DEGREES

The Georgia Institute of Technology at present offers curricula leading to the following degrees which are shown in the order of the establishment of the school in which the work is given:

**Undergraduate Degrees**

Bachelor of Mechanical Engineering  
Bachelor of Electrical Engineering  
Bachelor of Civil Engineering  
Bachelor of Textile Engineering  
*Bachelor of Science in Textile Chemistry*  
Bachelor of Science in Textiles  
Bachelor of Chemical Engineering  
Bachelor of Science in Chemistry  
*Bachelor of Architecture*  
Bachelor of Ceramic Engineering  
Bachelor of Aerospace Engineering  
Bachelor of Science in Industrial Management  
Bachelor of Science in Physics  
Bachelor of Industrial Engineering  
Bachelor of Science in Applied Mathematics  
*Bachelor of Science in Building Construction*  
*Bachelor of Science in Industrial Design*  
Bachelor of Science in Engineering Mechanics  
Bachelor of Science in Applied Psychology  
Bachelor of Science in Applied Biology

To graduates who have completed their courses under the Cooperative Plan, the degree is awarded with the designation “Cooperative Plan.”

**Graduate Degrees**

The degree of Master of Science (with or without designation) is offered in all fields shown above (with the exception of those marked*) and also in:

Geophysical Sciences  
Information Science  
Metallurgy  
Nuclear Engineering  
Nuclear Science  
Public Health  
Public Health Engineering  
Safety Engineering  
Sanitary Engineering

Also offered are the degrees:  
Master of Architecture  
Master of City Planning

The degree of Doctor of Philosophy is offered in:

Aerospace Engineering  
Chemical Engineering  
Chemistry  
Civil Engineering  
Electrical Engineering  
Engineering Mechanics  
Industrial Engineering  
Mathematics  
Mechanical Engineering  
Nuclear Engineering  
Physics  
Sanitary Engineering
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**CALCULATION 1968-69**

**Summer Quarter 1968**
- **June 21** New students report for orientation.
- **June 24** Registration.
- **June 25** Classes begin.
- **June 26** Late registration fees apply.
- **June 28** Last day for registration. Last day for adding a subject.
- **July 1** Last day for payment of tuition and fees.
- **July 4** Holiday.
- **July 15** Last day for dropping a subject without penalty.
- **Aug. 2** End of deficiency report period.
- **Sept. 6** End of term.
- **June 9** Summer Surveying Course, first session starts.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tr>
<td>July 6</td>
<td>Summer Surveying Course, first session ends.</td>
</tr>
<tr>
<td>July 7</td>
<td>Summer Surveying Course, second session starts.</td>
</tr>
<tr>
<td>Aug. 3</td>
<td>Summer Surveying Course, second session ends.</td>
</tr>
</tbody>
</table>

**Fall Quarter 1968**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Sept. 16</td>
<td>All entering freshmen report for orientation.</td>
</tr>
<tr>
<td>Sept. 19</td>
<td>Transfer students report for schedule conferences.</td>
</tr>
<tr>
<td>Sept. 23</td>
<td>Registration.</td>
</tr>
<tr>
<td>Sept. 24</td>
<td>Classes begin.</td>
</tr>
<tr>
<td>Sept. 25</td>
<td>Late registration fees apply.</td>
</tr>
<tr>
<td>Sept. 27</td>
<td>Last day for registration. Last day for adding a subject.</td>
</tr>
<tr>
<td>Sept. 30</td>
<td>Last day for payment of tuition and fees.</td>
</tr>
<tr>
<td>Oct. 14</td>
<td>Last day for dropping a subject without penalty.</td>
</tr>
<tr>
<td>Nov. 1</td>
<td>End of deficiency report period.</td>
</tr>
<tr>
<td>Nov. 28-</td>
<td></td>
</tr>
<tr>
<td>Dec. 1</td>
<td>Thanksgiving recess.</td>
</tr>
<tr>
<td>Dec. 13</td>
<td>End of term.</td>
</tr>
<tr>
<td>Dec. 14-</td>
<td></td>
</tr>
<tr>
<td>Jan. 5</td>
<td>Christmas recess.</td>
</tr>
</tbody>
</table>

**Winter Quarter 1969**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 6</td>
<td>Registration.</td>
</tr>
<tr>
<td>Jan. 7</td>
<td>Classes begin.</td>
</tr>
<tr>
<td>Jan. 8</td>
<td>Late registration fees apply.</td>
</tr>
<tr>
<td>Jan. 10</td>
<td>Last day for registration. Last day for adding a subject.</td>
</tr>
<tr>
<td>Jan. 13</td>
<td>Last day for payment of tuition and fees.</td>
</tr>
<tr>
<td>Jan. 27</td>
<td>Last day for dropping a subject without penalty.</td>
</tr>
<tr>
<td>Feb. 14</td>
<td>End of deficiency report period.</td>
</tr>
<tr>
<td>Mar. 21</td>
<td>End of term.</td>
</tr>
<tr>
<td>Mar. 22-30</td>
<td>Spring recess.</td>
</tr>
</tbody>
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**Spring Quarter 1969**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 31</td>
<td>Registration.</td>
</tr>
<tr>
<td>Apr. 1</td>
<td>Classes begin.</td>
</tr>
<tr>
<td>Apr. 2</td>
<td>Late registration fees apply.</td>
</tr>
<tr>
<td>Apr. 4</td>
<td>Last day for registration. Last day for adding a subject.</td>
</tr>
<tr>
<td>Apr. 7</td>
<td>Last day for payment of tuition and fees.</td>
</tr>
<tr>
<td>Apr. 21</td>
<td>Last day for dropping a subject without penalty.</td>
</tr>
<tr>
<td>May 9</td>
<td>End of deficiency report period.</td>
</tr>
<tr>
<td>June 13</td>
<td>End of term.</td>
</tr>
<tr>
<td>June 14</td>
<td>Commencement.</td>
</tr>
</tbody>
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**Summer Quarter 1969**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>June 30</td>
<td>Registration.</td>
</tr>
<tr>
<td>July 1</td>
<td>Classes begin.</td>
</tr>
<tr>
<td>Sept. 12</td>
<td>End of term.</td>
</tr>
<tr>
<td>June 15</td>
<td>Summer Surveying Course, first session starts.</td>
</tr>
<tr>
<td>July 12</td>
<td>Summer Surveying Course, first session ends.</td>
</tr>
<tr>
<td>July 13</td>
<td>Summer Surveying Course, second session starts.</td>
</tr>
<tr>
<td>Aug. 9</td>
<td>Summer Surveying Course, second session ends.</td>
</tr>
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THE UNIVERSITY SYSTEM OF GEORGIA

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   (Jan. 8, 1968-Jan. 1, 1975)
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   (Feb. 5, 1965-Jan. 1, 1971)
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*Deceased, June 30, 1967.
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MRS. J. HENLEY CROSLAND, Certificate in Library Science, Director

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RICHARD WIEGAND, Ph.D., Director of Continuing Education  
DALLAS B. COX, B.S., Director of Industrial Education

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Southern Technical Institute  
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PEGGY PROFFITT, Senior Secretary • T. H. EDWARDS, Office Manager, Auxiliary Services • ELMO PRATER, Manager, College Inn • FRANK B. WILSON, B.S., Manager, Book Store • A. M. BARBER, Postmaster • FRANK B. HARP, Director, Dining Halls • IRMA MORRIS, Married Housing
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DONALD L. COX, Associate Secretary

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JOHN B. RIGGSBEE, M.D., Director of Health
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ROBERT L. DODD, Athletic Director

Department of Physical Training
JOHN MCKENNA, B.A., Head

WGST RADIO STATION
JACK COLLINS, General Manager
HISTORICAL SKETCH

A May, 1882, conversation between two Confederate veterans initiated the drive to open a technological school in Georgia. The two men were Major J. F. Hanson, a publisher and manufacturer who became president of a great railroad, and Nathaniel E. Harris, a Macon attorney who eventually became Governor of Georgia. Hanson had the vision for the need for such a school and he called on Harris to make the dream a reality. Harris immediately ran for the State Legislature on the need for a technological school. He was elected and during the next three years all of his efforts were directed toward getting a bill creating such a school passed by the Legislature. After several failures, the bill was finally passed by the narrowest of margins in the summer of 1885.

In April, 1888, Dr. Isaac Hopkins, then president of Emory College at Oxford, Georgia, and a rare combination of a physicist and theologian, was chosen Tech’s first president by the Board of Trustees, headed by founder Harris.

Two buildings, both financed by the State, were erected during the Hopkins administration. The Administration Building, which cost $43,250, was completed in 1888 and was the major academic building of the early Georgia Tech. It was used for teaching and administrative offices until December, 1959, when it became purely an administrative office building. The Old Shop Building was also completed in 1888 at an initial cost of $20,000. In 1892 it was badly damaged by fire but was rebuilt the same year at a cost of $10,000. It was torn down in early 1968 as part of the campus improvement plan.

Dr. Lyman Hall, professor of mathematics and a West Point graduate, succeeded Hopkins in 1896. Hall was well-known as a tough disciplinarian. But, he was also a dedicated man who literally worked himself to death in nine years trying to build a decent physical plant for the struggling young school.

In 1896, he added two small temporary dormitories at a cost of $4,000 from State funds.

First major building in his administration was Knowles Dormitory, completed in 1897 at a cost of $20,000, of which $15,000 came from the State. Named for Clarence Knowles, Fulton County legislator who worked so diligently to secure the funds from the Legislature, the building now houses administrative offices.

Next building erected under Hall was the A. French Textile Building, completed in 1898 at a cost of $20,000. Funds for this building and its equipment came from the State ($10,000), Aaron French, Pennsylvania manufacturer for whom the building and Textile Department were named, and from textile manufacturers throughout the State. This building now houses the School of Industrial Engineering.

By late 1901 both the Electrical Building and Swann Dormitory were added to the growing plant. Money for the Electrical (now called the
Administration Annex Building) Building came from the State ($16,000) and from private contributions ($2,500), and Swann Hall was financed by a grant of $20,000 from Mr. James Swann providing Hall could raise an additional $15,000 and would name the dormitory for Swann's late wife. Both conditions were met by Hall within a year. The Electrical Building now houses administrative offices, and Swann Hall is headquarters for the Engineering Extension Division and the Modern Languages Department.

Hall's last act was securing a matching grant for a Chemistry Building in 1905. The State had given $10,000 for the building in 1904 and Hall managed to secure the additional $10,000 before he died in August, 1905. The building—named for Lyman Hall—was completed in 1906 and is still used for the teaching of chemistry and for offices.

Dr. Kenneth G. Matheson, professor of English, was named chairman of the faculty on August 23, 1905. Less than a year later, he was named president.

Matheson was the founder of a school library for Tech, operating it in his office and finally expanding it into three rooms in the Administration Building. It came as no surprise then that the new president's first move was toward a library building for the campus. On March 12, 1906, Andrew Carnegie donated $20,000 for a building providing that the school guarantee an annual appropriation of at least $2,000 a year to support the library. The terms were met and by September, 1907, the Carnegie Building, now an administrative office building, was open for student and faculty use.

In November, 1909, Mrs. Joseph Whitehead made an initial gift of $5,000 towards an infirmary for Tech. Within a year, other gifts brought the total of this fund up to $15,000 and construction began on the Joseph Brown Whitehead Memorial Hospital, now called the Dean of Students Building.

Matheson followed this with his February, 1910, announcement that John D. Rockefeller had offered Tech $50,000 for a YMCA Building if the school could raise $25,000. Less than a year later, a fund drive met these terms and in June, 1912, the YMCA Building was dedicated. The building is still in use.

In August, 1910, the Legislature appropriated $35,000 for a Mechanical Engineering Building on the omnipresent condition that $15,000 be raised by the school. Through the aid of the Atlanta Chamber of Commerce, $22,000 was subscribed within two months. The first three units of this building were completed in 1912. After the Legislature appropriated $100,000 in 1919, the remaining units of the Mechanical Engineering Building were completed.

Matheson also initiated the first Greater Georgia Tech campaign of 1914 to raise money to build a Power Plant to house $100,000 worth of equipment donated by manufacturers. The Power Plant Building was completed in 1917.
During Matheson's administration, several important parcels of land were added to the school's property. Included was the land that now holds Grant Field, Tech's 52,000-seat football stadium. This land was purchased in two segments, the first two-thirds in 1906 for $16,000 and the remainder in 1913. The State furnished the money for the initial purchase, while two gifts from John W. Grant were used for the second parcel and to build the West stands in 1913 and 1915. The field was named for Grant's son. The East and South stands were erected during the 1924-25 year through the use of Athletic Association funds. Since then there have been four additions to the stadium, all of them built without the use of state money.

The pressures of running Tech finally began to break down Matheson's health and on orders of his physician, he resigned in October, 1921 (effective April, 1922) to accept the less-taxing position of president of Drexel Institute. For four months after Matheson's departure, N. P. Pratt, chairman of the executive committee of the Trustees, ran the school as administrative executive ad interim.

On July 14, 1922, the Trustees selected Dr. Marion Luther Brittain, the state superintendent of schools, as Tech's fourth president. Brittain's first goal as president was to rebuild the faculty decimated by World War I and the financial crisis in Georgia that followed it. The politically astute Brittain went to the Legislature for more money for Tech and managed to convince the politicians to push through a deficiency bill of $39,000 which he used to raise salaries.

He then approached the Carnegie Foundation for the $150,000 it had pledged to Tech providing the Greater Georgia Tech campaign of 1918-1921 had reached over $1,500,000 in pledges. He received the grant even though less than 40% of the campaign pledges had been paid. With this money and the Greater Tech money, he began construction on the Physics Building which was completed in 1923. It was this building that set the architectural style for the Tech campus for the next 20 years.

The next building on the list was a Ceramic Engineering Building. Brittain, with the help of the State's top ceramics industrialists, raised $500,000 for this new department in less than six months. The building was completed in November, 1924.

Then Brittain's building program began to pick up steam. In 1925, Brown Dormitory was completed at a cost of $85,000 with the funds coming from the Brown Estate and the Greater Georgia Tech campaign. The same year, the $100,000 Emerson addition to the Chemistry Building and Harris Dormitory were completed with the funds again coming from the campaign.

With the help of the money still left from the campaign, federal monies from various agencies (including the WPA and PWA), private donations, and a stronger State support, Brittain managed to add a total of 22 buildings to the growing Tech campus. Included in this group were the Army Headquarters Building (1927), the Brittain
Dining Hall (1928), Rose Bowl Field (1929), Cloudman Dormitory (1931), the Naval Armory (1934), Techwood Dormitory (1935), another addition to the Chemistry Building (1936), the Old Gym (1937), the Civil Engineering Building (1938), the Engineering Drawing Building (1938), the Clark Howell Dormitory (1939), the George W. Harrison, Jr. Dormitory (1939), the Engineering Experiment Station Building (1939), the Athletic Office Building (1941), and the Chemistry Annex (1942). At the close of Brittain's term in 1944, the entire campus was valued at $4,500,000 with over $3,460,000 of that being vested in buildings.

But Marion Luther Brittain's proudest accomplishment was the securing of the Guggenheim award in 1930 which made possible the establishment of the Guggenheim School of Aeronautics.

When Dr. Brittain retired in 1944 at the age of 78 after setting a longevity record of 22 years for a Tech president, the Board of Regents (Tech became part of Georgia's University System in 1933) named Colonel Blake R. Van Leer as his successor. One of Van Leer's first projects was the expansion of Tech. In his 11 years as president, Van Leer saw the campus expand from 50 acres of land to over 130 and the physical plant value rise from $4,500,000 to over $25,000,000.

First new buildings added during the Van Leer administration were the Burge and Callaway Apartments for the faculty and married students. Both were completed during the 1946-47 year and were financed by bonds amortized by rentals. Still more housing followed in September, 1947, when Glenn and Towers dormitories were opened. They, too, were made possible through a self-liquidating bond issue.

First of the major academic structures to go up during the Van Leer administration was the Harrison Hightower Textile Building named for one of the school's great alumni benefactors. The building, financed by the State and equipped by the Textile Education Foundation, Inc., was started in October, 1947, and completed two years later. During 1949, Van Leer's continuing efforts to expand the campus paid off with a $65,000 remodeling of Brittain Dining Hall, another dormitory (Smith), and a new campus lighting system (paid for by the City of Atlanta, Fulton County, and the State of Georgia).

In 1951, the Thomas P. Hinman addition to the Research Building was completed and ground was broken for the Price Gilbert Memorial Library. In September, 1952, the new Architecture Building, funded by the University System Building Authority, was dedicated. In November, 1953, the new library, costing $2,200,000 of the Building Authority money and initiated through a gift from the late Judge Price Gilbert, was dedicated. The Building Authority also financed Tech's $1,000,000 modernization of the heating and electrical switching plant and the $800,000 modernization of the Carnegie Building in 1954.

By 1955, the Rich Electronic Computer Center — financed by the Rich Foundation, the State of Georgia, and the Georgia Tech Research Institute — was in operation,
On January 23, 1956, Van Leer died suddenly in an Atlanta hospital and Dean of Faculties Paul Weber was named acting president while the Regents searched for a successor. During Weber’s 17 months in office, the Joint Research and Laboratory Building of the State Highway Department and Georgia Tech was dedicated (February 29, 1956) and the Alexander Memorial Building, financed by gifts from the alumni and friends of the school and by Radio Station WGST and the Georgia Tech Athletic Association, was dedicated (November, 1956).

Dr. Edwin D. Harrison became Tech’s sixth president on August 15, 1957. On January 7, 1959, Tech’s Radioisotopes and Bioengineering Laboratory was dedicated. The $500,000 building was financed by State funds, National Institutes of Health, and the Atomic Energy Commission which provided $250,000 worth of equipment.

In November of the same year, Tech accepted the $2,300,000 New Classroom Building which was financed by the University System Building Authority. The new Joseph Brown Whitehead Memorial Infirmary financed by the estate of Lettie Pate Evans, was dedicated on June 23, 1960. It was followed by five new dormitories which were dedicated in August, 1961. They were Field, Hanson, Hopkins, Matheson, and Perry. During May of 1962, Southern Technical Institute’s $2,000,000 campus near Marietta, funded by the State, the City of Marietta, and Cobb County, was dedicated.

In the summer of 1961, the new Physical Plant Building was opened. It was built with funds from the State as was the Crenshaw Field House, opened in the fall.

In January, 1962, the new $3,300,000 Electrical Engineering Building which was funded by the University System Building Authority was occupied by the School of Electrical Engineering. This building was named for Tech’s fifth president, the late Blake Ragsdale Van Leer, in special ceremonies held on February 18, 1964. During 1963, dedication services were held for the largest single building project in Tech’s history, the Frank H. Neely Nuclear Research Center which was supported by grants from the State of Georgia, the National Science Foundation, and national loans from the Atomic Energy Commission.

The new $2.5 million Chemical Engineering-Ceramic Engineering Building was completed in the closing months of 1964. It was also financed by the University System Building Authority.

The $1 million Electronics Building was dedicated in January, 1966, and is now occupied by the Electronics Division of the Engineering Experiment Station.

The new $3.5 million Physics Building, the addition to the Radioisotopes and Bioengineering Building, and the $2 million alumni addition to the West Stands of Grant Field (financed by Athletic Association funds) were completed during the 1967 year.

Several other building complexes are presently under construction. They include the four-building Space Science and Technology Center
(two of the buildings were completed and occupied in 1967 and the other two are scheduled for completion in 1968), the graduate addition to the Price Gilbert Memorial Library, the new Student Center, the new Civil Engineering Building, the new Chemistry Building, new undergraduate, graduate and women's dormitories, and the first unit of the new Engineering Experiment Station.

A long-range pattern of growth for the campus has been developed during recent years because of the expected acquisition of 90 acres of land through urban renewal. In the spring of 1964, Tech administrators asked the consulting firm of Perkins and Will of Chicago to conduct a study to plan current and future development of the campus. The report was completed in 1965 and presents a broad-stroke picture of what the campus might look like in 1975 and in 1985.

The plans envisioned by Perkins and Will anticipate a student body of 10,000 by 1975 with 7,800 undergraduates and 1,950 graduate students, and 12,500 by 1985 of which 9,500 will be undergraduates.
GENERAL INFORMATION

The Georgia Institute of Technology operates on the quarter plan with the fall, winter, and spring quarters normally constituting the academic year. A summer quarter is also offered and many students accelerate their program by attending four quarters per year. The requirements for a degree may be completed at the end of any quarter, although only one annual commencement is held.

Because of the heavier workload associated with technological education in this country, the average student takes fourteen (14) quarters to complete the four-academic-year or twelve (12) quarter curricula at Georgia Tech. Many students prefer to attend one or more summer sessions in order to obtain the greatest benefit from their educational program and also fulfill the requirements for graduation in the four-year period. Georgia Tech recommends that students plan to attend a summer session and reduce their academic load.

Courses are offered in Aerospace, Ceramic, Chemical, Civil, Electrical, Industrial, Mechanical, and Textile Engineering; Engineering Mechanics; Applied Biology, Applied Mathematics; Applied Psychology; Architecture; Building Construction; Industrial Design; Chemistry; Physics; Industrial Management; Textile Chemistry; and Textiles. The curricula in these various fields are listed on the following pages and work submitted for credit must be checked against these basic requirements.

The Georgia Institute of Technology is a member of the Southern Association of Colleges and Schools. As such, it is accredited by this Association.

All of the four-year engineering curricula leading to bachelor's degrees in engineering and the five-year program leading to a master's degree in Sanitary Engineering are accredited by the Engineers' Council for Professional Development, which is the national engineering accrediting agency.

The curriculum leading to the degree Bachelor of Architecture is accredited by the National Architectural Accrediting Board.

The curriculum leading to the B.S. in Chemistry degree is accredited by the American Chemical Society.

ADMISSION REQUIREMENTS

If you are interested in applying for admission to Georgia Tech you should write to the Director of Admissions, Georgia Tech, Atlanta, Ga., and request application forms. Freshman students are accepted at Georgia Tech for the quarters beginning in September, March, and June. Transfer students are accepted for the quarters beginning in September, January, March, and June. An application cannot be considered until the application blank has been properly executed and returned to the Institute. The application form, together with a transcript of the applicant's previous academic work, must be submitted to the Director of Admissions at least 35 days before the registration date for the quarter for which the applicant wishes to enroll. It is advisable for candidates to the freshman class to make application not earlier than
one year or later than six months prior to the date of the beginning of
the quarter for which he is applying.

The Institute reserves the right to refuse to accept applications at any
time when it appears that students already accepted for the quarter
which the applicant wishes to enroll will fill the Institute to its maximum
capacity. The Institute also reserves the right to reject an applicant
who is not a resident of the State of Georgia.

FRESHMEN
The Georgia Institute of Technology has two different sets of require-
ments insofar as high school units are concerned: one for students
planning to major in engineering, science or architecture (Group I),
and one for those planning to major in industrial management or textiles
(Group II).

<table>
<thead>
<tr>
<th>Group I (Engineering, Science, Arch.)</th>
<th>Group II (I.M. or Textiles)</th>
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<tbody>
<tr>
<td>English</td>
<td>4</td>
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<tr>
<td>Algebra</td>
<td>2</td>
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<tr>
<td>Plane Geometry</td>
<td>1</td>
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<tr>
<td>Trigonometry</td>
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<tr>
<td>Advanced Algebra</td>
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<tr>
<td>History</td>
<td>1</td>
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<td>†Chemistry</td>
<td>1</td>
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<tr>
<td>†Physics</td>
<td>1</td>
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<tr>
<td>Optional Units</td>
<td>5 to 7</td>
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</tbody>
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†Applicants for Arch. may substitute General Science or Biology.

*Science units may be met with courses in General Science, Biology,
Chemistry and/or Physics.

Georgia Tech does not require a foreign language for admission, but
recommends two years of study of a modern language in high school.
Other recommended courses for high school study include extra courses
in mathematics and science. Students planning to major in an engineer-
ing field will find a mechanical drawing course helpful. The total number
of high school units presented should be sufficient to insure graduation
under local requirements. Students who have been unable to schedule
required courses should write to the Director of Admissions for infor-
mation regarding ways of making up missing high school credits. Ordin-
arily not more than three units will be allowed from the group including
drawing, commerce, agriculture, military and shop work.

Special attention is called to the required one-half unit in advanced
algebra in Group I. Suggested topics to be included in this course in-
clude the following: the system of real numbers, functions, complex
numbers, theory of equations, systems of equations, permutations, com-
binations, and the binomial theorem. More detailed information regard-
ing these suggested topics may be secured on request. Solid geometry
is not an acceptable substitute for this algebra requirement but honors
programs or other advanced courses including mathematical analysis or
analytic geometry will be acceptable.
The Institute reserves the right to reject the credits from any high school or other institution notwithstanding its accredited status, where the Institute determines from investigation that the quality of instruction available at such high school or institution is for any reason deficient or unsatisfactory.

In addition to the scholastic units mentioned above, Georgia Tech uses the following criteria to judge its high school applicants:

(1) The applicant must have graduated from an accredited school with a record high enough to indicate that he is prepared for college work.

(2) The applicant must take the College Entrance Examination Board Tests. All applicants must take the Scholastic Aptitude Tests and the Achievement Tests in English and mathematics. In addition those students planning to major in engineering or science must take the Achievement Test in either chemistry or physics.

(3) All applicants must be at least 16 years of age and of established good moral character. The Institute reserves the right to examine and investigate the moral worth, character, and personality of the applicant.

(4) The applicant must have a predicted grade-point average which indicates that he has the potential to pursue effectively the educational program of the Institute.

Each applicant will be required to take a physical examination and forms for this purpose will be sent with the notice of acceptance. (Additional information regarding physical examinations may be found on page 33.)

A deposit of $25.00 (in addition to the $25.00 dormitory room deposit mentioned on page 37) is required of each accepted applicant for admission to the Fall Quarter within two weeks after notification of acceptance has been issued. After enrollment, this fee will be credited to the student’s fee account. If the applicant decides not to enter, his deposit may be refunded by application to the Director of Admissions not later than June 1st. Thereafter, the deposit is forfeited except for instance of an act of Providence.

Advanced Placement and Honors Programs

Superior students entering Georgia Tech may receive college credit for courses completed in high school if their grades and scores on the advanced placement tests or the achievement tests of the College Board indicate a satisfactory knowledge of college course work. In addition, honors programs, some of which excuse a student from basic freshman courses, are available. Departments which offer advanced placement credit and/or honors programs include mathematics, English, chemistry, physics, modern languages, and social sciences. Participation in the honors programs is voluntary.
TRANSFER STUDENTS

Applicants who have made satisfactory records in scholarship and in conduct at other colleges may be considered for admission with advanced standing.

Transfer students wishing to enter the School of Architecture are generally confronted with a difficult problem because of the highly specialized nature of the curriculum in this school (starting with the first quarter of the freshman year). These specialized courses may not ordinarily be obtained in other colleges unless in a School of Architecture.

(1) A student transferring from another college must ask the Registrars of all colleges that he has previously attended to send official transcripts to the Director of Admissions. A transcript of high school work is ordinarily required.

(2) Transfer students must take the College Entrance Examination Board Achievement Tests in English composition, mathematics, and either chemistry or physics. (Applicants for Architecture, Industrial Management, or Textiles, may omit the test in chemistry or physics.) Candidates for admission must take the required Achievement Tests not more than six months prior to the planned date of enrollment. Information regarding these tests may be obtained from the College Board, Box 592, Princeton, N. J.

(3) Courses completed in other colleges must have an over-all average of "C" or better and grades must be satisfactory for the last term prior to transferring. Credit for specific courses will not be allowed unless grades received are above the lowest passing grade.

(4) Courses used as credits for a degree must have been completed in a period of ten years, counted from the time the first credits were acquired until the time all requirements for the degree have been met. Courses not falling within this time limit may be validated by examination. Transfer students should realize that credits six years (or more) old at the time of transferring are in danger of being voided by this regulation.

(5) The basic policy regarding the acceptance of courses by transfer is to allow credit for courses completed with satisfactory grades in other accredited colleges providing the courses correspond in general in time and content to courses in the curriculum they expect to enter at the Georgia Institute of Technology.

(6) It is ordinarily impossible to give an official statement regarding transfer credit without having an interview with the applicant.

TRANSIENT STUDENTS

A student who has taken work in another college or university may apply for the privilege of temporary registration in the Georgia Institute of
Technology. Such registration is generally for the summer quarter and the student will ordinarily be one who expects to return to the institution in which previously enrolled.

A transient student may be admitted on the basis of a transcript sent from the institution that he last attended stating that the student is in good standing, or a statement of permission from the dean or registrar.

**GRADUATE STUDENTS**

All correspondence relative to admission to graduate study should be directed to the Dean of the Graduate Division. Necessary application forms may be obtained from his office. These forms, together with letters of recommendation and official transcripts of previous academic work, should be on file in the office of the Dean at least four weeks before the beginning of the quarter for which the applicant plans to register if he is to be assured consideration for acceptance. The Graduate Bulletin may be obtained on request.

**AUDITORS**

Any officially enrolled student who has obtained the approval of his adviser and the departments of instruction concerned may audit courses. However, no credit is granted for courses scheduled on an auditing basis, and students are not permitted to change to or from an auditing status except through the regular procedures for schedule changes and during the period for changes as published in the college calendar for each given quarter.

All students registered as auditors are required to pay tuition at the regular rate.

Members of the faculty or staff of the Georgia Institute of Technology may audit a course providing permission is obtained from the Department concerned and the Registrar.

**SEMINARS, SHORT COURSES, AND INSTITUTES**

Applicants seeking admission to seminars, short courses, and institutes with programs of work that carry academic credit shall be required to meet all requirements prescribed for admission of students to undergraduate or graduate programs of work.

Applicants who wish to enroll in non-credit seminars, short courses, and institutes shall present evidence to prove:
(1) That the applicant has the educational background and the ability to pursue successfully the program of work that he or she wishes to take.

(2) That the applicant is of good moral character; that he or she possesses a sense of social responsibility, and that he or she has a capacity for growth and development in the program for which he or she seeks admission.

In the case of an applicant who is seeking admission to a non-credit seminar, short course, or institute, the Georgia Institute of Technology shall have the right to prescribe the types of evidence that an applicant must submit in order to establish qualifications for admission.

SPECIAL STUDENTS

Special students shall be required to meet all requirements prescribed for admission to undergraduate or graduate programs of work as the case may be and to meet any additional requirements that may be prescribed by the Institute. Special students are not considered as degree candidates.

INSTITUTE POLICIES REGARDING ADMISSIONS

When the application, necessary transcripts, College Board scores, and any other required information on an applicant are found to be complete and in order, the applicant will be evaluated in terms of his test scores and grades, scholastic aptitude, social and psychological adjustment, and the probability of his completing the requirements for the desired degree. The Institute reserves the right, in every case, to reject any applicant whose general records and attitude do not indicate a probability of success in college in the Institute environment, notwithstanding the satisfaction of other requirements. Applicants must comply with such other procedures, including personal interviews and psychological or other tests, as may be necessary to determine the applicants' sense of social responsibility, adjustment of personality, sturdiness of character, and general fitness for admission to the Institute.

In order that the appraisal of a student's ability and fitness for college work may be as nearly accurate as possible, officials of the Institute will study carefully all the information, including biographical data that is submitted by the applicant. The officials of the Institute shall have the right to require each applicant for admission to appear for an interview before his application is finally accepted or rejected. If an interview is required, the Director of Admissions will notify the applicant of the time and place at which the interview will be conducted.
The ultimate decision as to whether an applicant shall be accepted or rejected will be made by the Director of Admissions, subject to the applicant’s right of appeal as provided by the bylaws of the Institute and of the Board of Regents of the University System.

**Admission of Women**

By action of the Board of Regents, December 13, 1967, qualified women students were ruled eligible for admission in all programs of study offered at Georgia Tech. The requirements for admission and the regulations governing students apply alike to men and women but for certain exceptions as listed below:

*Physical Training.* Women students will not be required to schedule physical training and will not have to make up the credit hours.

*Residence Accommodations.* See page 35. Due to the very limited residence hall facilities on the campus for women, incoming freshmen students should make reservations with the Housing Office as early as possible prior to registration.

**College Entrance Examination Board Tests**

During the academic year 1968-69, the College Entrance Examination Board will hold tests on each of the following dates: December 7, 1968, January 11, March 1, May 3, and July 2, 1969.

The Bulletin of Information obtainable without charge from the College Entrance Examination Board, contains rules regarding applications, fees, reports, and the conduct of the tests; lists of examination centers; and an application blank bound in. This application blank may be used for any College Board examination.

Candidates applying for examination should write to College Entrance Examination Board, P. O. Box 592, Princeton, N. J., or P. O. Box 1025, Berkeley, Calif. Each application submitted for registration must be accompanied by the appropriate examination fee. All applications and fees should reach the appropriate office of the Board at least 30 days before the examination date for those living in the United States, Canada, Alaska, Hawaii, The Canal Zone, Mexico, or the West Indies, and 60 days before for those in Europe, Asia, Africa, Central and South America, and Australia.

The Board will report the results of the tests to Georgia Tech and other institutions indicated on the candidates’ applications. The college will in turn notify the candidates of the action taken upon their applications for admission. Candidates will not receive reports upon their tests from the Board.
Veterans' Program

Any veteran desiring to further his education under veterans' benefits at the Georgia Institute of Technology should first be accepted as a student of Georgia Tech by the Director of Admissions. This acceptance has no direct connection whatsoever with the Veterans' Administration. After being accepted by Georgia Tech, the new veteran student must secure from the Registrar instructions on how to register on registration day. The veteran who is a resident of Georgia will pay resident fee costs, and the veteran who is a resident of another state will pay non-resident fee costs.

At least one month before entering Georgia Tech, any student who plans to enroll under Public Law 634 (War Orphans Educational Assistance for Sons and Daughters of Deceased Veterans); Public Law 894 (Disabled Veterans' Bill); or Public Law 89-358 (Post-Korean Bill), should go in person to the nearest Veterans' Administration to make application. After the Veterans' Administration has issued a certificate of eligibility, any questions regarding procedure for enrolling under one of these bills should be directed to the Coordinator of Veterans' Affairs located in Room 107, Dean of Students Building on the Georgia Tech campus.

The 3-2 Plan of Engineering Education

With more and more engineers occupying positions of leadership in the business, manufacturing, and governmental fields, there has developed a need for a plan of engineering education that will provide more courses in liberal arts, physical sciences, and mathematics than is possible under the regular engineering curriculum. Recognizing this need, the Georgia Institute of Technology in 1954 arranged a combined plan with a limited number of outstanding liberal arts colleges in the South to offer to qualified prospective engineers a more complete and well-rounded form of training for the world of today and tomorrow.

Under this plan the student may attend one of these liberal arts colleges for three years and then one of the nine engineering schools of the Georgia Institute of Technology for two years. Upon satisfactory completion of his two years at the school of engineering, he is eligible for the appropriate bachelor's degree from his original college and the bachelor of engineering in his particular field from the Georgia Institute of Technology.

Colleges and universities associated with the Georgia Institute of Technology in offering the 3-2 Plan of Engineering Education include:

The University of The South—Sewanee, Tennessee

The University of the South, founded in 1856 and popularly called Sewanee, is a small institution, with an enrollment of approximately
800 men students. Sewanee is under the jurisdiction of 22 dioceses of the Protestant Episcopal Church in the Southeast, but it welcomes men of all faiths. For further information, including admission requirements, write to Director of Admissions, The University of the South, Sewanee, Tennessee.

Davidson College—Davidson, North Carolina
Davidson College, founded in 1837 by Presbyterians, is a liberal arts college with an enrollment of about 1,000. It is a church-related college without being narrowly sectarian. Since enrollment is limited, an applicant should request necessary information and forms from the Director of Admissions as early as possible.

University of Chattanooga—Chattanooga, Tennessee
The University of Chattanooga is a privately controlled and endowed university for men and women. A successor to two older institutions founded in 1866 and 1886, it today through its various colleges and divisions has an enrollment of over 3,000. For further information, write to Dean of Admissions, Scholarships and Guidance.

Southwestern at Memphis—Memphis, Tennessee
Southwestern at Memphis, with an enrollment of about 1,000, originated in 1848 at Clarksville, Tenn., and in 1900 was relocated in Memphis. Identified with the Presbyterian Church for almost a hundred years, it provides a Christian liberal education program. Complete information is available from the Registrar.

University of Georgia—Athens, Georgia
The nation's oldest state-chartered university, the University of Georgia was chartered in 1785. Like Georgia Tech it is a member of the State's University System. Today, through its 11 schools and colleges it has a total enrollment of over 15,000 students. For further information, write to the Director of Admissions.

Special Information for International Students
The number of international students enrolled at Georgia Tech is one of the largest of any engineering and scientific college in the United States. The administration, faculty, and students at Tech welcome the opportunity to meet students from other countries, and to help them gain the education they desire.

Since Georgia Tech is a highly specialized, selective institution, there are certain requirements which must be met by all students. The administrative staff feels that any international student wishing to enter Georgia Tech should have at least as strong an academic background as the American students here. For this reason, international students must have completed, as a minimum, twelve years of education
in a program roughly similar to the American program of secondary education. This program should include at least four years study in mathematics through advanced algebra and trigonometry, a minimum of one year's study in both chemistry and physics, and four years' study of the English language. International students are required to take the tests of the College Entrance Examination Board, which are given in most countries of the world, and make grades on these tests comparable to the grades made by American students who enter Georgia Tech.

All applicants are required to take the Scholastic Aptitude Test and the Achievement Tests in English, mathematics (Level 1 or Level 2), and chemistry or physics. Industrial Management and Textiles candidates may omit the Achievement Test in chemistry or physics.

Applicants may take the tests on these dates: December 7, 1968, January 11, 1969, and March 1, 1969. It is recommended that the Scholastic Aptitude Test be scheduled in December or January, and the Achievement Tests in January or March.

Students who do not speak English as a native language may schedule the Test of English as a Foreign Language (TOEFL) administered by the College Board as a substitute for the Scholastic Aptitude Test, but should schedule the Achievement Tests as listed above.

Application blanks for the tests can be obtained by writing the College Entrance Examination Board, Box 592, Princeton, New Jersey, or Box 1025, Berkeley, California.

International students are accepted for the fall quarter only. This school term begins in September, and applications from international students must be received by March 1st for consideration for the fall quarter. With the application, the student or the school should file an official transcript of his academic record, showing courses taken, grades received, and ranking in class, for at least the last four years of school. Action on applications can be taken only after the application form, school records, and College Board scores have been received.

Classes at Georgia Tech are conducted in English only, and all international students are expected to be able to write, read, speak and understand the English language with competence. International students who wish an intensive course in English may apply for the special course in English for international students which is taught at Georgia Tech each summer. This course is not a beginning course in English, but a course for students who have completed the four years' study of English required by the admission standards. Inquiries concerning this course should be sent to: Department of Continuing Education, Georgia Institute of Technology, Atlanta, Georgia 30332, U.S.A.
All applicants for admission should read carefully and follow as closely as possible the step-by-step instructions given below for planning to attend Georgia Tech.

(1) Make sure that you can afford the cost of attendance at Georgia Tech. The approximate total cost per year is $2,500 to $3,000. This figure includes tuition and fees, books and equipment, and room and board. It does not include travel costs, clothing, entertainment, etc. **THERE ARE VIRTUALLY NO SCHOLARSHIPS OR LOANS AVAILABLE FOR INTERNATIONAL STUDENTS.** Part-time work while attending college is not recommended, and is restricted by the U. S. Immigration regulations. You should be sure that you will have funds available to meet your financial obligations.

(2) Obtain a passport from your country giving you permission to go abroad.

(3) Complete and return the form “Request for Application Material.” Give complete information regarding **FINANCIAL SUPPORT.**

(4) Submit the required “Student Health Service Record.”

(5) Make application for admission to Georgia Tech following instructions given above. If you are accepted, you will be sent a certificate of acceptance, dormitory application, and the form I-20A of the U. S. Immigration Service. **I-20A FORMS ARE SENT ONLY TO THOSE STUDENTS WHO HAVE FOLLOWED THE INSTRUCTIONS FOR FILING AN APPLICATION, AND WHO HAVE BEEN ACCEPTED FOR ADMISSION.**

(6) Make an application for a visa at the nearest office of the American Consul. Among other documents, you will need your passport, your certificate of acceptance, and your I-20A form in order to receive a visa.

(7) Make your travel plans to arrive in Atlanta on the day before the orientation program stamped on your acceptance. A special program of welcome and orientation is provided for foreign students, and you should make every effort to arrive on time.

**Definition of Legal Residence**

To be considered a legal resident of Georgia for the purpose of registering at an institution of the University System of Georgia, a student must establish the following facts to the satisfaction of the Residence Committee of that institution:
1. A student who is under 21 years of age at the time he seeks to register or re-register at the beginning of any quarter will be accepted as a resident student only upon a showing by him that his supporting parent or guardian has been legally domiciled in Georgia for a period of at least twelve months immediately preceding the date of registration or re-registration.

2. In the event that a legal resident of Georgia is appointed as guardian of a non-resident minor, such minor will not be permitted to register as a resident student until the expiration of one year from the date of appointment, and then only upon proper showing that such appointment was not made to avoid payment of the non-resident fee.

3. If a student is over 21 years of age, he may register as a resident student only upon a showing that he has been domiciled in Georgia for at least twelve months prior to the registration date.

   Any period of time during which a person is enrolled as a student in any educational institution in Georgia may not be counted as a part of the twelve months' domicile and residence herein required when it appears that the student came into the State and remained in the State for the primary purpose of attending a school.

4. A full-time faculty member of the University System, his or her spouse, and minor children may register on the payment of resident fees, even though such faculty member has not been a resident in Georgia for twelve months.

5. If the parents or legal guardian of a minor changes residence to another state following a period of residence in Georgia, the minor may continue to take courses for a period of twelve consecutive months on the payment of resident fees. After the expiration of the twelve months' period the student may continue his registration only upon the payment of fees at the non-resident rate.

6. Military personnel and their dependents may become eligible to enroll in institutions of the University System as resident students provided they file with the institution in which they wish to enroll the following:

   (a) A statement from the appropriate military official showing that the applicant's "home of record" is the State of Georgia; and

   (b) Evidence that applicant is registered to vote in Georgia; or

   (c) Evidence that applicant, if under 18 years of age, is the child of parents who are registered to vote in Georgia; and
(d) Evidence that applicant, or his supporting parent or guardian, filed a Georgia State income tax return during the preceding year.

