic effects of such currents. Field theory and a brief discussion of transients complete this one semester course of lectures (with demonstrations), class recitations, and computations.

948. ELECTRICITY. 2 *credits.*

Prerequisites: 630,* 947. Impedance and admittance with their components, as found in series, parallel, and series-parallel circuits, having resistance, inductance or capacitance, or any combination thereof, are treated extensively, using analytical and graphical methods. The computation of power in single-and multi-phase circuits receives appropriate consideration.

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* This prerequisite not offered after 1961-62.

DEPARTMENT OF PROFESSIONAL DEVELOPMENT AND INDUSTRIAL RELATIONS

Chairman: ROBERT E. KIEHL.
Acting Executive Associate: JOHN H. METZLER.

Professors: CAMBRELENG, KIEHL, STEPHANS; *Associate Professor:* LUBIN; *Assistant Professors:* LORD, METZLER, STOCHAJ, ZIMMER; *Instructor:* GILROY; *Special Instructing Staff:* BEDROSIAN, CHAPLEAU, MALONE, MINNIS, NOYES; *Adjunct Instructing Staff:* BEVERLEY, MCKOWN, MENK, YAROSZ.

The guiding philosophy of the Department of Professional Development and Industrial Relations, derived from the stated aims and objectives of the College, is based on a recognition that the student must understand himself as a maturing individual if he is to take his place in the community as a genuinely educated man.

To assist in the achievement of this important goal, the courses are planned to provide a broad foundation upon which to build an understanding, not only of the relationship of the individual to other individuals, which is the province of human relations, but also an appreciation of the complex industrial world. With this knowledge, the scientific annd mathematical proficiency of the engineer will be complemented by insights important to leadership and success.

The Department of Professional Development and Industrial Relations is associated with the Placement Office and the Counseling Center in assisting students with career choices and placement.

COURSES OF INSTRUCTION

IR 21. PSYCHOLOGY. ½ *credit.*

Success in engineering depends on the early recognition that preparation for a profession involves many disciplines. This course, therefore, deals with personal adjustment as a basic concept in professional development. Areas of exploration include effective study habits, principles of learning, personality development, mental health, and the development of personal values as a basis for a life philosophy. Emphasis is given to those other disciplines inherent to a mature concept of the study of engineering as an educational process. Stress is given to the philosophy of the College, engineering methodology, as well as technical, professional, and social conduct.

IR 22. PREFACE TO THE ENGINEERING PROFESSION. ½ *credit.*

The fundamental disciplines intrinsic to the engineering profession are expanded to include the responsibilities of professional life. The role of engineering in society, both past and present, is considered and emphasis is placed on the development of professional consciousness, social and economic responsibilities, and the philosophy of the profession. Within this societal framework the branches and functions of engineering are explored for the purpose of assisting students in the choice of a professional department.

IR 23. ELEMENTS OF INDUSTRIAL GROWTH. 1 *credit.*

A comprehensive survey of the growth of Industry in the United States. Consideration is given to the social, economic, cultural and political forces which helped shape America. There is an examination of the problems encountered by management and labor in a growing and expanding U.S.A. Emphasis is on the relation of the individual to other individuals and the role of the engineer in an industrial society.

IR 24. ELEMENTS OF INDUSTRIAL GROWTH. 1 *credit.*

Prerequisite: IR 23. A continuation of IR 23.

IR 25. PERSONNEL RELATIONS. 1½ *credits.*

Prerequisite: IR 24. In this course the student considers the basic needs of the individual employee and the ways in which modern industry satisfies these needs in on-the-job relationships. The informal methods of the smaller firms and the systematic plans in personnel management in firms of the size that employs most of today's engineering graduates are considered. Students are given the opportunity to organize and lead discussions and conferences on the many employer-employee relationships that are studied.

IR 26. PERSONNEL RELATIONS. 1½ *credits.*

Prerequisite: IR 25. A continuation of IR 25.

IR 31. PSYCHOLOGY OF PERSONAL ADJUSTMENT. 1 *credit.*

This course combines the material of IR 21 and IR 22. For students enrolled in AFROTC.