7. Foreign students who attend institutions of the University System under sponsorship of civic or religious groups located in this state, may be enrolled upon the payment of resident fees, provided the number of such foreign students in any one institution does not exceed the quota approved by the Board of Regents for that institution.

8. All aliens shall be classified as non-resident students; provided, however, that an alien who is living in this country under a visa permitting permanent residence or who has filed with the proper federal immigration authorities a Declaration of Intention to become a citizen of the United States shall have the same privilege of qualifying for resident status for fee purposes as has a citizen of the United States.

9. Teachers in the public schools of Georgia and their dependents may enroll as students in University System institutions on the payment of resident fees, when it appears that such teachers have resided in Georgia for nine months, that they were engaged in teaching during such nine months' period, and that they have been employed to teach in Georgia during the ensuing school year.

10. If a woman who is a resident of Georgia and who is a student in an institution of the University System marries a non-resident of the State, she may continue to attend the institution on payment of resident fees, provided that her enrollment is continuous.

11. If a woman who is a non-resident of Georgia marries a man who is a resident of Georgia, she will not be eligible to register as a resident student in a University System institution until she has been domiciled in the State of Georgia for a period of twelve months immediately preceding the date of registration.

12. Non-resident graduate students who hold assistantships that require at least one-third time service may register as students in the institution in which they are employed on payment of resident fees.

PLEASE NOTE: In order to avoid delay and inconvenience upon arrival for registration, if there is any question in your mind concerning your residence status, application for clarification should be made immediately or not later than one month prior to the registration date. Applications should be addressed to Residence Committee, Office of the Vice President/Controller, Georgia Institute of Technology, Atlanta, Georgia 30332.
Tuition and Fees

The rates for fees, board and room are subject to change at the end of any quarter.

<table>
<thead>
<tr>
<th></th>
<th>Resident of Georgia</th>
<th>Non-Resident of Georgia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matriculation Fee per Quarter</td>
<td>$105.00</td>
<td>105.00</td>
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<tr>
<td>Tuition Fee per Quarter</td>
<td>none</td>
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<tr>
<td>Student Activity Fee per Quarter</td>
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<tr>
<td>Medical Fee per Quarter</td>
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<tr>
<td>Total Fees per Quarter</td>
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<td>355.00</td>
</tr>
<tr>
<td>Per Academic Year</td>
<td>$375.00</td>
<td>1065.00</td>
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</tbody>
</table>

NOTE: (a) An extra fee may be charged in special courses.

(b) A deposit of $25.00 (in addition to the $25.00 dormitory room deposit mentioned on page 37) is required of each accepted applicant for admission to the Fall Quarter within two weeks after notification of acceptance has been issued. After enrollment, this fee will be credited to the student’s fee account. If the applicant decides not to enter, he may be refunded his deposit by application to the Director of Admissions not later than June 1. Thereafter, the deposit is forfeited except for instance of an act of Providence.

(c) Any student who withdraws during the first quarter of his attendance shall have his admission deposit deducted before any computation is made of the refund to which he may be entitled.

Summary of Expenses

(Estimated for Academic Year)

<table>
<thead>
<tr>
<th></th>
<th>Resident of Georgia</th>
<th>Non-Resident of Georgia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matriculation, Tuition and Fees</td>
<td>$375.00</td>
<td>$1,065.00</td>
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<tr>
<td>Board, Room, and Laundry</td>
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<td>860.00*</td>
</tr>
<tr>
<td>Books and Equipment</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Total for Academic Year</td>
<td>$1,335.00**</td>
<td>$2,025.00**</td>
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</table>

Other Fees

Each person receiving a diploma must pay a diploma fee of $8.00 before graduating. A candidate for the doctor’s degree must pay a charge of $25.00 for microfilming his dissertation and depositing it with the University Microfilms Service.

Examinations at other than regular examination times will be granted in exceptional cases only and by Faculty action. A fee of $2.00 will be charged in all such cases.

A LATE REGISTRATION FEE OF NOT MORE THAN SIXTEEN DOLLARS ($16.00) IS CHARGED AT THE RATE OF TEN DOLLARS ($10.00) FOR THE FIRST DAY AFTER REGULAR REGISTRATION, AND AN ADDITIONAL TWO DOLLARS ($2.00) FOR EACH OF THE NEXT THREE DAYS.

*Prices for room and board are available in a separate bulletin which may be obtained from the Director of Auxiliary Services.

**Does not include ROTC uniforms if applicable.
Refund of Fees

Refunds of tuition and other educational fees may be made only upon written application for withdrawal. Student activity and medical fees are not refundable.

Students who formally withdraw during one week following the scheduled registration date are entitled to a refund of 80% of the fees paid for that quarter.

Students who formally withdraw during the period between one and two weeks after the scheduled registration date are entitled to a refund of 60% of the fees paid for that quarter.

Students who formally withdraw during the period between two and three weeks after the scheduled registration date are entitled to a refund of 40% of the fees paid for that quarter.

Students who formally withdraw during the period between three and four weeks after the scheduled registration date are entitled to a refund of 20% of the fees paid for that quarter.

Students who withdraw after a period of four weeks has elapsed from the scheduled registration date will be entitled to no refund of any part of fees paid for that quarter.

Student Motor Vehicles

Students who are classified as freshmen or sophomores and are living within the defined campus boundaries are not allowed to own or operate a motor vehicle on the campus. Any exception to this regulation will be granted only by special permission by the Dean of Students.

Any student (day, evening, graduate, or co-operative) who drives a vehicle to the campus must register it for either ON CAMPUS or OFF CAMPUS parking. ON CAMPUS registration will allow student parking in designated institutionally-owned areas. OFF CAMPUS registration will allow student parking in areas not institutionally controlled nor restricted.

An annual registration fee of $6.00 must be paid to register each vehicle for ON CAMPUS parking. This fee is applicable regardless of which quarter the vehicle is registered and will cover an entire academic year from September until registration the following September.

Freshmen and upperclassmen granted student parking permits are required to observe all parking regulations on the campus. The Georgia Institute of Technology reserves the right to limit in any way whatsoever the issuance of student parking privileges at the beginning of any quarter.

Physical Examinations

Entrance physical examination forms are mailed to students with the notice of their acceptance for enrollment. These forms are to be com-
pleted by the prospective student and his personal physician and mailed to the Director of Health in sufficient time to be received prior to the date of initial registration. After review of the medical history and physical examination report, the school physicians determine the assignments to ROTC and physical training. Any student who desires special consideration because of mental or physical disability should have his physician write an explanatory letter to the Director of Health giving full details of the disability and any desired limitations on physical activity. This letter is to be attached to the physical examination form. Any special examinations or reports needed to determine eligibility for enrollment or assignment are at the expense of the student, not the school. Any student who fails to submit the required physical examination and immunization record prior to registration will have the examination ordered by the school at the expense of the student.

ROTC

The entire Georgia Tech ROTC program is on a voluntary basis. Tech offers both the four-year and the two-year programs as provided for in the 1964 ROTC Vitalization Act.

Each applicant for formal enrollment in the basic course of the Air Force, Army or Navy ROTC shall be required to execute a Certificate of Loyalty Oath in such form as shall be prescribed by the Secretary of Defense.

Students who have successfully completed the basic course on a college level (senior division) and who are selected, may pursue the advanced course in the junior and senior years. However, not more than six hours of basic and nine hours of advanced ROTC may be used as elective credit towards a degree.

A student who is qualified for and enrolled in the ROTC while matriculating at Georgia Tech may be deferred from induction until after his graduation provided he possesses certain qualifications and meets the prescribed requirements. Such an individual, if required to report for active duty, would report as an officer after having received his reserve commission through the ROTC.

For further details regarding the Army ROTC, see page 168, the Naval ROTC, see page 188, and for Air ROTC, see page 49.

Selective Service Deferments

All full-time students desiring a II-S classification (student deferment) should file this request with the Selective Service Office. In order to be placed in Class II-S under the new Selective Service Law (effective July, 1967) a registrant must request the deferment in writing (preferable on the SSS Form 104).

In Class II-S shall be placed any registrant who has requested such deferment and who is satisfactorily pursuing a full-time course of in-
struction; such deferment to continue until registrant completes the requirements for his baccalaureate degree, fails to pursue satisfactorily a full-time course of instruction, or attains his 24th birthday, whichever occurs first.

No undergraduate student will be granted a II-S classification beyond his 24th birthday.

Co-op students on their work quarter are still considered as full-time students and are granted a II-S deferment on that basis.

Any questions concerning draft status should be directed to Georgia Tech's Coordinator of Selective Service, Room 107, Dean of Students Building.

**Dormitory Housing**

It is the policy of the Institute to require all single freshmen, who do not reside with their parents, near relatives, or bona fide guardians, to live in the dormitories. Freshmen (except those from the Atlanta area) are given FIRST PRIORITY in making dormitory assignments.

Atlanta area freshmen are not assigned dormitory housing until all other students are housed. During the fall quarter, very few Atlanta area freshmen can be given dormitory housing. Some Atlanta area freshmen are given assignments after the fall quarter begins when some cancellations occur. These assignments can be obtained after the quarter begins by personally coming by the Housing Office. The majority of Atlanta area freshmen who desire dormitory housing during the winter and spring quarters can be accommodated. All students that request dormitory housing for the summer quarter can be given accommodations.

The Atlanta area includes that area with post office addresses of a 20-mile radius of Georgia Tech.

The priority for making dormitory assignments is as follows:

1st Priority—Freshmen (except Atlanta area)
2nd Priority—Sophomore (for Freshmen-Sophomore Dormitories)
3rd Priority—Junior
4th Priority—Senior
5th Priority—Graduate
6th Priority—Evening school students, co-ops on work period and Atlanta area students.

TRANSFER STUDENTS will be placed according to class status, as above. (Class status should not be taken for granted, as this is determined after credits have been evaluated by the Registrar's Office.) Sophomore classification requires 51 acceptable credit hours.

GRADUATE STUDENTS are placed in reserved sections of Matheson and Perry Dormitories. In addition, a limited number of single rooms are available for graduate students, on a first come—first serve basis, in Harrison and Howell Dormitories.
FRESHMEN AND SOPHOMORE dormitories consist of Brown, Cloudman, Glenn, Harris, Harrison, Howell, Smith, and Towers. (Limited number single rooms in Harrison and Howell reserved for Graduate Students.) TECHWOOD is reserved primarily for students in the Co-operative Plan, but some regular students are also given assignments in Techwood. Junior and Senior dormitories (all double rooms) consist of Field, Hanson, Hopkins, Matheson and Perry. (One section of Matheson and Perry Dormitories reserved for Graduate Students.)

Each Georgia Tech dormitory is staffed with a faculty or staff member, a mature Graduate Student or an advanced upperclassman as Resident Advisor, who is assisted by a Senior Counselor and a staff of upperclass Student Counselors, who advise and counsel student residents. The dormitory organization and operation is intended to express the individual student's personal responsibility for the development of social competence, the values of group living and practice in democratic processes, the elevation of scholastic standards and the fostering of a high academic atmosphere.

In each dormitory or dormitory area there is a Dormitory Council, which is a student government of elected representatives. The Dormitory Councils provide programs of social, recreational and leadership activities.

The dormitories provide housing for 2,727 students. Most of the rooms accommodate two students. There are a few three-man rooms and some four-man rooms which consist of two connecting rooms. Students are encouraged to indicate their roommate preference and it is usually possible to grant such requests. However, your application is for accommodations in the dormitories and NOT for a specific room or roommate.

Changes between dormitories are not permitted after the day before registration. However, room changes may be made within the dormitory, to which assigned, PROVIDED the change has been APPROVED by the Resident Advisor of that dormitory and then officially arranged in the Dormitory Housing Office BEFORE the change is made.

All rooms are equipped with beds, study desks, dressers, clothes lockers, book cases, chairs, mirrors and waste baskets. The student should provide himself with a mattress pad or cover, blankets, bedspreads, sheets (36" x 76" fitted, freshman and sophomore dormitories and 39" x 82" fitted for junior and senior dormitories—top and bottom fitted sheets as per these sizes are available in the College Inn), pillow and pillow cases, towels, and a good study lamp.

Linen service is available on an optional basis. Two sheets, one pillow case and two bath towels are provided each week. Detailed information concerning this service will be mailed along with the room assignment.

Dormitory regulations prohibit the installation and use of such electrical appliances as hot-plates, toasters, irons, coffee makers, heaters, radio transmitters and television. The only electrical appliances permitted are electric razors, radios, clocks and a fan not to exceed 2.5 amp. power rating.
DORMITORY APPLICATIONS should be sent to the Controller’s Office within two (2) weeks after you receive your Notification of Acceptance and Dormitory Application from the Registrar.

A $25.00 Room Deposit (in addition to the admission deposit mentioned on page 32) must be returned with the dormitory application. No dormitory application will be honored except when accompanied by the required deposit. The deposit is not applicable to dormitory rent. This deposit may be refunded at the end of the school year, or at such time a student leaves the dormitories, provided the resident checks out properly, the key is returned, and there is no damage for which a resident is responsible. The refund must be requested; it is not automatically refunded.

ASSIGNMENTS: Dormitory Room Assignments are mailed a minimum of forty (40) days prior to the first day of registration, for the quarter applied for. Those applying after the beginning of this 40-day period will receive a room assignment as available and be held responsible for acceptance. If it is too late to mail the assignment, it may be secured at the Dormitory Housing Office upon arrival at Tech.

THE DORMITORY HOUSING OFFICE will send instructions as to shipment of baggage and other information with the ROOM ASSIGNMENT.

CANCELLATIONS: If, for any reason, the Dormitory Application, or an assignment to a room, is to be cancelled, the cancellation must be recorded in the DORMITORY HOUSING OFFICE at least thirty (30) days prior to registration day, or the deposit is FORFEITED (excepting Fall Quarter freshman and transfer students whose cancellations must be on record prior to June 1st, or the deposit is forfeited). On applications received after June 1st, the thirty (30) days clause will apply.

A receipt for the key and security deposit will be promptly returned to the student, along with helpful preliminary instructions. Dormitory keys are issued at the Key Office in Smith Dormitory.

DORMITORY RENT is payable as follows:

(a) On or before the last day of scheduled registration, for assignments made before the beginning of a quarter, unless otherwise indicated on assignment notice.

(b) Within two (2) days from date the room is assigned (when assignment is made after the beginning of a quarter).

A penalty fee will be charged for failure to pay rent on or before the last date due. The penalty fee will be five dollars ($5.00) for the first day following the date due, and one dollar ($1.00) for each of the next three days, the total not to exceed eight dollars ($8.00).

Students who fail to pay their room rent, including penalty fees, according to the conditions in above paragraphs (a) and (b), will be reported to the Dean of Students for appropriate action, four days after the deadline stated in the notice of assignment.
Residents once having paid rent, will receive no refund of room rent should they decide to move from the dormitories during any given quarter, UNLESS disenrolling from school in good standing.

Any student who withdraws from school and is in good academic and disciplinary standing should receive a dormitory rent refund in accordance with the Institution tuition refund policy.

Any student who moves from a dormitory to an apartment, fraternity house, private home, or is removed from the dormitory for disciplinary reasons, or leaves the Institute without proper notification should not receive a room rent refund and should forfeit his room deposit.

COED DORMITORY ACCOMMODATIONS: The Girls' Dormitory, located at 171 Fifth St., N. W., has six bedrooms, two baths, a large living room and a study room. Quarterly rent is $90.00. The housemother lives in the dormitory at all times, and she will make your room assignment upon your arrival.

It is anticipated that with the opening of fall quarter 1968 and no later than the winter quarter 1969, Georgia Tech will provide new housing facilities to house an additional 630 students, including a 60-bed women's dormitory.

Apartments
The school has approximately 220 apartments for married students. These apartments range in size from efficiency to three-bedroom units. Detailed information and the apartment application blanks will be supplied upon request to the Married Student Housing Office. It is not necessary to be accepted as a student before application may be made.

Food Services
Brittain Dining Hall, recently redecorated and air conditioned, is located in the center of the dormitory area. Two cafeteria lines are provided as well as table service in the "T" Room and ODK Room. Meals may be paid for in cash or with coupon books. Books of coupons may be purchased for $20.00 and contain coupons valued at $22.00.

In addition, two board plans are now offered. One plan provides three meals per day six days per week, for the entire quarter exclusive of holidays. Under this plan the total cost of food amounts to slightly more than $2.00 per day. The alternative plan provides for any two meals per day six days per week for the entire quarter, exclusive of holidays.

An additional facility in the Administration Building provides a cafeteria serving breakfast and lunch as well as a snack bar.

NOTE: The rates for room and board are subject to change at the end of any quarter. Prices for room and board are available in a separate bulletin which may be obtained from the Director of Auxiliary Services.

College Inn
A supply store is also located in the Administration Building to provide the students with all of the equipment and supplies needed for classroom
work and study. In addition, the store carries shaving supplies and other items needed for dormitory living. It also has a complete supply of stationery and other school spirit merchandise.

**Book Store**

The Tech self-service book store is located in the Vernon Skiles Classroom Building. All textbooks required for class work are available in this store as well as technical and reference books, study aids, and approved novels.

**Student Placement**

*Campus Interviews:* The Georgia Institute of Technology maintains a centralized placement service. All B.S., M.S. and Ph.D. candidates are placed through this office. Business or educational institutions desiring a campus recruiting date should write to the Placement Office or call (404) 873-4211, Ext. 688, at least three to six months in advance. The main periods for interviews are as follows: M.S.-Ph.D. candidates—October-November, B.S.-M.S.-Ph.D. candidates—January, February, March, and April.

*Surveys:* Interviews are possible any time during the year on a survey system. Via this method, a survey of all available students is conducted and the student résumés are mailed directly to the employer. Individual interviews can be arranged by contacting the Placement Office after the prospective employer has screened the student résumés.

*Alumni:* In addition, an excellent Alumni Placement Service is available. All that is needed to contact experienced graduates is to submit the pertinent information or job description. Interested graduates will contact the employer directly.

*Part-Time and Summer:* All part-time and summer student jobs are available through the Placement Office.

**Other Information**

*Class Attendance:* There are no formal regulations regarding class attendance at the Georgia Institute of Technology. The resources of the Institute are provided for the intellectual growth and development of the students who attend. A schedule of courses is provided for the students and faculty to facilitate an orderly arrangement of the program of instruction. The fact that classes are scheduled is evidence that attendance is important and students should, therefore, maintain regular attendance if they are to attain maximum success in the pursuit of their studies.

*Examinations and Grade Reports:* Final examinations are scheduled during the last week in each quarter and reports of the student’s academic progress are issued after the close of the quarter.

*Constitution and History Examinations:* A Georgia law, amended March 4, 1953, requires all students to pass examinations on United
States and Georgia history and the United States and Georgia constitutions or pass comparable courses before graduation. Courses which may be substituted for the United States and Georgia constitutions examination are S.S. 113 or S.S. 323; courses which may be substituted for the United States and Georgia history examination are: S.S. 319, S.S. 324, S.S. 325, S.S. 327, or S.S. 328.

Limitations on credit for ROTC courses: Six (6) quarter hours in Basic ROTC courses and nine (9) quarter hours in Advanced ROTC courses are the maximum credits allowed toward meeting the requirements for any degree.

Grading System:

A—excellent (4 quality points)
B—good (3 quality points)
C—satisfactory (2 quality points)
D—passing (1 quality point)
F—failure, must be repeated if in a required course (no quality points)
S—Credit by transfer, examination for advanced standing, or satisfactory completion of a non-credit course (not included in calculation of scholastic average).
V—audited, no credit

A grade of D is passing in a single subject but a general average of C is required for graduation.

More detailed information regarding the academic regulations of the Institute is contained in the handbook of student rules and regulations which is available to all students in the Office of the Dean of Students.

Curricula

In the following pages there will be found in alphabetical order a tabulation of the work required for degrees in the curricula offered by the Georgia Institute of Technology.

At least 24 credit hours of humanities and social science must be included in all curricula leading to an undergraduate degree. The following courses have been approved as meeting this requirement:

I.M. 201, 202, 203, 204, 486, 487, 490.
Music 201, 202, 203.
Psy. 303, 304, 402, 410.

From time to time additional courses may be added to this list.
School of Aerospace Engineering

(Daniel Guggenheim School of Aeronautics)

(Established in 1930)


General Information

The mission of the School of Aerospace Engineering is the preparation of graduates for a career in flight vehicle engineering and related applied research. The curriculum is specifically designed to develop proficiency for research, analysis and design in the three disciplines of fluid flow, structures and vehicle performance. The background developed in these disciplines is applicable to vehicles within the complete flight spectrum—underwater, atmospheric and space flight.

Chemistry, mathematics, physics and the humanities are emphasized in the first two years of the curriculum. The disciplines in Aerospace Engineering and the related engineering sciences are covered in the third and fourth years. Basic principles and theories are stressed in recognition of the sophistication and rapid changes associated with modern engineering technology. The curriculum prepares the graduate for either an engineering position, usually in the aerospace industry, or for additional education at the graduate level, usually with specialization in one of the disciplines in Aerospace Engineering. Electives are offered during the last two years of the curriculum so that a student's program of study can be tailored for his objectives and abilities.

The School offers graduate work leading to both the Master of Science and the Doctor of Philosophy degrees.
### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
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<th>3rd Q.</th>
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<tbody>
<tr>
<td>Chem.</td>
<td>101-2-3</td>
<td>Inorganic Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<tr>
<td>E.Gr.</td>
<td>113-14-15</td>
<td>Engineering Graphics</td>
<td>0-6-2</td>
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<td>Eng.</td>
<td>107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
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<td>Math.</td>
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<td>Calculus I, II, III</td>
<td>5-0-5</td>
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<tr>
<td>M.L.</td>
<td>*</td>
<td>Modern Language OR</td>
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<td>S.S.</td>
<td>111-12-13</td>
<td>Social Science</td>
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<td>Physical Training</td>
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<td>ROTC</td>
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<td>Basic ROTC (optional)</td>
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<td>Gen.</td>
<td>101</td>
<td>Orientation</td>
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**Totals (excluding ROTC)** | 15-13-18 | 14-13-18 | 14-13-18 |

**NOTE:** Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish. Three quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

### Sophomore Year

<table>
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<th>Course</th>
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<th>3rd Q.</th>
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<td>203</td>
<td>Introduction to Aerospace Engineering</td>
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<tr>
<td>A.E.</td>
<td>322</td>
<td>Aerodynamics of the Airplane I</td>
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<td></td>
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**Totals (excluding ROTC)** | 14-10-17 | 16-7-18 | 16-7-18 |

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
### Junior Year

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**NOTE:** Three (3) hours of electives must be chosen from the approved humanities list which appears in the preceding pages of the catalog. All other electives are to be considered as free electives. Not more than nine (9) hours of advanced ROTC may be counted for credit.
Courses of Instruction

NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

A.E. 203. Introduction to Aerospace Engineering
1-3-2. Prerequisites: Phys. 207 concurrently. Open to Aerospace Engineering students only.

An introduction to the basic principles upon which aeronautical and space technology depends. Various topics discussed by the staff will be preparatory to specialized courses that the aerospace engineering student will encounter subsequently in both undergraduate and graduate work. Included will be some discussion of today's practice and research as well as a preview of the future in this field.

A.E. 322. Aerodynamics of the Airplane I.
3-0-3. Prerequisites: Math. 208 and Physics 209 or concurrently.

Applied aerodynamics including properties of air, airfoil theory, Reynolds Number, airfoil characteristics, induced drag and downwash, aspect ratio corrections, effects of wing platform, and auxiliary lift devices.


A.E. 323. Aerodynamics of the Airplane II.

Drag; horsepower; basic performance; special performance problems; load factors and maneuvers; compressibility effects.

Text: Sherby, Dommasch, and Connelly, Airplane Aerodynamics; Perkins and Hage, Airplane Performance, Stability and Control.

A.E. 325. Aero and Hydro Mechanics
3-0-3. Prerequisites: Math. 412 or concurrently; 2.0 overall average and a 2.0 average in Freshman and Sophomore Math. and in Sophomore Physics.

Fluid mechanics, hydrodynamics, including continuity, circulation and curl, irrotational flow, velocity potential, vortex theorems, Euler equations, momentum theory, Bernoulli equation.

Text: Kuether and Schetzer, Foundations of Aerodynamics.

A.E. 330. Aerospace Materials
3-0-3. Prerequisites: Mech. 334 and M.E. 322 or concurrently; 2.0 overall average and a 2.0 average in Freshman and Sophomore Math. and in Sophomore Physics.

Structure of solids, mechanical behavior, plasticity, ductile and brittle states, thermal properties, fatigue, experimental methods.


A.E. 331. Theory of Structures I.

Basic theory of aircraft and missile structural design including: a review of plane stress and strain theory; loads, shears, and moments in wings and fuselages; inertia loads and load factors; section properties of aircraft components, space structures; bending of beams; materials properties and testing.

Text: Peery, Aircraft Structures; Mil HNBK-5.

0-9-3. Prerequisites: Third Quarter Junior or Senior Standing and approval of A.E. School Director.

A clearly stated program prepared by the student describing in detail the nature, purpose and scope of the proposed problem, carrying the endorsement of the sponsoring A.E. staff member, must be submitted to the A.E. School Director for approval. Library, experimental, or theoretical work will be considered.
A.E. 410. Thermal Stresses
3-0-3. Prerequisites: A.E. 435, or consent of instructor.

Origin of thermal stress; external constraints; determination of temperatures—the heat transfer problem; fundamental equations of uncoupled isotropic thermoelasticity; some solutions of typical thermoelastic problems; properties of materials at high temperatures; problems in creep analysis.

Text: Gatewood, B.E., Thermal Stresses.

A.E. 421. Aerodynamics—Elementary Supersonics
3-0-3. Prerequisites: A.E. 325, M.E. 322.

The equations of motion, energy and continuity, thermodynamic principles, one-dimensional flow. Mach waves, shock waves, Prandtl-Meyer flow.


A.E. 424. Aerodynamics—Perfect Fluids
5-0-5. Prerequisites: A.E. 325, Math. 412.

Flow about a body; finite thickness airfoils and three-dimensional wing theory; complex variable theory; conformal mapping and transformations.

Text: Rauscher, Introduction to Aeronautical Dynamics.

A.E. 426. Viscous Flow
3-0-3. Prerequisites: A.E. 421, A.E. 430.

A study of the momentum and energy equations as applied to viscous flows with applications. Boundary layer equations with applications.

Text: Kuethe and Schetzer, Foundations of Aerodynamics.

A.E. 428. Experimental Methods

The methods, equipment, and instrumentation used in experimental aerospace engineering. The technique of recording and interpreting experimental data from selected laboratory tests is emphasized.

A.E. 430. Theory of Structures II.
3-3-4. Prerequisites: A.E. 331, Math. 412.

Development of the basic concepts of stress and strain suitable for both solids and fluids; statement of generalized Hooke's Law and simplification to isotropic materials; introduction to plane stress, with applications to beam bending; torsion of cylindrical rods; laboratory experiments.

Text: Peery, Aircraft Structures; Sechler, Elasticity in Engineering.

A.E. 435. Theory of Structures III.
3-3-4. Prerequisite: A.E. 430.

General discussion of strain energy in elastic structures; application to rods, webs, beams, and shafts; virtual work and generalized virtual work; structural deflections by virtual work, Rayleigh-Ritz, and double integration; introduction to stability analysis; use of energy methods; long and short columns; elastic and plastic buckling of plates; the pure tension field beam; the semi-tension field beam.

Text: Peery, Aircraft Structures; Mil HNBK-5.

A.E. 437. Theory of Structures IV.
3-3-4. Prerequisite: A.E. 435.

Statically indeterminant structures by energy methods and special methods; torsion of multicell sections; elastic axis of multicell sections; elastic axis of wing sections, warping of box beams; correlation of theory and practice by experiments in laboratory.

Text: Perry, Aircraft Structures.

A.E. 439. Advanced Structures
3-0-3. Prerequisites: A.E. 435.

Detailed study of beam columns, shear webs with cut-outs; shear lag,
bending in the plastic range; miscellaneous thin metal structural problems.

**A.E. 440. Aerospace Vehicle Design I.**
Preliminary design of an advanced contemporary flight vehicle in accordance with appropriate F.A.A. or Air Force requirements, including weight and balance, performance, loading report, and general arrangement. A team effort with emphasis on the systems engineering approach.

**A.E. 441. Aerospace Vehicle Design II.**
Continuation of A.E. 440 including a stability, propulsion system and wing and fuselage or landing gear structural analysis.

**A.E. 442. Aerospace Vehicle Design III.**
0-9-3. Prerequisites: A.E. 441 and A.E. 437.
Preliminary design of a space vehicle or satellite. A team effort with emphasis on the systems engineering approach.

**A.E. 456. Vibration and Flutter**
Structural dynamics of one-dimensional systems utilizing normal coordinates. Fundamental analyses of static aeroelastic phenomena and various types of flutter. Formulation of the generalized equations of motion for complete aeroelastic systems and a description of the techniques used for this solution.

**A.E. 457. Static and Dynamic Stability**
5-0-5. Prerequisites: A.E. 323, Mech. 421 or concurrently.
Airplane and missile static lateral and longitudinal stability and a study of the equations and methods used in the analysis of dynamic stability of airplanes and missiles.

**A.E. 467-468. Seminar**
Scheduled meetings at which individual students present technical papers on important current aeronautical developments, the reading of each paper being followed by group discussion.

**A.E. 471. Internal Aerodynamics**
3-0-3. Prerequisite: A.E. 421.
One dimensional, internal aerodynamics. Flow characteristics of wind tunnels, diffusers and exhaust nozzles. Flow in ducts with friction, energy change and mass addition.

**A.E. 473. Introduction to Propeller and Rotor Theory**
3-0-3. Prerequisite: A.E. 323 or consent of instructor.
A study of the theory and equations used in the design of propellers and helicopter rotors.

**A.E. 481. Jet Propulsion**
3-0-3. Prerequisite: A.E. 471.

**A.E. 482. Jet Propulsion and Rocketry**
3-0-3. Prerequisite: A.E. 481.
A.E. 495. Engineering Analysis

Introduction to programming for digital computer; numerical analysis for digital computation; problem solution on an analog computer; applications to problems in aerospace engineering. Students have the opportunity to work with both analog and digital computers.

Text: Notes.

Graduate Courses Offered

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<td>Special Problems in Aerospace Engineering</td>
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<td>A.E. 607*</td>
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<td>A.E. 608*</td>
<td>Combustion I</td>
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*Also taught as M.E. 607, 608, and 609, respectively.

**Also taught as M.E. 711, 712, 713, and 714, respectively.
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Department of Air Force Aerospace Studies
(Established in 1950)


Air Force Officers' Training Corps

The Department of Air Force Aerospace Studies was established in 1950 to select and prepare students to serve as officers in the Regular and Reserve components of the United States Air Force. The curriculum emphasizes the high level of military understanding and knowledge required of all Air Force officers.

AFROTC training is divided into two phases: The first two years constitute the General Military Course; the last two the Professional Officer Course. The Department offers a four-year and a two-year program. Each of these options leads to a commission in the Air Force. The four-year program requires completion of both the General Military Course and Professional Officer Course. Students with prior active military service or previous training at military schools may, on the basis of their experience, receive a waiver for portions of the General Military Course. The two-year program requires, as a substitute for the General Military Course, completion of a six-week Field Training Course at an Air Force Base prior to formal enrollment in the Professional Officer Course.

The ROTC Vitalization Act of 1964 provides for Financial Assistance Grants to AFROTC cadets. Cadets receiving Financial Assistance Grants are selected on a competitive basis. Only cadets enrolled in the four-year program are eligible for Financial Assistance. These grants pay the cost of tuition, books, fees, supplies and equipment, plus a monthly subsistence of $50.

General Military Course

A study of World Military Systems, the General Military Course is designed to acquaint the student with causes of the present world conflict as they affect the security of the United States. It includes an introductory analysis of the United States' power position in World affairs and the fundamental aspects of aerospace operations. In addition to exploring western military forces and alliances, it also includes an up-to-date familiarization with communist and satellite forces.

The Professional Officer Course

Enrollment in the Professional Officer Course is limited to applicants who demonstrate a high officer potential. Applicants must: (1) be able
to fulfill all requirements for a commission prior to their 28th birthday (before age 26 1/2 for flying category or before their 25th birthday if they are recipients of Financial Assistance Grants); (2) have two academic years remaining in the institution, including anticipated graduate study; (3) sign a written contract agreeing to complete the course; (4) be a citizen of the United States; (5) pass the Air Force Officers' Qualification Test; (6) pass the Officer physical examination; (7) terminate membership (if a member) of Air Force Reserve, secure release if a member of other reserve components, and enlist in Air Force Reserve (Obligated Reserve Section); and (8) be accepted by a board of Air Force Officers.

All Professional Officer Course cadets receive subsistence pay amounting to about $1000. This is in addition to the pay received for the four-week Field Training which is accomplished between the junior and senior year. Field Training pay is at the rate of $160.00 a month. Cadets also receive compensation for travel expenses and are furnished food, housing, uniforms and medical care while attending Field Training, which is conducted at regularly established Air Force Bases.

Completion of the Professional Officer Course, including Field Training, and receipt of a degree make a cadet eligible for a commission as a lieutenant in the United States Air Force Reserve. Cadets receiving commissions will be ordered to active duty shortly after graduation. The active duty commitment for those who enter and complete pilot or navigator training is five years after graduation from flying school. For others, the commitment is four years after initial call to active duty.

The Professional Officer Course is a recognized elective in all departments at Georgia Tech to the extent that nine hours of credit may be applied toward a degree, providing the entire course is completed. If the student does not complete the entire program, ROTC credits may not be used as electives unless the student has been relieved of his contract obligations by the Secretary of the Air Force.

Uniforms

The Air Force ROTC uniform is identical to the regulation Air Force uniform except for insignia. Air Force ROTC cadets are required to wear the uniform during Corps Training periods.

Newly entering students in the Air Force ROTC are issued required uniforms from AFROTC supply. A deposit of $25.00 is required. The uniform remains the property of the Air Force and is returned to supply during quarters of non-attendance, transfer to another institution or upon completion of the General Military Course. The full $25.00 deposit, less cost of lost or damaged items of uniform, will be refunded to the student when he returns the uniform.

A cadet entering the Professional Officer Course is required to purchase a new uniform through Georgia Institute of Technology. The cost of the Professional Officer Course uniform is approximately $108.00.
A Professional Officer Course cadet will receive a $100.00 reimbursement for the uniform upon completion of the Course or upon disenrollment without prejudice. In addition he will be allowed to retain the uniform.

Texts

Textbooks are furnished by the Air Force.

Grading System

Letter grades are awarded as in other departments. However, the grade received by the General Military Course cadet is not based entirely on classroom recitations, oral or written, but includes aptitude and leadership ability as demonstrated during Corps Training periods.

A cadet's potential value as a leader is demonstrated to an important degree by his response to the entire scope of military instruction and military procedure, as portrayed by his interest, conduct, alertness, neatness, attendance and similar related matters. Final grades for each quarter will be based on evidence of those attributes combined with academic standing.

Academic Credit

Academic credit is granted for the completion of Air Force ROTC courses as indicated in the sections that follow, however, not more than 6 hours in General Military Courses and not more than 9 hours in Professional Officer Courses may be applied toward a degree.

General Military Course:

<table>
<thead>
<tr>
<th></th>
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<th>2nd Q.</th>
<th>3rd Q.</th>
<th>Credit Hrs.</th>
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<tr>
<td>1st year</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
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Professional Officer Course:

<table>
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<th>3rd Q.</th>
<th>Credit Hrs.</th>
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</thead>
<tbody>
<tr>
<td>1st year</td>
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<td>3</td>
<td>3</td>
<td>9</td>
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<tr>
<td>2nd year</td>
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<td>9</td>
</tr>
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<td><strong>Total</strong></td>
<td><strong>24</strong></td>
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</table>

Courses of Instruction

**Note:** 3-1-3 means 3 hours class, 1 hour laboratory, 3 hours credit.

**GENERAL MILITARY COURSE**

**AEROSPACE STUDIES I** — World Military Systems

A.S. 141. The United States Aerospace Forces

1-1-1.

A study of the United States organization for national security and the mission and organization of the Air Force. The major combat and support commands with emphasis on mission and employment.

A.S. 142. The Air Force as a Profession

1-1-1.

A study of the role of the individual Air Force officer in the military organization. Air Force education, training and career programs, pres-
ent and future requirements and assignment procedures.

A.S. 143. Military Patterns of Confrontation
1-1-1.
An analysis of the military aspects of national interest, concentrating on the elements of national power, and the interrelationships of these elements to the methods of applying power. Concludes with a study of Air Force Doctrine.

AEROSPACE STUDIES II — World Military Systems — 2
A.S. 241. The United States General Purpose Forces
1-1-1.
A study of the mission, organization, and capabilities of U.S. General Purpose Forces. Includes a discussion of the Tactical Air Command, United States Air Force in Europe, Pacific Air Forces, United States Strike Command, and the limited war forces of the U.S. Army and Navy.

1-1-1.
An investigation of international security organizations including NATO, SEATO, CENTO and the Warsaw Pact. The reasons for these organizations, their characteristics, commitments, issues, and problems. A comparison of the military capabilities of Communist and free-world alliances contrasting individual national objectives with collective security and individual national viewpoints on defense postures. Includes a discussion of the doctrine, organization, and current capabilities of Soviet, Eastern European, and Communist Chinese military forces.

A.S. 243. The Struggle for Peace
1-1-1.
An analysis of the trends and implications of world military power, insurgency, nationalism, the United Nations, disarmament, the propensity for war, and the search for peace.

PROFESSIONAL OFFICER COURSE

AEROSPACE STUDIES III — The Growth and Development of Aerospace Power
3-1-3.
A detailed study of the nature of war with emphasis on the Air Force role. Mission and Organization of the Department of Defense; development of Air Power in the United States; the Air Force mission, concepts, doctrine and employment.

A.S. 312. Astronautics and Space Operations—1
3-1-3.
An examination of the national space effort and its evolution; characteristics of the spatial environment; types of orbits and trajectories; current space operations.

A.S. 313. Astronautics and Space Operations—2
3-1-3.
Characteristics of present day systems including the vehicle and associated ground support equipment. Concepts of space operations and their application to future aerospace power.

AEROSPACE STUDIES IV—THE PROFESSIONAL OFFICER
A.S. 411. Air Force Leadership
3-1-3.
A study of the need for Air Force leadership, human relations, discipline in the military services, and the military justice system. Command positions in leadership laboratory.
A.S. 412. Command-Staff Relationships

3-1-3.

A study of the variables affecting leadership, problem solving, and the principles and concepts of the commander and his staff. Introduction to Air Force management.

A.S. 413. Air Force Management and the Junior Officer

3-1-3.

School of Architecture
(Established in 1908)

Director—Paul M. Heffernan; Professor Emeritus—Harold Bush-Brown; Regents Professor of City Planning—Howard K. Menhinick; Professors—Hin Bredendieck, H. Griffith Edwards (part time), James H. Grady, Julian H. Harris, Malcolm G. Little, Jr., D. A. Polychrone (part time), Richard Wilson; Associate Professors—Arthur F. Beckum, Jr., Arnall T. Connell, Edward L. Daugherty (part time), C. Malcolm Gailey, John C. Gould (part time), Guy J. Kelnhofer, Jr., Roger F. Rupnow, Isaac E. Saporta, Vernon M. Shipley, Jr., Joseph N. Smith; Assistant Professors—Anthony J. Catanese, Dale A. Durfee, Rufus R. Greene, John A. Kelly, Peter J. R. Norris, Robert F. Rabun, Clyde Robbins (part time), William J. Seay, Robert J. Young; Instructor—Albert H. Smith; Lecturer—Frederick F. Bainbridge (part time); Special Lecturers—*George Beattie, Jr., John C. Hardy; Secretaries—Joan M. Jordan, J. Carolyn Carter, Duane Bedwell, Nelly E. Burch (part time), Frances Tolar (part time); Head Architecture Librarian and Assistant Professor—Helen B. Martini; Assistant Architecture Librarian—Joe E. Poe; Library Assistant—Lyn Young.

General Information
The School of Architecture was established as a degree granting department of the Institute in 1908 and now offers the following courses of study—(1) the five-year curricula in Architecture with options in Architectural Design or Structural Design both leading to the degree Bachelor of Architecture, (2) a four-year curriculum in Building Construction leading to the degree Bachelor of Science in Building Construction and (3) a four-year curriculum in Industrial Design leading to the degree Bachelor of Science in Industrial Design. In addition, the graduate program in Architecture** prepares for the degree Master of Architecture, and the graduate program in City Planning** leads to the degree Master of City Planning.

Architecture
The original objective and first aim of the School is to prepare students for the profession of Architecture. The scope of the field is of such breadth in current practice that need is felt not only for men who are strong in design but for others whose interests will be closely integrated with design in structural and mechanical techniques. The training in Architecture is uniform for the first four years with two areas of specialization, Architectural Design and Structural Design, strongly emphasized in the final year. The central core of the curriculum in Architecture is the study of design, with related exercises in drawing, graphics, visual composition and model building. The student is given an opportunity in these courses to develop his creative as well as his analytical powers by finding solutions to programs employing the re-

*On leave.
**For the graduate program in Architecture and City Planning, see Graduate Bulletin.
quirements of contemporary buildings and paralleling the conditions to be encountered in later practice. Instruction is generally in the form of guidance and suggestion on the part of the instructor to each student individually, accompanied by group discussions, lectures, and demonstrations. Solutions are submitted as drawings or models for review and judgment by a jury of teachers, practicing architects, and such designers or specialists as the occasion may require.

Closely allied to design and, insofar as possible, integrated with it are the courses in construction which, in turn, are dependent on the basic requirements of mathematics, physics, and mechanics. Courses in the history and theory of architecture supply a fuller understanding of our architectural heritage, its meaning and impact on contemporary problems. Work of technical importance is offered in building materials, mechanical plant (plumbing, heating, air-conditioning and electrical installations), office and field practice.

The National Architectural Accrediting Board has officially accredited the five-year course leading to the degree Bachelor of Architecture at the Georgia Institute of Technology.

The National Council of Architectural Registration Boards and the Georgia State Board for the Examination, Qualification and Registration of Architects, recognize the Bachelor of Architecture degree at the Georgia Institute of Technology as adequate preparation for practice, with the exception of experience requirements. After three years internship in the office of a registered architect, Bachelor of Architecture graduates may apply for examination and registration as licensed architects.

All work executed in classes administered by the School becomes the property of the School and will be retained, or returned at the discretion of the faculty.

The faculty reserves the right to refuse for credit any project executed outside the precincts of the School of Architecture, or otherwise executed without proper coordination with the instructor.

Standards for Advancement

All students entering the School of Architecture are required during the first term of residence to take interest and aptitude tests with the Office of Guidance and Testing.

Curriculum in Architecture

In order for students to obtain the greatest benefit from courses offered concurrently in the curriculum, progress will be noted at several intervals as follows:

a) Averages in drawing and design will be checked at the end of each year group of three courses (151-52-53; 251-52-53, etc.). A student will not be permitted to enter a more advanced group until his record in the previous group equals 2.0 or better.
b) Admission to the third year of Architecture will be based on faculty approval plus the completion of all required and prerequisite courses, both academic and departmental, in the first two years of the curriculum. A point average in design of 2.0 and an overall average not less than 1.9 are required. The student on entering the third year must be prepared to schedule his primary subjects concurrently (Arch. 351, 361, 371).

c) Admission to the 5th year of Architecture will be based on faculty approval plus the completion of all required and prerequisite courses, both academic and departmental, in the first four years of the curriculum. A point average of 2.0, both overall and in design courses is required. The student must be prepared to schedule his primary subjects concurrently (Arch. 551 or 554, 561 and C.E. 400); in addition he must present an affidavit confirming at least three months practical experience in the office of a registered architect or approved construction company.

d) Admission to the thesis in Architecture requires faculty approval and a minimum average of 2.0 in Arch. 551-52 (Option I) or 554-55 (Option II).

Curriculum in Building Construction

a) Requirements for the first two years are identical with those for architectural students.

b) Admission to the third year of Building Construction will be based on faculty approval plus the completion of all required and prerequisite courses, both academic and departmental, in the first two years of the curriculum. An overall average not less than 1.9 is required. The student must be prepared to schedule his primary subjects concurrently (Arch. 322, 337, 371).

c) To become a candidate for a degree, the student must present an affidavit confirming at least three months practical experience with an approved construction or materials concern.

Curriculum in Industrial Design

a) Requirements for the first four quarters are identical with those for architectural students.

b) Averages in Industrial Design will be checked at the end of each year's group of courses (I.D. 202-3, I.D. 301-2-3, etc.). A student will not be permitted to enter a more advanced group until his record in the previous group equals 2.0 or better.
### ARCHITECTURE

#### Freshman Year

*Uniform for Architecture, Building Construction and Industrial Design*

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch. 151-52-53</td>
<td>Arch. Drawing</td>
<td>0-9-3</td>
<td>0-9-3</td>
<td>0-9-3</td>
</tr>
<tr>
<td>Arch. 162-63</td>
<td>Arch. Orientation</td>
<td>1-0-0</td>
<td>1-0-0</td>
<td>1-0-0</td>
</tr>
<tr>
<td>Arch. 171-72-73</td>
<td>Graphics</td>
<td>1-3-2</td>
<td>1-3-2</td>
<td>1-3-2</td>
</tr>
<tr>
<td>Eng. 107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Math. 107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
<td>5-0-5</td>
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<tr>
<td><em>M.L.</em></td>
<td>Modern Language</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<td>P.T. 101-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC **</td>
<td>Basic ROTC (optional)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen. 101</td>
<td>Orientation</td>
<td>1-0-0</td>
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</table>

**Totals (excluding ROTC)** 13-16-17 13-16-17 13-16-17

**NOTE:** Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*Chemistry is required in place of M.L. for the curricula in Building Construction and Industrial Design.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

#### Sophomore Year

*Uniform for Architecture and Building Construction*

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
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<tbody>
<tr>
<td>Eng. 201-2-3</td>
<td>Survey of the Humanities</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 211-12-13</td>
<td>Mech.; Elec.; Heat, Light &amp; Sound</td>
<td>4-0-4</td>
<td>4-0-4</td>
<td>4-0-4</td>
</tr>
<tr>
<td>P.T. 201-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC **</td>
<td>Basic ROTC (optional)</td>
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<tr>
<td><em>Electives</em></td>
<td></td>
<td>3-0-3</td>
<td></td>
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</tr>
</tbody>
</table>

**Totals (excluding ROTC)** 10-19-16 12-19-18 12-19-18

*Arch. 351 is required in place of Arch. 253 for the curriculum in Building Construction.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

#### Junior Year

<table>
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<tbody>
<tr>
<td>Arch. 361-62-63</td>
<td>History and Theory</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Arch. 371-72-73</td>
<td>Structures</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Arch. 322-23-24</td>
<td>Building Materials</td>
<td>2-0-2</td>
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<td>S.S. 111-12-13</td>
<td>Social Sciences</td>
<td>3-0-3</td>
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<td><em>Electives</em></td>
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<td>3-0-3</td>
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</table>

**Electives:** 11 hours must be chosen from the restricted list of the School of Architecture, Group I or Group II corresponding to option.

9 hours must be chosen from the list of general electives approved by the School of Architecture.

9 hours may be used as free electives. If advanced military is elected, 9 hours only will be credited toward a degree.
Senior Year

<table>
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<th>Course No.</th>
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<tr>
<td>Arch. 451-52-53</td>
<td>Arch. Design</td>
<td>0-18-6</td>
<td>0-18-6</td>
<td>0-18-6</td>
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<tr>
<td>Arch. 461-62-63</td>
<td>History and Theory</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Arch. 471</td>
<td>Structures</td>
<td>3-0-3</td>
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<tr>
<td>C.E. 306, 406</td>
<td>Structural Analysis,</td>
<td></td>
<td>3-3-4</td>
<td>2-3-3</td>
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<td></td>
<td>Reinforced Concrete</td>
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<td></td>
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<tr>
<td>M.E. 334-35</td>
<td>Mech. Equip. Bldgs.</td>
<td>3-0-3</td>
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<td>E.E. 315</td>
<td>Mech. Equip. (Elec.)</td>
<td>3-0-3</td>
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<td>'Electives</td>
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<tr>
<td>Totals</td>
<td></td>
<td>12-18-18</td>
<td>11-24-19</td>
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Fifth Year (Option I—Architectural Design)

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<td>Seminar</td>
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<td>Arch. 581-82-83</td>
<td>Professional Practice</td>
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<td>C.E. 400</td>
<td>Reinforced Concrete</td>
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'Electives: 11 hours must be chosen from the restricted list of the School of Architecture, Group I or Group II corresponding to option.
9 hours must be chosen from the list of general electives approved by the School of Architecture.
9 hours may be used as free electives. If advanced military is elected, 9 hours only will be credited toward a degree.

Fifth Year (Option II—Structural Design)

<table>
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<th>Course No.</th>
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<td>Arch. 554-55-56</td>
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<td>Arch. 581-82-83</td>
<td>Professional Practice</td>
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<td>Arch. 522</td>
<td>Structural Design: Integration</td>
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<td>Group II Electives</td>
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'Electives: 11 hours must be chosen from the restricted list of the School of Architecture, Group I or Group II corresponding to option.
9 hours must be chosen from the list of general electives approved by the School of Architecture.
9 hours may be used as free electives. If advanced military is elected, 9 hours only will be credited toward a degree.

Building Construction

As one of the major industries in the country, Construction has need of many men who are trained in the field of materials, products, manufacture, sales and general contracting. The Building Construction cur-
Architecture

Curriculum at Georgia Tech is designed to supply graduates for these varied building activities which, with the architect and engineer, help to coordinate all building projects. The course parallels the curriculum in Architecture for the first two years, then specializes in technical studies in construction, materials, personnel and management problems. The degree, Bachelor of Science in Building Construction, is awarded on the completion of four years of study.

Freshman and Sophomore years—see Architecture.

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
<th>1st Q.</th>
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<tr>
<td>Arch.</td>
<td>322-23-24</td>
<td>Building Materials</td>
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<td>Arch.</td>
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<td>Arch.</td>
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<td>Structures</td>
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<tr>
<td>C.E.</td>
<td>206</td>
<td>Elem. Surveying</td>
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<td>C.E.</td>
<td>306</td>
<td>Structural Analysis</td>
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<tr>
<td>Eng.</td>
<td>320</td>
<td>Tech. Writing</td>
<td>3-0-3</td>
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<tr>
<td>I.M.</td>
<td>204</td>
<td>Economics</td>
<td>3-0-3</td>
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<tr>
<td>I.M.</td>
<td>340</td>
<td>Accounting Survey</td>
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<td>19-0-19</td>
<td>16-6-18</td>
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Senior Year

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<th>Course</th>
<th>No.</th>
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<td>Arch.</td>
<td>471</td>
<td>Structures</td>
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<td>Arch.</td>
<td>581-82-83</td>
<td>Professional Practice</td>
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<td>Cost Analysis</td>
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<tr>
<td>C.E.</td>
<td>406, 400</td>
<td>Reinforced Concrete</td>
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<td>M.E.</td>
<td>334-35</td>
<td>Mech. Plant</td>
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<td>E.E.</td>
<td>315</td>
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<td>I.M.</td>
<td>316-17</td>
<td>Fin. Survey; Ind. Mkt.</td>
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<td>15-9-18</td>
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</table>

1Electives: 15 hours must be chosen from the approved list of the School of Arch. 9 hours may be used as free electives. If advanced military is elected, 9 hours only will be credited toward a degree.

Industrial Design

Industrial Design deals with the development of those products of industry with which man, in utilizing them, has direct visual physical relationship, such as utensils, appliances, equipment, and furnishings for the home, industry, commerical and public places.

The specialized curriculum in Industrial Design begins with the second term of the Sophomore Year. It is comprised of two design series which are taken concurrently.
The Industrial Design Series deals with the nature of objects, the design processes, the different fields of design, and the types and groups of objects. In this series the student deals with the actual design and execution of test models as well as with the theoretical aspect of design for mass-production.

The Material and Technique Series covers the relationship of design to various industrial materials and processes. In this series the student designs and executes objects, but is limited in each assignment to specific materials and/or processes.

The degree, Bachelor of Science in Industrial Design, is awarded on the completion of four years of study.

**Freshman year—see Architecture.**

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
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<th>3rd Q.</th>
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<tr>
<td>Arch.</td>
<td>251</td>
<td>Arch. Design</td>
<td>0-15-5</td>
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<tr>
<td>Arch.</td>
<td>254-55</td>
<td>Color Theory</td>
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<td>I.D.</td>
<td>202-3</td>
<td>Design</td>
<td>1-12-5</td>
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<td>I.D.</td>
<td>215-16</td>
<td>Material and Technique</td>
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<tr>
<td>Eng.</td>
<td>201-2-3</td>
<td>Survey of the Humanities</td>
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<td>Phys.</td>
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<td>P.T.</td>
<td>201-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC *</td>
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<td>Basic ROTC (optional)</td>
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<td>10-22-17</td>
<td>10-22-17</td>
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*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
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<td>Arch.</td>
<td>354-55</td>
<td>Arch. Rendering</td>
<td>0-3-1</td>
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<td>Arch.</td>
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<td>Arch. History</td>
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<td>I.D.</td>
<td>301-2-3</td>
<td>Design</td>
<td>1-12-5</td>
<td>1-12-5</td>
<td>1-15-6</td>
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<td>314-15-16</td>
<td>Material and Technique</td>
<td>1-3-2</td>
<td>1-3-2</td>
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<tr>
<td>Met.</td>
<td>325</td>
<td>General Metallurgy</td>
<td>3-0-3</td>
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<td>L.E.</td>
<td>311</td>
<td>Manufacturing Processes</td>
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*Electives: 17 hours must be chosen from the approved list of the School of Arch. 9 hours may be used as free electives. If advanced military is elected, 9 hours only will be credited toward a degree.
### Senior Year

<table>
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<tr>
<th>Course</th>
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<td>401-2-3</td>
<td>Design</td>
<td>1-15-6</td>
<td>1-18-7</td>
<td>1-21-8</td>
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<td>414</td>
<td>Material and Technique</td>
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<td>Eng.</td>
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<td>Tech. Writing</td>
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<tr>
<td>I.E.</td>
<td>490</td>
<td>Legal and Ethical Phases of Engr.</td>
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<td>3-0-3</td>
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<tr>
<td>I.M.</td>
<td>317</td>
<td>Industrial Marketing</td>
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<td>Psy.</td>
<td>303-4</td>
<td>General Psychology A and B</td>
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<td>S.S.</td>
<td>313</td>
<td>Problems of Public Opinion</td>
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### Electives

Electives: 17 hours must be chosen from the approved list of the School of Arch. 9 hours may be used as free electives. If advanced military is elected, 9 hours only will be credited toward a degree.

### Electives

General Electives: See humanities list on page 40 plus the following:
- C.E. 201 or 206; Eng. 315, 320; Geol. 101, 201; I.D. 215, 216; I.M. 316, 317, 329, 443; Math. 207, 208, 209, 235.

Restricted Electives: Group I: Arch. 254, 255, 335, 336, 354, 355, 416, 455, 436, 444, 465, 466, 510, 511, 512, 522, 530, 540, 541. Group II: Arch. 540, 541, 584; C.E. 201 or 206, 211, 460; I.M. 443; M.E. 353; I.E. 460.

### Courses of Instruction: Architecture

**Arch. 151, 152, 153. Architectural Drawing**

0-9-3.

Introductory studies in drawing and the principles of visual expression; includes one laboratory period per week in creative drawing.


**Arch. 162, 163. Orientation**

1-0-0.

An introduction to the field of architecture and design; a requirement for all students in the School of Architecture.

Texts: Danby, Grammar of Architectural Design; Rasmussen, Experiencing Architecture.

**Arch. 171, 172, 173. Graphics**

1-3-2.

Lectures and laboratory exercises in descriptive geometry; shades and shadows; perspective.


**Arch. 251, 252, 253. Design**

0-15-5. Prerequisites: Arch. 153, 163, 173.

Basic composition, architectural problems and presentation methods; includes one laboratory period per week in creative drawing.

**Arch. 254, 255. Color Theory**

1-3-2. Prerequisite: Arch. 251 or Soph. standing.

Lecture and laboratory experiments on the properties of color and its use in design.
Arch. 310, 311, 312. Freehand Drawing 0-3-1.
For non-architects and architects entering under catalogs previous to June, 1961. Creative drawing from compositions by students.

Arch. 322, 323, 324. Building Materials 2-0-2. Prerequisite: Arch. 253 or consent.
A study of materials of construction, their properties and use in modern construction, with special attention to their effect upon architectural design.

Arch. 335, 336. Art History 2-0-2. Prerequisite: Junior standing.
A history of the development from primitive to modern times of the useful objects, artifacts, and inventions of man (tools, utensils, furniture, weapons, etc.) as distinguished from the usual categories of painting, sculpture, and architecture; with an analysis of present-day principles and processes.

Arch. 337, 338, 339. Architectural History 2-0-2. Prerequisite: Arch. 252 or consent.
A survey course in architectural history for non-architectural students. In non-technical language, it covers architectural development from ancient times to the present. Lectures, supplemented by slide projection, notes and reading assignments.
Text: Hamlin, Architecture Through the Ages.

Arch. 351, 352, 353. Design 0-15-5. Prerequisites: Arch. 253 and admission to the third year curriculum.
Elementary problems in architectural design and presentation methods; includes one laboratory period per week in creative drawing.
Text for 351: Burbank and Shaftel, House Construction Details.

Arch. 354, 355. Architectural Rendering 0-3-1. Prerequisite: Arch. 251.
Rendering of architectural subjects in various media.

Arch. 361, 362, 363. History and Theory 3-0-3. Prerequisite: Admission to the third year curriculum or consent.
History of architecture in ancient Egypt and Mesopotamia, Greece and Rome; Medieval Europe; the Renaissance in continental Europe.
Texts: Millon, Key Monuments of Architecture; Fletcher, A History of Architecture.

Introduction to methods of construction, proportioning and qualitative explanation of behavior; theory and design of ordinary timber structures; theory and design of metal structures (Part I).

Arch. 381, 382. Design and Graphic Presentation 1-12-4. Prerequisite: Senior standing.
A basic course in drawing and design for students preparing for the Master's program in City Planning. Not open to architectural students.

Arch. 410. Freehand Drawing 0-6-2.
For non-architects, and architects entering under catalogs previous to June, 1961.
Pencil sketching.

Arch. 411. Freehand Drawing 0-3-1.
For non-architects, and architects entering under catalogs previous to June, 1961.
Pen and ink sketching.

Arch. 412. Freehand Drawing 0-6-2.
For non-architects, and architects entering under catalogs previous to June, 1961.

Water color sketching.

Arch. 416. Introduction to Landscape Architecture
2-0-2. Prerequisite: Arch. 451 and Arch. 461.
A brief history of landscape architecture followed by a study of the principles of landscape design as applied to contemporary problems.

Arch. 435, 436. Art History
2-0-2. Prerequisite: Junior standing.
A survey course in the history of artistic manifestations from primitive times to our own day.
Text: Janson, History of Art.

Arch. 444. Housing Seminar
2-0-2. Prerequisite: Junior standing.
Lecture and discussion broadly covering the housing field and the home building industry, housing needs, housing markets and financing, standards of design and construction, the Government and housing.

Arch. 451, 452, 453. Design
0-18-6. Prerequisites: Arch. 353 and advancement standard.
Intermediate problems in architectural design and presentation methods; includes one laboratory period per week in freehand drawing from live models.

Arch. 461, 462, 463. History and Theory
3-0-3. Prerequisite: Arch. 363 and advancement standard.
Renaissance architecture in England and America; the 19th and 20th centuries; history of town and city planning in Europe and America.
Texts: Fletcher, A History of Architecture; Richards, Modern Architecture; Gallion, The Urban Pattern.

Arch. 465, 466. Art History
2-0-2. Prerequisite: Junior standing.
A history of Pre-Columbian and Oriental art and architecture.

Arch. 471. Structures
3-0-3. Prerequisite: Arch. 373.
Theory and design of metal structures (Part II).

Arch. 510, 511, 512. Freehand Drawing: Advanced
0-3-1. Prerequisite: Arch. 453.
Freehand drawing of varied subjects and in various media.

Arch. 513, 514. Freehand Drawing: Advanced
0-3-1, 0-6-2. Prerequisite: Arch. 453.
Freehand drawing from live models.

Arch. 522. Structural Design: Integration
3-3-4. Prerequisites: Arch. 373 and C.E. 400 or concurrent.
This course brings together the information obtained in previous courses in Structural Design and presents the subject matter as an integrated whole.

Arch. 530. Art History
2-0-2. Prerequisites: Arch. 339, 462 or consent.
A survey of 19th and 20th century art in Europe and the United States.
Text: Hunter, Modern French Painting.

Arch. 540, 541. Research
0-6-2, 0-9-3 or 1-9-4.
A clearly stated program by the student describing in detail the nature, purpose and extent of the proposed problem must be submitted for approval. The major portion of the work will be conducted in library, drafting room, or shop.
Arch. 551, 552, 553. Design
Group I. Advanced problems in architectural design with emphasis on the solution of complex building programs and site planning, terminating in an independent major problem submitted as a thesis for the degree Bachelor of Architecture (Option I).

Arch. 554, 555, 556. Design
Group II. Advanced Problems in architectural design with emphasis on structural solutions, computations and details, terminating in an independent problem submitted as a thesis for the degree Bachelor of Architecture (Option II).

Arch. 561, 562, 563. Seminar
2-0-2. Prerequisites: Arch. 453, 463.
Preparation of thesis programs and research; lectures and discussions of current problems in architecture and design.

Arch. 581, 582, 583. Professional Practice
3-0-3. Prerequisites: Arch. 453, 463 or Senior standing.
Conduct of architectural practice, office organization, competitions, contracts, legal and ethical problems; specification writing; estimating and supervision of construction.

Arch. 584. Cost Analysis
2-3-3. Prerequisite: Senior standing.
Principles and methods of cost analysis in the construction industry. Methods of compiling and analyzing material, labor and equipment production costs. Exercises in office and field management procedures.

Courses of Instruction: Industrial Design

**NOTE:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

I.D. 202. Design
1-12-5. Prerequisite: Arch. 251. Concurrent with I.D. 215.
Introduction to Industrial Design. A series of abstract problems dealing with the elements of a design process.

I.D. 203. Design
Analytical approach to design.

I.D. 215. Material and Technique
1-3-2. Prerequisite: Arch. 153 or consent.
The standard joints and hand operated machines. Exercises, execution and development of joints.

I.D. 216. Material and Technique
1-3-2. Prerequisite: I.D. 215 or consent.

I.D. 301. Design
1-12-5. Prerequisite I.D. 203. Concurrent with I.D. 314.
Design of structural objects.

I.D. 302. Design
1-12-5. Prerequisite I.D. 301. Concurrent with I.D. 315.
Design analysis of specific groups of objects.

I.D. 303. Design
Continuation of I.D. 303.

I.D. 314. Material and Technique
1-3-2. Prerequisite: I.D. 216.
Casting and fabricating techniques — plaster, plastic-casting, blowing, sand casting, ceramics, paper, rubber, etc.
Design of objects for the various techniques.

I.D. 315. Material and Technique
1-3-2. Prerequisite: I.D. 314.
The industrial pre-formed materials — extrusion, rolled and drawn profiles, mouldings, etc.
Design of objects for the various techniques.

I.D. 316. Material and Technique
1-3-2. Prerequisite: I.D. 315.
Semi-automatic and mass-production techniques — forging, stamping, heading, screw machining, wire forming.
Design of objects for various techniques.

I.D. 401. Design
Design of appliances and equipment for the commercial, industrial and public fields (such as machines, store and office appliances). Design of packaging for industrial products.

I.D. 402. Design
1-18-7. Prerequisite: I.D. 401.
Design of groups of objects which comprise larger functional units.

I.D. 403. Design
1-21-8. Prerequisite: I.D. 402.
Continuation of I.D. 402 comprising more complex units such as home, public, and commercial interiors, exhibitions and displays.

I.D. 414. Material and Technique
1-3-2. Prerequisite: I.D. 316.
The mass-production techniques — die casting, impact extrusion, compression — transfer — injection — molding, etc.
Design of objects for various techniques.

GRADUATE COURSES
(Complete details about graduate courses in Architecture and City Planning are contained in the Graduate Bulletin, a copy of which is available upon request.)
School of Biology  
(Established in 1960)

Director—Robert H. Fetner; Professor Emeritus—Hugh A. Wyckoff; Professors—Thomas W. Kethley, Walter L. Bloom; Associate Professors—Allen B. Eschenbrenner, John J. Heise, Hong S. Min; Assistant Professors—Nancy W. Walls, Konrad Bachmann, Edward K. Yeargers; Instructors—Ann M. Colley, Henry J. Kania; Principal Secretary—Mrs. Corinne K. Morgan.

General Information

The purpose of the School of Biology is to provide competence in this basic science to students of the Institute. There are unique opportunities for biological instruction and research in an environment of science and technological excellence. The curriculum draws heavily from the other sciences and engineering programs to prepare students for professional careers in Biology. Completion of the curriculum also prepares students who wish to continue their studies in graduate programs or in medicine.

The school offers a program leading to the Master of Science degree. The members of the faculty are actively engaged in such research areas as: cell physiology, molecular biology, radiobiology, bacterial physiology, and cytology.

Curriculum in Biology

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
<th>1st Q.</th>
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<td>101</td>
<td>General Chemistry</td>
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<td>113</td>
<td>Engineering Graphics</td>
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<td>Eng.</td>
<td>107</td>
<td>Introduction to Literature</td>
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<tr>
<td>M.L.</td>
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<td>Modern Language or</td>
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<tr>
<td>S.S.</td>
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<tr>
<td>P.T.</td>
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<td>Physical Training</td>
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Total (excluding ROTC)**: 15-13-18

NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish. Three quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
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<th>3rd Q.</th>
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<td>Physical Training</td>
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Total (excluding ROTC)*: 13-16-18

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
### Junior Year

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<th>3rd Q.</th>
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<td>Comparative Anatomy</td>
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**Totals** 12-9-19 12-9-19 11-16-23

*At least six quarters of Modern Language and/or Social Science shall be taken during Freshman and Junior year.

**Not more than 9 hours of Electives in the Junior and Senior Years may be advanced ROTC. The remaining electives must be chosen in conference with a staff advisor to provide a sequence or group of courses which is interrelated to a specific field of interest.

### Senior Year

<table>
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<tr>
<th>Course</th>
<th>No.</th>
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<th>3rd Q.</th>
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<td>Radiation Biology</td>
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<td>Cytology</td>
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<td>Applied Biology</td>
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<td>Bio.</td>
<td>443-4-5</td>
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<td>0-0-6</td>
<td>0-0-10</td>
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</table>

**Totals** 9-12-19 6-6-18 8-9-18

*Not more than 9 hours of Electives in the Junior and Senior Years may be advanced ROTC. The remaining electives must be chosen in conference with a staff advisor to provide a sequence or group of courses which is interrelated to a specific field of interest.

### Courses of Instruction

**Note:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

**Bio. 201. Introduction to Biology**
3-3-4.
Study of invertebrate animals.
Text: Storer and Usinger, *General Zoology*.

**Bio. 202. Introduction to Biology**
3-3-4.
Study of vertebrate animals.
Text: Storer and Usinger, *General Zoology*.

**Bio. 203. Comparative Anatomy**
Study of the comparative anatomy of the vertebrates with laboratory dissection of several vertebrate forms.

**Bio. 204. Introduction to Biology**
3-3-4.
Fundamental principles and theories of botany.
Text: Conquist, *Introductory Botany*.

**Bio. 307. General Bacteriology**
3-4-4. Prerequisite: Bio. 201.
Study of bacteria and other microorganisms.
Text: Pelczar and Reid, *Microbiology*.

**Bio. 316. Industrial Hygiene**
3-0-3. Prerequisite: None.
Problems of health in industry; industrial poisons, occupational hazards and diseases, industrial fatigue, ventilation, and accident prevention.
Text: References.
Bio. 333. Biostatistics
3-3-4. Prerequisites: Math. 201, Bio. 204.

An introduction to statistical methods and their use in the preparation and interpretation of biological experiments.

Text: Croxton, Elementary Statistics with Emphasis in Medical and Biological Sciences; Goldstein, Biostatistics.

Bio. 334. Genetics
3-3-4. Prerequisite: Bio. 333 or consent of instructor.

An introduction to the principles of heredity.

Text: Srb and Owens, General Genetics.

Bio. 407. Advanced Microbiology
3-4-4. Prerequisite: Bio. 307, Chem. 341.

Advanced discussion and laboratory procedures in Mycology, Virology, and bacterial Physiology.

Text: To be selected.

Bio. 413. Air and Water Pollution
3-0-3. Prerequisite: None.

An introduction to the technical and legal problems of air and water pollution by industry and its control, for those engineers working in industry.

Text: References.

Bio. 415. Introductory Radiation Biology
3-3-4. Prerequisite: Consent of instructor.

A general survey of biological systems and their responses to various kinds of radiations.


Bio. 429. Biological Principles of Radiobiology
3-3-4. Prerequisite: None.

A survey of the biological principles necessary as a prerequisite for the study of radiobiology. Non-credit for Biology majors.

Text: Selected references.

Bio. 431. Cytology
3-6-5. Prerequisite: Bio. 204.

Modern aspects of the morphologic, functional and cytochemical organization of the cell. Preparative techniques and principles for observations in light, phase and electron microscopy.


Bio. 435, 436. Applied Biology
3-0-3. Prerequisite: Bio. 307.

Selected topics in modern biology.

Text: References.

Bio. 443, 444, 445. General Physiology
3-6-5, 3-6-5, 3-6-5. Prerequisites: Bio. 307, Chem. 342.

The chemical, physical and biological responses and functions of living systems. The study of cellular biochemistry and metabolism, tissue and organ function, interrelationship of organ systems and the response of the whole organism to its environment.

Text: Giese, Cell Physiology; Other texts to be selected.

Bio. 450. Seminar
2-0-2. Prerequisite: Senior status.

Student and staff presentations of reports on laboratory or literature searches.

Text: References.

Bio. 460, 461, 462. Special Problems
Hours to be arranged. Prerequisite: Bio. 204.

A course for the study of special laboratory problems in biology, to be given any quarter with credits (not to exceed 6) to be arranged.

Text: References.
### Graduate Courses Offered

<table>
<thead>
<tr>
<th>Bio.</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Bio.</td>
<td>630</td>
<td>Biological Effects of Radiation</td>
<td>3-3-4</td>
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<tr>
<td>Bio.</td>
<td>632</td>
<td>Design of Experiments in Quantitative Biology</td>
<td>3-3-4</td>
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<tr>
<td>Bio.</td>
<td>633</td>
<td>Selected Topics in Radiobiology</td>
<td>3-3-4</td>
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<tr>
<td>Bio.</td>
<td>634</td>
<td>Selected Topics in Experimental Cell Biology</td>
<td>3-3-4</td>
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<tr>
<td>Bio.</td>
<td>640</td>
<td>Instrumental Methods in Biology</td>
<td>3-6-5</td>
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<td>Bio.</td>
<td>641</td>
<td>Electron Microscopy Laboratory</td>
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<tr>
<td>Bio.</td>
<td>703</td>
<td>Public Health Administration and Organization</td>
<td>4-0-4</td>
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<td>Bio.</td>
<td>704, 5, 6</td>
<td>Special Problems</td>
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</table>

(Complete details about these courses are contained in the Graduate Bulletin, a copy of which is available upon request.)
School of Ceramic Engineering  
(Established 1924)

Director—Lane Mitchell; Professors—Willis E. Moody, Charles E. Weaver; Associate Professors—A. T. Chapman, William C. Hansard, J. H. Reuter; Assistant Professors—Kevin C. Beck, J. O. Pollard, Jr., J. M. Wampler; Instructor—Joe K. Cochran, Jr.; Special Lecturers—R. J. Gerdes, Jerry Johnson, Jas. Neiheisel; Principal Secretary—Thelma Saggus; Secretaries—Dianne Clark, Jane Thacker; Senior Laboratory Mechanic—Thomas Mackrovitch.

General Information
A four-year curriculum leads to the degree of Bachelor of Ceramic Engineering. Graduate work leading to the Master of Science in Ceramic Engineering and to the Master of Science in Geophysical Sciences is also offered. A broad basic training is given the Bachelor degree candidate in the fundamental and engineering courses, thus preparing the student to enter successfully any division of ceramic engineering. However, the necessary cultural courses are included. The classroom, laboratory and library work are coordinated to combine theoretical and practical knowledge. Periodic contracts with the non-metallic mineral and clayworking industries of the State enlarge the practical viewpoint of the student.

The school is vitally concerned with future development of the ceramic and mineral industries in the South. Through research, the use of Georgia minerals has been extended so that almost every ceramic industry may find the greater proportion of its raw materials within the state boundaries. Demonstration of a stable market and the many industrial advantages of Georgia are encouraging the establishment of new industries. In this program the School is using its facilities to aid proper development.

A Master of Science in Geophysical Sciences is offered. At the undergraduate level it is possible to obtain a Bachelor of Science in Physics with an option in Geophysics. A similar arrangement is planned with the School of Chemistry. Conferences with the Director of the degree School and with the Professors of Geophysical Sciences are advised.

The school also offers to non-majors survey courses in Ceramics and service courses in Geology. These courses broaden the viewpoint of other students concerning a vital field contributing to contemporary civilization.
### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
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<th>3rd Q.</th>
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<tbody>
<tr>
<td>Chem*</td>
<td>101-2-3</td>
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<td>3-3-4</td>
<td>3-3-4</td>
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<td>E.Gr.</td>
<td>113-14-15</td>
<td>Engineering Graphics</td>
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<td>Eng.</td>
<td>107-8-9</td>
<td>Introduction to Literature</td>
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<td>Math.</td>
<td>107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
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<td>M.L. **</td>
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<td>Modern Language OR</td>
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<td>S.S.</td>
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<td>Physical Training</td>
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<td>Basic ROTC (optional)</td>
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<tr>
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<td>Orientation</td>
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**Totals (excluding ROTC)*** 15-13-18 14-13-18 14-13-18

**NOTE:** Under Quarters, 3-3-4 means 3 hours class, 3 hours lab, 4 hours credit.

*Chem. 107-108-109 is a recommended substitution for Chem. 101-2-3. A grade of C or better in Chem. 103 is a prerequisite for Chem. 214.

**Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish. Three quarters of either M.L. or S.S. are required.

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### Sophomore Year

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>Cer.E.</td>
<td>202</td>
<td>Products and Materials</td>
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<td>2-3-3</td>
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<td>Cer.E.</td>
<td>203</td>
<td>Equipment and Tests</td>
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<td>Cer.E.</td>
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<td>Cer.E.</td>
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<td>Ceramic Survey Laboratory</td>
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<td>201</td>
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**Totals (excluding ROTC)** 14-16-19 15-13-19 15-10-18

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
**Junior Year**

<table>
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<td>Cer.E. 315</td>
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<td>Cer.E. 318</td>
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<td>11-15-16</td>
<td>17-6-19</td>
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*If Advanced Air or Military is the elective, credit will be 4-1-3. If Advanced Navy is the elective, credit will be 3-2-3.

**Chem. 335 and Chem. 336 are to be scheduled concurrently to allow a six-hour lab. period.

**Senior Year**

<table>
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<th>Course No.</th>
<th>Subject</th>
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<td>Cer.E. 419</td>
<td>Firing and Combustion</td>
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<td>Electric Circuits and Fields</td>
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<td>Motion and Time Study</td>
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*Not more than 9 hours electives may be in advanced ROTC.

**At least 6 hours electives must be in Humanities from approved list on page 40.
### Recommended Electives*

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<tr>
<th>Course No.</th>
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<th>Hours</th>
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<td>Cer.E. 421</td>
<td>Cements</td>
<td>2-3-3</td>
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<td>Cer.E. 450</td>
<td>Engineering Materials in Nuclear Engineering</td>
<td>2-3-3</td>
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<td>C.E. 204</td>
<td>Elementary Surveying</td>
<td>1-3-2</td>
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<td>C.E. 458</td>
<td>Elementary Aerial Photogrammetry</td>
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<td>Geol. 310</td>
<td>Crystallography and Tests</td>
<td>1-3-2</td>
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<tr>
<td>Geol. 311</td>
<td>Economic Geography</td>
<td>3-0-3</td>
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<td>Geol. 312</td>
<td>Economic Geology</td>
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<td>Geol. 418</td>
<td>Petrography</td>
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<td>Geological Processes</td>
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<td>Geol. 422</td>
<td>Structural Geology</td>
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<td>Field Methods in Geology</td>
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<td>Geol. 431</td>
<td>Petrology of the Sedimentary Rocks</td>
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<td>Geol. 432</td>
<td>Petrology of the Metamorphic Rocks</td>
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<td>Mining of Ceramic Materials</td>
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<td>Special Problems in the Earth Sciences</td>
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<tr>
<td>Geol. 460</td>
<td>Introduction to Geochemistry</td>
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*Check quarterly schedule of course offerings to determine if offered. Ordinarily a request for a course by eight or more students will be honored. Also, check prerequisites required.

### Courses of Instruction

**NOTE:** 3-4-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

**Cer.E. 202. Products and Materials**
2-3-3. Prerequisites: Chem. 103, Cer. E. 208.

An engineering survey of ceramics; relationship between industrial service requirements and the properties of ceramic products. The common ceramic materials are classified according to mineralogical character; their influence on each other, the effects of size, and the physical properties of particles are stressed. Text: Norton, *Elements of Ceramics*.

**Cer.E. 203. Equipment and Tests**
2-3-3. Prerequisite: Chem. 103, Cer. E. 208.

Testing of ceramic raw materials and products; requirements of proper test methods and practical applications to industry.

Interpretation of results and writing of formal reports. Uses, operation, and calibration of machinery, apparatus, and equipment for ceramic manufacture of testing. Mathematical analysis of data; inherent errors.


**Cer.E. 208. Ceramic Survey**
2-0-2. Prerequisite: None. General Elective for non-ceramic majors.

A survey is made of the classification and physical properties of ceramic products. The physical properties of raw materials are studied briefly with emphasis on qualities and limitations which relate to design and manufacturing processes.

Text: Mitchell, *Ceramics — Stone Age to Space Age*.

**Cer.E. 209. Ceramic Survey Laboratory**
0-3-1. Prerequisite or Corequisite:
Cer.E. 208.  
Plant trips to local ceramic plants. Production of molds and pottery.

Cer.E. 305. Phase Equilibria for Ceramists  
3-0-3. Prerequisite or Corequisite: Chem. 331.  
Heterogeneous equilibria of inorganic systems. One, two, and three component systems. Solid solutions and isomorphous replacement. Alkemade lines. Metastable equilibrium. Paths of crystallization.  

Cer.E. 311. Processing and Forming  
3-3-4. Prerequisite: Cer.E. 203.  
Winning, refining and preparation of ceramic raw materials, methods and mechanism of processing and forming ceramic products; their effect on the control of the properties of the products and adaptation to service requirements.  
The relation of laboratory technique to plant practice including properties of materials, machines, processing and products. Commercial raw materials and products are provided and analyzed and, where practical, the corresponding plants are visited.  
Text: Kingery, *Ceramic Fabrication Processes*.

Cer.E. 315. Solid State Ceramics  
3-0-3. Prerequisite: Cer.E. 311.  
The physical and chemical properties of materials throughout common processes used in the production of ceramic products. Control of phases of manufacture to introduce in the product those properties service conditions require. Sintering, melting, and crystallization processes and their effects on structure and density are discussed. Whitewares, terra cotta, heavy clay products, glass, and body, mold, and sagger composition and processing are studied.  
Text: Kingery, *Introduction to Ceramics; Course Notes*.

Cer.E. 318. Pyrometry and Instruments  
1-3-2. Prerequisite: Physics 208.  
The principles of heat measurement by shrinkage rings, melting points, color, pyrometric cones, expanding metals, thermocouples and resistance bridges. The factors governing choice of thermocouples. The principles behind construction of couples, CO₂ meters, temperature controls, and other control instruments.  

Cer.E. 320. Glass  
2-3-3. Prerequisite or Corequisite: Cer.E. 305.  
The fundamentals of glass structure, composition, manufacture, properties and applications. Phase relations of the important oxides. Reasons for glass formation instead of crystallization. Melting, quenching, annealing, tempering, fracturing, devitrification and modification are phenomena studies. Techniques of forming and basis of selection of ingredients for glass forming, fluxing, color, refractive index, and other properties are carefully considered.  

Cer.E. 406-7-8. Seminar  
2-0-2. Prerequisite: Senior standing in Cer.E.  
Discussion of current ceramic and scientific literature and reports of investigation. Course may be repeated with different numbers.  
Text: *Journal of American Ceramic Society*.

Cer.E. 409. Microscopy  
3-6-5. Prerequisites: Physics 209, Geology 414.  
Involves the use of the microscope
in the study and control of composition and structure of ceramic bodies and raw materials. Nature of light and crystallography are briefly studied.

Text: Kerr, *Optical Mineralogy*.

**Cer.E. 422-23-12. Thesis**
1-0-1, 0-6-2, 0-6-2. Prerequisite: Senior standing in Ceramic Engineering.

Each senior conducts an original investigation on an approved ceramic subject under the supervision of the instructor in charge. The object of this course is to place the student upon his own initiative and to coordinate the knowledge that he has previously received.

**Cer.E. 418. Drying and Psychrometry**
2-0-2. Prerequisites: Cer.E. 315, Physics 209.

Fundamental consideration of water removal from unfired ceramic products by heat and air. Control of humidity, temperatures, air velocity and volume; economy and efficiency of drying and driers; problems to be met in safe drying.


**Cer.E. 419. Firing and Combustion**
2-3-3. Prerequisites: Physics 209, M.E. 320 or equivalent.

Objectives of firing; combustion behavior of gaseous, liquid and solid fuels; the mechanics of heat transfer; physical and chemical properties of clay and other raw materials under heat treatment; design, operation and heat accounts of periodic and continuous kilns. The utilization of refractories in industry; the control of properties of refractories through raw materials and all phases of manufacture to best meet industrial requirements; fundamentals of aggregate packing and photo-elastic study of expansion and contraction.


**Cer.E. 421. Cements**
2-3-3. Prerequisites: Chem. 332; Cer.E. 305.

Includes the required properties of raw materials, processing and the hydraulic properties of cements. Portland, magnesia, high alumina, dental, and gyspiferous cements are included. This is an elective course for seniors and graduates. This course is offered periodically upon demand of six or more students.


**Cer.E. 425-426. Physical Ceramics**
3-3-4, 2-0-2. Prerequisites: Cer.E. 315, Chem. 331, and Physics 209.

Application of Physical Chemistry, Crystal Chemistry, Colloid Chemistry, and Solid States Physics to Ceramics. Dispersion, viscosity, plasticity, grain size, crystal structure as related to properties, densification with additives to fill holes in structure, and theory of clay as a colloidal electrolyte are studied. Differential thermal analysis, thermal shock, thermal expansion, electrodialysis, viscosity measurement, X-ray analysis, and other techniques of analysis are studied in the laboratory. Sintering, melting, and recrystallization.

Text: Kingery, *Introduction to Ceramics*; Course notes.

**Cer.E. 431-32-34. Design and Construction**
1-3-2, 0-6-2, 0-3-L. Corequisite: Cer.E. 418. Prerequisite: Drawing 109 (or 103).

Design and working drawings of ceramic manufacturing equipment and plant layouts for specified products. The student makes his own selection under the supervision and with the approval of the instructor.

**Cer.E. 440. Glaze and Enamel Coatings**
3-3-4. Prerequisite: Cer.E. 320.

The fundamental methods for calculating, compounding, manufactur-
ing and using vitreous and crystalline protective coatings as well as the methods commonly employed to correct faults. The prior preparations of frits, and ceramic bodies for glazing, or metals or glass for enameling are also considered. Compositions of low, moderate, and high temperature coatings are studied to learn bases of glass properties, adhesion, color, opacification, and texture.