IR 34. ELEMENTS OF INDUSTRIAL GROWTH. 2 *credits.*

A comprehensive survey of the growth of industry in the United States. Consideration is given to the social, economic, cultural and political forces which helped shape America. There is an examination of the problems encountered by management and labor in a growing and expanding U. S. A. Emphasis is on the relation of the individual to other individuals and the role of the engineer in an industrial society.

PR 12A. PRINCIPLES OF ENGINEERING (INDUSTRY). 2 *credits.*

A comprehensive survey of the growth of industry in the United States. Consideration is given to the social, economic, cultural and political forces which helped shape America. There is an examination of the problems encountered by management and labor in a growing and expanding U.S.A. Emphasis is on the relation of the individual to other individuals and the role of the engineer in an industrial society.

PR 13. STAFF CONTROL AND PERSONNEL PROBLEMS. 3 *credits.*

Prerequisites: 841, PR 12.* This is a series of conferences and lectures designed to explore those phases of personnel management which are likely to be part of the engineer's responsibility. The leadership of the conferences is assumed by the students under faculty guidance. The broad area of manpower management is investigated and particular attention is given to the area of personnel recruitment, selection, placement, and related techniques, personnel services, training, rating, financial and nonfinancial incentives, and working conditions. The study of these areas is directed toward the problem of employee morale.

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* This prerequisite not offered after 1961-62.

PR 14. STAFF CONTROL AND EXECUTIVE PROBLEMS. 3 *credits, two semesters.*

Prerequisite: PR 13. The conference method and lectures are continued during the Senior year. Labor-management relations will be explored and specific attention will be given to the organization and policies of unions, collective bargaining, employers' associations, the settlement of disputes, and the social control of activities through appropriate legislative acts. Executive problems in the development and control of staff will be reflected in this work. Further emphasis on these group relationships will be considered in the study of the effects of technology on society and the engineer's responsibilities in the community.

PR 15. PSYCHOLOGY. 1½ *credits.*

This course is designed to assist the engineer as a professional man to acquire insight with regard to human behavior. Through lectures and discussions an analysis is made of the dynamics of adjustment. In view of the leadership and responsibilities of the engineer today, consideration is given to basic human needs, adjustment to complex situations, evaluation of personality, and mental health.

PR 16. SOCIOLOGY. 1½ *credits.*

The impact of technological change on society has been such as to warrant the attention of the engineer. In order to be meaningful, a study of the forces within society in general, and the relationships of industrial groups in particular, is undertaken. A study of the forces operating in society is the primary objective of the course.

PR 17. PRINCIPLES OF PHILOSOPHY. 1½ *credits.*

An examination of problems of a social, ethical, political, aesthetic, and scientific nature and a study of the related principles and methods of philosophy, with emphasis on logic. Particular attention is given to the practical application of these principles in everyday living.

PR 18. REPRESENTATIVE PHILOSOPHERS. 1½ *credits.*

A study of the ideals of important philosophers from the time of the Greeks to the present day. This course does not attempt a survey of philosophy but concentrates on the work of a few great thinkers so that the student may perceive at first hand how these men once accelerated intellectual progress and how their work may still contribute to the solution of modern problems.

PR 19. STAFF CONTROL (PERSONNEL AND LABOR RELATIONS PROBLEMS). 3 *credits, two semesters.*

Prepared especially for the ROTC student, this course includes topics on personnel relations such as interviewing, testing, wage administration, and personnel operating problems. This is followed by a study of the union organization, an analysis of collective bargaining, the legislation affecting labor-management relations and the effects of technological change on society.

841. PRINCIPLES OF ENGINEERING. 2 *credits.*

This course is described under PR 12A, above.

DIVISION OF HEALTH, PHYSICAL EDUCATION AND ATHLETICS

Director: ROBERT F. SWANSON.
Associate Professor: SWANSON; *Assistant Professors:* HAUSSER, SIMON.

The acquisition and maintenance of student health for the purpose of pursuing an engineering education is the primary purpose of physical education and athletics at the College. To accomplish this purpose, the Division marshals the available resources of the community, conducts a formal instruction program for freshman students, and coordinates and advises students in the operation of various intramural and intercollegiate athletic activities.

PHYSICAL EDUCATION. *No credit, two semesters.*

Physical Education is required of all freshman students. Those freshmen who submit evidence of a disability, or who have been examined by the College physician and declared physically unable to participate in strenuous physical activity, take part in an individualized program under the guidance of a physical education instructor.

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