Texts: Parmelee, Ceramic Glazes; Andrews, Porcelain Enamels.

Cer.E. 450. Engineering Materials in Nuclear Engineering
2-3-3. Prerequisites: Senior or graduate standing and consent of instructor.

The basic principles of ceramics and metallurgy with particular emphasis on problems inherent in reactor technology. Engineering aspects of the structure and constitution of materials used in reactors including ceramic materials, cermets, metals and alloys. The behavior of these materials under conditions involving elevated temperatures, corrosion, and irradiation.

Text: Hausner, Materials of Nuclear Reactors; Notes.

Geol. 101. Introduction to the Earth Sciences
3-0-3. Prerequisite: None

An introduction to some of the geophysical sciences. A careful examination of the movement of the earth with respect to celestial bodies; of the physical interactions of the earth, sun, and moon; and of the earth's gravitational and magnetic fields. These physical relationships are the basis of an introduction to planetary science, geodesy, meteorology, oceanography and climatology. (Note: Geology 101 does not include a study of the composition and structure of the solid earth. These topics are considered in Geology 201).


Geol. 201. General Geology
3-0-3. Prerequisite: None.

An introduction to geological processes.

Text: Gilluly, Waters, and Woolford, Principles of Geology.

Geol. 203. Physical Geology
3-3-4. Prerequisite: Chem. 102 or equivalent. Corequisites: Chem. 103 or equivalent and Phys. 207 or equivalent.

Introduction to the nature of minerals and rocks, the processes forming them, and their pattern in space and time. Laboratory exercises on minerals, rocks, and geologic maps.

Text: Gilluly, Waters, and Woolford, Principles of Geology.

Geol. 308. Historical Geology
3-3-4. Prerequisite: Geol. 203 (or consent of instructor).

Principles and methods used to interpret and reconstruct the earth's history; origin and development of the continents, oceans and other features of the earth; evolution of plants and animals.

Geol. 311. Mineral Resources
3-0-3. Prerequisite: None.

The effects of climate, location, power, soil types, mineral deposits, agriculture and manufacture upon nations, peoples, civilization, and trade routes.

Text: To be selected.

Geol. 312. Economic Geology
3-0-3. Prerequisites: Geol. 201 or 203.

A geographical, geological, and economic study of commercially valuable minerals and rocks.

Text: To be selected.
Geol. 325. Mineralogy
3-3-4. Prerequisites: Chem. 103 (or equivalent), Phys. 209 (or equivalent).

Bonding and symmetry in the crystalline state; mineral structure and crystal chemistry; application to geologically important minerals. Laboratory is devoted to crystal morphology structure models, hand specimen verification, x-ray diffraction, and silicate analysis (x-ray fluorescence, atomic absorption).

Geol. 326. Optical Mineralogy
0-3-1. Prerequisite: Geol. 325.
A brief introduction to the use of the polarizing microscope in petrology.

Geol. 414. Mineralogy
2-3-3. Prerequisites: Geol. 201, 202.
A course in descriptive and determinative mineralogy which includes the determination of important minerals and rocks by their chemical and physical properties.
Text: Kraus, Hunt, and Ramsdell, Mineralogy, 5th Ed.

Geol. 421. Geological Processes
2-6-4. Prerequisites: Geol. 201-2, Senior standing.
An advanced treatment of geological processes, with emphasis upon applications to engineering. The course will cover the more detailed phases of geological processes, gradation, volcanism, and diastrophism, with special emphasis upon those phases which have the greatest bearing in the various fields of engineering.

Geol. 422. Structural Geology
3-3-4. Prerequisite: Geol. 203 or equivalent. Spring Quarter.
An introduction to the description and analysis of structural features of rocks. Primary structures produced during sedimentation and igneous activity are briefly reviewed, but the major part of the course is devoted to the structures produced by rock deformation during tectonic and metamorphic activity. The laboratory will include several field trips.

Geol. 423. Introduction to Geophysics
3-3-4. Prerequisites: Physics 207-8-9, Geology 201, 202, Senior standing.
A general survey of terrestrial physics, with emphasis upon applications to engineering.

Geol. 424-25-26. Field Methods in Geology
0-6-2, 0-6-2, 0-6-2. Prerequisites: Geol. 201-2, Senior standing.
Methods and procedures of areal and subsurface geological mapping, with special emphasis upon structures and problems that arise in connection with engineering work. The development of the techniques of geological surveying as applied to field study and map work in which various aspects of processes are interpreted and mapped in terms of engineering utility. Lithological unity and petrographic types are likewise studied, calculated, and mapped.
Text: Lahee, Field Geology; Notes.

Geol. 435. Petrology of the Sedimentary Rocks
2-3-3. Prerequisites: Geol. 203 (or consent of instructor), Geol. 325, and Geol. 326 or Cer.E. 409.
Texture, composition, and structure of sediments and sedimentary rocks; sedimentary processes (hydraulics and aqueous geochemistry); analysis of sedimentary environments.

Geol. 436. Petrology of Igneous and Metamorphic Rocks
3-3-4. Prerequisites: Geol. 203 (or consent of instructor), Geol. 325, and Geol. 326 or Cer.E. 409.
Composition, texture, and structure of igneous and metamorphic rocks; physical and chemical factors controlling genesis of igneous and metamorphic rocks; (emplacement of magma, equilibrium mineral and melt assemblage in closed and open systems, relation of mineral fabric to stress); geologic conditions controlling metamorphism and igneous activity.

Geol. 443. Engineering Geology
2-6-4. Prerequisites: Geol. 201-202.
Applications of geological science to problems of civil engineering.
Text: To be selected.

Geol. 450. Special Problems in the Earth Sciences
0-6-2. Prerequisite: Junior or senior standing.

Literature, laboratory or field investigation and preparation of a written or oral report or both covering some branch of earth sciences.
Text: To be selected.

Geol. 460. Introduction to Geochemistry
3-3-4. Prerequisite: Geol. 203; Chem. 103 or 109.
Application of elementary chemical and physical chemical principles to geologic problems. Element and isotope distribution and associations in earth, ocean, ground water; crystal chemistry; geochemical processes, cycles, measurements, prospecting; biogeochemistry.

GRADUATE COURSES
(Complete details about graduate courses in Ceramic Engineering and Geology are contained in the Graduate Bulletin, a copy of which is available upon request.)
School of Chemical Engineering
(Established in 1901)


General Information
The degree, Bachelor of Chemical Engineering, may be obtained upon the completion of the following curriculum. The number of students who will be permitted to register for the Junior and Senior work in Chemical Engineering will be strictly limited. The selection will be made on the basis of the student’s ability as demonstrated in two years of previous work.

Freshman Year

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<tr>
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Totals (excluding ROTC) *** 14-13-18 14-13-18 14-7-16

*Chem. 101, 102, 103 may be scheduled. A minimum grade of C is required for Chem. 101 and 102. The prerequisite for Ch.E. 207 will be Chem. 109. Students completing Chem. 101-2-3 will be required to schedule Chem. 109 before taking Ch.E. 207.
**German recommended.

Sophomore Year

<table>
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Totals (excluding ROTC) *** 16-7-18 16-7-18 16-7-18

***ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
### Junior Year

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<td>Ch.E. 315</td>
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**Totals**: 14-12-18 15-9-18 15-9-18

### Senior Year

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<tr>
<td>Ch.E. 435-36</td>
<td>Chem. Engineering Thermodynamics</td>
<td>3-0-3</td>
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<td>Ch.E. 446</td>
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<td>Ch.E. 407-8</td>
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<td>Ch.E. 413</td>
<td>Unit Operations III</td>
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<td>Ch.E. 431</td>
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<td>Ch.E. 434</td>
<td>Chemical Plant Design</td>
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<tr>
<td>E.E. 325</td>
<td>Electrical Circuits and Fields</td>
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<tr>
<td>E.E. 326 or 327</td>
<td>Elementary Electronics</td>
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<tr>
<td>Ch.E. 341</td>
<td>Process Instrumentation</td>
<td>2-3-3</td>
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<td>Electives*</td>
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<td>3-0-3</td>
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</tbody>
</table>

**Totals**: 15-6-17 17-3-18 15-12-19

*Not more than 9 hours electives may be in advanced ROTC. At least 6 hours of electives must be humanities from list on page 40.

### Courses of Instruction

**NOTE**: Under Quarters, 3-3-4 means 3 hours class, 3 hours laboratory, 4 hours credit.

**Ch.E. 207, 208. Chemical Process Principles I, II**


A study of stoichiometric principles, physical and chemical properties, thermophysics and thermochemistry leading to rather detailed material and energy balances on chemical metallurgical and petroleum processes.

Text: Hougen, Watson and Ragatz, Ch.E. 209. Computers in Chemical Engineering

3-0-3. Prerequisite: Math. 208.

A study of the application of digital and analog computers to the solution of Chemical Engineering problems.

Text: To be selected.
Ch.E. 304. Transport Phenomena I
3-3-4. Prerequisites: Ch.E. 209 and Math. 209.
Fundamental principles of momentum and energy transfer are developed. Applications of these principles are stressed.

Ch.E. 305. Transport Phenomena II
3-3-4. Prerequisites: Ch.E. 304.
The development of Ch.E. 304 is extended to include mass transfer. Major emphasis is placed on applications involving heat and mass transfer.

Ch.E. 306. Unit Operations I
3-0-3. Prerequisites: Ch.E. 304 and concurrently with Ch.E. 305.
The analyses of chemical engineering processes and operations involving fluid and heat transfer.
Texts: McCabe and Smith, Unit Operations of Chemical Engineering; Perry, Chemical Engineer's Handbook.

Ch.E. 315. Unit Operations II
3-3-4. Prerequisite: Ch.E. 305.
Stagewise operations.
Texts: McCabe and Smith, Unit Operations of Chemical Engineering; Perry, Chemical Engineer's Handbook; Notes.

Ch.E. 328. Chemistry of Engineering Materials
3-0-3. Prerequisite: Chem. 103.
A survey of materials of construction with emphasis on nonmetallics.
The fundamental properties of plastics, and all types of surface coatings are studied.

Ch.E. 329. Survey of Chemical Engineering
3-0-3. Prerequisites: Chemistry 103, Mathematics 107 and Physics 209 or 213.

A general survey of chemical engineering including processes, equipment and calculations. Not open to students in the School of Chemical Engineering.

Ch.E. 339. Chemical Engineering Literature
1-0-1. Prerequisites: Ch.E. 304, Chem. 340, 331.
This course has as its objective the training of students in the use of the sources of information and an introduction to the finding of information in the library.
Text: Notes

Ch.E. 341. Process Instrumentation
2-3-3. Prerequisite: Ch.E. 305; E.E. 326 recommended.
A study of the methods and technology associated with chemical process systems analysis and the application of measurement and control devices and techniques to these systems.
Text: Harriott, Process Control.

Ch.E. 350. Elementary Heat and Mass Transfer
3-0-3. Prerequisites: Math. 208, Physics 209, M.E. 320, and Senior standing or consent of instructor.
Elementary heat and mass transfer primarily designed for Textile students. Not open to students in the School of Chemical Engineering. Offered in the fall quarter only.
Text: Notes

Ch.E. 407. Chemical Process Analysis
3-0-3. Prerequisites: Ch.E. 315, Chem. 342 and Chem. 333. Fall and Spring.
Introduction to the engineering of chemical reaction involving colloidal and amorphous materials.
Texts: Shaw, Introduction to Colloidal and Surface Chemistry; Golding, Polymers and Resins.
Ch.E. 408. Chemical Process Analysis
Introduction to applied chemical kinetics.
Text: Levenspiel, Chemical Reaction Engineering.

Ch.E. 413. Unit Operations
3-3-4. Prerequisite: Ch.E. 305.
Diffusional processes, including combined mass and heat transfer.
Text: Perry, Chemical Engineer's Handbook; McCabe and Smith, Unit Operations of Chemical Engineering.

Ch.E. 431. Chemical Engineering Economics
3-0-3. Prerequisite: Ch.E. 315.
A study of techniques required in project analysis in areas of systems cost analysis and the use of the economic balance for design and optimization.
Text: Happel, Chemical Process Economics.

Ch.E. 434. Chemical Plant Design
1-6-3. Prerequisites: Ch.E. 407, 408, 413, 431, 436, Mech. 331. Fall and spring.
A comprehensive problem in plant design.

Ch.E. 435-436-437. Chemical Engineering Thermodynamics
3-0-3. Prerequisites: Chem. 333 and Ch.E. 315.
A study of the principles of thermodynamics with applications to the problems of industry. The areas covered include flow of compressible fluids, estimation and use of thermodynamic properties, charts and tables, power and refrigeration cycles, phase equilibria, chemical equilibria and properties of solutions.
Text: Hougen and Watson, Chemical Process Principles, Parts I and II; Weber and Meissner, Thermodynamics of Chemical Engineers.

Ch.E. 443-444-445. Special Problems
0-3-1. Prerequisite: Ch.E. 305.
The student is given an opportunity to develop initiative and to apply fundamental principles by doing semi-original laboratory investigation of a chemical engineering research nature.

Ch.E. 446. Comprehensive Problems
3-0-3. Prerequisites: Ch.E. 408, 431, 496.
The integration of the professional work of the previous courses by means of a series of comprehensive problems.
Text: To be selected.

Ch.E. 447. Comprehensive Problems
3-0-3. Prerequisites: Ch.E. 446, 413, 407, 435, Met. 402.
Continuation of Ch.E. 446. Emphasis on Unit Operations.
Text: Perry, Chemical Engineer's Handbook.

Ch.E. 448. Comprehensive Problems
3-0-3. Prerequisites: Ch.E. 447, 408, 436, Met. 402.
A continuation of Ch.E. 447, with emphasis on thermodynamics.
Text: Perry, Chemical Engineer's Handbook.

Courses of Instruction in Metallurgy

NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*Met. 325. General Metallurgy
3-0-3. Prerequisites: Chem. 103 and Physics 207.
An introductory survey of basic physical metallurgical concepts followed by a study of the characteris-

*This course is not to be scheduled by chemical engineering students, since they are required to schedule Met. 401.
tics and engineering applications of carbon steels, gray and malleable cast irons. Consideration is given to the engineering significance of static and dynamic properties of metals and alloys.


**Met. 327. General Metallurgy**
3-0-3. Prerequisite: Met. 325.

A study of the characteristics and engineering applications of the more widely used nonferrous alloys. Consideration is given to powder metallurgy as a tool in the fabrication of metallic materials and also to some of the new alloys for ultra high temperature service.


**Met. 401. Engineering Materials**
3-0-3. Prerequisite: Chem. 333.

Principles of physical metallurgy including binary phase diagrams and mechanical testing methods as applied to metallic materials. Production of iron, steel, and nonferrous metals is surveyed.


**Met. 402. Engineering Materials**
3-3-4. Prerequisite: Met. 401.

A study of the properties and application of carbon and alloy steels, cast irons, and nonferrous alloys. Some time is devoted to corrosion as an engineering problem and methods utilized in minimizing its effects. Laboratory work consists of metallographic observation of common ferrous and nonferrous alloys in various conditions.

Text: Guy, *Elements of Physical Metallurgy and Notes*.

**Met. 403. Introductory Nuclear Metallurgy**
3-3-4. Prerequisites: Chem. 103 and Phys. 209.

The fundamentals of physical metallurgy, metal crystals, phase diagrams, properties, fabrication, and testing with emphasis on refractory metals and fuel materials. The laboratory will essentially be demonstrations and plant trips.


**Met. 411. Basic Extractive Metallurgy**
3-0-3. Prerequisite: Chem. 333 or equivalent.

Theory and practice of extraction and refining of ferrous and nonferrous metals. Calculations and reactions related to pyrometallurgical and hydro-metallurgical extractive processes will be emphasized.


**Met. 421. Nonferrous Metallography**
2-3-3. Prerequisite: Met. 441 or 402, or equivalent.

The use of the microscope to study the influence of processing variables on the structure and properties of metals and alloys. Pyrometric instrumentation as applied to heat treating operations and thermal analysis of metals and alloys is also covered.

Text: Kehl, *Metallographic Laboratory Practice*.

**Met. 422. Ferrous Metallography**
3-3-4. Prerequisites: Met. 401 and 402.

The influence of processing variables on the microstructure and properties of steels and ferrous alloys. Heat treat operations and thermal analysis of ferrous materials.


**Met. 423. Metallurgical Fabrication**
3-0-3. Prerequisite: Met. 401.

Primary forming techniques and secondary fabrication and joining processes will be discussed. Some of the processes to be considered are casting, rolling, forging, welding, etc.


**Met. 441. Theoretical Physical Metallurgy**
3-0-3. Prerequisites: Met. 402 and Chem. 333 or equivalent.

**Met. 445. Electron Microscopy**


The theory and principles of electron optics and electron microscopy will be covered. Techniques of preparation and observation of materials by electron microscopy will be presented in lecture and applied in the laboratory.


**Met. 446. X-ray Metallography**

3-3-4. Prerequisites: Met. 401.

The theory and application of x-ray diffraction to metallurgy. Crystal studies, texture studies, phase diagram determination and chemical analysis will be discussed.


**Met. 461. Pyrometry**

1-3-2. Prerequisite: Met. 402.

Temperature measurement and control methods. Dilations, resistance, thermoelectric, total radiation, and color pyrometry. Control devices and methods of obtaining constant temperature.

Text: To be selected.

**Met. 463. Metallurgical Testing**

2-3-3. Prerequisites: Met. 402, Phys. 319 or equivalent.

Destructive and nondestructive test methods are outlined. The emphasis will be on the significance of results and the choice of materials based on test data.

Text: Notes.

**Met. 464. Nondestructive Testing**

2-3-3.

The principles and theory of current industrial nondestructive testing methods will be covered. The emphasis will be on testing the soundness and reliability of primary and secondary fabricated metal structures.


**Met. 491. Corrosion and Protective Measures**

3-0-3. Prerequisites: Chem. 333 and Met. 325 or 401.

The electrochemical theory of corrosion; recommended materials and protective measures for chemical processing equipment and for atmospheric, underground, underwater, and elevated temperature exposures.

Text: Notes.

**Graduate Courses Offered**

<table>
<thead>
<tr>
<th>Ch.E.</th>
<th>613</th>
<th>Technology of Fine Particles</th>
<th>3-0-3</th>
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<tbody>
<tr>
<td>Ch.E.</td>
<td>619</td>
<td>Chemical Engineering Calculations I</td>
<td>3-0-3</td>
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<tr>
<td>Ch.E.</td>
<td>620</td>
<td>Chemical Engineering Calculations II</td>
<td>3-0-3</td>
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<tr>
<td>Ch.E.</td>
<td>622</td>
<td>Applied Chemical Kinetics</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Ch.E.</td>
<td>630</td>
<td>Radiochemical Separations Processes I</td>
<td>3-0-3</td>
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<tr>
<td>Ch.E.</td>
<td>631</td>
<td>Radiochemical Separations Processes II</td>
<td>1-6-3</td>
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<tr>
<td>Ch.E.</td>
<td>632</td>
<td>Nuclear Process Kinetics</td>
<td>3-0-3</td>
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<tr>
<td>Ch.E.</td>
<td>646</td>
<td>Economic Analysis of Chemical Engineering Processes</td>
<td>3-0-3</td>
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<tr>
<td>Ch.E.</td>
<td>701, 2, 3</td>
<td>Seminar</td>
<td>1-0-0</td>
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<tr>
<td>Ch.E.</td>
<td>704, 5, 6</td>
<td>Special Topics in Chemical Engineering (Credit to be arranged)</td>
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### Chemical Engineering Courses

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<tr>
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<td>Ch.E. 707, 8, 9</td>
<td>Organic Chemistry and Industry</td>
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<tr>
<td>Ch.E. 713</td>
<td>Fluid Flow</td>
<td>3-0-3</td>
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<tr>
<td>Ch.E. 714, 15</td>
<td>Heat Transmission</td>
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<td>Ch.E. 716, 17, 18</td>
<td>Advanced Unit Operations</td>
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<td>Ch.E. 719, 20, 21</td>
<td>Chemical Engineering Thermodynamics</td>
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<td>Ch.E. 722</td>
<td>Foundations of Gaseous Kinetics</td>
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<td>Ch.E. 724</td>
<td>Properties of Matter at Low Temperatures</td>
<td>3-0-3</td>
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<td>Ch.E. 725</td>
<td>Special Topics in Thermodynamics</td>
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<td>Ch.E. 732</td>
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<td>Ch.E. 740</td>
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<td>High Pressure Technology, II</td>
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<td>Ch.E. 742</td>
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### Graduate Courses in Metallurgy

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<td>Met. 604</td>
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<td>Met. 605</td>
<td>Dental-Medical Materials</td>
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<td>Met. 614</td>
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<td>Met. 621</td>
<td>Metallurgical Design Problems</td>
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<td>Met. 625</td>
<td>Powder Metallurgy</td>
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<td>Met. 633</td>
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<td>Advanced Theory of Metallic Corrosion</td>
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<td>Met. 700</td>
<td>Master's Thesis</td>
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<td>Met. 701</td>
<td>Special Topics in Advanced Physical Metallurgy</td>
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<td>Met. 741</td>
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<td>Met. 745-6</td>
<td>Advanced Electron Microscopy I, II</td>
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<td>Met. 751</td>
<td>Advanced Mechanical Metallurgy</td>
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<td>Met. 752, 3</td>
<td>Dislocations and Strengthening Mechanisms I, II</td>
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<td>Met. 762</td>
<td>Magnetism in Metals</td>
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<td>Met. 763</td>
<td>Neutron Diffraction</td>
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<td>Met. 781</td>
<td>Metallurgical Thermodynamics</td>
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<td>Met. 785</td>
<td>Metallurgical Kinetics</td>
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(Complete details about these courses are contained in the Graduate Bulletin, a copy of which is available upon request.)
School of Chemistry
(Established in 1906)


General Information
Included in the School are:

1. The courses in chemistry required in the various engineering curricula.

2. A curriculum leading to the degree of Bachelor of Science in Chemistry.

3. Graduate courses and research leading to the degree of Master of Science in Chemistry, and Master of Science in Nuclear Science.

4. Graduate courses and research leading to the degree of Doctor of Philosophy in Chemistry.

The degree of Bachelor of Science in Chemistry will be awarded upon the completion of the following prescribed courses and 42 quarter hours of elective work. No elective course will be given for less than six applicants. A student must have had the prerequisites for any course he elects.

A prerequisite for senior courses is a minimum grade-point average of 2.0 in the following junior courses: Chem. 331, 332, 333, 334, 335, 336, 340, 341, 342, 343, 344, and 345.
### Freshman Year

<table>
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<tr>
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<td>General Chemistry</td>
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<tr>
<td>Eng. 107-8-9</td>
<td>Introduction to Literature</td>
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<td>Math. 107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
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<tr>
<td>M.L. 101-2-3**</td>
<td>Elementary German or S.S. 111-2-3</td>
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<td>P.T. 101-2-3</td>
<td>Physical Training</td>
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<td>Gen. 101</td>
<td>Orientation</td>
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</table>

Totals (excluding ROTC)** 15-7-16

**NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.**

*Chem. 101, 102, 103 may be scheduled. However, a minimum grade of C is required for Chem. 101 and 102 and the prerequisite for Chem. 214 is Chem. 103 with a grade of C or better or Chem. 105.

**The School of Chemistry recommends that German be taken in the Freshman year. However, should Social Science be taken in the freshman year, German must be elected in the junior year.

***ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied towards the requirements for a degree.

### Sophomore Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
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<td>Chem. 214-15</td>
<td>Analytical Chemistry</td>
<td>2-6-4</td>
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<td>Chem. 340</td>
<td>Organic Chemistry</td>
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<td>Chem. 343</td>
<td>Org. Chemistry Lab.</td>
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<td>Math. 207</td>
<td>Calculus IV</td>
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<td>Math. 208</td>
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<tr>
<td>Phys. 207-8-9</td>
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<td>ROTC 201-2-3</td>
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Totals (excluding ROTC)* 12-13-16 12-13-16 8-13-15

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

### Junior Year

<table>
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<th>Subject</th>
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<td>Chem. 331-2-3</td>
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Totals 9-9-18 11-9-17 8-12-18
Senior Year

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*Not more than 9 hours of electives may be in the advanced ROTC. At least 15 hours of electives must be selected from the humanities electives on page 40. Among these electives the second year of German and the first year of French or Russian are recommended. For technical electives the school of Chemistry recommends Math. 304 (or 305 & 306), 309, 412, and 415. Physics 319, and the sequence 398, 420, 406, and 318.

Courses of Instruction

**NOTE:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

**ADDITIONAL NOTE:** All students are required to wear safety glasses while working in the laboratories. The glasses will be provided at the students' expense.

**Chem. 101, 102, 103. General Chemistry**
3-3-4. Prerequisite: Entrance Requirements.
A lecture and laboratory study of the fundamental laws and theories of chemistry with abundant descriptive matter included to illustrate them. This course includes an introduction to qualitative analysis.
Texts: Sienko and Plane, Chemistry; Smith and Wood, Laboratory Manual for General Chemistry.

**Chem. 107, 108, 109. General Chemistry**
3-3-4. Prerequisites: Chem. 107: Satisfactory Placement Examination; Chem. 108: Chem. 107 or B or better in Chem. 101, and consent of staff.
This series of courses is designed for those students planning to pursue advanced courses in chemistry. The approach is more quantitative and less descriptive than in Chem. 101, 102, and 103.
Text: Mahan, University Chemistry.

**Chem. 110. General Chemistry**
3-6-5. Prerequisite. Satisfactory Placement Examinations.
This is an accelerated course with emphasis on chemical equilibrium. The laboratory work will consist mainly of qualitative analysis.
This course makes it possible for the well-prepared student to complete freshman chemistry in one quarter. If a grade of C or better is made, credit for Chemistry 108, 109 will be granted. If a grade of D is made, Chemistry 108, 109 or 102, 103 must be taken.
Text: Hogness and Johnson, An Introduction to Qualitative Analysis and Companion, Chemical Bonding.

**Chem. 214, 215. Analytical Chemistry**
2-6-4. Prerequisites: Chem. 109, Chem. 110 or Chem. 103 with a grade of C or better.
A classroom and laboratory study of the laws, theories, and techniques of analytical chemistry. Problem work is stressed.
Text: To be selected.

**Chem. 305, 306. Survey of Organic Chemistry**
3-6-4. Prerequisite: Chem. 103.
A study of the various classes of organic compounds at an elementary level with emphasis on applications...
to the textile field.

**Chem. 331, 332, 333. Physical Chemistry**
Physico-chemical properties of matter in the gaseous, liquid, and solid states; solutions; equilibrium, kinetics and thermodynamics of chemical reactions, electrochemistry. Text: Daniels and Alberty, *Physical Chemistry.*

**Chem. 334, 335, 336. Physical Chemistry Laboratory**
0-3-1. Prerequisite: Chem. 214.
To be taken concurrently with or following Chem. 331, 332, 333.
Text: Eberhardt, *Physical Chemistry Laboratory Notes.*

**Chem. 338. Physical Chemistry Laboratory**
0-6-2. Prerequisite: Chem. 334, 335. To be taken concurrently with or following Chem. 333.
Applications of vibration — rotation and electronic spectroscopy, electric and magnetic susceptibility, and resonance techniques to the study of molecular structure. This course may be elected in lieu of Chemistry 336. Enrollment is limited—and subject to the approval of the instructor.
Text: *Notes.*

**Chem. 340, 341, 342. Organic Chemistry**
3-0-3. Prerequisite: Chem. 103 or Chem. 109.
The principal classes of organic compounds, aliphatic and aromatic, are studied.

**Chem. 343, 344, 345. Organic Chemistry Laboratory**
0-6-2. Prerequisite: Chem. 103 or 109. To be taken concurrently with or following Chem. 340, 341, and 342 respectively. But Chem. 343 is prerequisite to Chem. 344, 345.


**Chem. 346, 347. Organic Chemistry Laboratory**
0-3-1. Prerequisite: Chem. 343. To be taken concurrently with or following Chem. 341 and 342, respectively.
Organic preparations and reactions—similar to, but less extensive than, Chem. 344, 345.

**Chem. 348. Organic Chemistry Laboratory**
0-6-2. Prerequisite: Chem. 343, 342 or concurrent with 342.
Contents identical to Chem. 346 and 347.

**Chem. 400. Physical Chemistry**
Application of molecular spectroscopy, electron diffraction, X-ray diffraction, neutron diffraction, and magnetic methods to the determination of molecular structure.
Text: To be selected.

**Chem. 403. Physical Chemistry**
3-0-3. Prerequisite: Chem. 333.
A study of the relation of atomic and molecular structure to the physical properties of matter and the nature of chemical bonding.
Text: Cartmell and Fowles, *Valency and Molecular Structure.*

**Chem. 405-406. Instrumental Analysis**
1-6-3. Prerequisite: Chem. 333.
This is an introductory course in both the theory and practice of modern instrumental methods: spectroscopy, polarography, colorimetry, microscopy, polarimetry, measurement of hydrogen ion concentration.
Text: Willard, Merrit, and Dean, *Instrumental Methods of Analysis.*
Chem. 410. Identification of Organic Compounds
2-9-5. Prerequisite: Chem. 345.
The methods of identification of compounds and characteristic groups are studied.

Chem. 432. Synthetic Inorganic Chemistry
0-6-2. Prerequisites: To be taken concurrently with or following Chem. 434.
The preparation and characterization of inorganic compounds, with special emphasis on the apparatus and techniques employed in modern synthetic inorganic chemistry.
Text: Jolly, Synthetic Inorganic Chemistry.

Chem. 434, 435. Advanced Inorganic Chemistry
3-0-3. Prerequisite: Chem. 403.
A classroom study of selected topics with emphasis on laws, principles and generalizations; the periodic classifications, atomic structure, natural and artificial radioactivity, valence, complex compounds, and other topics.

Chem. 437, 438, 439. Special Problems
0-6-2. Prerequisites: Chem. 333, Chem. 345.
The instruction will be individual and will include library, conference, and laboratory work.

Chem. 443, 444. Organic Reactions
3-0-3. Prerequisite: Chem. 342.
A study of the scope and usefulness of some important reactions and theories in organic chemistry from the standpoint of physical organic chemistry.

Chem. 445. Biochemistry
3-0-3. Prerequisite: Chem. 342, and consent of the instructor.
Lectures, independent reading, and discussion of topics relating to the chemistry and metabolism of plant and animal products.

Chem. 450. Chemical Bibliography
2-0-2. Prerequisites: Chem. 341 or concurrently.
A study of the chemical library with instruction in the use of chemical journals, reference books, and other sources of information.
Text: Notes.

Chem. 461. Chemistry of Nuclear Technology
3-3-4. For students in Nuclear Engineering only.
A course for non-chemist, covering principles of inorganic chemistry, radiation chemistry, radio chemistry, separation methods for actinide elements and fission products, and other topics related to the production and utilization of nuclear energy.
Text: Notes.

Chem. 475. Physical Chemistry for Engineers
3-0-3. Prerequisite: M.E. 320 or equivalent.
This course is designed to familiarize students who have had some thermodynamics in other areas with the applications of thermodynamics to chemical systems and with a foundation of the modern theory of chemical bonding.
Text: Barrow, Physical Chemistry.

Chem. 476. Chemistry of the Solid State
3-0-3. Prerequisite: Chem. 333 or Chem. 475.
Applications of the concepts developed in Chemistry 475 to the structure of solids and their chemical and physical properties.
Text: Barrow, Physical Chemistry.
**Graduate Courses Offered**

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<td>Chem. 626</td>
<td>Fast-neutron Interactions</td>
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<td>Chem. 631, 2</td>
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<td>Chem. 633, 4, 5</td>
<td>Reactivity, Mechanism, and Structure in Organic Chemistry</td>
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<td>Chem. 639</td>
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<td>Chem. 644, 5</td>
<td>Molecular Structure and Chemical Principles</td>
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<td>Chem. 658</td>
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<td>Chem. 661, 2, 3</td>
<td>Chemical Thermodynamics</td>
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<td>Chem. 664, 5, 6</td>
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<td>Chem. 674</td>
<td>Organic Reagents in Analytical Chemistry</td>
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<td>Chem. 675</td>
<td>Electroanalytical Chemistry</td>
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<td>Chem. 747, 8, 9</td>
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<td>Chem. 750</td>
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(Complete details about these courses are contained in the *Graduate Bulletin*, a copy of which is available upon request.)
School of Civil Engineering
(Established in 1896)


General Information
The civil engineer conceives, designs, constructs, and maintains projects coordinating and utilizing natural and human resources for urban and regional development. He works in the following broad fields of specialization within the profession: structural and construction engineering, hydraulic engineering, sanitary engineering, transportation, soils engineering, municipal and regional engineering and management, surveying and mapping. The functional phases of civil engineering are research and development, planning and design, construction, and operation and maintenance.

It is not the purpose of the four-year curriculum described herein to cover in detail all that is known or considered in the profession or in any one of its branches. Rather, emphasis is placed on fundamental laws and concepts to enable the students to attack problems in a logical manner and to draw conclusions from principles and facts. In addition to specific civil engineering courses, the curriculum provides training in the physical and social sciences and selected subjects from the other engineering professions.

Satisfactory completion of the four-year curriculum leads to the degree of Bachelor of Civil Engineering. Honors seniors are allowed to substitute electives for certain required courses.

Laboratories
The School of Civil Engineering occupies most of the Civil Engineering Building, the Civil Engineering Annex, and most of the Joint Highway Research Laboratory. Modern laboratories provide for practical experience and research in air pollution, building materials, fluid mechanics, foundation models, highway materials, hydraulics, hydrology, photogrammetry, sanitary engineering, soil mechanics, stress analysis, structural models, and surveying.
### Freshman Year

<table>
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** Totals (excluding ROTC)** 15-13-18 14-13-18 14-13-18

*NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish. Three quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

### Sophomore Year

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<td>C.E. 211</td>
<td>Digital Computers</td>
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<td>Mech. 305</td>
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** Totals (excluding ROTC)** 16-10-18 14-13-18 16-10-19

* C.E. 203. Summer Surveying Course—6 hours credit—(Offered during summer on the campus of West Georgia College, Carrollton, Georgia. Course lasts 4 weeks. Students who are exempt from C.E. 203, take C.E. 312. See course description for C.E. 203 and C.E. 312.)

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
### Junior Year

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<td>C.E. 311</td>
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<td>C.E. 431</td>
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*Selected from list on page 40.
**See note on approved electives following Senior Year.

### Senior Year

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<th>Subject</th>
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<tr>
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<td>Advanced Surveying I</td>
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*Students who take C.E. 203, Summer Surveying Camp, 6 credits, omit C.E. 312. See course description for C.E. 203.
**Nine hours of electives must be taken if Advanced ROTC is not taken. These electives are to be 300, 400 and 600 level courses from any engineering curriculum, Industrial Management, Mathematics, Physics, Chemistry, Social Sciences, Psychology, Applied Biology, Architecture, Information Science and English.
***Group Electives—Senior C.E. Design Courses. Each C.E. senior must choose 4 of the following 7 courses:

- C.E. 403 Construction
- C.E. 433 Applied Hydraulics
- C.E. 453 Structural Design
- C.E. 464 Advanced Surveying II
- C.E. 466 Transportation Engineering II
- C.E. 459 Sanitary Engineering III
- C.E. 461 Applied Soil and Rock Mechanics

"Honors Student" may substitute approved electives (not ROTC) for any of the Group Electives. An "Honors Student" is a first quarter senior who has an overall grade point average which places him in the upper 25 percent of all students at Georgia Institute of Technology and has a minimum grade point average of 2.5 on all courses taken during the period he was classified as a junior. Exceptions will be made to this definition to allow for students who have shown improvement in their scholastic performances during their sophomore and junior years.
Courses of Instruction

NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

C.E. 201. Plane Surveying
3-3-4. Prerequisite: E.Gr. 113.
The theory and practice of surveying; care and use of transit, level and tape; traverse computations; areas; stadia; topographic mapping; construction surveys; error analysis.

C.E. 202. Route Surveying
3-3-4. Prerequisite: C.E. 201.
Planning and construction surveys for route location; computation of circular, reverse, compound, parabolic and spiral curves; slope stakes; earthwork; mass diagram; grade and curvature effects.

C.E. 203. Summer Surveying Course, 4 weeks course during summer*. 6 hours credit
Prerequisite: C.E. 202.
Field astronomy; precise tape, level, theodolite, sub-tense bar; figure and net adjustments; plane table; division of areas and curved boundaries, elements of photogrammetry; route location.
*This course should be scheduled between the Sophomore and Junior years. It is required of all Civil Engineering students except as follows:
Coed students and those who graduate under either the Cooperative Plan or the Regular Navy R. O.T.C. program. These students may substitute C.E. 312 for C.E. 203.

C.E. 206. Elementary Surveying
2-3-3. For non-C.E. students. Not offered winter quarter.
Use of tape, transit and level with applications to planimetric and topographic mapping; traverse and area computations; stadia; construction surveys; optical tooling.

C.E. 211. Civil Engineering Applications of Digital Computers
1-3-2. Prerequisite: Math. 108.
A study of the application of digital computers to the solution of Civil Engineering problems. Exercises will use an algebraic compiler language and selected numerical methods. This course is a prerequisite to all junior and senior C.E. courses.

C.E. 302. Civil Engineering Seminar
0-3-1. Prerequisite: Sophomore standing.
Lectures, discussions and reports on current Civil Engineering projects and problems, including engineering ethics, professionalism, introductions to the specialties in civil engineering and introductions to civil engineering contemporary literature.

C.E. 306. Structural Analysis II
3-3-4. Prerequisite: Mech. 343. No credit for C.E. students.
Analysis of structures to find reactions, deflections and internal forces with emphasis on methods of analysis for statically indeterminate structures.

C.E. 309. Materials of Construction
3-3-4. Prerequisite: Mech. 334.
Basic principles of the properties of materials. Physical, chemical and mechanical properties of metals, concrete, timber, masonry and asphalt. The laboratory period is for tests, demonstrations and writing reports.

C.E. 311. Structural Analysis I
5-3-6. Prerequisite: Mech. 334.
Determination of internal forces in statically determinate and indeterminate structures including influence lines with applications to beams, frames and trusses.

C.E. 312. Advanced Surveying I
3-3-4. Fall Quarter. Prerequisite: C.E. 202. For C.E. students exempt from C.E. 203, Surveying Camp.
Field astronomy. Precise taping, leveling, triangulation, sub-tense bar, adjustments of level nets and trian-
gulation figures; special problems in land division; photogrammetry; history and fundamental principles.

**C.E. 313. Fluid Mechanics I**
3-0-3. Prerequisite: Mech. 308.
Elementary mechanics of fluids with emphasis on analysis, fluid statics; fluid kinematics; equations of motion; momentum and energy principles; surface and form resistance.

**C.E. 314. Fluid Mechanics II**
3-3-4. Prerequisite: C.E. 313.
Elementary mechanics of fluids with emphasis on engineering applications. Enclosed conduit flow; open-channel flow; hydraulic machinery; fluid measurements; dynamic similarity.

**C.E. 320. Fluid Mechanics Laboratory**
0-3-1. Prerequisite: C.E. 314.
Experiment, demonstration and analysis of basic fluid phenomena and exercise in laboratory techniques.

**C.E. 324. Elements of Fluid Mechanics**
3-3-4. Prerequisite: Mech. 306. For non-C.E. students.
Elementary mechanics of fluids in a single comprehensive course. Hydrostatics; fluid kinematics; equations of motion; momentum and energy principles; flow in pipes, fluid measurements, pump selection.

**C.E. 400. Reinforced Concrete Design II**
Analysis and design of reinforced concrete foundations, slabs and building frames.

**C.E. 403. Construction**
2-3-3. Prerequisites: C.E. 460, I.E. 425. Restricted to C.E. students.
The relations of construction to design and ultimate use; the construction contract; basic machinery and construction operations; job planning, estimating; cost accounting; preparation of bids. The laboratory is for supervised problems and inspection trips.

**C.E. 406. Reinforced Concrete Design**
3-0-3. Prerequisites: Mech. 343, and Arch. 324. No credit for C.E. students.
Principles of behavior of reinforced concrete beams and columns with application to the design of elementary structures.

**C.E. 413. Structural Analysis III**
2-3-3. Prerequisite: C.E. 311.
General elastic solution of indeterminate framed structures using digital computer. Stiffness and flexibility matrices; frames and trusses in plane and space; grids; nonprismatic members.

**C.E. 431. Hydrology**
3-0-3. Prerequisite: C.E. 314.
Occurrence and movement of water on the earth as expressed in the hydrologic cycle; elementary meteorology; precipitation, evapotranspiration and runoff; infiltration and groundwater; hydrograph analysis.

**C.E. 433. Applied Hydraulics**
3-0-3. Prerequisites: C.E. 314, C.E. 431.
Analysis and design of hydraulics works and structures. Typical exercises; stability of dams; spillway design; stilling basins; culverts; pipe systems; sediment transport, erosion, and erosion control.

**C.E. 438. Elementary Aerial Photogrammetry**
2-3-3. Prerequisite: C.E. 203 or C.E. 312 or consent of instructor.
Principles of stereoscopy and stereoscopic instruments. Analytical solutions of altitude, base line, line
of flight and parallax. Radial line plotting for planimetric and topographic maps.

C.E. 442. Applied Hydrology
3-0-3. Prerequisites: C.E. 314, 431. Winter Quarter.
Applications of hydrology in the design of hydraulic structures for water supply, irrigation, power, drainage and flood control facilities.

C.E. 443. Water Resources Development
2-2-3. Prerequisite: C.E. 431. Spring Quarter.
Identification and evaluation of problems related to comprehensive water resources development; flood management, power, navigation, water quality, irrigation, conservation, and other objectives. Socio-economic and policy implications.

C.E. 444. Special Problems
1 Credit.

C.E. 445, 446. Special Problems
2 Credits. Prerequisite: Senior standing.
Minor research or special problems involving analytical or experimental investigations to develop student initiative and technique under supervision.

C.E. 447. Engineering Astronomy
2-3-3. Prerequisite: Math. 208. Spring Quarter.
Study of the celestial sphere including horizon and equator systems. Study of the Sun, Moon, Earth and planets, including man's early theories of the universe.

C.E. 448. Design in Timber and Prestressed Concrete
2-3-3. Prerequisite: C.E. 452.
Principles of behavior of timber and of prestressed concrete structural members; application to the design of elementary structures.

C.E. 449. Engineering Aspects of Environmental Health
3-0-3. Prerequisite: C.E. 458.
Sanitary Engineering in public health administration and the control of environmental health problems.

C.E. 450. Groundwater Hydrology
3-0-3. Prerequisites: C.E. 431, Geol. 203. Spring Quarter.
Occurrence, distribution and movement of water below the surface of the earth; groundwater resources and dependable supply rates from wells; artificial recharge and waste disposal.

C.E. 451. Metal Structural Components
3-3-4. Prerequisites: C.E. 309 and C.E. 311.
Principles of behavior of tension and compression members, beams, and connections with application to the design of elementary structures.

C.E. 452. Concrete Structural Components
3-3-4. Prerequisites: C.E. 309 and C.E. 311.
Principles of behavior of reinforced concrete beams, columns and slabs with application to the design of elementary structures.

C.E. 453. Structural Design
2-3-3. Prerequisites: C.E. 451, C.E. 452 and C.E. 460.
Design of structures in metal and concrete with emphasis on buildings and bridges.

C.E. 454. Advanced Surveying II
2-3-3. Prerequisite: C.E. 203 or C.E. 312.
Errors and adjustments of surveying and photogrammetric instruments; analysis of measurement errors; Mercator and Lambert projections; plane table traversing; special control problems; hydrographic surveying.
C.E. 455. Transportation Engineering I
3-3-4. Prerequisite: C.E. 309.
Planning, design, and construction of streets and highways. A computer-oriented laboratory problem will acquaint the student with modern highway design techniques and criteria.

C.E. 456. Transportation Engineering II
3-0-3. Prerequisite: C.E. 309.
The history and economics of transportation systems; traffic and planning problems and techniques; planning and design of air, rail, highway and water transportation facilities as a system.

C.E. 457. Sanitary Engineering I
Introduction to water treatment. The evaluation of water quality as related to public water supplies. The engineering theory and application of disinfection, chemical precipitation, coagulation, adsorption, sedimentation and filtration to water treatment.

C.E. 458. Sanitary Engineering II
3-0-3. Prerequisite: C.E. 457.
Introduction to waste treatment. The analysis of the waste assimilative capacity of a stream. The engineering theory and application of sedimentation, chemical processes, bio-kinetics, and aerobic and anaerobic fermentation techniques to the treatment of waste water.

C.E. 459. Sanitary Engineering III
1-6-3. Prerequisite: C.E. 458.
The layout and the hydraulic, process, and operational design of water and waste water systems. The laboratory period is for supervised design problems and inspection trips.

C.E. 460. Physical Behavior of Soil and Rock
3-3-4. Prerequisite: C.E. 309.
An introduction to the engineering properties of soil and rock. The origin, composition and structure of soils. The effect of water and its control. The physical properties of soil and rock affecting engineering design and construction. Boring and sampling. Laboratory is for soil tests.

C.E. 461. Soil and Rock Engineering
2-3-3. Prerequisite: C.E. 460.
The mechanics of soil and rock masses as applied to civil engineering design and construction: footing and pile foundations, retaining walls, bulkheads, fills, embankments and the control of landslides.

Graduate Courses Offered
C.E. 601 Advanced Aerial Photogrammetry ........................................ 2-3-3
C.E. 602 Photographic Interpretation ................................................. 1-3-2
C.E. 603 Geodetic Engineering .......................................................... 2-3-3
C.E. 604 Legal Principles of Land Surveying ....................................... 2-3-3
C.E. 605 Dock, Harbor and Shore Structures ....................................... 3-0-3
C.E. 606 Pavement Design .................................................................. 3-0-3
C.E. 607 Physical and Physico-Chemical Properties of Soils .................. 3-0-3
C.E. 608 Soil Testing ........................................................................ 1-3-2
C.E. 611 Advanced Soil Mechanics ..................................................... 3-3-4
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<tr>
<th>Course Code</th>
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<tr>
<td>C.E. 613</td>
<td>Reinforced Concrete Structures I</td>
<td>4-0-4</td>
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<tr>
<td>C.E. 614</td>
<td>Structural Planning</td>
<td>3-0-3</td>
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<tr>
<td>C.E. 617</td>
<td>Experimental Analysis I</td>
<td>3-0-3</td>
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<tr>
<td>C.E. 621</td>
<td>Indeterminate Structural Theory I</td>
<td>4-0-4</td>
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<tr>
<td>C.E. 622</td>
<td>Indeterminate Structural Theory II</td>
<td>3-0-3</td>
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<tr>
<td>C.E. 625,6</td>
<td>Steady Flow in Open Channels I and II</td>
<td>3-0-3</td>
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<td>C.E. 627</td>
<td>Flow in Enclosed Conduits</td>
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<td>C.E. 628</td>
<td>Sedimentation and Sediment Transport</td>
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<td>C.E. 629</td>
<td>Mechanics of Flow in Porous Media</td>
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<td>C.E. 631</td>
<td>Introduction to Meteorology</td>
<td>3-0-3</td>
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<tr>
<td>C.E. 633</td>
<td>Intermediate Fluid Mechanics</td>
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<tr>
<td>C.E. 635</td>
<td>Airport Planning and Design</td>
<td>2-3-3</td>
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<tr>
<td>C.E. 636</td>
<td>Highway Administration</td>
<td>2-3-3</td>
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<tr>
<td>C.E. 637</td>
<td>Highway Design</td>
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<td>C.E. 638</td>
<td>Traffic Engineering</td>
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<td>C.E. 639,40</td>
<td>Sanitary Engineering Design I and II</td>
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<td>C.E. 641</td>
<td>Concrete Technology</td>
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<td>C.E. 649</td>
<td>Urban Sanitary Facilities</td>
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<tr>
<td>C.E. 650</td>
<td>Urban Transportation Facilities and Policies</td>
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<td>C.E. 652</td>
<td>Air Pollution, Measurements and Control</td>
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<td>C.E. 653</td>
<td>Analytical Methods for Air Pollution Studies</td>
<td>3-3-4</td>
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<tr>
<td>C.E. 655</td>
<td>Asphalt Technology</td>
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<td>C.E. 657</td>
<td>Advanced Topics in Hydromechanics</td>
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<td>C.E. 658</td>
<td>Urban Transportation Planning</td>
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<tr>
<td>C.E. 659</td>
<td>Theory of Traffic Flow</td>
<td>2-3-3</td>
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<tr>
<td>C.E. 663</td>
<td>Technology in Water Resources Development</td>
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<td>C.E. 664</td>
<td>Economics of Water Resources Development</td>
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<td>C.E. 665</td>
<td>Seminar in Water Resources Engineering</td>
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<td>C.E. 666</td>
<td>Flood Management</td>
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<td>C.E. 670</td>
<td>Advanced Structural Mechanics</td>
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<td>C.E. 671</td>
<td>Plastic Design in Steel</td>
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<td>C.E. 672</td>
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<tr>
<td>C.E. 677</td>
<td>Soil Construction</td>
<td>2-3-3</td>
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<td>C.E. 678</td>
<td>Advanced Foundation Engineering</td>
<td>2-3-3</td>
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<tr>
<td>C.E. 682</td>
<td>Basic Radiological Health</td>
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<tr>
<td>C.E. 683</td>
<td>Environmental Radiation Surveillance</td>
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<tr>
<td>C.E. 684</td>
<td>Industrial Waste Treatment and Disposal</td>
<td>3-0-3</td>
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<tr>
<td>C.E. 685</td>
<td>Sanitary Engineering Processes I</td>
<td>3-3-4</td>
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<td>C.E. 686</td>
<td>Sanitary Engineering Processes II</td>
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<td>C.E. 687</td>
<td>Stream Analysis</td>
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<tr>
<td>C.E. 689</td>
<td>Applied Limnology</td>
<td>2-3-3</td>
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<tr>
<td>C.E. 699</td>
<td>Doctor's Examinations Preparation</td>
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</table>
C.E. 700 Master's Thesis

C.E. 704, 5, 6 Special Problems

C.E. 716 Structural Dynamics

C.E. 727 Theoretical and Applied Soil Mechanics I

C.E. 728 Theoretical and Applied Soil Mechanics II

C.E. 730 Engineering Hydrodynamics

C.E. 735 Reinforced Concrete Structures III

C.E. 737 Gravity-Wave Phenomena

C.E. 750, 1, 2 Special Problem

C.E. 753, 4, 5 Special Course

C.E. 756, 7, 8 Research Topic

C.E. 760 Hydrologic Models

C.E. 761 Watershed Analysis

C.E. 762 Hydrometeorology

C.E. 763 Urban Hydrology

C.E. 765 Hydrology of Floods

C.E. 767 Hydrologic Simulation

C.E. 771 Seminar in Soil and Rock Mechanics

C.E. 772 Seminar in Foundation Engineering

C.E. 773 Dynamic Characteristics of Soils

C.E. 774 Dynamics of Massive Media

C.E. 780 Seminar in Transportation Engineering

C.E. 799 Doctor's Dissertation Preparation

C.E. 800 Doctor's Thesis

(Complete details about these courses are contained in the Graduate Bulletin, a copy of which is available upon request.)
School of Electrical Engineering
(Established in 1896)


General Information
Almost every part of our society is influenced by the work of electrical engineers. They have long pioneered the fields of control, power, and communication and without controlled electricity, industry as we know it simply could not exist. Today electricity and electronics are expanding anew into the non-industrial world—into commerce, medicine, astronomy, and a seemingly endless array of diverse areas. The large-scale computer is becoming almost as familiar a sight in the insurance company office as it is in the scientific laboratory. The revolutionary achievements of the past have made electricity the servant of society. There is every reason to believe that the achievements of electrical engineering will be even more revolutionary in the future.

The School of Electrical Engineering offers a program that prepares its graduates to enter any phase of electrical engineering. Accordingly, all students are required to master the fundamentals of mathematics, physics, and electrical theory. Mastery of these fundamentals enables the student to learn quickly the techniques that are necessary for any special job. Moreover, a thorough mastery of fundamental concepts puts the student in a position to help extend knowledge in his own special field or even originate new fields that are unknown at the present.

Laboratory work is included, where appropriate, in the electrical engineering program to accustom the student to the use of electrical equipment and to develop his skill in practice as well as theory. Finally, a broad range of humanistic studies is included to help the engineer recognize and fulfill his responsibilities as a citizen and at the same time to prepare him for the day when he may leave strictly engineering work to assume administrative responsibilities.

The School of Electrical Engineering requires a scholastic average of C in the prescribed courses in mathematics, physics and electrical engineering. Students who fail to meet this requirement may continue in the School only on a probationary status.

*On leave.
Courses of Instruction

**Freshman Year**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
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<tr>
<td>Chem. 101-2-3</td>
<td>Inorganic Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<tr>
<td>E.Gr. 113-14-15</td>
<td>Engineering Graphics</td>
<td>0-6-9</td>
<td>0-6-2</td>
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<tr>
<td>Eng. 107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
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<tr>
<td>Math. 107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
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<tr>
<td>M.L. *</td>
<td>Modern Language OR</td>
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<tr>
<td>S.S. 111-12-13</td>
<td>Social Science</td>
<td>3-0-3</td>
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<tr>
<td>P.T. 101-2-3</td>
<td>Physical Training</td>
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<td>ROTC **</td>
<td>Basic ROTC (optional)</td>
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<tr>
<td>Gen. 101</td>
<td>Orientation</td>
<td>1-0-0</td>
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Totals (excluding ROTC) ** 15-13-18 14-13-18 14-13-18

*Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish. Three quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

**Sophomore Year**

<table>
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<tr>
<td>E.E. 205-6</td>
<td>Elements of Elec. Eng.</td>
<td>2-3-3</td>
<td>2-3-3</td>
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<td>Eng. 201-2-3</td>
<td>Survey of the Humanities</td>
<td>3-0-3</td>
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<td>Math. 207</td>
<td>Calculus IV</td>
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<tr>
<td>Math. 208</td>
<td>Calculus and Linear Algebra</td>
<td>5-0-5</td>
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<tr>
<td>Math. 209</td>
<td>Ordinary Differential Equations</td>
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<td>Phys. 207-8-9</td>
<td>Physics</td>
<td>5-3-6</td>
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<tr>
<td>I.S. 151</td>
<td>Computer Programming</td>
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<td>P.T. 201-2-3</td>
<td>Physical Training</td>
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Totals (excluding ROTC) ** 15-10-18 15-10-18 15-10-18

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

**Junior Year**

<table>
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<th>3rd Q.</th>
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<tr>
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<td>Electric Circuits</td>
<td>3-3-4</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<tr>
<td>E.E. 304-5-6</td>
<td>Engineering Electronics</td>
<td>3-3-4</td>
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<tr>
<td>E.E. 308,409</td>
<td>Electric Fields and Waves</td>
<td>3-0-3</td>
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<td>M.E. 320</td>
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<td>Humanities</td>
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Totals 17-6-19 15-6-17 16-6-18

*Humanities elective must be selected from the approved list on page 40 of this bulletin.
### Senior Year

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<tr>
<td>E.E. 410</td>
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<td>3-3-4</td>
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<td>E.E. 444</td>
<td>Random Signals and Noise</td>
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<td>E.E. 429</td>
<td>Communication Engineering</td>
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<td>Eng. 315</td>
<td>Public Speaking</td>
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<td>Eng. 320</td>
<td>Technical Writing</td>
<td>4-0-4</td>
<td>10-0-10</td>
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<td>Totals</td>
<td>16-6-18</td>
<td>16-6-18</td>
<td>16-3-17</td>
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</table>

***Of the 33 hours of electives in the junior and senior years, at least 11 hours must be in electrical engineering courses at the 400 level or above. A maximum of nine hours of these electives may be in advanced ROTC courses.

### Courses of Instruction

**NOTE:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

**E.E. 205. Elements of Electrical Engineering**


Text: Scott, *Linear Circuits and Notes.*

**E.E. 206. Elements of Electrical Engineering**

2-3-3. Prerequisite: Physics 208, Math. 208.

An introduction to the theory of electric and magnetic fields.

Text: *Notes.*

**E.E. 304. Engineering Electronics**

3-3-4. Prerequisite: E.E. 206.

A basic study of the electronic structure of matter related in particular to the conduction process and other processes which govern the behavior of solid state electronic devices and of electron tubes.


**E.E. 305. Engineering Electronics**

3-3-4. Prerequisites: E.E. 304, 311.

Includes a study of ideal diode and ideal amplifier circuits, practical rectifier circuits, practical vacuum tube and transistor amplifiers, and incremental models for practical amplifiers. Lectures, recitation, computing, and laboratory periods. Covers first nine chapters of text.


**E.E. 306. Engineering Electronics**

3-3-4. Prerequisite. E.E. 305.

A continuation of E.E. 305. Includes a study of audio-frequency power amplifiers, analysis of piecewise linear circuits, frequency characteristics of single-stage and cascaded amplifiers, tuned amplifiers with small signal, and feedback amplifiers. Lecture, recitation, computing and laboratory periods. Covers Chapters 9 through 19 of text. Parts of Chapters 14, 15, and 18 are omitted.


**E.E. 308. Electric Fields and Waves**


An introduction to electromagnetic theory including the study of vector analysis, Maxwell's equations, static electric and magnetic fields, and interaction between fields and matter.

Text: *Notes.*

**E.E. 311, 312, 313. Electric Circuits**

3-3-4. Prerequisites: E.E. 205, Math. 209 or parallel.

A study of the transient and
steady-state responses of RLC networks to a variety of types of forcing functions. Solutions of the differential equations for dynamic equilibrium lead to the concepts of complex impedance and complex frequency. These results are used to analyze single-phase and three-phase circuits, resonant circuits, coupled circuits and others of special interest. Introductions to Laplace transforms and Fourier integrals are included.

This course is an introduction to electronic and semiconductor devices and includes a study of circuits containing these elements.


**E.E. 327. Electric Power Conversion**

2-3-3. Prerequisite: E.E. 325. For non-electrical engineering students.

A study of energy conversion principles and devices such as motors, generators and rectifiers. Lectures, computation and laboratory periods.

Text: Del Toro, *Principles of Electrical Engineering* and notes.

**E.E. 328. Electronic Control**

3-3-4. Prerequisites: E.E. 326 and E.E. 327. For non-Electrical Engineering students.

A study of electronic control components and systems, both digital and continuous. An introduction to theories of digital and analog computation; instruments and instrumentation. Lectures, computation and laboratory periods.

Text: Notes.

**E.E. 342. Electrical Measurements**

3-3-4. Prerequisite: E.E. 312, or concurrently.

This course includes the modern methods of measuring resistance, current, capacitance, inductance and iron losses, and the calibration of electrical instruments. Lectures, recitations, computing and laboratory periods.

E.E. 410. Electric Fields and Waves
3-3-4. Prerequisite: E.E. 409.
A continuation of E.E. 409. Steady-state and transient response of lossless transmission lines, dissipative transmission lines, radiation, antennas, and quasistatics.
Text: Notes.

3-3-4. Prerequisites: E.E. 308 and E.E. 313.
Texts: Meisel, Principles of Electromechanical Energy Conversion; Dorf, Modern Control Systems.

E.E. 414. Electric Circuits
3-0-3. Prerequisite: E.E. 313.
A continuation of E.E. 313. The behavior of image-parameter filters, electrical systems, and analogous electromechanical systems are studied by means of Laplace transform and Fourier transform methods.
Text: Cheng, Analysis of Linear Systems.

E.E. 416. Electronic Computation
3-3-4. Prerequisites: E.E. 306 and E.E. 313.
A study of the basic principles of analog computation.
Text: Johnson, Analog Computer Techniques.

E.E. 417. Pulse Circuits
3-0-3. Prerequisites: E.E. 306 and E.E. 313.
A study of the characteristics and the design of pulse generating and shaping circuits, digital circuits, and other nonlinear circuits.

E.E. 418. Introduction to Digital Systems
3-0-3. Prerequisite: E.E. 306.
A study of the application of digital techniques to the design of special purpose digital systems. The techniques utilized take advantage of the flexibility inherent in typical commercially available logic modules. Considerable emphasis is placed upon the solution of meaningful design problems.
Text: Selected references.

E.E. 419. Power System Analysis
3-0-3. Prerequisites: E.E. 313 and E.E. 308.
A study of power system parameters, fault currents, stability and protective relaying.
Text: Stevenson, Power System Analysis.

E.E. 420. Solid-State Electronics
3-3-4. Prerequisite: E.E. 304.
A study of crystalline state, waves in crystals, transport properties of solids, semiconductors, semiconductor junctions, integrated circuits, and superconductivity.
Text: Beam, Electronics of Solids.

E.E. 421. Electromagnetic Properties of Solids
3-3-4. Prerequisite: E.E. 304.
A study of dielectric and magnetic processes, domain magnets, thin film electronics, and quantum electronics.
Text: Beam, Electronics of Solids.

E.E. 422. Industrial Electronics
3-3-4. Prerequisites: E.E. 306 and E.E. 313.
Theory and operating characteristics of electronic power conversion and industrial electronic control devices. Laboratory and problem work are included.
Text: To be selected.

E.E. 428. Communication Engineering
3-3-4. Prerequisites: E.E. 306 and E.E. 313.

Text: Babb, Pulse Circuits: Switching and Shaping.
A study of circuit components in the radio-frequency region below one kilo-mega cycle. The theory and operating characteristics of low-pass and band-pass amplifiers at radio frequencies. Distortion in amplifiers and the application of feedback are included in the study. Laboratory and computation are included.


**E.E. 429. Communication Engineering**  
3-3-4. Prerequisites: E.E. 306 and E.E. 444.  
The definitions and basic concepts of various analog and digital modulation techniques are considered. Modulators for generating the signals and demodulators for information recovery are studied. Applications are discussed.  
Text: Hancock, *An Introduction to the Principles of Communication Theory*.

**E.E. 430. Communication Engineering**  
3-3-4. Prerequisites: E.E. 306 and E.E. 313.  
A study of relaxation oscillators, wave shaping techniques, pulse generation, and kindred subjects. Noise, interference, propagation, antenna systems, and the problem of frequency allocation is studied. Receivers and transmitters for radio and television are also studied.  

**E.E. 432. Communication Circuits**  
3-3-4. Prerequisite: E.E. 313.  
A study of communication circuits and electric filters. Lectures, recitations, computing and laboratory periods.  

**E.E. 434. High-Frequency Measurements**  
3-0-3. Prerequisite: E.E. 410.  
A study of the techniques employed in the measurement of voltage, current, power, inductance, resistance and capacitance at audio and radio frequencies.  
Text: To be selected.

**E.E. 435. Transistor Circuit Analysis**  
3-3-4. Prerequisites: E.E. 306, 313.  
After a short review of transistor parameters and equivalent circuits, quiescent-point and stability considerations are discussed. The analysis and design of both small-signal and large-signal amplifiers, transistor oscillators, modulators and pulse circuits are studied.  

**E.E. 436. Ultra-High-Frequency Techniques**  
3-3-4. Prerequisite: E.E. 409.  
Elective for undergraduates and first-year graduate students. Primarily concerned with rectangular and cylindrical waveguides and resonators; qualitative study of klystrons, magnetrons, and traveling wave tubes; introduction to ferrite devices, such as gyrators and ferrite isolators. Coordinated laboratory exercises concerned with basic measurements of frequency, SWR, attenuation, etc., at microwave frequencies.  

**E.E. 437. Antennas**  
3-3-4. Prerequisite: E.E. 410, or concurrently.  
An introductory course in antenna theory and practice for senior students. Topics emphasized are the linear antenna, antenna arrays, aperture antennas, antenna patterns and antenna gain. The important characteristics of specialized antennas such as the helix, the rhombic, and the log-periodic, etc. are presented.  
Text: Kraus, *Antennas*.

**E.E. 442. Electrical Design**  
3-3-4. Prerequisites: E.E. 306, 313.  
Design problems of various types of electrical and electronic systems.
Lectures and computation periods. Text: To be selected.

**E.E. 443. Linear Graph Theory**  
Text: Seshu and Reed, *Linear Graphs and Electrical Networks*.

**E.E. 444. Random Signals and Noise**  
3-0-3. Prerequisite: E.E. 313.  
An introduction to the theory of random signals and noise. The concepts of probability theory are applied to the characterization of random waveforms through the use of probability distributions, correlation functions and power spectra. A study is made of the behavior of electrical systems excited by random signals and noise.  

**E.E. 450. Special Topics**  
3-0-3. Prerequisite: Senior standing.  
Special topics of unusual current interest; introductory treatments of new developments in Electrical Engineering technology.  
Text: To be selected.

**E.E. 452-453-454-455. Special Problems**  
0-3-1. Prerequisite: Senior E.E. standing.  
Special engineering problems will be assigned to the student according to his needs and capabilities.

### Graduate Courses Offered

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<td>E.E. 608</td>
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<tr>
<td>E.E. 622, 3</td>
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<td>E.E. 624</td>
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<td>E.E. 640</td>
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<td>E.E. 647</td>
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<td>E.E. 648</td>
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<td>E.E. 652</td>
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<td>E.E. 659</td>
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<td>E.E. 660</td>
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<td>E.E. 800</td>
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(Complete details about these courses are contained in the Graduate Bulletin, a copy of which is available upon request.)
Department of Engineering Graphics
(Established in 1962)

Department Head—R. Kenneth Jacobs; Professor—Joseph C. Durden, Jr.; Associate Professors—John D. Hutcheson, Donald H. Smith, H. William Streitman, Ira E. Wilks; Assistant Professors—*Joseph W. Adams, Ishmael L. Ellis, Theodoric C. Linthicum, John R. Murphy, John G. Nevitt, Hardy J. Smith, Earl M. Wheby; Senior Secretary—Gloria W. Angier.

General Information
Graphics has long been a language of the Engineer. It has endured through the years because it is the most flawless means of communication yet invented by man. Where the spoken word or the written document is always subject to misinterpretation, a well executed graphical analysis conveys the thought or plan exactly as intended.

As the line of demarcation between the efforts of engineers and scientists continues to diminish, it becomes increasingly imperative that rapid communication between them be extended and improved. Engineering Graphics, or Graphic Science, not only supplies the common language linking the closely oriented fields of engineering and science, it also takes on the added task of providing the engineer with means of expression in his newer role in the area of analysis and synthesis without relinquishing his command in design, which has long been his primary responsibility. This nowise ignores the cultural attainments arising from study in this discipline which, for many, initiates first steps into our modern and ever changing world of precise measurements, spatial relationships, and clear thinking.

To visualize in three dimensions and to express thoughts and ideas in concise form readily understood by those conversant with the common language is one of the essentials for growth in engineering and allied sciences. Setting a climate conducive to the student's development in this phase of his education is the aim and purpose of the department.

It is, therefore, expected that the able student will reach that level of graphics literacy whereby he may live comfortably within his professional environment.

Courses of Instruction
NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.
Students are expected to use drawing instruments approved by the Department of Engineering Graphics.

E.Gr. 105. Managerial Graphics
0-6-2. Prerequisite: None. Not open, generally, to students with credit in E.Gr. 113.
Study of effective graphic communication through sketches, multiview orthographic projection, auxiliary views, sectional views, and pictorial drawings. Design and construction of charts for illustrative purposes. Translating statistical data into meaningful graphic forms.

E.Gr. 113. Introduction to Engineering Graphics
0-6-2. Prerequisite: None.
An introduction to graphics in engineering and science. Primary emphasis on effective graphic communication through freehand and instrument representation of multiview orthographic projections, sections and conventions, primary auxiliary views, isometric and oblique drawings.

*Deceased, January 19, 1968.
E.Gr. 114. Engineering Descriptive Geometry
0-6-2. Prerequisite: E.Gr. 113.

E.Gr. 115. Engineering Graphics
0-6-2. Prerequisite: E.Gr. 105 or E.Gr. 113.
Use of the graphic techniques of sectioning, dimensioning, pictorial representation, detail and assembly sketches and drawings in engineering design. Application of graphical computations (graphic algebra, graphic calculus, nomography and empirical equations) to the analysis and synthesis of engineering problems.

E.Gr. 213. Industrial Graphics
1-6-3. Prerequisite: E.Gr. 114 and E.Gr. 115.
Sketching and simplified representation techniques as applied to production drawings; advanced study of auxiliary views and sections; threads and fasteners; geometric tolerancing and true-position dimensioning; working drawings and assembly drawings as a part of the design process; use of mechanical drafting aids in technical illustration.
Text: To be selected.

E.Gr. 304. Graphic Statics I
0-3-1. Prerequisite: One of the following courses: Mech. 301, Mech. 305, Mech. 306, or Mech 342.
Graphical solutions of coplanar force systems, resultants, equilibrium of simple structures, funicular polygon through three points, trusses, friction.
Text: Notes and Departmental Work Sheets.

E.Gr. 305. Graphic Statics II
1-3-2. Prerequisites: E.Gr. 114, E.Gr. 304 or consent of instructor.
Graphical solutions of three dimensional force systems and structures; graphical integration and funicular polygon solutions of area properties and beam slopes and deflections.
Text: Notes and Departmental Work Sheets.

E.Gr. 413. Introduction to Graphical Computation
3-0-3. Prerequisites: E.Gr. 115 or consent of instructor and Math. 209 or equivalent.
An introduction to the use of graphics as an applied science in the solution of engineering problems. Special emphasis on empirical equations, calculus, and differential equations.
Text: Rule and Coons, Graphics.

E.Gr. 415. Nomography
3-0-3. Prerequisite: E.Gr. 114 and 115.
Text: Hoelscher, Graphic Aids in Engineering Computation.

E-Gr. 423. Descriptive Geometry Systems
3-0-3. Prerequisite: E.Gr. 114.
A presentation of Mongean descriptive geometry theory with a study of applications of different
descriptive geometry systems to advanced spatial analysis.
Text: Schumann, *Descriptive Geometry*.

E.Gr. 433. Pictorial Projections
3-0-3. Prerequisite: E.Gr. 213 or consent of instructor.

School of Engineering Mechanics
(Established in 1959)


General Information

Engineering Mechanics has long been recognized as a fundamental of engineering, and all engineering curricula include some courses in mechanics. Recent advances in science and technology are creating problems which are demanding for their solution the direct application of fundamental principles of mechanics in the hands of a trained analyst. The course of study offered here provides both breadth and depth through a strong foundation in mathematics, basic electricity and electronics, dynamics and vibration, advanced strength of materials, theoretical and experimental stress analysis. Successful completion of the program outlined should enable the graduate to enter upon a career in any one of a number of different phases of engineering or to fit into a research program. An excellent background is also provided for further study at the graduate level.

A minimum scholastic average of C is required in the prescribed courses in mathematics, physics and engineering mechanics. Students who fail to meet this requirement may continue only on a probationary status.

Several modern experimental research laboratories are maintained for graduate and undergraduate research in the area of Experimental Stress Analysis, Vibrations and Materials. A departmental research machine shop under the direction of a competent machinist is maintained for constructing special research equipment and models and for servicing laboratory equipment.

The School of Engineering Mechanics offers a four-year undergraduate program of study leading to the degree Bachelor of Science in Engineering Mechanics and graduate programs leading to the Master of Science and Doctor of Philosophy degrees. The requirements for the B.S. in Engineering Mechanics are listed on the following pages; the requirements for the M.S. and Ph.D. degrees may be found in the Graduate Bulletin.

*On leave.
### Freshman Year

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<td>E.Gr.</td>
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<tr>
<td>P.T.</td>
<td>101-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
</tr>
<tr>
<td>ROTC</td>
<td>**</td>
<td>Basic ROTC (optional)</td>
<td></td>
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<tr>
<td>Gen.</td>
<td>101</td>
<td>Orientation</td>
<td>1-0-0</td>
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</tbody>
</table>

**Totals (excluding ROTC)** 15-13-18 14-13-18 14-13-18

**NOTE:** Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish. Three quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eng.</td>
<td>201-2-3</td>
<td>Survey of Humanities</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Math.</td>
<td>207</td>
<td>Calculus IV</td>
<td>5-0-5</td>
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</tr>
<tr>
<td>Math.</td>
<td>208</td>
<td>Calculus and Linear Algebra</td>
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<td>5-0-5</td>
<td></td>
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<tr>
<td>Math.</td>
<td>209</td>
<td>Ordinary Differential Equations</td>
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<tr>
<td>Phys.</td>
<td>207-8-9</td>
<td>Physics</td>
<td>5-3-6</td>
<td>5-3-6</td>
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<tr>
<td>M.E.</td>
<td>208</td>
<td>Engineering Materials and Processes</td>
<td>2-5-3</td>
<td></td>
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<tr>
<td>Mech.</td>
<td>305</td>
<td>Statics</td>
<td></td>
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<td>P.T.</td>
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<td>Physical Training</td>
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<td>Basic ROTC (optional)</td>
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</table>

**Totals (excluding ROTC)** 15-10-18 16-7-18 16-7-18

*Humanities elective must be elected from the approved list on page 40.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
### Junior Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
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<th>3rd Q.</th>
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<tbody>
<tr>
<td>M.E. 342-43</td>
<td>Transport Phenomena</td>
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<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Math. 411-12-13**</td>
<td>Advanced Engineering Mathematics</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Phys. 319</td>
<td>Modern Physics for Engineers</td>
<td>5-0-5</td>
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<tr>
<td>Mech. 308</td>
<td>Dynamics</td>
<td></td>
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<tr>
<td>Mech. 421</td>
<td>Mechanical Vibrations</td>
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<tr>
<td>M.E. 322-3</td>
<td>Thermodynamics</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>E.E. 325</td>
<td>Electrical Circuits and Fields</td>
<td>2-3-3</td>
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<tr>
<td>E.E. 326</td>
<td>Elementary Electronics</td>
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<td>2-3-3</td>
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<td>Elective *</td>
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<td>3-0-3</td>
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<tr>
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<td>16-3-17</td>
<td>16-3-17</td>
<td>18-0-18</td>
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</table>

*Of the 24 hours of undesignated electives in the junior and senior years, at least 9 hours must comprise a sequence of systems or design courses leading to some goal. A maximum of 9 hours of these electives may be in advanced ROTC.

**Math. 491, Advanced Calculus, (3-0-3) may be substituted for Math. 413.

### Senior Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
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<td>Mech. 401-2</td>
<td>Dynamics</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Mech. 422</td>
<td>Mechanical Vibrations</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mech. 441</td>
<td>Advanced Strength of Materials</td>
<td>3-0-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mech. 444</td>
<td>Stress Analysis</td>
<td>3-3-4</td>
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<td>3-0-3</td>
</tr>
<tr>
<td>Mech. 446</td>
<td>Continuum Mechanics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mech. 471</td>
<td>Introduction to Experimental Stress Analysis</td>
<td></td>
<td>1-6-3</td>
<td></td>
</tr>
<tr>
<td>Eng. 320</td>
<td>Technical Writing</td>
<td>3-0-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem. 475</td>
<td>Physical Chemistry for Engineers</td>
<td>3-0-3</td>
<td></td>
<td></td>
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<tr>
<td>A.E. 410</td>
<td>Thermal Stresses</td>
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<td>3-0-3</td>
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<tr>
<td>Chem. 476</td>
<td>Chemistry of the Solid State</td>
<td>3-0-3</td>
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<tr>
<td>Elective</td>
<td>Humanities</td>
<td>6-0-6</td>
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<td>Totals</td>
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<td>18-0-18</td>
<td>18-5-19</td>
<td>13-6-15</td>
</tr>
</tbody>
</table>

### Courses of Instruction

#### Engineering Mechanics

**NOTE:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

**Mech. 305. Statics**

3-0-3. Prerequisites: Phys. 207; Math. 202 or 207.

Topics of study include elements of statics in two and three dimensions; review of centroids and moments of inertia of areas; laws of equilibrium applied to machines and structures; friction.


**Mech. 306. Applied Mechanics**

5-0-5. Prerequisites: Phys. 207; Math. 203 or 208, or concurrently.

Elements of statics in two and three dimensions; laws of equilibrium applied to machines and structures; friction; centroids, centers of gravity, and moments of inertia;
kinematics; kinetics of translation, rotation, and plane motion; work-energy and impulse-momentum principles.

**Mech. 308. Dynamics**
5-0-5. Prerequisites: Mech. 305; Math. 203 or 208, or concurrently.
Kinematics of rectilinear and curvilinear motion of particles; kinematics of rotation and plane motion of rigid bodies; kinetics of a particle; kinetics of translation, rotation, and plane motion of bodies; work and energy relations; impulse and momentum principles.

**Mech. 331. Mechanics of Materials**
3-0-3. Prerequisites: Math. 203 or 208, or concurrently; Mech. 305 or Mech. 306.
Stress and strain analysis; stresses and displacements due to torsion, bending and axial loading; introduction to elastic stability and vibrations.

**Mech. 334. Mechanics of Materials**
5-0-5. Prerequisites: Mech. 305 or Mech. 306; Math. 203 or 208, or concurrently.
Simple stresses and strains; membrane stresses; torsion; shear and bending moment diagrams; flexure stresses and shearing stresses in beams; introduction to plastic bending of beams; combined stresses; deflection of beams; statically indeterminate beams; introduction to strain energy; column theory.

**Mech. 337. Mechanics of Materials**
3-0-3. Prerequisite: Mech. 334.
Deflection of beams due to bending and shear; statically indeterminate beams; strain energy; theorems of Castigliano; impact loading; curved beams; thick-walled cylinders.

**Mech. 342. Statics**
5-0-5. Prerequisites: Phys. 211; Math. 109 or 201.
Topics of study include two and three dimensional force systems; equilibrium of particles and rigid bodies; simple structures; review of centroids and moments of inertia of areas; load, shear and bending moment diagrams; parabolic and catenary cables.
Text: Beer and Johnston, *Statics*.

**Mech. 343. Mechanics of Materials**
5-0-5. Prerequisite: Mech. 342.
Topics of study include Hook's Law; simple stresses and strains; mechanical properties of materials; combined stresses; Mohr's circle; deflection of beams; columns.

**Mech. 401. Intermediate Dynamics I**
3-0-3. Prerequisite: Mech. 421, or consent of instructor.
Topics of study include the two and three dimensional kinematics and kinetics of particles and systems of particles with application to motion in a resisting medium, central force motion, problems involving redistribution of mass and the motion of a particle allowing for the effects of the earth's rotation.
Text: Marris and Stoneking, *Advanced Dynamics*.

**Mech. 402. Intermediate Dynamics II**
3-0-3. Prerequisite: Mech. 401, or consent of instructor.
Topics of study include the two and three dimensional motion of a rigid body, Euler's Equations, and an introduction to energy methods and Lagrange's Equations.
Text: Marris and Stoneking, *Advanced Dynamics*.

**Mech. 421. Mechanical Vibrations**
3-0-3. Prerequisites: Math. 209 or
Kinematics of vibration; free and forced vibrations of single and many degree of freedom systems, without and with damping; critical speeds. Text: Thomson, *Vibration Theory and Applications*.

**Mech. 422. Mechanical Vibrations**
3-0-3. Prerequisite: Mech. 421.
Continuation of Mechanics 421. Complex representation; *Fourier* series; step and impulse loads; many degrees of freedom; influence coefficients; matrix method; stability of solution; beam vibrations; approximate methods.

**Mech. 441. Advanced Strength of Materials**
3-0-3. Prerequisites: Mech. 334.
Comprehensive analysis of bending, transverse force transmission, and instability in structural sections; effect of non-symmetry, tapered sections, curved shear webs, multiple flanges.
Text: Instructors Notes and Lectures.

**Mech. 444. Stress Analysis**
3-3-4. Prerequisites: Mech. 337 or Mech. 441 or A.E. 331 or equivalent; Math. 209 or 304 or equivalent.
Stress relations for an arbitrary continuous body; introduction to the theory of isotropic elasticity; strain gages and strain measurements; illustrative elasticity solutions for beams; unsymmetrical bending; torsion; shear flows in closed box beams; practical applications to structures.
Text: Dover and Adams, *Experimental Stress Analysis and Motion Measurement*.

**Graduate Courses Offered**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mech. 421</td>
<td>Mechanical Vibrations</td>
<td>3-0-3</td>
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<tr>
<td>Mech. 422</td>
<td>Mechanical Vibrations</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Mech. 446</td>
<td>Continuum Mechanics</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Mech. 480</td>
<td>Theory and Properties of Materials</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Mech. 604</td>
<td>Advanced Dynamics I</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Mech. 605</td>
<td>Advanced Dynamics II</td>
<td>3-0-3</td>
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</table>


**Mech. 446. Continuum Mechanics**
3-0-3. Prerequisite: Mech. 444 or consent of instructor.
Geometrical foundations; concept of stress and strain tensors; analysis of stress and strain; fundamental physical laws; constitutive equations; introduction to elasticity, plasticity, thermoelasticity, viscoelasticity, wave propagation.

**Mech. 471. Introduction to Experimental Stress Analysis**
1-6-3. Prerequisite: Senior standing.
Topics of study include the elements of two dimensional photoelasticity; the elements of electric resistance strain gage theory and practice; strain recording devices; measurement of damping in simple vibrating systems; introductory study of fatigue.
Text: Dove and Adams, *Experimental Stress Analysis and Motion Measurement*.

**Mech. 480. Theory and Properties of Materials**
3-0-3. Prerequisite: Senior standing.
Topics of study include fatigue; creep; effect of shape, size, temperature, and microstructure of specimen; the more common stress-strain equations, hysteresis, after effect, etc.; theories of failure. Considerable reading and report writing required.

Hours and credit to be arranged.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>Mech. 610</td>
<td>Theory of Oscillations</td>
<td>3-0-3</td>
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<tr>
<td>Mech. 613</td>
<td>Vibration of Elastic Bodies</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Mech. 615</td>
<td>Gyroscopic Motion and Devices</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Mech. 618</td>
<td>Space Ballistics</td>
<td>3-0-3</td>
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<tr>
<td>Mech. 620</td>
<td>Theory of Experimental Stress Analysis</td>
<td>2-3-3</td>
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<tr>
<td>Mech. 622</td>
<td>Energy Methods in Mechanics</td>
<td>3-0-3</td>
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<td>Mech. 635</td>
<td>Advanced Strength of Materials</td>
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<td>Mech. 636</td>
<td>Random Vibrations I</td>
<td>3-0-3</td>
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<td>Mech. 637</td>
<td>Random Vibrations II</td>
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<tr>
<td>Mech. 640</td>
<td>Introductory Photoelasticity</td>
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<td>Mech. 643</td>
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<td>Mech. 645</td>
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<td>Mech. 646</td>
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<td>Mech. 647</td>
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<tr>
<td>Mech. 652</td>
<td>Theory of Plates</td>
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<tr>
<td>Mech. 653</td>
<td>Theory of Elastic Stability</td>
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<tr>
<td>Mech. 654</td>
<td>Theory of Shells</td>
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<tr>
<td>Mech. 662</td>
<td>Plasticity</td>
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<td>Mech. 665</td>
<td>Continuum Mechanics — Fluids</td>
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<td>Mech. 666</td>
<td>Continuum Mechanics — Solids</td>
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<td>Mech. 700</td>
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<td>Mech. 701</td>
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<tr>
<td>Mech. 704</td>
<td>Special Problems in Engineering Mechanics</td>
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<td>Mech. 710</td>
<td>Space Mechanics</td>
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<td>Mech. 711</td>
<td>Dynamics of Space Vehicles</td>
<td>3-0-3</td>
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<td>Mech. 725</td>
<td>Continuum Mechanics</td>
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<td>Mech. 730</td>
<td>Wave Propagation in Continuous Media — Fluids</td>
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<td>Mech. 731</td>
<td>Wave Propagation in Continuous Media — Solids</td>
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<td>Nonlinear Vibrations</td>
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<td>Mech. 762</td>
<td>Stability of Plates</td>
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<td>Mech. 763</td>
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<tr>
<td>Mech. 800</td>
<td>Ph.D. Thesis</td>
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</tr>
</tbody>
</table>

(Complete details pertaining to these courses are contained in the *Graduate Bulletin*, a copy of which is available upon request.)
Department of English


General Information

The Department of English will demand in its sequence of required freshman courses the ability to think logically, to organize material properly, to express ideas in clear and effective prose, and to read and understand literature. These courses will consist of introductions to the short story, drama, and poetry, with emphasis on the relation of form to content.

The Department offers to all sophomores a unified sequence of courses in the humanities aimed at a deeper appreciation of the value of the individual in society and a wider acquaintance with the great writers and great ideas basic to an understanding of western culture. In all courses, both freshman and sophomore, the student must demonstrate an acceptable proficiency in writing.

Elective courses in communication, written and oral, and electives in literature and language are also available. Credit in drama is granted for participation in Drama Tech productions.

Entering students desiring advanced standing must present advanced placement examinations to be evaluated by the Department. For students from foreign countries a special two-year program serves as an introduction to the American language and the American way of life and thought.

Courses of Instruction

NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

Eng. 50. Reading for Speed and Comprehension
2-0-0. Prerequisite: None. Mechanics of reading, exercises in increasing speed and improving comprehension. Recitations, tests, and individual practice. Text: Brown, Efficient Reading.

Eng. 107-108-109. Introduction to Literature
3-0-3. Freshman year. Courses must be taken in numerical sequence. Guided analysis of selected literary works, with special attention to the relationship of content and form, and to the expression of ideas in ef-
effective prose. Lectures, discussions, quizzes, papers.


**Eng. 110. Vocabulary Building**

3-0-3. Prerequisite: None.

Development of a useful vocabulary required in technical and scientific courses and general reading. Recitations, written exercises, individual practice and research, quizzes.


**Eng. 131-2-3. English for International Students**

5-0-5. Freshman year, consecutive quarters.

Admission by consent of the Department.

A one-year course designed as an introduction to written and spoken English, stressing American pronunciation, idiomatic phrases, and language appropriate to basic social situations and customs of the American people.

Text: To be announced.

**Eng. 201-2-3. Survey of the Humanities**

3-0-3. Prerequisite: Eng. 109.

A sequence of courses studying the contribution of several western civilizations from the Greeks to modern times as revealed in literature. Lectures, quizzes, reports, collateral reading.

Texts: Selected readings in each period.

**Eng. 204. Creative Writing**

3-0-3. Prerequisite: Eng. 109.

Study and practice in several forms and methods of composition, with emphasis on effective writing. Recitations, quizzes, compositions.

**Eng. 206. Survey of English Literature**


A study of English literature since Shakespeare, with emphasis on significant figures and their works through the 19th Century. Lectures, reports, collateral reading, quizzes.

Texts: To be announced. May be substituted for Eng. 203.

**Eng. 207. Survey of American Literature**


A study of the development of literature in America with emphasis on significant figures and their works through the 19th Century. Lectures, reports, collateral reading, quizzes.

Texts: To be announced. May be substituted for Eng. 203.

**Eng. 221-2-3; 331-2-3. Acting and Producing the Play**

0-3-1. Prerequisite: Admission by consent of instructor.

Participation in the Drama Tech productions of various kinds of plays, including the presentation of one play before an audience.

**Eng. 241-2-3. Literature for International Students**

3-0-3. Sophomore year, consecutive quarters. Prerequisite: Eng. 133.

An introduction to American ideas as expressed in American literature, with continued training in writing and speaking the American language.

Texts: Selected texts as announced.

**Eng. 301. Modern Drama**

3-0-3. Prerequisite: Eng. 203.

Dramatic theory and technique as illustrated by a number of modern playwrights. Lectures, reports, collateral reading, quizzes.

Text: To be announced.

**Eng. 302. Shakespeare**

3-0-3. Prerequisite: Eng. 203.

A brief statement of the life and times of Shakespeare and a careful study of certain of his principal works. Lectures, reports, collateral reading, quizzes.

Text: *The Complete Plays of Shakespeare*. 
Eng. 303. American Literature
3-0-3. Prerequisite: Eng. 203.
Reading of American writers for form and ideas. Lectures, reports, collateral reading, quizzes.
Text: Selected texts as announced.

Eng. 304. Contemporary Literature
3-0-3. Prerequisite: Eng. 203.
A careful study of major figures and movements in modern fiction. Lectures, reports, collateral reading, quizzes.
Text: Selected texts as announced.

Eng. 306. The English Language
3-0-3. Prerequisite: Eng. 109.
Study of the origin of the English language, its relation to other languages, and its differentiation and development into modern English and American. Lectures, quizzes, term paper.
Text: Pyles, *Origin and Development of the English Language*.

Eng. 315. Public Speaking
3-0-3. Prerequisite: Eng. 203.
Instruction in the basic principles of effective public speaking, with emphasis on practice and criticism. The course is conducted as a laboratory.

Eng. 318. Argumentation and Debate
3-0-3. Prerequisite: Admission by consent of the instructor.
Principles of argumentation and persuasion, with emphasis on issues of current public interest.
Text: To be announced.

Eng. 320. Technical Writing
3-0-3. Prerequisite: Eng. 203.
Study and practice of effective English in business letters, technical papers, engineering reports. Letters, reports, quizzes.
Text: To be announced.

Eng. 324. Advanced Writing
3-0-3. Prerequisite: Eng. 203.
Intensive practice in composition at an advanced level in informative, argumentative, and persuasive forms; discussion of principles and theory of composing; analytical reading of models of appropriate essays and articles.
Text: To be announced.

Eng. 360. The Literature of the Bible
3-0-3. Prerequisite: Eng. 203.
Study of a number of Biblical selections of unusual literary merit. Lectures, collateral reading, reports, quizzes.

Eng. 381-2.3. Seminars in Literature
3-0-3. Prerequisite: Consent of the Department.
Intensive study of individual writers, movements, periods or themes in literature, with the purpose of developing through discussion and critical papers knowledge in depth, critical independence, and expository skill.
Text: To be announced.
School of Industrial Engineering
(Established in 1945 — Option in M.E., 1924 - 1945)
(Including a Program in Systems Engineering. See Page 217)

Director—Robert N. Lehrer; Associate Director of Undergraduate Programs—William N. Cox, Jr.; Associate Director of Graduate Programs—David E. Fyffe; Professors—Adam Abruzzi, James M. Apple, Paul T. Eaton, Cecil G. Johnson, Joseph Krol, Harold E. Smalley, Harrison M. Wadsworth; Associate Professors—William W. Hines, Lynwood A. Johnson, C. M. Shetty, Jack R. Walker, Pranas Zunde; Assistant Professors—Stan Aaronson, J. Gordon Davis, John J. Jarvis, Phillip A. Reed, Bobby C. Spradlin; Instructors—Daniel M. Sipper, William W. Swart; Lecturers—Jackson H. Birdsong, Gary W. Draper, Tee H. Hiett, Jose’ C. Irastorza, Nelson K. Rogers; Principal Secretary—Shirley J. Whelchel; Laboratory Mechanic—Clarence F. Heriford.

General Information

Industrial Engineering is one of the most liberal of engineering fields, providing both a general and basic engineering foundation as well as a grounding in the interactions between technology and management. Students studying industrial engineering are usually interested in obtaining a fundamental engineering background as the basis for professional specialization dealing with those activities associated with the field—operations research, management science, systems engineering, methods, organization, planning, etc., or as preparation for other endeavors, such as management. The study of Industrial Engineering places emphasis upon developing the student's abilities to analyze and design systems which integrate technical, economic and social-behavioral factors both in industrial and in various service-social-governmental organizations.

The principal strength of the program leading to the Bachelor of Industrial Engineering degree lies in a solid, well coordinated core of courses in systems analysis and systems design, which rely heavily upon the engineering sciences, basic sciences, and social sciences. Flexibility is introduced into the program through the provision of eighteen hours of electives in the senior year, as well as through three options, which permit a student to place emphasis on operations and facilities design, information and control systems design, or systems engineering.

At the conclusion of his junior year, the student selects the Operations and Facilities Design Stem, the Information and Control Systems Design Stem or the Systems Engineering Stem. In the first case, he would take two courses (I.E. 471 and I.E. 472) which would provide an in-depth coverage of operations and facilities design and, in addition, he would be required to take a survey (I.E. 480) in the design of information and control systems. In the second case, the student would take two courses (I.E. 481 and I.E. 482) which would provide an in-depth coverage of information and control systems design and also he would be required to take a survey course (I.E. 470) in the design of operations and facilities.
In the third case, the student would take a series of systems engineering courses and the two survey courses in both the design of information and control systems and in the design of operations and facilities. In all options, the student would be expected to select a sequence of industrial engineering electives which would be oriented toward the stem which he selects.

Options for Exceptional Students
An Option program is available to encourage students with superior abilities to fully avail themselves of a range of unusual educational opportunities. Participation in these programs requires demonstrated scholastic excellence, requires prior arrangements with the student’s advisor, and provides the following options, individually or in combination:

a. Graduate level courses in lieu of senior year electives: for students with a cumulative grade point average of 3.3 or above, up to 18 credit hours of approved graduate level courses may be scheduled. For such students, up to 18 credit hours of senior year electives may be waived. These credits, when approved by the student’s advisor, may be made available for subsequent credit toward a graduate degree.

b. Accelerated study: for students with a 3.3 or above average during the three preceding quarters (including at least 45 credits) course requirements for any non-project Industrial Engineering course may be completed at the student’s own pace by self study, counseling and guidance by the course instructor, etc. Students may register for any number of courses, but must satisfy instructor and course examination requirements. This may be done at the student’s own timing. Class attendance is not required. Arrangements must be made with course instructors prior to the start of the quarter.

c. Individual project and research work: for students with a 3.0 or above average during the preceding three quarters (including at least 45 credits) up to 18 credits of project and/or research work, done in collaboration with the faculty or advanced graduate students, may be substituted for senior year electives.

d. Director’s Honor Seminar (I.E. 500): for senior students with a 3.0 or above cumulative grade point average, the Director’s Honor Seminar may be taken as an elective.

Graduate Programs
Graduate programs are available leading to the degree of Master of Science, Master of Science in Industrial Engineering, and Doctor of Philosophy. Enrollment in the graduate program provides opportunity for students from BIE programs to continue their professional preparation, and for students from other engineering and science programs to enrich their educational exposure by study and research which relates engineering, management and science. The growing recognition of the importance of advanced education in this field has caused a substantial growth of graduate study during recent years.
Industrial Engineering / 123

While graduate study within the educational philosophy of the School is a highly individual matter which allows each student to design his own program of study, emphasis in course and research work is typically along the lines of (a) Operations Research and Systems Engineering, (b) Facilities Design (including facilities location, facilities layout, materials handling, transportation and logistics), and (c) Industrial Engineering Contributions to the Health and Medical Care Fields (including Hospital Industrial Engineering). Other emphases, such as Safety Engineering or cross-discipline programs, may be pursued.

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
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<th>2nd Q.</th>
<th>3rd Q.</th>
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<tbody>
<tr>
<td>Chem.</td>
<td>101-2-3</td>
<td>General Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<tr>
<td>E.Gr.</td>
<td>113, 114</td>
<td>Engineering Graphics</td>
<td>0-6-2</td>
<td>0-6-2</td>
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<tr>
<td></td>
<td>or 115</td>
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<tr>
<td>Eng.</td>
<td>107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Math.</td>
<td>107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
<td>5-0-5</td>
<td>5-0-5</td>
</tr>
<tr>
<td>I.S.</td>
<td>151</td>
<td>Digital Computer Organization and Programming</td>
<td></td>
<td></td>
<td>2-3-3</td>
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<tr>
<td>S.S.*</td>
<td>111-12-13</td>
<td>Social Science</td>
<td>3-0-3</td>
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<tr>
<td>P. T.</td>
<td>101-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>Gen.</td>
<td>101</td>
<td>Orientation</td>
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</table>

**Totals (excluding ROTC)** 15-13-18 14-13-18 16-10-19

NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.
*Modern Language sequence may be substituted for Social Science sequence.
**Basic ROTC or a total of six hours of free electives.

### Sophomore Year

<table>
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<tr>
<th>Course</th>
<th>No.</th>
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<th>3rd Q.</th>
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<tbody>
<tr>
<td>Eng.</td>
<td>201-2-3</td>
<td>Survey of the Humanities</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>I.E.</td>
<td>204</td>
<td>Introduction to Industrial Engineering</td>
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<td>3-3-4</td>
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<tr>
<td>I.M.</td>
<td>201-2</td>
<td>Economic Principles &amp; Problems</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Math.</td>
<td>207</td>
<td>Calculus IV</td>
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<tr>
<td>Math.</td>
<td>208</td>
<td>Calculus and Linear Algebra</td>
<td>5-0-5</td>
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<tr>
<td>Math.</td>
<td>209</td>
<td>Differential Equations</td>
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<td>5-0-5</td>
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<tr>
<td>Phys.</td>
<td>207-8-9</td>
<td>Physics</td>
<td>5-3-6</td>
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**Totals (excluding ROTC)** 16-7-18 16-7-18 16-10-19

**Basic ROTC or a total of six hours of free electives.**
### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
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<tr>
<td>C.E.</td>
<td>324</td>
<td>Elements of Fluid Mechanics</td>
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<td>3-3-4</td>
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<tr>
<td>E.E.</td>
<td>325</td>
<td>Electric Circuits and Fields</td>
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<td>2-3-3</td>
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<tr>
<td>E.E.</td>
<td>326</td>
<td>Elementary Electronics</td>
<td></td>
<td>2-3-3</td>
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<tr>
<td>I.E.</td>
<td>315</td>
<td>Analysis of Production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operations</td>
<td></td>
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<td>3-3-4</td>
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<tr>
<td>I.E.</td>
<td>325</td>
<td>Engineering Economy</td>
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<td>3-0-3</td>
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<td>I.E.</td>
<td>334</td>
<td>Optimization Methods</td>
<td></td>
<td>3-3-4</td>
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<tr>
<td>Sy.E.</td>
<td>416</td>
<td>Standard Methods</td>
<td></td>
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<tr>
<td>I.E.</td>
<td>335</td>
<td>Applications of Probability</td>
<td></td>
<td>3-3-4</td>
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<tr>
<td>Sy.E.</td>
<td>411</td>
<td>Systems Analysis II</td>
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<tr>
<td>I.E.</td>
<td>336</td>
<td>Statistical Methods</td>
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<tr>
<td>I.M.</td>
<td>340</td>
<td>Analysis of Financial Data</td>
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<td>3-3-4</td>
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<tr>
<td>Mech.</td>
<td>306</td>
<td>Applied Mechanics</td>
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<td>5-0-5</td>
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<tr>
<td>M.E.</td>
<td>320</td>
<td>Thermodynamics</td>
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<tr>
<td>Psy.</td>
<td>303-4</td>
<td>General Psychology A, B</td>
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### Senior Year A. Operations and Facilities Design Stem

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<th>Course</th>
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<tbody>
<tr>
<td>I.E.</td>
<td>316</td>
<td>Analysis of Production Systems</td>
<td>2-3-3</td>
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<tr>
<td>I.E.</td>
<td>317</td>
<td>Management Control Systems</td>
<td>2-3-3</td>
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<tr>
<td>I.E.</td>
<td>440</td>
<td>Case Problems in Industrial Engineering</td>
<td></td>
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<tr>
<td>I.E.</td>
<td>471-2</td>
<td>Operations and Facilities Design I, II</td>
<td>3-6-5</td>
<td>2-6-4</td>
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<tr>
<td>I.E.</td>
<td>480</td>
<td>Survey of Information &amp; Control Systems Design</td>
<td>3-3-4</td>
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<tr>
<td>I.E.</td>
<td>491</td>
<td>Professional Practices</td>
<td>2-0-2</td>
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<td>*****</td>
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<td>12-9-15</td>
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### Senior Year B. Information and Control Systems Design Stem

<table>
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<tbody>
<tr>
<td>I.E.</td>
<td>316</td>
<td>Analysis of Production Systems</td>
<td>2-3-3</td>
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<tr>
<td>I.E.</td>
<td>317</td>
<td>Management Control Systems</td>
<td>2-3-3</td>
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<td>I.E.</td>
<td>440</td>
<td>Case Problems in Industrial Engineering</td>
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<tr>
<td>I.E.</td>
<td>470</td>
<td>Survey of Operations and Facilities Design</td>
<td>3-3-4</td>
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<td>I.E.</td>
<td>481-2</td>
<td>Information and Control Systems Design I, II</td>
<td>3-6-5</td>
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<td>I.E.</td>
<td>491</td>
<td>Professional Practices</td>
<td>2-0-2</td>
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<td>2nd Q.</td>
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<td>Analysis of Productions</td>
<td>2-3-3</td>
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<td>I.E. 317</td>
<td>Management Control Systems</td>
<td>2-3-3</td>
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<td>Case Problems in Industrial Engineering</td>
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<td>I.E. 470</td>
<td>Survey of Operations and Facilities Design</td>
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<td>I.E. 480</td>
<td>Survey of Information and Control Systems Design</td>
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<td>I.E. 491</td>
<td>Professional Practices</td>
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<tr>
<td>Sy.E. 425</td>
<td>Case Studies in Systems Engineering</td>
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<td>Sy.E. 380</td>
<td>Systems Engineering I</td>
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<td>Computer Methods in Systems Engineering</td>
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</tr>
<tr>
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<td>13-9-16</td>
<td>13-6-15</td>
<td>10-9-13</td>
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</tbody>
</table>

***Nine hours of industrial engineering courses to be selected from unified sequences approved by the School of Industrial Engineering.

****Nine hours of electives approved by the School of Industrial Engineering. In general, any elective which contributes to the student's educational objectives will be approved. However, not more than nine hours of electives may be in advanced R.O.T.C.

*****Materials science elective to be selected from the following courses: Met. 325, Met. 401, M.E. 207, Mech. 480, Ch.E. 328, C.E. 309.
Courses of Instruction

NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

I.E. 204. Introduction to Industrial Engineering
3-3-4. Prerequisite: None.
A broad introduction to the field of Industrial Engineering, to organizational structure, management, the interrelationships of engineering-science-management, and to the professional practice of Industrial Engineering-Operations Research-Management Science.

I.E. 304. Organization for Production
3-0-3. Prerequisite: None.
The principles of organization and administration which are applicable to various engineering and industrial enterprises. An elective course for all non-Industrial Engineering students.

I.E. 311. Manufacturing Processes
3-0-3. Prerequisite: None.
A study of modern manufacturing processes and production methods.
Text: Begeman, Manufacturing Processes.

I.E. 315. Analysis of Production Operations
3-3-4. Prerequisites: I.E. 204, I.E. 336 or concurrently.
This is the first of two courses concerned with methods for the analysis of production systems, including both physical systems which produce goods and services and management systems which produce managerial decision information and control data. This course is concerned with the analysis, synthesis, and improvement of individual operations within a production system, with emphasis upon measurement, data generation, and engineering design.

I.E. 316. Analysis of Production Systems
2-3-3. Prerequisites: I.E. 315, I.E. 325 or concurrently.
This course is concerned with the analysis of interrelated operations and their associated facilities, anticipating the optimization of major production systems within the firm, and is concerned with the analysis, improvement, and synthesis of work systems, with emphasis upon the use of measurements and other data in quantifying the engineering design of facilities.
Text: Buffa, Models for Production and Operations Management.

I.E. 317. Management Control Systems
2-3-3. Prerequisites: I.E. 204, I.S. 151, I.E. 336 or concurrently.
This course provides an introduction to principles and methods for the analysis of information and control systems. Topics covered include the structure of management control, the nature of information systems, models of control systems, and application to industrial control problems.

I.E. 325. Engineering Economy
3-0-3. Prerequisites: I.M. 340 and I.E. 335, or concurrently.
A study of the important principles and methods of economic analysis in engineering and management science, including developments in decision theory and statistical decision theory. Topics treated include the structure of decision problems, value measurement, interest relationships, criteria for decisions under certainty, risk, and uncertainty, and statistical decision theory.

I.E. 334. Optimization Methods
3-3-4. Prerequisite: Math. 208.
A study of optimization techniques employed in the solution of modern industrial engineering problems. Emphasis is on deterministic rather than random variation and on the utility of the analytical techniques in application. Mathematical foundation topics are presented in order to develop sufficient background to deal with the optimization topics in linear programming, dynamic programming, calculus methods, and other response surface search methods. (I.E. 334 is cross-listed with Sy. E. 416.)


**I.E. 335. Applications of Probability**

3-3-4. Prerequisites: Math. 209 or concurrently.

This course emphasizes the application of the theory of probability and random variables in the analysis of industrial systems. In particular, probabilistic aspects of problems in queuing, reliability, maintenance, production, and logistics will be treated. (I.E. 335 is cross-listed with Sy. E. 411 Systems Analysis II.)


**I.E. 336. Applications of Statistical Methods**

3-3-4. Prerequisites: I.E. 335 or equivalent.

This course emphasizes the application of statistical methods. Topics include statistical methods which have broad application in the practice of Industrial Engineering in particular, and engineering research in general. The laboratory is to provide a controlled problem solving experience for the student.

Text: Ostle, *Statistics in Research*.

**I.E. 339. Evaluation of Engineering Data**

3-0-3. Prerequisite: Math. 207 or concurrently.

An introduction to engineering statistics. (Students desiring two-quarter coverage should elect I.E. 335 and I.E. 336.) Elementary probability theory, descriptive statistics, theoretical probability distribution, statistical inference, point and confidence interval estimation, simple regression and correlation analysis.


**I.E. 349. Elementary Quality Control**

3-0-3. Prerequisite. Not to be scheduled for credit if credit in I.E. 439 has been earned. Not open to Industrial Engineering students.

An introduction to industrial quality control by statistical methods. This course will include methods of data analysis, sampling, and control charts as applied to manufacturing processes.

Text: Grant, *Statistical Quality Control*.

**I.E. 411. Seminar**

1-0-1. Prerequisite: Senior standing in I.E.

To provide an hour for the Industrial Engineering students and faculty to join in discussions on current problems, professional responsibilities and opportunities.

**I.E. 416. Motion and Time Study**

2-3-3. Prerequisite: Junior standing; Non-Industrial Engineering students.

An introduction to the philosophy and problems associated with increasing the productivity of processes and operations comprising work systems through the use of methods engineering and work measurement.


**I.E. 418. Industrial Engineering in Hospitals**

3-0-3. Prerequisite: Senior standing or consent of instructor.

A study of hospital management systems and the means by which such systems may be improved through the application of industrial engineering principles and techniques. The hospital as a managerial environment, characteristics of the management systems utilized in striving toward hospital goals, and the philosophies and approaches involved in improving hospital man-
agement systems. Establishing, operating, and evaluating the hospital industrial engineering program. Procedures for conducting formal indoctrination courses for administrators, department heads, supervisors, and other hospital personnel. Approaches and techniques of modern industrial engineering and their applicability to the problems of modern hospital administration.

Text: Smalley and Freeman, *Hospital Industrial Engineering*.

I.E. 422. Job Evaluation and Wage Incentives
3-0-3. Prerequisite: I.E. 315 or I.E. 416.

A course designed to give the student the principles used in establishing wage rates and salaries. The characteristics and objectives of different wage incentive plans and the design and analysis of incentive formulas and curves are considered.

Text: Brennan, *Wage Administration*.

I.E. 424. Fundamentals of Materials Handling
2-3-3. Prerequisite: I.E. 315 and I.E. 325.

A combined lecture and laboratory course dealing with procedures and techniques for the analysis and solution of materials handling problems. Plant trips are utilized to illustrate modern handling methods.


I.E. 425. Engineering Economy
3-0-3. Prerequisites: Math. 109 and Junior standing. Not open to Industrial Engineering students.

The fundamental principles and basic techniques of economic analysis of engineering projects. Topics such as time value of money, economic measures of effectiveness, costs and their estimation, basic comparative models, breakeven analysis, and replacement analysis are included.

Text: Grant and Ireson, *Engineering Economy*.

I.E. 433. Electronic Data Processing
3-0-3. Prerequisite: Senior standing.

A survey of electronic data processing, including important applications, characteristics of data processing equipment, programming systems, and methodology for analysis and design of management information systems. Some insight is given into the use of computers for scientific applications, such as systems simulation, mathematical programming, and statistical analysis.


I.E. 434. Introduction to Operations Research
3-0-3. Prerequisites: I.E. 334 and I.E. 355 or equivalents.

An introduction to the methodology of Operations Research in the solution of engineering and management problems. Emphasis is placed on the development and use of mathematical decision models.


I.E. 439. Quality Control
3-0-3. Prerequisite: I.E. 317.

A detailed study of theory and methods for the design and analysis of quality control systems. Included are quantitative techniques for solution to problems of product specifications, process control, acceptance inspection, and other means of quality assurance.

I.E. 440. Case Problems in Industrial Engineering

The objective of this course is to give the student experience in dealing with problems approximating those encountered by practicing Industrial Engineers. The cases used will simulate actual situations by bearing little or no identification as to the nature of the problem, by containing extraneous information,
by lacking complete information, and by containing verbal statements which reflect judgments and opinions, rather than facts.

The student will be called upon to integrate the techniques and philosophy dealt with in his earlier course work. Problem formulation and the necessity for generating and evaluating alternative solutions will be stressed. Formal oral and written defense of case problem solutions will be an integral part of the course, but informal discussions among the students will be utilized heavily to promote recognition of individual variations in interpretations of problems.

I.E. 441. Sales Engineering
3-0-3. Prerequisite: Senior standing in engineering.
A study of the problems involved in selling technical goods and services requiring engineering skill and knowledge in their application. Particular attention is given to the engineering application and service aspects of this work.
Text: Lester, *Sales Engineering*.

I.E. 451, 452, 453. Special Problems
0-3-1. Senior Year, First, Second and Third Quarters. Prerequisites: Senior standing and special permission.
The student is given an opportunity to develop initiative and to apply fundamental principles by doing semi-original laboratory or research work of an industrial engineering nature.

I.E. 460. Project Management Systems Design
2-3-3. Prerequisite: Senior standing.
A study of project planning and control using activity network analysis. Topics included are network logic, scheduling computations, resource scheduling under various constraints, time-cost trade-off algorithms, cost control, and multi-project resource allocation. Laboratory work provides practical applications and use of computer programs.

I.E. 470. Survey of Operations and Facilities Design
3-3-4. Prerequisites: I.E. 316, I.E. 317 or concurrently.
This course provides a survey of the design principles and practices included in I.E. 471 and I.E. 472. It is intended for those students electing the Information and Control Systems Design or Systems Engineering Stems. (Credit not given for both I.E. 470 and I.E. 471 or I.E. 472.)

I.E. 471. Operations and Facilities Design I
3-6-5. Prerequisites: I.E. 316, I.E. 317 or concurrently.
This is the first course in a two course sequence dealing with the design of operations and processes. Design principles and methods are applied to problems in operations design, product design, and process design. This course and I.E. 472 are intended for those electing the physical systems design option.

I.E. 472. Operations and Facilities Design II
2-6-4. Prerequisites: I.E. 471.
This is a continuation of I.E. 471, including the same general subject areas. The emphasis is upon facilities design as opposed to operations and process design. An unstructured off-campus system design project is an important part of the course requirements.

I.E. 480. Survey of Information and Control Systems Design
3-3-4. Prerequisites: I.E. 317, I.E. 316 or concurrently.
The course provides a survey of the design principles and practices included in I.E. 481 and I.E. 482. It is intended for those students electing the Operations and Facili-
ties Design or Systems Engineering Stems. (Credit not allowed for both I.E. 480 and either I.E. 481 or I.E. 482.)

I.E. 481. Information and Control Systems Design I
3-6-5. Prerequisites: I.E. 317, I.E. 316 or concurrently.
This is the first course in a two course sequence concerned with the design of information and control systems. Design principles and techniques are developed and applied to design problems in production, inventory, distribution, quality, manpower, and fiscal control systems. This course and I.E. 482 are intended for those electing the Information and Control Systems Design Stem.

I.E. 482. Information and Control Systems Design II
2-6-4. Prerequisite: I.E. 481.
This course, a continuation of I.E. 481, places emphasis upon organization design and information systems design to permit implementation of control procedures. An unstructured off-campus design project is an important part of the course requirements.

I.E. 490. Legal and Ethical Phases of Engineering
3-0-3. Prerequisite: Senior standing.
This course covers the subject of contracts, patents, copyrights and trademarks, agency, sales agreements, and engineering specifications. The engineer and his relations to the law, to the public and the ethics of his profession.
Text: Mead and Ackerman, Contracts, Specifications and Engineering Relations.

I.E. 491. Professional Practices
2-0-2. Prerequisite: Senior standing in engineering.
This course is intended to provide the student with an appreciation of the legal and ethical responsibili-

ties of the engineering profession, to introduce him to the literature he will use in his continuing education, and to point out means by which he can continue his professional development.

I.E. 494-495-496. Research and Projects
Credit to be arranged.
Open to students in the Honors Program. Research or project work in conjunction with faculty investigations, which may result in an undergraduate thesis.

I.E. 497-498-499. Topics
Credit to be arranged. Prerequisite: Consent of instructor.
The purpose of this course is to permit the School of Industrial Engineering to offer formal course work in special topics not included in regular courses.

I.E. 500. Director's Honor Seminar
3-0-3. Prerequisite: Cumulative Grade Point Average of 3.0 or better and Senior standing in the School of Industrial Engineering.
An informal discussion-study course dealing with topics to be selected by the course participants, intended to provide an informal and intellectual interchange dealing with topics and issues of significance to the profession, and to the professional development of the student. Offered only in the Winter Quarter and open only to students with superior academic records. Junior students who will not be in school during the Winter Quarter of their Senior year may register.

S.E. 403. Elements of Safety Engineering
3-0-3. Prerequisites: I.E. 204 or I.E. 304, I.E. 339 or equivalent, I.E. 315 or I.E. 416 (Engineering students only).
The nature and extent of the industrial accident problem with particular emphasis on the role of the engineer in modern industrial operations. The identification and solution of technical accident problems
using appropriate analysis procedures. Design principles and characteristics for accident prevention in the plant, the process, and the work-center. Not to be scheduled for credit if credit for S.E. 401 or S.E. 404 has been earned.

Text: Simond and Grimaldi, Safety Management.

S.E. 404. Industrial Safety Administration
3-0-3. Prerequisites: I.M. 220, I.M. 324, and I.M. 345 (Non-engineering students only).

The nature and extent of the industrial accident problem. The selection and evaluation of data appropriate to accident control measurements and decisions, including realistic treatment of cost factors. Modern organizational relationships in the safety program. The control of industrial accidents by non-technical measures. Not to be scheduled for credit if credit for S.E. 401 or S.E. 403 has been earned.

S.E. 405. Industrial Fire Prevention and Protection
3-0-3. Prerequisite: Senior standing.

The economics of the industrial fire risk. Design of the plant, process, and work-center of optimum fire hazard. Design of fire protection facilities under varying industrial conditions.

Graduate Courses Offered

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.E. 601</td>
<td>Modern Industrial Organizations</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.E. 603</td>
<td>Methods of Industrial Engineering Research</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.E. 606</td>
<td>Materials Control</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 611</td>
<td>Industrial Engineering</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 613</td>
<td>The Design of Manufacturing Enterprises</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 614</td>
<td>Survey of Facilities Planning</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 615</td>
<td>Transportation Cost Analysis</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 619</td>
<td>Quality Control</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 624</td>
<td>Advanced Materials Handling</td>
<td>1-6-3</td>
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<tr>
<td>I.E. 625</td>
<td>Advanced Engineering Economy</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 629</td>
<td>Reliability Theory and Practice</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 634</td>
<td>Methods of Operations Research</td>
<td>5-0-5</td>
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<tr>
<td>I.E. 639</td>
<td>Experimental Statistics</td>
<td>4-0-4</td>
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<tr>
<td>I.E. 640</td>
<td>Advanced Work Measurement</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 641</td>
<td>Work Center Design</td>
<td>2-3-3</td>
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<tr>
<td>I.E. 642</td>
<td>Work Systems Design</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 643</td>
<td>Job Evaluation and Incentives</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 649</td>
<td>Design of Industrial Experiments</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 655</td>
<td>Econometric Models in Engineering Economy</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 660</td>
<td>Control Processes</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 665</td>
<td>Case Studies in Hospital Management Systems</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 680</td>
<td>Systems Theory and Application I</td>
<td>3-0-3</td>
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<tr>
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<tr>
<td>I.E. 681</td>
<td>Systems Theory and Application II</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 690</td>
<td>Topics</td>
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<tr>
<td>I.E. 691</td>
<td>Topics</td>
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<tr>
<td>I.E. 692</td>
<td>Topics</td>
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<tr>
<td>I.E. 700</td>
<td>Master's Thesis</td>
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<tr>
<td>I.E. 701, 2, 3</td>
<td>Seminar</td>
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<tr>
<td>I.E. 704, 5, 6</td>
<td>Special Problems in Industrial Engineering</td>
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<tr>
<td>I.E. 709</td>
<td>Evaluation of Design for Function &amp; Use</td>
<td>3-0-3</td>
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<td>I.E. 710</td>
<td>Automation</td>
<td>3-0-3</td>
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<td>I.E. 734</td>
<td>Operations Research I</td>
<td>3-0-3</td>
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<td>I.E. 735</td>
<td>Operations Research II</td>
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<td>I.E. 736</td>
<td>Operations Research III</td>
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<td>I.E. 745</td>
<td>Use of Computers in Industrial Engineering</td>
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<td>I.E. 749</td>
<td>Advanced Industrial Statistics I</td>
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<tr>
<td>I.E. 750</td>
<td>Advanced Industrial Statistics II</td>
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<td>I.E. 751</td>
<td>Advanced Industrial Statistics III</td>
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<tr>
<td>I.E. 755</td>
<td>Industrial Dynamics</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 760</td>
<td>Simulation Techniques</td>
<td>1-6-3</td>
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<tr>
<td>I.E. 765</td>
<td>Projects in Hospital Management Systems</td>
<td>Credit to be arranged</td>
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<tr>
<td>I.E. 770</td>
<td>Management of Improvement</td>
<td>3-0-3</td>
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<tr>
<td>I.E. 780</td>
<td>Seminar in Systems Research</td>
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<td>I.E. 785</td>
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<td>I.E. 787</td>
<td>Seminar in Operations Research</td>
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<td>I.E. 790</td>
<td>Projects in Operations Research</td>
<td>1-6-3</td>
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<td>I.E. 791</td>
<td>Projects in Operations Research</td>
<td>1-6-3</td>
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<tr>
<td>I.E. 800</td>
<td>Doctor’s Thesis</td>
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<tr>
<td>S.E. 603</td>
<td>History of Industrial Accident Prevention</td>
<td>3-0-3</td>
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<tr>
<td>S.E. 604</td>
<td>Indices of Safety Performance</td>
<td>3-0-3</td>
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<tr>
<td>S.E. 605, 6</td>
<td>Safe Design and Utilization of Industrial Facilities</td>
<td>3-0-3</td>
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<tr>
<td>S.E. 607</td>
<td>The Comprehensive Safety Program</td>
<td>3-0-3</td>
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<tr>
<td>S.E. 615</td>
<td>Industrial Fire Control</td>
<td>3-0-3</td>
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<tr>
<td>S.E. 616</td>
<td>Safety Standards in Industry</td>
<td>2-0-2</td>
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<tr>
<td>S.E. 618</td>
<td>Engineering Control of Industrial Health Hazards</td>
<td>3-0-3</td>
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<tr>
<td>S.E. 704, 5, 6</td>
<td>Problems in Safety Engineering</td>
<td></td>
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</tbody>
</table>
School of Industrial Management  
(Established in 1935)

Director—Sherman Dallas; Associate Director—R. E. Green; Professors Emeritus—Maurice R. Brewster, Hubert E. Dennis, W. J. Proctor, Fred B. Wenn; Regents' Professor—Glenn Gilman; Professors—W. Carl Biven, E. R. Bollinger, Robert W. Carney, John L. Fulmer, Ramon G. Gamoned, A. R. Marshall, R. F. O'Connor; Associate Professors—A. F. Abril, James L. Caldwell, Kong Chu, A. J. Cooper, III, William A. Finn, Paul B. Han, Jack Kleiner, George Maddox, Ralph A. Maggio, Mack A. Moore, William A. Schaffer; Assistant Professors—Philip Adler, Jerry L. Dake, John T. Etheridge, T. A. Jennings, John R. Kaatz, Marlin V. Law, James B. McCollum, Paul O'Connor, A. W. Stalnaker, Fred A. Tarpley; Special Lecturers—Donald A. Fuller, Modesto Garcia, Roy Stout; Instructors—Donald T. Kelley, Charles D. Menser, John R. Stepp; General Secretaries—Mrs. Sarah Adams, Mrs. Jean Bateman, Mrs. Sarah Born, Mrs. Mildred Buckalew; Principal Clerk and Secretary to Dr. Green—Mrs. Grace Groover; Principal Secretary and Secretary to Dr. Dallas—Miss Frances Smith.

General Information
The principal objective of the School of Industrial Management is to provide collegiate education of the highest possible quality to prepare students for careers as industrial managers. The continuing growth of industry in Georgia, the South and the nation, and the increasing complexity of modern industrial operations have resulted in a great need for college graduates with formal preparation in industrial management. Georgia Tech's industrial management program concentrates on long-range career objectives, rather than attempting to develop specific job knowledge. The emphasis in the program, therefore, is upon developing the student's abilities to utilize the tools of analysis commonly required of industrial managers, to be responsive to his changing environment, and to both express and implement his ideas.

Undergraduate program. Georgia Tech's School of Industrial Management has a single undergraduate degree program leading to the degree Bachelor of Science in Industrial Management. A student is not permitted a narrow field of specialization or major concentration, as is typical in schools of business.

In the first two years of the program, much of the required work is taken in other departments, including mathematics through introductory calculus and finite mathematics; two full years of laboratory science, chemistry or biology, and physics. In addition, the industrial management student acquires a sound background in the social and behavioral sciences, and the humanities.

Within the School, beginning in the sophomore year, the student is required to complete an integrated core of courses in the following areas: (1) organization and administration, including principles of management, human relations and organization theory; (2) economic analysis and managerial applications; (3) industrial relations, production, marketing and financial management; and (4) legal, political and
social environment of industry. Required courses in analytical methods, statistics, managerial accounting and managerial applications of data processing are also included in the program.

Transfers to Industrial Management. Many students who enter Georgia Tech intending to major in one of the engineering or scientific areas become interested in transferring to the School of Industrial Management. Only students who demonstrate their ability to successfully complete the requirements of the program are permitted to transfer. It is, therefore, definitely to the student’s advantage to determine the requirements which must be met before transfer will be permitted, as early as possible, in consultation with the Associate Director of the School of Industrial Management.

Graduate Program. The program leading to the degree of Master of Science in Industrial Management provides an opportunity for graduates from a broad range of rigorous undergraduate curricula to prepare themselves for general management or challenging staff responsibility. The courses listed on pages 143 and 144 are described in detail in the Graduate Catalogue as are the graduate admission requirements.

Survey Courses for Non-Majors. In addition to courses offered primarily for its own undergraduate and graduate programs, the School of Industrial Management offers several courses designed expressly for non-majors, as follows:

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>I.M. 204</td>
<td>Survey of Principles of Economics</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 316</td>
<td>Finance Survey for Engineers</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 317</td>
<td>Industrial Marketing</td>
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<tr>
<td>I.M. 329</td>
<td>Survey in Business Law</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 340</td>
<td>Analysis of Financial Data</td>
<td>3-3-4</td>
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<tr>
<td>I.M. 390</td>
<td>Survey of Statistics</td>
<td>3-0-3</td>
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Curriculum in Industrial Management

Freshman Year

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<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
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<tbody>
<tr>
<td>Chem. 101-2-3</td>
<td>Inorganic Chemistry OR</td>
<td>3-3-4</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<tr>
<td>Biol. 201-2-4</td>
<td>Introduction to Biology</td>
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<tr>
<td>Eng. 107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
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<tr>
<td>S.S. 111-12-13</td>
<td>Social Science OR</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<td>M.L. *</td>
<td>Modern Language</td>
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<tr>
<td>Math. 100</td>
<td>College Algebra and Trigonometry</td>
<td>5-0-5</td>
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<tr>
<td>Math. 105</td>
<td>Calculus for Management I</td>
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<tr>
<td>Math. 106</td>
<td>Calculus for Management II</td>
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<tr>
<td>E.Gr. 105</td>
<td>Graphic Presentation</td>
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<tr>
<td>P.T. 101-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC **</td>
<td>Basic ROTC (optional)</td>
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<tr>
<td>Gen. 101</td>
<td>Orientation</td>
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<td>Totals (excluding ROTC)**</td>
<td>15-7-16</td>
<td>14-7-16</td>
<td>14-13-18</td>
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*Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish. Three quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
## Sophomore Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eng. 201-2-3</td>
<td>Survey of the Humanities</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 211-12-13</td>
<td>Mechanics, Electricity, Heat, Light and Sound</td>
<td>4-0-4</td>
<td>4-0-4</td>
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<tr>
<td>I.M. 201-2-3*</td>
<td>Economics</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Math. 236</td>
<td>Finite Mathematics</td>
<td>5-0-5</td>
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<tr>
<td>I.M. 210*</td>
<td>Management Applications of Data Processing</td>
<td></td>
<td></td>
<td>2-3-3</td>
</tr>
<tr>
<td>I.M. 215-16*</td>
<td>Accounting I, II</td>
<td></td>
<td>3-0-3</td>
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<tr>
<td>I.M. 220*</td>
<td>Industrial Organization</td>
<td></td>
<td>3-0-3</td>
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<tr>
<td>P.T. 201-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC **</td>
<td>Basic ROTC (optional)</td>
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**Totals (excluding ROTC)** 15-4-16 15-7-17 16-4-17

*To receive credit towards the degree B.S. in I.M., a minimum grade of “C” must be earned in each of these courses, viz., I.M. 201, 202, 203, 210, 215, 216, 220.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

## Junior Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.M. 323-24</td>
<td>Statistics I, II</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 345-46</td>
<td>Cost Accounting and Control I, II</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 325-26</td>
<td>Business Law</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 352</td>
<td>Industrial Economic Analysis</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 320</td>
<td>Industrial Management Prin.</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 310-11</td>
<td>Marketing I, II</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 338</td>
<td>Finance I</td>
<td></td>
<td></td>
<td>3-0-3</td>
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<tr>
<td>Psy. 303</td>
<td>Introductory Psychology</td>
<td>3-0-3</td>
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<tr>
<td>Psy. 410</td>
<td>Social Psychology</td>
<td>3-0-3</td>
<td></td>
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<tr>
<td>L.E. 416</td>
<td>Motion and Time Study</td>
<td>3-0-3</td>
<td></td>
<td></td>
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<tr>
<td>I.M. 409-10</td>
<td>Analytical Methods in I.M., I, II</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Electives</td>
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<td>3-0-3</td>
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**Totals** 18-0-18 18-0-18 18-0-18
Senior Year*

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
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<tbody>
<tr>
<td>I.M.</td>
<td>329</td>
<td>Finance II</td>
<td>3-0-3</td>
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<tr>
<td>Eng.</td>
<td>315</td>
<td>Public Speaking</td>
<td>3-0-3</td>
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<td>I.M.</td>
<td>428-29</td>
<td>Industrial Relations</td>
<td>3-0-3</td>
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<td>I.M.</td>
<td>455</td>
<td>Marketing III</td>
<td>3-0-3</td>
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<tr>
<td>I.M.</td>
<td>486</td>
<td>National Income and Fiscal Policy</td>
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<td>3-0-3</td>
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<tr>
<td>I.M.</td>
<td>418-19</td>
<td>Production Management I, II</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>I.M.</td>
<td>422</td>
<td>Finance III</td>
<td>3-0-3</td>
<td></td>
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<tr>
<td>I.M.</td>
<td>420</td>
<td>Integrated Management Problems</td>
<td></td>
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<td>3-0-3</td>
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<tr>
<td>I.M.</td>
<td>491**</td>
<td>Seminar</td>
<td>1-0-1</td>
<td></td>
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<tr>
<td>I.M.</td>
<td>Elective</td>
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<td>3-0-3</td>
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<td>Elective***</td>
<td></td>
<td></td>
<td>6-0-6</td>
<td>3-0-3</td>
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<tr>
<td>Totals</td>
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<td></td>
<td>18-0-18</td>
<td>16-0-16</td>
<td>18-0-18</td>
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</tbody>
</table>

*Minimum grade average of "C" must be earned during the student's last three full-time quarters to qualify for graduation.

**I.M. 491 is offered only during Winter Quarter.

***At least (12) hours of electives, as approved by the School of Industrial Management and exclusive of advanced ROTC, must be taken outside the School.

Courses of Instruction

NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

I.M. 201, 202, 203. Economic Principles and Problems
3-0-3. Prerequisite: Sophomore standing or permission of instructor.
This three-course sequence begins with an examination of the scope and method of economics. It continues with a study of the theory of markets and distribution. It concludes with an examination of national income theory and international trade.

I.M. 204. Survey of Principles of Economics
3-0-3. Prerequisite: Sophomore standing. Not open to I.M. students.
A survey and an introduction to economics. It includes an examination of the two major areas of economics: national income and employment theory, and the theory of markets, distribution, and the behavior of the firm.
Text: Ulmer, Economics.

I.M. 210. Management Applications of Data Processing
2-3-3. Prerequisite: Sophomore standing.

The objective of this course is to provide (1) the technical foundation for the development of computer-based management systems and (2) the competence to successfully use the computer in subsequent courses. Computing concepts, programming, time-sharing and other information technology developments applicable to business are presented. Assignments involve use of the computer for the solution of problems in economics, statistics and the functional areas of management.
Text: To be selected.

I.M. 215, 216. Accounting I, II
3-0-3. Prerequisite: Sophomore standing.
This is a two-course sequence in the fundamentals of accounting. During the first quarter fundamental accounting concepts are introduced and their use in business decisions discussed. During the second quarter attention is given to various types of business organizations and the parallel effects on operations, taxes, and accounting procedures. These courses together are designed to emphasize the "tool aspect" of accounting for management.
Applications of accounting informa-
tion to management decisions are stressed throughout the two-quarter sequence.
Text: Meigs and Johnson, Accounting.

I.M. 220. Industrial Organization
3-0-3. Prerequisite: I.M. 201 and I.M. 215.

Presents a fundamental understanding of the process, objectives and functional areas of business from the managerial viewpoint as well as the dynamic nature of business and the emerging tools and analytical approaches of modern business.
Text: Drucker, Practice of Management.

I.M. 310, 311. Marketing I, II
3-0-3. Prerequisite: I.M. 203 or equivalent.

The role of marketing in the productive process, the functions performed and the institutional organizations supporting the marketing task are examined critically. Emphasis is given to basic principles and analysis of factors influencing the development of marketing policy and strategy.
Text: Stanton, Fundamentals of Marketing, 2nd Ed.

I.M. 312. Distribution Management
3-0-3. Prerequisite: I.M. 310, 311.

An analysis is made of the functions and problems of the sales manager, particularly with reference to the characteristics of the sales organization and the selection, training, supervision and control of the personal selling force.
Text: To be selected.

I.M. 316. Finance Survey for Engineers
3-0-3. Prerequisite: Junior standing. Not open to I.M. undergraduates.

Designed to acquaint the student with the more popular types of business organizations, with special emphasis on the corporation, its organization, management and types of securities issued. Credit not given for both I.M. 316 and I.M. 338.

I.M. 317. Industrial Marketing
3-0-3. Prerequisite: Junior standing. Not open to I.M. undergraduates.

A survey of marketing principles and policies, with emphasis on the functions that must be performed by manufacturers and marketing institutions to insure customer satisfaction and profitable operation of the firm. Credit not given for both I.M. 317 and I.M. 310 or I.M. 311.
Text: Matthews and others, Marketing.

I.M. 320. Industrial Management Principles
3-0-3. Prerequisite: I.M. 220.

A presentation of the evolving theory of management as a framework for the analysis of the interaction between the characteristics of humans, and the social-task environment created by complex industrial organizations and their objectives.
Text: To be selected.

I.M. 323, 324. Statistics I, II
3-0-3. Prerequisite: Junior standing.

The first course deals with statistical prescriptions, probability and statistical inference.

The second course covers regressive and correlation, analysis of variance, time series, introduction to multivariate analysis and sampling with applications to industry and business.
Textbook: Bryant, Statistical Analysis.

I.M. 325, 326. Law I, II
3-0-3. Prerequisite: Junior standing.

The first course includes background of the law and legal procedures; the problem of organizing a business; forms it may take and procedure of organization; agency and business organizations.

The second course deals with legal problems peculiar to distribution

**I.M. 328. Introduction to Econometrics**  
3-0-3. Prerequisites: Economics 202, Statistics 324 or equivalent.  
The objective for this course is to introduce methods of estimating the quantitative relationships among economic variables. The course will be concerned with problems of specification, estimation, prediction and verification. Tools used will include two and three variable linear regression models, simultaneous equation models and non-linear models. Text: To be selected.

**I.M. 329. Survey in Business Law**  
3-0-3. Prerequisite: Junior standing. Not open to I.M. undergraduates.  
The course is made of those law cases which pertain strictly to legal questions arising out of commerical operations. It is designed for students who are not able to take a more extended course in business law. Text: Corley and Black, *The Legal Environment of Business*.

**I.M. 336. Accounting Survey**  
Redesignated I.M. 340.  
Credit not given for I.M. 336, or 337, and 340.

**I.M. 337. Cost Accounting**  
Redesignated I.M. 340.  
Credit not given for I.M. 336, or 337, and 340.

**I.M. 338. Finance I**  
3-0-3. Prerequisites: I.M. 203, 216.  
The course acquaints the student with the alternative short term sources and costs of funds for the business enterprise. Particular emphasis is placed upon commercial banks as sources of funds. The economic impact of bank lending policies, and the controls exercised by the Federal Reserve System are examined. Debt management theory and practice is briefly traced. The objective is to permit the student to understand the relative costs of financing alternatives, and to comprehend the forces which determine the level of those costs at a point in time. Text: Hunt, Williams, and Donaldson, *Basic Business Finance; Smith & Teigen, Money, National Income and Stabilization Policy*.

**I.M. 339 Finance II**  
3-0-3. Prerequisite: I.M. 338.  
The objectives of this course are to introduce the concepts of financial management and provide experience in financial decision making. The course acquaints the student with the long term sources of funds, including long term debt, equity instruments, and financial leasing. Concepts of corporate valuation and modifications in the capital structure are also studied. Analysis of alternative security issues and the bargain for funds are studied through the use of the case method. Text: Hunt, Williams, and Donaldson, *Basic Business Finance*.

**I.M. 340. Analysis of Financial Data**  
3-3-4. Not open to I.M. undergraduates.  
A survey in general and cost accounting. The first portion is devoted to familiarizing students with the accounting data collection system and with an examination and evaluation of accounting data output in financial statement form. Considerations involved in the analysis of costs and the development of the control and decision function of management in industrial operations follow. The course emphasizes the use of accounting data in a decision atmosphere rather than the generation of accounting data. Treatment of "accounting mechanics" is minimal. Credit will not be given for I.M. 340 and I.M. 336 or I.M. 337. Neither will it be given for I.M. 340 and I.M. 215, 216, 345, 346. Text: Moore and Jaedicke, *Managerial Accounting*.
I.M. 343. Taxation
3-0-3. Prerequisite: I.M. 216.
This course deals with federal income taxes and is directed toward the management planning necessitated by various tax alternatives. The tax implications of business management are reviewed. Major emphasis is on the business income tax requirements, though some attention will be given to the personal incidence of income tax. Personal incidence is covered relative to tax applications in the partnership and proprietorship forms of business organization.

I.M. 344. Cases in Management Control through Accounting Analysis
3-0-3. Prerequisites: I.M. 215 & 216, or I.M. 340 and I.M. 201, 202, and 203 or I.M. 204.
A case and problems course designed to stress the application of accounting data to decisions in a management framework. Limitations as well as direct applicability of such accounting type data will be studied.
Text: Smith, Management Through Accounting.

I.M. 345, 346. Cost Analysis and Control, I, II
3-0-3. Prerequisite: I.M. 216.
This is a two-course sequence in cost accounting fundamentals and in the management application of cost data. The first quarter is concerned with the mechanics of cost determinations and the application of such data to budgetary applications. The second quarter includes such topics as: quantitative elements in decision-making, capital expenditure analysis, profit/volume analysis, product pricing. During the two-quarter sequence major emphasis is placed on management use of the cost accounting tool, more than on the mechanics of cost determination.
Text: Crowningshield, Cost Accounting Principles and Managerial Applications.

I.M. 347. Techniques of Industrial Communications
3-0-3. Prerequisite: Junior standing.
A study of the basic techniques of communication as employed in industry by management, by employees and by the public. Internal and external functions of public relations are covered with emphasis on the application of practical media in achieving definite results.
Text: Cutlip and Center, Effective Public Relations.

I.M. 348. Procurement Management
3-0-3. Prerequisite: Junior standing.
The functions and procedures involved in purchasing for industrial use and in the supervision and management of materials are considered in relation to the development of effective procurement policies.
Text: To be selected.

I.M. 352. Industrial Economic Analysis
3-0-3. Prerequisite: I.M. 201, 202, 203.
An advanced course in micro-economics, concerned with the scope and methods of economics, production and distribution theory, and the structure of markets, which emphasizes managerial applications of economic theory.

I.M. 390. Survey of Statistics
3-0-3. Prerequisite: Junior standing. Not open to I.M. undergraduates.
A survey of discrete statistics with special emphasis on economic and business applications. Includes sampling, the normal distribution, hypothesis testing, linear regressions and correlation, time series and index numbers.
Text: To be selected.
I.M. 391. Seminar  
1-0-0. Re-designated I.M. 491. 
Credit not given for both I.M. 491 and I.M. 391.

I.M. 402. The Management of Organized Effort  
3-0-3. Prerequisites: I.M. 320, Psych. 410 and consent of instructor.  
This course builds on and employs the material presented in the prerequisite courses to develop a systematic overview of the management of organized human effort within the complex agencies characteristic of modern society. Emphasis will be shifted from "the management of people," to the use of organization as a managerial vehicle for developing and controlling situations toward which members of organizations act and to which they respond. 
Text: Instructor's syllabus and assigned readings.

I.M. 408. Personnel Management Problems  
3-0-3. Prerequisite: Junior standing.  
This course concentrates on typical problems encountered by the personnel department in an industrial organization, such as selection, training and placement of workers, merit rating and promotion, and the development of sound personnel management techniques. 
Text: Pigor and Myers, Personnel Administration.

I.M. 409, 410. Analytical Methods in Industrial Management, I, II  
3-0-3. Prerequisites: I.M. 323 and Math. 235.  
This sequence of courses is an introduction to analytical models and their use in industrial management. The first quarter is concerned with decision models and optimization theory in general. Included are discussions of the nature of decisions, objectives and goals, and the fundamental theories of decision making. In the second quarter, allocation methods including simplex and transportation methods of linear programming, game theory and waiting line theories are covered. Emphasis in both courses is on the solution of managerial problems. 
Texts: Dean, Sasieni and Gupta, Mathematics for Modern Management, and Carr and Howe, Quantitative Decision Procedures.

I.M. 415. Automation and Management  
3-0-3. Prerequisite: I.M. 210 or equivalent and Senior standing.  
The objective of this course is to establish and apply the principles of analysis and design of computer-based management systems. Case studies are employed to illustrate the current and potential applications in industry of system development concepts—particularly the concept of the integrated or "total" information system. Assignments involve the application of optimization techniques in system design, simulation by computer, computer time sharing and other information technology developments. 
Text: To be selected.

I.M. 416. Management Applications of Data Processing  

I.M. 418. Production Management, I  
3-0-3. Prerequisites: I.M. 320, 352 and 410.  
The objective of this course is to develop student understanding of the organizational, economic, and physical framework within which the manufacturing division functions and contributes to overall objectives. Students are expected to develop a philosophy of production management as well as analytical insight in solving various production problems. 
Text: Bowman and Fetter, Analysis for Production Management.

I.M. 419. Production Management, II  
3-0-3. Prerequisites: I.M. 410, 418.  
A course requiring students to apply quantitative and non-quantitative analytical methods to production management case problems. 
Text: Bowman and Fetter, Analysis for Production Management.
I.M. 420. Integrated Management Problems
3-0-3. Prerequisites: I.M. 418, 422 and 455.
Comprehensive cases are used to integrate knowledge about the functional areas of industrial management—production, finance, marketing, industrial relations, human relations and administration. Text: Selected cases.

I.M. 422. Finance III
3-0-3. Prerequisite: I.M. 339.
The development and application to case studies of analytical techniques pertaining to the capital budgeting decision of the firm, including the theory of cost of capital, measurement of investment profitability, and a treatment of uncertainty. Text: Porterfield, *Investment Decisions and Capital Costs*.

I.M. 428, 429. Industrial Relations
3-0-3. Prerequisite: Junior standing.
The first course makes an examination of the trade-union as an economic institution and of issues in management-union relations. The second course deals with the economics of the labor market, including analysis of labor mobility, unemployment, wage determination, and theories of wages. Texts: Reynolds, *Labor Economics and Labor Relations*; and Sloane and Witney, *Labor Relations*.

I.M. 430. Management Decision Laboratory
0-3-1. Prerequisite: Senior standing.
This course gives students practice in making certain management decisions. Use is made of computers and simulated operations of manufacturing firms in a competitive market. Text: Fulmer, *The Theory and Practice of Management Decision-making with Business Simulation Games*.

I.M. 443. Investments
3-0-3. Prerequisite: I.M. 339 or I.M. 316.

A study of the sources of financial information and its interpretation, the operation of stock exchanges, over-the-counter markets, and methods of underwriting. A study is also made of the various types of securities available for investment and tests to determine their investment quality. Text: To be selected.

I.M. 454. Labor Relations Problems
3-0-3. Prerequisite: I.M. 428.
An analysis of public policy in labor relations as reflected in legislative enactments, court decisions, and the common law. Emphasis will be given to management-labor problems arising out of strikes, labor injunctions, picketing, union security, contract negotiation, and other matters as affected by and related to recent laws such as the Norris-LaGuardia Act, Wage-Hour Act, Wagner Act, Taft-Hartley Act and Landrum-Griffin Act. Text: Morris Stone, *Labor Grievances and Decisions*.

I.M. 455. Marketing III
3-0-3. Prerequisite: I.M. 311.
This course consists of cases involving the management of marketing activities. Careful consideration is given to the functions of planning, organizing, and controlling the essential elements of the overall marketing program of the firm. Text: To be selected.

I.M. 456. Marketing Management Problems
3-0-3. Prerequisite: I.M. 455 or permission of instructor.
This is an advanced problems course in the field of marketing management. Text: To be selected.

I.M. 458. Contemporary Unionism and Collective Bargaining
3-0-3. Prerequisite: I.M. 428.
This is a study of the organization and structure of unions in the United
States and includes such subjects as union policies and aims, the theory of collective bargaining, collective bargaining procedures and techniques, and analysis of union-management contracts with attention given to typical clauses such as provisions for grievance machinery, technological changes, lay-offs, and union security.

Text: Beal and Wickersham, Collective Bargaining.

I.M. 459. Industrial Relations in the Piedmont Region
3-0-3. Prerequisite: Senior standing.

The ecological, anthropological and social as well as the economic dimensions of the emergence of the Southeastern Piedmont as an industrial region are investigated. This course demonstrates a method of analysis having general applicability for the study of regional industrial development.

Text: To be selected.

I.M. 465. Nonmarket Environment of the Firm
3-0-3. Prerequisite: Senior standing.

Analysis of the nature of and significance to management of the legal, social and political framework within which broad economic influences are generated, market transactions are conducted, and the firm is managed.

Text: Instructor's syllabus and selected readings.

I.M. 467. Management Concepts and Issues in World Business
3-0-3.

No business or industry today is immune to the effects of international business. It is important that every student understand the nature of this swiftly changing field and the implications it has for U.S. industry and the job of the manager.

The course will cover organizing for international business; industrial, economic, political, social, legal, labor, and technological aspects of international business; the changing patterns of world industry, the emergence of common markets; the role of U.S. industry overseas.

I.M. 472. Management of Industrial Research and Development Programs
3-0-3. Prerequisite: I.M. 320.

An analysis of the fundamental concepts underlying effective management of research and development programs within the industrial environment. Attention is directed to such problem areas as the role and integration of research and development in the industrial organization, project proposal and evaluation, staffing and organizing the project team, project administration, and transition of projects from development to production and marketing.

I.M. 474. Industrial Development in Latin America
3-0-3. Prerequisites: I.M. 203 or I.M. 204; knowledge of Spanish; and consent of the instructor.

A course designed to acquaint the student with the latest theories and principles of industrial development in developing countries. The student will prepare an analysis of the problems and opportunities in industrial development in a specific Latin American country.

Text: Powelson, Latin America.

I.M. 485. International Trade
3-0-3. Prerequisite: I.M. 201, 202, 203 or equivalent.

This course deals with the foreign exchange market, foreign trade and commercial policy, international finance and the achievement of equilibrium in the balance of payments and current problems of international economics.

Text: To be selected.

I.M. 486. National Income and Fiscal Policy
3-0-3. Prerequisites: I.M. 201, 202, and 203.

An intermediate macroeconomic theory course designed to develop the student's understanding of the
national economic environment within which the firm operates. Principal topics are: analysis of the national income model and its components, and contemporary fiscal and monetary theory.


**I.M. 487. Comparative Economic Systems**
3-0-3. Prerequisite: I.M. 203 or equivalent.

A critical study is made of the methods by which various economic systems meet common fundamental problems in production, exchange, distribution, consumption, and capital formation. Comparative analyses of the major theories underlying these methods are undertaken, and their efficacy considered in the light of modern technology.

Text: Selected readings.

**I.M. 488. Economics of Industrial Competition**
3-0-3. Prerequisite: Senior standing.

A study of the competitive structure of industry in terms of theoretical models and contemporary business organization, alternative public policy goals, and a critical review and appraisal of antitrust legislation.


**I.M. 491. Seminar**
1-0-1. Prerequisite: Junior standing.

This course consists primarily of lectures, and question and answer periods with prominent business, government, labor and educational leaders concerned with aiding the student in making career decisions and preparing him for adjustment to the industrial world. The course is offered winter quarter only.

**I.M. 495. Economics of Industrial Location**
3-0-3. Prerequisites: I.M. 203 and I.M. 311 or equivalent.

A survey of economic factors influencing industrial location. General consideration will be given to locational patterns, processes of economic growth, and the public policy aspects of managerial decisions. More particular attention will be directed to the impact of transfer and processing costs, land use competition and technological change on problems of plant location.

Text: Hoover, *The Location of Economic Activity*.

**I.M. 496, 497, 498. Special Topics in Industrial Management**
2-0-2. Prerequisite: Consent of the instructor.

A course designed to permit groups of students to pursue a common, specialized interest in an area of industrial management which is not extensively treated in other offerings of the School, or to engage in minor research or special problems involving analytical or experimental investigations.

Text: Selected readings.

**I.M. 499. Industrial Management Honors Seminar**
3-0-3. Prerequisite: Last or next to last quarter seniors by invitation of the Faculty of the School of Industrial Management.

This course is designed to give a selected group of outstanding seniors in the School of Industrial Management an opportunity to research, analyze, and discuss current management and economic problems with specialists in the various areas.

Text: Selected readings.
### Graduate Courses Offered

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.M. 602</td>
<td>Regional Economics</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 603</td>
<td>Economics of Industrialization</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 604</td>
<td>Developmental Finance</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 606</td>
<td>Research Methods in Development</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 612</td>
<td>Computer Simulation of Management Problems</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 613</td>
<td>Management Systems Analysis</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 618</td>
<td>The Law of Market</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 620</td>
<td>The Theory of Industrial Organization</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 622</td>
<td>Development of Management Thought</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 624</td>
<td>Economics of Production</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 626</td>
<td>Development of Economic Thought</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 630</td>
<td>Production Management</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 632</td>
<td>Manufacturing Management Problems</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 635</td>
<td>Managerial Accounting</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 636</td>
<td>Problems in Accounting Control</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 649</td>
<td>Financial Management I</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 650</td>
<td>Financial Management II</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 653</td>
<td>Industry and Government</td>
<td>3-0-3</td>
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<td>I.M. 654</td>
<td>Personnel Administration</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 656</td>
<td>Administrative Practices in Human Relations</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 657</td>
<td>Marketing Management</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 658</td>
<td>Cases in Marketing Management</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 659</td>
<td>Marketing Research and Analysis</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 660</td>
<td>Economic Forecasting</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 667</td>
<td>Labor Problems</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 671</td>
<td>Labor and the Economy</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 672</td>
<td>Manpower Legislation</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 673</td>
<td>Macroeconomic Analysis</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 674</td>
<td>Application of Statistical Methods to Management Decision-Making</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 680</td>
<td>Executive Development and Motivation</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 699</td>
<td>The Entrepreneur, Innovation and Change</td>
<td>3-0-3</td>
</tr>
<tr>
<td>I.M. 700</td>
<td>Master's Thesis</td>
<td>unknown</td>
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<tr>
<td>I.M. 701, 2, 3</td>
<td>Seminar</td>
<td>1-0-0</td>
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<tr>
<td>I.M. 704, 5, 6</td>
<td>Industrial Management Research Credit to be arranged</td>
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<td>I.M. 707</td>
<td>Development Seminar I</td>
<td>1-0-1</td>
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<tr>
<td>I.M. 708</td>
<td>Development Seminar II</td>
<td>3-0-3</td>
</tr>
</tbody>
</table>
School of Information Science
(Established in 1963)

Director and Professor — Vladimir Slamecka; Professors — Daniel C. Fielder, Harrison M. Wadsworth, Jr.; Visiting Professors—Andrew D. Booth, Frank H. George; Associate Professors—Lucio Chiaraviglio, James Gough, Jr., Edward G. Roberts, Pranas Zunde; Associate Research Professor—Paul B. Han; Assistant Professors—John M. Gwynn, Jr., David H. Kraus; Assistant Research Professor—Richard L. Hawkey; Lecturers—Alton P. Jensen, Sterling P. Lenoir, Jr., Charles P. Reed, Jr.; Instructor—John J. Goda, Jr.; Research Associates—Jesse H. Poore, Jr., Edmond F. Rumiano, Robert M. Siegmann, Terrance T. Stretch; Systems Analysts—Mrs. Frances T. Armstrong, Glenn E. Duncan; Assistant to the Director—Richard H. Austin; Secretary—Miss June L. Willman; Principal Secretary and Secretary to Dr. Slamecka—Mrs. Adele L. Champaign.

General Information
Information science is a field of study and research concerned with the nature and properties of information, and with the laws governing its generation, organization, transformation, transmission and utilization. Information engineering, as a field of professional practice and applied research, is concerned with the design and operation of advanced information and computer systems, and with applications of information processing techniques and devices.

The School of Information Science offers programs of study leading to the degrees of Master of Science and Doctor of Philosophy. The programs endeavor to prepare students for advanced study and research in information science (Option I) or for careers in information engineering (Options II and III).

Option I, concerned primarily with the theory of information processes and processors, emphasizes semiotics. Students are expected to proceed toward academic or research careers.—Option II has as its objective the professional education of engineers in the application of information processing devices and techniques in such processes as learning, problem solving and decision making, and in the design and operation of advanced information systems and networks.—Option III, concerned with the professional education of computer systems engineers, focuses on the design and study of advanced computing systems and utilities.

Although the School offers only graduate degree programs, it endeavors to serve the undergraduate division of the Institute by advising undergraduate students who wish to either pursue information science as a minor field of their study or prepare for entering graduate work in this discipline. For the former students, the School offers an array of diversified but carefully structured undergraduate course sequences in computer and information systems sciences, and specialized courses in such scope, structure and components of advanced information processing facilitating process mechanization; desirable computer characteristics.
basic fields as philosophy, linguistics and mathematics. For the prospective graduate student in information science, the School is pleased to assist in the judicious selection of courses for optimum preparation for graduate work. Such undergraduate preparation can significantly accelerate the M.S. and Ph.D. degree programs in information science.

For graduate work in information science, the student's undergraduate work should include substantial work in mathematics, at least through the calculus, differential equations, introductory modern algebra, and some probability. Entering graduate students are expected to have a basic knowledge of computer programming (I.S. 151 and 251), and at least one college course in symbolic logic.

**Courses of Instruction**

**NOTE: 3-0-3 means 3 hours class, 0 hours laboratory, 3 hours credit.**

**I.S. 151. Digital Computer Organization and Programming**
2-3-3. Prerequisite: Entrance algebra and trigonometry.

**I.S. 251. Automatic Data Processing**
2-3-3. Prerequisite: I.S. 151 or equivalent training in programming.
An introduction to computer file structures (tables, arrays, matrices; linear, inverted, and list structures) and their handling in conventional operations (searching, sorting, maintenance, etc.) on different types of memory devices. Criteria of efficiency in file systems design. Problem-oriented languages for non-numeric applications. Laboratory.

**I.S. 336. Introduction to Information Engineering**
3-0-3.
An introduction to the fundamentals, methodology, products and implications of information engineering. Topics covered include: the nature and properties of information; the structure and uses of the "information utility"; information-based models of problem solving and communication processes; the methodology of information system design; and social and other implications of information engineering.

**I.S. 401, 402. Languages for Science and Technology**
3-0-3, 3-0-3.
A survey of the chief languages in which scientific and technical literature is published. Emphasis is on the orthography, phonology, basic grammatical structure, and technical and bibliographic vocabulary of German, French, Russian, with limited examination of other important languages.

**I.S. 404. Topics in Linguistics**
3-0-3.
A general outline of phonology, morphology, and syntax, with em-
phasis on grammar models.

I.S. 410. Problem Solving
3-0-3. Prerequisites: Math. 235 or S.S. 334 or equivalent.
General approaches to problem solving with special emphasis on methods and techniques of formalizing intuitively based heuristics.

I.S. 415. The Literature of Science and Engineering
2-3-3. Prerequisite: Senior standing or consent of instructor.
Study of the reference and bibliographic sources of scientific and engineering literature, stressing strategies of searching. Major search project in student's field of study.

I.S. 423. Mathematical Techniques for Information Science
3-0-3. Prerequisite: Math. 208 or equivalent.
Applications in information science of mathematical techniques selected from areas such as matrix theory, theory of graphs and networks, statistics, vectors, lattices, projective geometry and probability and optimization techniques.

I.S. 424. Elements of Information Theory
3-0-3. Prerequisites: Math. 205 or 415, or equivalent training in probability.
A mathematical approach to information theory primarily through probability on finite spaces; the uniqueness and function; transmission rate, channel capacity, coding theorem for discrete memoryless channel; decision schemes and data processing; applications.

I.S. 436. Information Systems
2-3-3. Prerequisite: I.S. 336 or permission of instructor.
A descriptive analysis of the scope, structure and components of advanced information processing systems for corporate and social management and services. The student is expected to be familiar with the substantive content of his discipline or field of specialization and with problem solving methods and techniques used in it. A problem is assigned.

I.S. 445. Logistic Systems
3-0-3. Prerequisite: S.S. 334 or equivalent course in symbolic logic.
Algebraic logic and the generalized arithmetics of syntax. The algebras of sentential, monadic and polyadic languages. Godel’s theorems. An introduction to the mathematical study of some of the principal properties of formal languages.

I.S. 452. Switching Theory and Logic Design
3-0-3. Prerequisites: I.S. 151 or equivalent, Math. 235 or S.S. 334 or equivalent.
An outline of the logical design of digital computer elements and systems, covering: a review of functions of basic computer components and their interrelations; principles of symbolic representation of information for computer processing; the logical design of switching networks (including code converters, counters, registers and adders); the combination of basic networks to perform arithmetic functions; and basic notions of error detecting and correcting codes.

I.S. 455. Non-Numeric Information Processing
2-2-3. Prerequisites: I.S. 251 or equivalent, I.S. 404.
Computer-oriented techniques currently in use for modeling, simulating, and mechanizing non-numeric information processes. Structures for representing information; algorithms and heuristics for describing information processes; languages for facilitating process mechanization; desirable computer characteristics. Laboratory.
I.S. 456. Computer Systems
3-0-3. Prerequisites: I.S. 251 or equivalent.

An introduction to the concept of the computer system as consisting of the following interacting elements: hardware, software, and human beings and their objectives. The general properties, capabilities, and limitations of each system component are surveyed and discussed with respect to the current state of the art and their relationships and interactions explored in some detail. The functional properties of the various components of an operating system (compilers, assemblers, etc.) are studied. The student is introduced to the problems encountered in configuring and specifying a computer system.

Graduate Courses Offered
Applications for admission to the graduate programs in information science will be considered from qualified students with undergraduate backgrounds which included substantial training in mathematics (at least through calculus and differential equations). With the approval of their advisor and the director of the School of Information Science, students in their senior undergraduate year may also take a graduate course in information science. The following graduate level courses will be offered in 1968/1969:

- I.S. 607 Communication and Control of Information 3-0-3
- I.S. 608 Syntax of Natural Languages 3-0-3
- I.S. 609 Mathematical Linguistics 3-0-3
- I.S. 611 Information Representation and Structures 3-0-3
- I.S. 616 Information Control Methods 3-0-3
- I.S. 619 Theory of Classification and Indexing 3-0-3
- I.S. 621 Theory of Communication 3-0-3
- I.S. 625 Cybernetics 3-0-3
- I.S. 632 Equipment of Information Systems 2-2-3
- I.S. 636 Information Systems Design 3-0-3
- I.S. 638 Problems in Systems Design 0-6-2
- I.S. 642 Advanced Semiotics 3-0-3
- I.S. 646 Philosophy of Mind 3-0-3
- I.S. 653 Computer Techniques for Information Storage and Retrieval 2-2-3
- I.S. 657 Design of Computer Operating Systems 3-0-3
- I.S. 661 Computer Language Design 3-0-3
- I.S. 673 Organization and Management of Information Systems 3-0-3
- I.S. 700 Master's Thesis
- I.S. 701, 2, 3 Seminar
- I.S. 704, 5, 6 Special Problems in Information Science Hours
  and Credit to be arranged
- I.S. 726 Theory of Automata 3-0-3
School of Mathematics
(Established in 1952)


General Information
The School of Mathematics has two functions: (1) to train students in basic mathematics and in its use as an effective tool in engineering, the sciences, and management; (2) to provide more advanced mathematical training for those who plan to make mathematics their profession.

In addition to the usual undergraduate service courses, programs of study are offered which lead to the degrees of

Bachelor of Science in Applied Mathematics
Master of Science in Applied Mathematics
Doctor of Philosophy.

Numerous advanced undergraduate and graduate courses are offered which may be used as electives by students in the schools of engineering and the sciences. Close cooperation is maintained with the staff of the Rich Electronic Computer Center, which is located on the campus.

Students of especial ability are invited to participate in an Honors Program which extends through a large part of the freshman and sophomore years.

The requirements for the B.S. in Applied Mathematics are listed on the following pages; the requirements for the graduate degrees may be found in the Graduate Bulletin.

Departmental Degree Requirements
The following institutional regulation concerning degrees is quoted from the publication Student Rules and Regulations as amended by the Faculty May 25, 1965:

system of equations, permutations, combinations, the binomial theorem,
"To be a candidate for a degree, a student must have passed all courses required for the degree, must have a scholastic average for his entire academic program of at least 2.0 and must have done creditable work in his departmental courses so as to merit the recommendation for the degree by the director of his school and by the dean of his college. (X, A2, p. 10)."

The School of Mathematics interprets "creditable work in departmental courses" to mean a minimum grade of C in each mathematics course required in the curriculum. In cases where this rule appears to work unreasonably or unjustly, exceptions may be made by the Director or Associate Director of the School of Mathematics.

Freshman Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 101-2-3</td>
<td>Inorganic Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
<td>3-3-4</td>
</tr>
<tr>
<td>E. Gr. 113</td>
<td>Engineering Graphics</td>
<td></td>
<td></td>
<td>0-6-2</td>
</tr>
<tr>
<td>Eng. 107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Math. 107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
<td>5-0-5</td>
<td>5-0-5</td>
</tr>
<tr>
<td>M.L. *</td>
<td>Modern Language OR 111-12-13</td>
<td>Social Science</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>P.T. 101-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC **</td>
<td>Basic ROTC (optional)</td>
<td></td>
<td></td>
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<tr>
<td>Gen. 101</td>
<td>Orientation</td>
<td>1-0-0</td>
<td></td>
<td></td>
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Totals (excluding ROTC)**  15-7-16  14-7-16  14-13-18

NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*The School of Mathematics recommends that French, German or Russian be taken in the freshman year. Should this not be done, French, German or Russian must be elected in the junior year.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

Sophomore Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
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<tbody>
<tr>
<td>Eng. 201-2-3</td>
<td>Survey of the Humanities</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Math. 207</td>
<td>Calculus IV</td>
<td>5-0-5</td>
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<tr>
<td>Math. 208</td>
<td>Calculus and Linear Algebra</td>
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<td>5-0-5</td>
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<tr>
<td>Math. 239</td>
<td>Introduction to Set-Theoretic Concepts</td>
<td>3-0-3</td>
<td></td>
<td></td>
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<tr>
<td>Math. 305-6</td>
<td>Differential Equations</td>
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<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 207-8-9</td>
<td>Physics</td>
<td>5-3-6</td>
<td>5-3-6</td>
<td>5-3-6</td>
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<tr>
<td>P.T. 201-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC *</td>
<td>Basic ROTC (optional)</td>
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<td></td>
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<tr>
<td>Elective</td>
<td>Electives (Note 1)</td>
<td>0-0-3</td>
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</table>

Totals (excluding ROTC)*  16-7-18  16-7-18  11-7-16

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
## Junior Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
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<th>3rd Q.</th>
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<tbody>
<tr>
<td>Eng. 320</td>
<td>Technical Writing</td>
<td>3-0-3</td>
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<tr>
<td>Eng. 315</td>
<td>Public Speaking</td>
<td>3-0-3</td>
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<tr>
<td>Math. 309</td>
<td>Introd. to Higher Algebra</td>
<td>3-0-3</td>
<td></td>
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<tr>
<td>Math. 401-2-3</td>
<td>Introd. to Analysis</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Math. 405-414</td>
<td>Modern Algebra</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Phys. 308</td>
<td>Intermediate Electricity</td>
<td>3-0-3</td>
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<tr>
<td>Phys. 319</td>
<td>Modern Physics for Engineers</td>
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<td>3-0-3</td>
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<tr>
<td>Elective</td>
<td>Electives (Note 1)</td>
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<td>0-0-6</td>
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<td>9-0-18</td>
<td>12-0-18</td>
<td>9-0-18</td>
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## Senior Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
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<th>2nd Q.</th>
<th>3rd Q.</th>
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</thead>
<tbody>
<tr>
<td>Math. 404</td>
<td>Introd. to Analysis</td>
<td>3-0-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math. 427-8-9</td>
<td>Seminar</td>
<td>2-0-2</td>
<td>2-0-2</td>
<td>2-0-2</td>
</tr>
<tr>
<td>Math.</td>
<td>(Any four Math. Courses at the 400 level or higher)</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>6-0-6</td>
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<tr>
<td>Phys. 301</td>
<td>Mechanics</td>
<td>5-0-5</td>
<td></td>
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<tr>
<td>Elective</td>
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<td>0-0-9</td>
<td>0-0-9</td>
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<td>Totals</td>
<td>8-0-17</td>
<td>10-0-19</td>
<td>8-0-17</td>
</tr>
</tbody>
</table>

**Note 1:** The total of 54 hours of electives in the sophomore, junior, and senior years must include at least 9 hours of humanistic-social studies from the list on page 40 and at least 12 additional hours of course work in fields other than mathematics and advanced ROTC. The total of 54 hours must not include more than 9 hours of advanced ROTC.

## Courses of Instruction

### Math. 100. College Algebra and Trigonometry
5-0-5. Prerequisite: Entrance algebra. (No credit toward graduation for engineering or science degrees.)

Real and complex numbers; the function concept; exponential, logarithmic, and trigonometric functions; theory of equations including trigonometric equations; sequences, mathematical induction.

Text: To be selected.

### Math. 102. Trigonometry
5-0-5. Prerequisite: Math. 101. (No credit toward graduation for engineering or science degrees.)

Exponential and logarithmic functions, trigonometric functions, complex numbers, inverse functions, trigonometric equations.

Text: To be selected.

### Math. 101. College Algebra
5-0-5. Prerequisite: Entrance algebra. (No credit toward graduation for engineering or science degrees.)

The real number system, the concept of function, theory of equations, systems of equations, permutations, combinations, the binomial theorem, sequences, mathematical induction, progressions.

Text: To be selected.

### Math. 105. Calculus for Management I
5-0-5. Prerequisite: Math. 100.

Background for calculus; the limit concept; the derivative; techniques and applications of the derivative.

Text: Youse and Stalnaker, Calculus for Students of Business and Management.
Math. 106. Calculus for Management II
5-0-5. Prerequisite: Math. 105 or Math. 107.
Functions of several variables: partial derivatives; maxima and minima; exponential, logarithmic, and trigonometric functions; the definite integral; techniques of integration.
Text: Youse and Stalnaker, Calculus for Students of Business and Management.

Math. 107. Calculus I
5-0-5. Prerequisite: Entrance algebra and trigonometry.
Text: Protter and Morrey, College Calculus with Analytic Geometry.

Math. 108. Calculus II
5-0-5. Prerequisite: Math. 107.
Text: Protter and Morrey, College Calculus with Analytic Geometry.

Math. 109. Calculus III
5-0-5. Prerequisite: Math. 108.
Text: Protter and Morrey, College Calculus with Analytic Geometry.

Math. 117, 118, 119. Honors Calculus I, II, III
5-0-5.
This sequence of courses is designed for students with superior mathematical ability and training. Although the topics covered parallel those in Math. 107-108-109, the treatment of the subject matter is more intensive and rigorous. Participation is by invitation of the School of Mathematics.

Math. 205. Elementary Statistical Analysis
3-0-3. Prerequisite: Entrance algebra.
Construction of consistent probability measures for finite sequences of statistical experiments; independent trials; random variables, their means, variances and distributions; sampling; estimation and testing of hypotheses; nonparametric tests of association. Entire development restricted to finite sample spaces.
Text: Kurz, Basic Statistics.

Math. 206. Elementary Statistical Analysis
3-0-3. Prerequisites: Math. 205; Math. 108 or concurrently.
Motivation and definition of random variables with continuous distributions; normal distribution and the Central Limit Theorem; nonparametric tests; estimation and testing hypotheses in normal distributions; simple regression and correlation.
Text: Kurz, Basic Statistics.

Math. 207. Calculus IV
5-0-5. Prerequisite: Math. 109.
Text: Protter and Morrey, College Calculus with Analytic Geometry.

Math. 208. Calculus and Linear Algebra
5-0-5. Prerequisite: Math. 207.
Text: Protter and Morrey, College Calculus with Analytic Geometry
Math. 209. Differential Equations
5-0-5. Prerequisite: Math. 208.


Text: Kattsoff and Simone, *Finite Mathematics with Applications in the Social and Management Sciences*.

Math. 239. Introduction to Set-Theoretic Concepts 3-0-3. Prerequisite: Math. 108.
Set operations, set identities, cartesian product, relations, equivalence classes, functions, mappings, sequences, cardinality of sets.
Text: Kasriel, *Relations, Mappings and Continuity*.

A course centered around the linear equation with applications selected from physics, chemistry, and mechanics.

Systems of linear differential equations, linear differential equations with variable coefficients, power-series solutions, the method of Frobenius.

Vectors, vector spaces, matrices, systems of linear equations, transformations of coordinates in a vector space, quadratic forms, diagonalization, characteristic values.
Text: Cullen, *Matrices and Linear Transformations*.

Math. 400. Special Topics 3-0-3. For example Math. 400 (a) could be Optimization Techniques, a companion course to Math. 407.
The purpose here is to enable the School of Mathematics to comply with requests for courses in selected topics. Given on demand.

Math. 401. Introduction to Analysis 3-0-3. Prerequisite: Math. 209 or 305 or concurrently.
The first of four courses on fundamental concepts of analysis. Real and complex number systems, sets, limits, continuity, compactness, connectedness.
Text: Buck, *Advanced Calculus*.

Differentiation, L'Hospital's rule, Taylor's theorem, integration, functions of bounded variation, sequences and series of functions, uniform convergence, power series.
Text: Buck, *Advanced Calculus*.

Math. 403. Introduction to Analysis 3-0-3. Prerequisite: Math. 402.
Miscellaneous topics in series, equicontinuous families of functions, the Stone-Weierstrass theorem, functions of several variables, differen-
tiation, the implicit function theorem, integration, differential forms, Stokes’ theorem.
Text: Buck, Advanced Calculus.

Math. 404. Introduction to Analysis
3-0-3. Prerequisite: Math. 403 or concurrently.
The Lebesgue theory, Lebesgue measure, measure spaces, measurable functions, integration.
Text: Buck, Advanced Calculus.

Math. 405. Modern Algebra
3-0-3. Prerequisite: Math. 309.
A survey of modern algebraic systems including groups, rings, fields, and finite-dimensional vector spaces.
Text: Herstein, Topics in Algebra.

Math. 407. Linear Programming
3-0-3. Prerequisite: Math. 208 or concurrently.
Text: Smythe and Johnson, Introduction to Linear Programming.

Math. 409. Fundamental Concepts in Mathematics
3-0-3. Prerequisite: Differential equations or consent of instructor.
A course designed for mathematics majors and beginning graduate students. Unifies and extends certain basic notions of college mathematics.
Text: To be selected.

Math. 411. Advanced Engineering Mathematics
3-0-3. Prerequisite: Math. 209 or 305.
The Laplace transformation and its properties. Elementary applications to physical systems involving the solution of ordinary and partial differential equations.
Text: Churchill, Operational Mathematics.

Math. 412. Advanced Engineering Mathematics
3-0-3. Prerequisite: Math. 209 or 306 or consent of instructor.
Fourier series, Bessel functions, partial differential equations.

Math. 413. Advanced Engineering Mathematics
3-0-3. Prerequisite: Math. 209 or 305 or consent of instructor.
Topics from complex function theory including conformal mapping and contour integration.
Text: Churchill, Complex Variables and Applications.

Math. 414. Modern Algebra
3-0-3. Prerequisite: Math. 405.
Text: Herstein, Topics in Algebra.

Math. 415. Introduction to Probability
3-0-3. Prerequisite: Math. 208 or concurrently.
An introduction to probability theory and its applications; discrete and non-discrete probability distributions; laws of large numbers.

Math. 416. Mathematical Statistics
3-0-3. Prerequisite: Math. 415.
A general study of discrete, continuous, and limiting distributions with emphasis on the normal distribution and the central limit theorem; exact sampling distributions, selected topics in estimation and testing hypotheses.

Math. 417. Mathematical Statistics
3-0-3. Prerequisite: Math. 416.
A continuation (from Math. 416) of estimation and of testing hypotheses; regression theory, design of experiments, analysis of variance, distribution-free methods.
Math. 418. Probability with Applications
3-0-3. Prerequisite: Math. 208.
An introduction to random processes with the necessary preliminary study of discrete sample spaces, combinatorial analysis, and basic laws of probability.

Math. 419. Probability with Applications
3-0-3. Prerequisites: Math. 418; Math. 309 or concurrently.
Text: Kemeny, Finite Markov Chains.

Math. 420. Vector Analysis
3-0-3. Prerequisite: Math. 209 or 306 or consent of instructor.
Vector algebra and applications to force diagrams; vector calculus, divergence, curl, and their role in potential theory. Line integrals, Gauss’ theorem, Stokes’ theorem, Green’s theorem.
Text: Lindgren, Vector Calculus.

3-0-3. Prerequisite: Math. 208.
Organization and characteristics of digital computers; development of algorithms for elementary numerical methods; natural language and problem oriented language programming for machines currently available at the Rich Electronic Computer Center; the digital computer as a tool for experimental analysis.
Text: To be selected.

Math. 426. Computer Programming and Coding
3-0-3. Prerequisites: Math. 425, 443; Math. 444 or concurrently or consent of instructor.
Application of the digital computing equipment currently available at the Rich Electronic Computer Center to implement and investigate methods studied in numerical analysis.
Text: To be selected.

Math. 427. Seminar
2-0-2. Prerequisites: Math. 309, 402, and either 306 or 304.
Study and discussion intended to enhance investigative independence and expository skill. Content varying from year to year, usually beginning with solution of a series of related problems.

Math. 428. Seminar
2-0-2. Prerequisite: Math. 427.
A continuation of Math. 427 with greater emphasis on individual study. Oral and written presentation of results.

Math. 429. Seminar
2-0-2. Prerequisite: Math. 428.
Individual investigations of problems of moderate difficulty with a suitable account of results.

3-0-3. Prerequisite: Math. 208.
An elementary tensorial treatment of various geometric and mechanical concepts needed in the study of hydrodynamics, elasticity, and plasticity.

Math. 431. Introductory Topology
3-0-3. Prerequisite: Math. 401 or consent of instructor.
A course to provide background for the use of topological methods in analysis. Topological spaces, continuous transformations, metric spaces.

Math. 434. Differential Geometry
3-0-3. Prerequisite: Math. 208.
The theory of curves and surfaces, including the first and second fundamental forms of a surface and
topics related to them.
Text: Langwitz, *Differential and Riemannian Geometry.*

**Math. 435. Elements of Information Theory**
3-0-3. Prerequisite: Math. 205 or 415 or equivalent training in probability.
A mathematical approach to information theory primarily through probability on finite spaces: the uniqueness and basic properties of the information function; transmission rate, channel capacity, coding theorem for discrete memoryless channel; decision schemes and data processing; applications.

**Math. 436. Elementary Decision Theory**
3-0-3. Prerequisite: Math. 205 or 415 or equivalent training in probability.
A mathematical approach to the concepts of decision theory based primarily on probability for finite spaces: loss and risk functions and expectations; bayesian and minimax strategies in response to statistical uncertainty; the special cases of classical statistics; applications.

**Math. 437. Introduction to Stochastic Processes**
3-0-3. Prerequisite: Math. 415 or equivalent level of probability.
Description of a process by means of probability laws; the Wiener and Poisson processes; tools from conditional probability theory; mean and covariance of a process; stationarity; normal processes; Markov processes; applications.

**Math. 438. Mathematical Logic**
3-0-3. Prerequisite: Math. 208 or consent of instructor.
An introductory course in the basic topics of set theory, the statement calculus, the restricted predicate calculus. Additional topics considered to the extent that time permits include the relationship of logic to the foundations of mathematics, recursive functions (Turing machines), formal languages, extended predicate calculus, decision problems.

**Math. 441. Theory of Groups**
3-0-3. Prerequisite: Math. 309.
An introductory course in group theory suitable for students of mathematics, chemistry, and physics.
Text: Barnes, *Introduction to Abstract Algebra.*

**Math. 443. Numerical Analysis I**
3-0-3. Prerequisite: Math. 208.
Numerical solutions of systems of linear and nonlinear equations; interpolation and approximation of functions; finite difference calculus.

**Math. 444. Numerical Analysis II**
3-0-3. Prerequisites: Math. 209 or 306; Math. 443 or consent of instructor.
Numerical differentiation, numerical integration; difference equations; numerical solutions of ordinary differential equations.

**Math. 445. Numerical Analysis III**
3-0-3. Prerequisite: Math. 444 or consent of instructor.
Numerical approximation of solutions of integral equations and partial differential equations; eigenvalue problems; selected topics of current interest.
Text: To be selected.

**Math. 446. Introduction to Game Theory**
3-0-3. Prerequisites: Math. 235 or Math. 309 or Math. 407 or consent of instructor.

Math. 447. Introduction to Partial Differential Equations
3-0-3. Prerequisite: Math. 209 or 306.

The one-dimensional wave equation; characteristics; classification of second-order linear differential operators; properties of elliptic and parabolic equations; the method of separation of variables; Fourier series; methods for solving nonhomogeneous problems including, for example, Green's function. Text: Weinberger, *A First Course in Partial Differential Equations*.

Math. 448. Introduction to Partial Differential Equations
3-0-3. Prerequisite: Math. 447.

Sturm-Liouville theory, general Fourier expansions (eigenvalues and eigenfunctions, Bessel functions, Legendre polynomials); elementary theory of analytic functions of a complex variable and applications to Laplace's equation and the evaluation of improper integrals. Text: Weinberger, *A First Course in Partial Differential Equations*.

Math. 449. Introduction to Partial Differential Equations
3-0-3. Prerequisite: Math. 448.


Math. 491. Topics from Advanced Calculus
3-0-3. Prerequisite: Math. 208.

A course designed to furnish a broader foundation in analysis for students in the engineering curricula. Jacobians and the implicit function theorems, Riemann-Stieltjes integral, uniform continuity, theorems of Green, Stokes, and Gauss, uniform convergence of infinite series and improper integrals. Text: Widder, *Advanced Calculus*.

Graduate Courses Offered

**NOTE:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

<table>
<thead>
<tr>
<th>Math.</th>
<th>Course Description</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>Special Topics</td>
<td>3-0-3</td>
</tr>
<tr>
<td>601, 2, 3</td>
<td>Methods of Applied Mathematics</td>
<td>3-0-3</td>
</tr>
<tr>
<td>604, 5, 6</td>
<td>Modern Abstract Algebra I, II, III</td>
<td>3-0-3</td>
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<tr>
<td>607, 8, 9</td>
<td>Ordinary Differential Equations</td>
<td>3-0-3</td>
</tr>
<tr>
<td>618, 19, 20</td>
<td>Mathematical Theory of Elasticity</td>
<td>3-0-3</td>
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<tr>
<td>624</td>
<td>Harmonic Analysis</td>
<td>3-0-3</td>
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<tr>
<td>627, 8</td>
<td>Theoretical Hydrodynamics I, II</td>
<td>3-0-3</td>
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<tr>
<td>631, 2, 3</td>
<td>Functions of a Real Variable</td>
<td>3-0-3</td>
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<tr>
<td>634, 5, 6</td>
<td>Functions of a Complex Variable</td>
<td>3-0-3</td>
</tr>
<tr>
<td>637, 8, 9</td>
<td>Partial Differential Equations</td>
<td>3-0-3</td>
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<tr>
<td>641, 2, 3</td>
<td>Mathematical Statistics</td>
<td>3-0-3</td>
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<tr>
<td>644, 5, 6</td>
<td>Functional Analysis I, II, III</td>
<td>3-0-3</td>
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<tr>
<td>Course Code</td>
<td>Credits</td>
<td>Title</td>
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<tr>
<td>Math. 651, 2, 3</td>
<td>3-0-3</td>
<td>General Topology</td>
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<tr>
<td>Math. 654, 5, 6</td>
<td>3-0-3</td>
<td>Topological Dynamics</td>
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<tr>
<td>Math. 661, 2, 3</td>
<td>3-0-3</td>
<td>Algebraic Topology</td>
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<tr>
<td>Math. 691</td>
<td>3-0-3</td>
<td>Calculus of Variations</td>
</tr>
<tr>
<td>Math. 692</td>
<td>3-0-3</td>
<td>Integral Transforms</td>
</tr>
<tr>
<td>Math. 693</td>
<td>3-0-3</td>
<td>Integral Equations</td>
</tr>
<tr>
<td>Math. 694</td>
<td>3-0-3</td>
<td>Special Functions of Higher Mathematics</td>
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<tr>
<td>Math. 695</td>
<td>3-0-3</td>
<td>Laplace Transforms</td>
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<tr>
<td>Math. 696</td>
<td>3-0-3</td>
<td>Tensor Analysis</td>
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<tr>
<td>Math. 697</td>
<td>3-0-3</td>
<td>Field Theory with Applications</td>
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<td>Math. 700</td>
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<td>Master's Thesis</td>
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<td>Math. 701, 2, 3</td>
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<td>Seminar</td>
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<td>Math. 704, 5, 6</td>
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<td>Math. 707, 8, 9</td>
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<td>Advanced Problems in Ordinary Differential Equations</td>
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<td>Math. 712, 13, 14</td>
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<td>Methods of Applied Mathematics</td>
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<td>Math. 715, 16, 17</td>
<td>3-0-3</td>
<td>Advanced Topics in Algebra</td>
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<td>Math. 731, 2, 3</td>
<td>3-0-3</td>
<td>Advanced Topics in Real Analysis</td>
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<td>Math. 734, 5, 6</td>
<td>3-0-3</td>
<td>Advanced Problems in Complex Variables</td>
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<td>Math. 741, 2, 3</td>
<td>3-0-3</td>
<td>Studies in Advanced Probability and Statistics</td>
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<td>Math. 744, 5, 6</td>
<td>3-0-3</td>
<td>Advanced Topics in Numerical Analysis</td>
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<tr>
<td>Math. 751, 2, 3</td>
<td>3-0-3</td>
<td>Advanced Topics in Topology</td>
</tr>
<tr>
<td>Math. 754, 5, 6</td>
<td>3-0-3</td>
<td>Topological Groups</td>
</tr>
<tr>
<td>Math. 800</td>
<td></td>
<td>Doctor's Thesis</td>
</tr>
</tbody>
</table>

**NOTE:** For requirements for the graduate degree in Mathematics, consult the Graduate Bulletin.
School of Mechanical Engineering

(Established in 1888)


SUPPORTING STAFF

M. E. Lead Technician—John W. Davis; Electronics Technician—Thomas J. Pilgrim; Principal Laboratory Mechanic—Joseph G. Doyal; Senior Laboratory Mechanic—Louis A. Cavalli; Laboratory Mechanic—Clifford R. Bannister; Machinists—Robert J. Collins, David W. Kiebel; Principal Secretary—Marjorie C. Wright; Senior Secretary—Mrs. Lucille F. Whitt; Editorial Assistant—Joan Leininger; Secretaries—Mrs. Louise K. Barge, Mrs. Ruth S. Shaw; Clerk—Mrs. Elsie L. Campbell.

General Information

Mechanical Engineering embraces the science and art of the generation, transmission, and utilization of heat and mechanical energy, and the design as well as the production of tools and machines and their products. Research, design, production, operation, administration, and economics are functional aspects of this branch of professional engineering.

The course of study is not designed to cover the entire field of Mechanical Engineering, but to impress basic principles upon the student, and to train him in the use of these principles in the solution of engineering situations.

Emphasis, in the freshman and sophomore years, is placed on mathematics, chemistry, and physics and, in the junior and senior years, on the strength and the metallurgy of materials, applied mechanics, thermodynamics, heat transfer and fluid mechanics, and the application of those fundamental subjects to the diverse problems of mechanical engineering.

Satisfactory completion of the curriculum leads to the degree, Bachelor of Mechanical Engineering.
### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
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<tbody>
<tr>
<td>Math.</td>
<td>107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
<td>5-0-5</td>
<td>5-0-5</td>
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<tr>
<td>Chem.</td>
<td>101-2-3</td>
<td>General Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<tr>
<td>Eng.</td>
<td>107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>E.Gr.</td>
<td>113</td>
<td>Engineering Drawing</td>
<td>0-6-2</td>
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<tr>
<td>E.Gr.</td>
<td>114</td>
<td>Applied Descriptive Geometry</td>
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<td>0-6-2</td>
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<tr>
<td>E.Gr.</td>
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<td>Engineering Graphics</td>
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<td>0-6-2</td>
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<tr>
<td>M.E.</td>
<td>101</td>
<td>Introduction to Mechanical Engineering</td>
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<td>1-0-1</td>
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<tr>
<td>M.L.</td>
<td>*</td>
<td>Modern Language OR</td>
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<tr>
<td>S.S.</td>
<td>111-12-13</td>
<td>Social Science</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>P.T.</td>
<td>101-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC **</td>
<td>Basic ROTC (optional)</td>
<td></td>
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<tr>
<td>Gen.</td>
<td>101</td>
<td>Orientation</td>
<td>1-0-0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


*Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish.

Three quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
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</thead>
<tbody>
<tr>
<td>Math.</td>
<td>207</td>
<td>Calculus IV</td>
<td>5-0-5</td>
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<tr>
<td>Math.</td>
<td>208</td>
<td>Calculus and Linear Algebra</td>
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<td>5-0-5</td>
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<tr>
<td>Math.</td>
<td>209</td>
<td>Differential Equations</td>
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<td>5-0-5</td>
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<tr>
<td>Phys.</td>
<td>207</td>
<td>Mechanics</td>
<td>5-3-6</td>
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<tr>
<td>Phys.</td>
<td>208</td>
<td>Electricity</td>
<td>5-3-6</td>
<td></td>
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<tr>
<td>Phys.</td>
<td>209</td>
<td>Heat, Sound &amp; Light</td>
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<td></td>
<td>5-3-6</td>
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<tr>
<td>Eng.</td>
<td>201-2-3</td>
<td>Survey of Humanities</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>I.S.</td>
<td>151</td>
<td>Digital Computer Organization &amp; Programming</td>
<td>2-3-3</td>
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<tr>
<td>Mech.</td>
<td>305</td>
<td>Statics</td>
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<td>3-0-3</td>
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<tr>
<td>M.E.</td>
<td>212</td>
<td>Materials Science</td>
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<td>3-0-3</td>
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<tr>
<td>P.T.</td>
<td>201-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
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Totals: 15-10-18 16-7-18 16-7-18

### Junior Year

<table>
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<tr>
<th>Course</th>
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<th>Subject</th>
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<th>2nd Q.</th>
<th>3rd Q.</th>
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</thead>
<tbody>
<tr>
<td>E.E.</td>
<td>325</td>
<td>Electric Circuits and Fields</td>
<td>2-3-3</td>
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<tr>
<td>E.E.</td>
<td>326</td>
<td>Elementary Electronics</td>
<td>2-3-3</td>
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<tr>
<td>E.E.</td>
<td>327</td>
<td>Electric Power Conversion</td>
<td>2-3-3</td>
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<tr>
<td>Mech.</td>
<td>308</td>
<td>Dynamics</td>
<td>5-0-5</td>
<td>5-0-5</td>
<td>3-0-3</td>
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<tr>
<td>Mech.</td>
<td>334-7</td>
<td>Mechanics of Materials</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>M.E.</td>
<td>322-3-4</td>
<td>Thermodynamics</td>
<td>3-0-3</td>
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<td>342-3-4</td>
<td>Transport Phenomena I, II, III</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<td>355</td>
<td>Experimental Methodology</td>
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<td>1-3-2</td>
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<td>M.E.</td>
<td>445</td>
<td>Principles of Automatic Control</td>
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<td>3-0-3</td>
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<tr>
<td>M.E.</td>
<td>313</td>
<td>Mechanisms, Analysis and Synthesis</td>
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<td>3-0-3</td>
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<tr>
<td>M.E.</td>
<td>312</td>
<td>Materials Technology</td>
<td>3-3-4</td>
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Totals: 16-6-18 16-3-17 15-9-18

*Choice of M.L. 101-2-3, German; M.L. 107-8-9, French; or M.L. 113-14-15, Spanish.

Three quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.
Senior Year

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<td>(Area of interest)</td>
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<tr>
<td>Hum. Elec.***</td>
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Totals 15-3-16 15-6-17 12-12-16

*Ten hours of group electives chosen from the list of ME Interest Area Courses shown below. Courses other than these may be selected from mathematics, physics, chemistry, biology, or another field of engineering. A student who wishes to take courses not listed below must so notify the Director or the Assistant Director of his choice and obtain approval when preregistering for the first quarter of his Senior year.

A student completing his Junior year with a grade average of 3.0 or higher may elect one group elective from the Special Problem courses ME 496-7-8-9. (The particular course selected depending on the number of hours of credit needed.) This student will follow a course of individual study under the guidance of a faculty member.

**Six hours of Group Electives may be replaced by Advanced ROTC.

***Nine hours of electives selected from the list of courses on page 40.

M.E. Interest Area Courses

Listed below are elective courses in various topical areas of interest to mechanical engineers:

- M.E. 403 Metal Cutting Principles
- M.E. 420 Internal Combustion Engines
- M.E. 421 Heating, Ventilating, and Air Conditioning
- M.E. 422 Power Plant Engineering
- M.E. 425 Engineering Analysis
- M.E. 426 Principles of Turbomachinery
- M.E. 427 Combustion and Flames
- M.E. 428 Elements of Rocket Systems
- M.E. 429 One-Dimensional Compressible Flow
- M.E. 431 Refrigeration
- M.E. 432 Steam Turbines
- M.E. 439 Gas Turbines
- M.E. 443 Heating, Ventilation, and Air Conditioning Design
- M.E. 447 Elements of Nuclear Engineering
- M.E. 449 Numerical Control of Machine Tools
Courses of Instruction

NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

M.E. 101. Introduction to Mechanical Engineering
1-0-1. Prerequisite: Math. 107.
Mechanical Engineering is briefly surveyed to acquaint the student with the profession. What it is, what its functions are, what its working tools are, and what must be studied and learned to practice mechanical engineering successfully are the major topics considered.
Text: Smith, Engineering As a Career, 2nd Ed.

M.E. 208. Engineering Materials and Processes
2-3-3. Prerequisites: M.E. 207, Math. 207, and Phys. 209 or concurrently.
Machine tools are analyzed. The theory and metallurgy of cutting are studied. Tool geometry, cutting fluids technology, thermal problems and surface finish are considered. Experiments include machinability, cutting dynamometry and metrology problems.
Text: Vidosic, Metal Machining and Forming Technology.

M.E. 212. Materials Science
3-0-3. Prerequisites: Math. 209 or concurrently and Phys. 209 or concurrently.
The course emphasizes those principles which relate the properties and behavior of different classes of materials to their structure and environment.
Text: To be selected.

M.E. 309. Metallurgy and Heat Treatment
2-3-3. Prerequisite: M.E. 207.
An expanded study of the elements of material science. Principles of physical metallurgy, metallography and strengthening mechanisms are studied and some experiments are performed.
Text: Guy, Elements of Physical Metallurgy.

M.E. 312. Materials Technology
3-3-4. Prerequisite: M.E. 212.
The course discusses the mechanical and physical properties of metallic and non-metallic materials and the relationship of these properties to behavior under service conditions.
Text: To be selected.

M.E. 313. Mechanisms, Analysis and Synthesis
3-0-3. Prerequisite: Mech. 308.
Analysis of the motion of linkages, cams and gears. An introduction of curvature theory and its application to the synthesis of plane linkages.
Texts: Faires, Kinematics; and Hall, Kinematics and Linkage Design.

M.E. 320. Thermodynamics
4-0-4. Prerequisites: Phys. 209 or parallel; Math. 208 or parallel.
The fundamentals of engineering thermodynamics are covered. The properties of fluids, energy equations, and practical applications are included.
Text: To be selected.

M.E. 322. Thermodynamics
3-0-3. Prerequisites: Phys. 209 or parallel; Math. 208 or parallel.
A study of the fundamental laws of engineering thermodynamics and the properties of systems. Processes in the perfect gas are considered.

M.E. 323. Thermodynamics
3-0-3. Prerequisite: M.E. 322.
A continuation of M.E. 322 including semi-perfect gases, real gases, vapors, mixtures, solutions, and general thermodynamic relations.
M.E. 324. Thermodynamics
3-0-3. Prerequisite: M.E. 323.
A continuation of M.E. 323 including power and refrigeration cycles, combustion, introduction to phase and chemical equilibrium.

M.E. 334. Mechanical Equipment of Buildings
3-0-3. Prerequisite: Phys. 209 or 213.
Principles of water supply, plumbing and heating are studied. Design features of various types of heating systems are considered.

M.E. 335. Mechanical Equipment of Buildings
2-3-3. Prerequisite: M.E. 334.
Principles of air conditioning are studied. Application of heating and air conditioning principles to practical design problems is carried out during the laboratory period.

M.E. 342. Transport Phenomena I
3-0-3. Prerequisites: Math. 209, M.E. 322 or concurrently.
Introduction to conductive heat transfer, steady one-dimensional conduction, two- and three-dimensional steady-state conduction, conduction of heat in the unsteady state, and kinematics of fluid flow.

M.E. 343. Transport Phenomena II
3-0-3. Prerequisites: M.E. 342, Mech. 305 and concurrent M.E. 323.
One-dimensional energy equation, fluid statics, Euler and Bernoulli equations, momentum equation, introduction to compressible flow, nozzles and shocks.
Texts: Streeter, Fluid Mechanics; Kreith, Principles Heat Transfer; and Keenan and Kaye, Gas Tables.

M.E. 344. Transport Phenomena III
3-3-4. Prerequisites: M.E. 343, M.E. 350 and concurrent M.E. 324.
Radiation heat transfer, fluid properties and flow characteristics, incompressible and compressible flow in ducts, flow over immersed bodies.

M.E. 353. Materials Laboratory
0-3-1. Prerequisites: Mech. 334 or Mech. 343 or parallel.
Basic methods of determining and evaluating phenomenological properties of engineering materials are experimented with. Stress analysis instrumentation is introduced.
Text: To be selected.

M.E. 355. Experimental Methodology
1-3-2. Prerequisites: Math. 209, Mech. 308 and M.E. 322.
Three major areas are considered: the calibration of instruments for meaningful experimental data; the interpretation of collections of data, to demonstrate the role of random error and the importance of confidence levels; and the response of physical systems, to correlate the measurements taken with the dynamic behavior of instruments.
Text: To be selected.

M.E. 403. Metal Cutting Principles
2-3-3. Prerequisites: M.E. 412, Mech. 337.
The following topics are studied: Mechanics, mechanism and metallurgy of chip formation. Lubrication, wear and cutting fluids, grinding, electrical machining processes, temperatures in metal cutting, economics. Experiments concerned with a study of chip formation, the effect of
speed, feed, and rake angle on tool forces, tool temperature, lubrication and wear are performed.

Text: To be selected.

M.E. 410. Materials Engineering
2-3-3. Prerequisite: M.E. 309, Mech. 334.

The mechanical, thermal, electrical, chemical and irradiation behavior of engineering materials are studied from macrostructural considerations. Ceramics and plastics are also introduced as engineering materials.


M.E. 412. Material Processes
3-3-4. Prerequisite: M.E. 312.

Fundamentals of the various techniques used in working materials. Casting, metal forming, extrusion, metal joining and metal cutting are among the topics included.

Text: To be selected.

M.E. 413. Dynamics of Machinery
3-0-3. Prerequisites: M.E. 313, Math. 209.

A continuation of the study of mechanism analysis and synthesis. Single position force analysis of mechanisms is covered in both the static and dynamic cases. The effects of friction are treated. Continuous positional analysis of rotating and reciprocating systems, including balancing, is also studied.

Text: Shigley, Dynamic Analysis of Machines.

M.E. 416. Thermal System Analysis I
3-0-3. Prerequisites: M.E. 324 and M.E. 444 or concurrently.

The application of the principles of thermodynamics and transport phenomena to the analysis of thermal systems. Typical thermal systems such as steam power plants, internal combustion engines, refrigeration, nuclear power, and direct energy conversion are analyzed.

Text: To be selected.

M.E. 417. Thermal System Analysis II
2-3-3. Prerequisite: M.E. 416.

Continuation of the work of the prerequisite course. In the laboratory the student will attempt to verify experimentally the analytical predictions of system performance.

Text: To be selected.

M.E. 420. Internal Combustion Engines
3-3-4. Prerequisites: M.E. 324, and 343.

The mechanical construction, engine cycles, ignition, fuels, fuel feeds, combustion, and performance of internal combustion engines, with reference to aeronautical, automotive, and industrial use. The laboratory is devoted to experimental study of engines and their component parts.

Text: Obert, Internal Combustion Engines.

M.E. 421. Heating, Ventilating and Air Conditioning
3-3-4. Prerequisites: M.E. 324, M.E. 344 or parallel.

The theory of heating, ventilating and air conditioning and its application to engineering systems. The laboratory work includes tests on equipment and materials pertinent to the field.

Text: Carrier, Cherne, Grant and Roberts, Modern Air Conditioning, Heating and Ventilating.

M.E. 422. Power Plant Engineering
3-3-4. Prerequisite: M.E. 324 and 444 or consent of instructor.

Modern power plant cycles, pumps, piping, fans, fuels, steam generators, boiler auxiliaries, heat exchangers and the economics of power plants are studied. The laboratory work consists of tests of equipment pertaining to the subject.

Text: To be selected.

M.E. 425. Engineering Analysis
3-0-3. Prerequisite: Consent of instructor.

Emphasis is placed on well-ordered analytical thought processes required
Mechanical Engineering

in the application of familiar fundamental principles of engineering sciences to the analysis of unfamiliar engineering situations.

Text: VerPlanck and Teare, Engineering Analysis.

M.E. 426. Principles of Turbomachinery
3-0-3. Prerequisite: M.E. 344.
Principles underlying all forms of turbomachinery are studied. Application of these principles is made to give a unified treatment of pumps, compressors, and turbines.

Text: Shepherd, Principles of Turbomachinery.

M.E. 427. Combustion and Flames
3-0-3. Prerequisite: M.E. 324 and 444 or consent of instructor.
Stoichiometric and thermochemical analyses of the principal fuel air reactions are examined. Concepts of modern theories of combustion and flame propagation are presented.

Text: To be selected.

M.E. 428. Elements of Rocket Systems
3-0-3. Prerequisite: M.E. 444 or parallel.
Basic elements, ballistics, and technical problems associated with the design of propulsion systems for solid and liquid propellant rockets are considered.

Text: To be selected.

M.E. 429. One-Dimensional Compressible Flow
3-0-3. Prerequisite: M.E. 444 or parallel.
An intermediate study of various one dimensional compressible flow systems relevant to mechanical engineering.


M.E. 431. Refrigeration
3-0-3. Prerequisite: M.E. 324.
A study of the compressor, condenser, piping and accessories of the refrigeration plant, and other practical applications of the principles of refrigeration.

Text: Jordan and Priester, Refrigeration.

M.E. 432. Steam Turbines
3-0-3. Prerequisite: M.E. 324.
A detailed study of the design and operation of steam turbines.

Text: Church, Steam Turbines.

M.E. 439. Gas Turbines
3-0-3. Prerequisites: M.E. 324 and 344.
The theory and design of gas turbines and jet engines and the various applications of these engines.

Text: To be selected.

M.E. 443. Heating, Ventilation, and Air Conditioning Design
3-0-3. Prerequisite: M.E. 421.
A continuation of M.E. 421. The subject matter emphasizes the design of various systems, including automatic controls, and the selection of equipment.

Text: Carrier, Cherne, and Grant, Modern Air Conditioning, Heating and Ventilating.

M.E. 444. Transport Phenomena IV
3-0-3. Prerequisite: M.E. 344.
Free and forced convection on immersed bodies, dimensional analysis, forced convection in ducts, heat transfer with phase changes, heat exchangers.


M.E. 445. Principles of Automatic Control
3-0-3. Prerequisite: Math. 209.
Fundamental principles and generalized behavior of closed loop linear systems are examined. Classical techniques based on frequency response and eigenvalue analysis are presented as well as state variable approaches in the time domain. Examples are drawn from pneumatic, mechanical and electrical applications to physical systems.

Text: Harrison and Bollinger, Introduction to Automatic Control.
M.E. 447. Elements of Nuclear Engineering
3-0-3. Prerequisite: M.E. 444 or concurrently, or equivalent.
A study of characteristics of nuclear power systems. Nuclear physics and nuclear reactions will be used for establishing some reactor principles and reactor types.
Text: To be selected.

M.E. 449. Numerical Control of Machine Tools
3-0-3. Prerequisite: M.E. 445 or concurrently.
A study of the design and the operation of typical digital control systems for machine tools. The flow and manipulation of control signals is followed and studied as they progress through the system from the tape input to the machined-part output.
Text: Notes and references.

M.E. 455. Experimental Engineering
1-3-2. Prerequisites: M.E. 355, 412, 416 and 483 and E.E. 326.
Engineering situations involving various disciplines are solved by experimental means. Students must seek understanding of the purpose of experimentation, plan the experiments and gather and interpret the results.
Text: To be selected.

M.E. 481. Machine Elements
3-3-4. Prerequisites: Mech. 337 and M.E. 412.
Principles of design — synthesis and analysis — are introduced. The application of engineering mechanics to the design and selection of machine elements is then pursued. Component design projects are undertaken in the laboratory.
Text: Shigley, Mechanical Engineering Design.

M.E. 483. Design Theory
3-0-3. Prerequisite: M.E. 481 or concurrently.
The design process including decision theory, creativity concepts, human factors, systems engineering, optimization techniques, reliability and ethics is studied. Some case studies are analyzed to illustrate application and the professional approach.
Text: Design theory notes.

M.E. 484. Design Engineering
0-6-2. Prerequisites: M.E. 412, 416 and 483.
The design process is applied to the team solution of real multidisciplinary engineering problem situations.
Text: To be selected.

M.E. 491. Seminar
1-0-1. (Winter quarter only). Prerequisite: Senior standing in Mechanical Engineering.
Civic and professional responsibilities and opportunities are brought to students by leaders in engineering, business, and community affairs.

M.E. 496-7-8-9. Special Problems in Mechanical Engineering
0-9-3, 0-6-2, 0-3-1, 0-12-4, respectively. Prerequisite: Senior standing in Mechanical Engineering.
These courses are for the student who is interested in creative work.
Graduate Courses Offered

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(Complete details about these courses are contained in the Graduate Bulletin, a copy of which is available upon request.)
Department of Military Science
(Established in 1917)


Reserve Officers’ Training Corps

The US Army offers instruction at Georgia Institute of Technology, a Senior Division of the Army Reserve Officers’ Training Corps, in the two-and four-year programs.

The purpose of the Senior Division, Army ROTC Program is to procure and train college students so that they may qualify as commissioned officers in the Army of the United States upon graduation. In addition, the Senior Division ROTC provides the principal source of junior officers for the Regular Army through selection of distinguished military graduates for direct Regular Army appointment, and through extended active duty tours of volunteers from which are selected additional officers for Regular Army appointments.

The course of instruction of the ROTC is divided into two parts, the Basic and Advanced courses, each of two years’ duration. Both courses are voluntary and may be chosen as an elective.

The ROTC instruction emphasizes training in military leadership, and includes subjects common to all branches of the Army.

The ROTC unit is organized as a brigade consisting of six battalions, a band, and the Pershing Rifles drill unit.

The two-year program is open to students who elect to take the Advanced course, but cannot complete the Basic course in the required time. Prior to enrollment into the Advanced course the student must attend a six weeks Summer Camp to cover those subjects taken in the freshman and sophomore years of Basic ROTC.

Academic Credit

Academic credit is granted for the completion of military courses as indicated in the sections that follow. However, not more than 6 hours credit in basic ROTC courses and not more than 9 hours credit in advanced ROTC courses may be applied toward a degree.
**Uniforms**

*Basic course cadets* are furnished the ROTC uniform by the United States Army on a loan basis. A. $25.00 deposit must be made by the cadet with the school cashier before the uniform will be issued. The cadet will bear the expense of maintaining the uniform while it is in his possession. Upon return of all items of the uniform, the deposit will be refunded to the cadet. The uniform must be returned to the Army Supply Room upon dropping Military Science or upon leaving school for any period in excess of one quarter.

*Advanced Course Cadets* are authorized a commutation in lieu of uniform. The commutation allowance for advanced course students is $113.00 per student and is reimbursed to the student upon completion of the advanced course.

The advanced course cadets are furnished the ROTC uniform through Georgia Tech at an approximate initial cost to the student of $122.00. Prior to formal enrollment in the ROTC advanced course, each student will deposit with the cashier of Georgia Tech the amount shown above. Uniforms become the property of the individual and are not returnable for reimbursement. This uniform, with minor alterations, can be worn on active duty by the Commissioned Graduate.

**Texts and Equipment**

The necessary equipment and textbooks are furnished by the Department of the Army.

**Scholarship Program**

The United States Army offers financial assistance in the form of four-year and two-year scholarships for outstanding students who are interested in a career as an Army Officer. Each scholarship provides for free tuition, textbooks and laboratory fees in addition to a commutation of $50.00 per month for the period that the scholarship is in effect.

Applicants for four-year scholarships will submit their application to the appropriate Army headquarters. Recipients of the four-year scholarship may attend Georgia Institute of Technology provided he is accepted for enrollment by the school.

The two-year scholarship application will be made to the Professor of Military Science at Georgia Tech by any one who has completed the

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*Basic 1st Year must be completed prior to starting Basic 2nd year.*
basic program and has been accepted for enrollment in the Advanced course. Additional information may be obtained from the Professor of Military Science.

The Basic Course
The basic course consists of formal instruction for two hours per week for two academic years of at least 30 weeks each, with the exception of one quarter of the freshman year. During this quarter the student will attend drill only. Subjects included in the basic course are the same for all students. During the sophomore year, selection is made of students considered eligible for enrollment in the advanced course. NOTE: All quarters include instruction in Leadership, Drill and Exercise of Command, to provide for leadership training, drill experience, and the development of certain essential characteristics of leadership such as initiative and self-confidence, through progressive training; also, to provide a thorough indoctrination in military courtesy and customs of the service.

Leadership, Drill, and Command, stressing fundamentals on small unit level. Marksmanship training on indoor range. Mechanical functioning disassembly, assembly, and employment with .30 and .22 cal. rifles.


M.S. 104. Leadership Laboratory (Drill) 0-1-0. Must be completed prior to starting Basic 2nd Year.
Military drill period will be attended, in uniform, by students enrolled in the Army ROTC program. Attendance and aptitude marks will be assigned, and a grade of "S" will be given for satisfactory completion of this course. Fundamentals of leadership, drill and command are stressed.

The Advanced Course
Those applicants who have demonstrated a high leadership potential and meet the following requirements may be selected by the Professor
of Military Science for enrollment in the Advanced course: (1) has completed the basic course or Basic Summer Camp; (2) passed the Army Officer Qualification test; (3) passed the officers physical examination (given by the U. S. Army at no cost to the applicant); (4) have five quarters of academic training remaining; (5) be recommended by a Board of Officers; (6) and if selected, enlist in the enlisted reserves.

The student when selected must sign a written contract whereby he agrees to meet certain requirements as to completion of the course and hours devoted to it, including one summer training camp and acceptance of a commission, if tendered.

Prior to enrollment in the Advanced Course, students will select the Branch he desires to serve with and receive his commission in. Army ROTC at Georgia Tech offers instructions in six branches of the Army, (Air Defense Artillery, Chemical Corps, Corps of Engineers, Infantry, Ordnance Corps, and Signal Corps).

The Advanced Course consists of two quarters of military classroom instruction and one quarter of drill only in each Junior and Senior year. Each quarter of classroom instruction includes four hours of class and one hour of drill. The program of instruction consists of a series of subjects which relate to the particular arm or service, and, in addition, a series of subjects common to all branches.

### Commutation Pay

Students formally enrolled in the ROTC and pursuing the Advanced Course will receive commutation pay at a rate of fifty (50) dollars a month which is non-taxable.

### Summer Training Camp

Members of the Advanced Course are required to attend Summer Camp, normally between the Junior and Senior years. All students going to Summer Camp receive mileage for the round trip at the rate of six (6c) cents per mile and are messed, housed, uniformed, and given medical and dental attention at government expense while attending camp. Students will receive pay at the rate of $160.50 per month. The duration of Summer Camp is not less than six weeks beginning about 15 June each year.

### Commissions

Upon graduation, students who satisfactorily complete the Advanced Course, including Summer Camp, and are qualified for appointment as Second Lieutenant prior to reaching 28 years of age, are offered Com-
missions by the President of the United States as Second Lieutenant, United States Army Reserve.

ROTC graduates who meet special requirements may be selected for direct Regular Army appointment or may volunteer for extended active duty tours with a view to being selected for Regular Army appointment.

**Army Air Defense Artillery Section**

Any qualified student enrolled in any academic course may make application.

**M.S. 311. Leadership, Military Teaching Principles and Infantry Tactics**

4-1-3. Prerequisite: Junior standing.

An analysis of the principles of leadership by the case study method. Examination of the fundamentals, techniques and methods of instruction. A study of small unit infantry tactics with emphasis on low intensity warfare.

**M.S. 312. Fundamentals of Missile Science, Infantry Tactics, and Pre-Camp Orientation**

4-1-3. Prerequisite: Junior standing.

The integrated air defense missile battery. Principles and procedures of operation of Nike and Hawk missile systems. A study of small unit infantry tactics. Preparation for the annual Army ROTC summer camp.

**M.S. 304. Leadership Laboratory (Drill)**

0-1-0. Prerequisite: Junior standing.

Participation as a cadet non-commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of “S” will be awarded for satisfactory completion of this course.

**M.S. 411. Army Administration, Military Justice Role of the United States in World Affairs, and Review of Map Reading**

4-1-3. Prerequisite: Senior standing.

Basic concepts of military administration. Fundamentals of military justice and court procedures. Orientation on geographical, economic, political and military factors which influence the role of the United States in world affairs.

**M.S. 412. Operations, Logistics, Air Defense Tactics, and Internal Defense**

4-1-3. Prerequisite: Senior standing.

Command and staff organization and functioning, military intelligence, and training management. Supply and evacuation, motor transportation and troop movements. Air defense organization, tactics, and defense planning. Explanation of United States policies and action to assist friendly foreign nations subjected to internal attack.

**M.S. 404. Leadership Laboratory (Drill)**

0-1-0. Prerequisite: Senior standing.

Participation as a cadet commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of “S” will be awarded for satisfactory completion of this course.
Chemical Corps Section

Admission to the Chemical Corps Unit is in general limited to those students who are enrolled in an academic course of instruction leading to an engineering, technical, or other scientific degree. However, students enrolled in other courses than these may be admitted if marked ability, aptitude, or interest in technical fields of endeavor is demonstrated.

M.S. 321. Leadership, Military Teaching Principles and Infantry Tactics
4-1-3. Prerequisite: Junior standing.
An analysis of the principles of leadership by the case study method. Examination of the fundamentals, techniques, and methods of instruction. A study of small unit infantry tactics with emphasis on low intensity warfare.

M.S. 322. Chemical Corps Missions, Organizations, Aspects of CBR Warfare and Defense, Infantry Tactics and Summer Camp Orientation
4-1-3. Prerequisite: Junior standing.
Mission, general organization, and functions of the Chemical Corps. Characteristics of Chemical, Biological and Radiological agents to include employment detection, defense against decontamination and munitions. A study of small unit infantry tactics. Preparation for the annual Army ROTC summer camp.

M.S. 304. Leadership Laboratory (Drill)
0-1-0. Prerequisite: Junior standing.
Participation as a cadet non-commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitudes observed for selective advancement within the group. A grade of “S” will be awarded for satisfactory completion of this course.

M.S. 421. Army Administration, Military Justice, Role of the U.S. in World Affairs, and Review of Map Reading
4-1-3. Prerequisite: Senior standing.
Basic concepts of military administration. Fundamentals of military justice and court procedures. Orientation on geographical, economic, political and military factors which influence the role of the United States in world affairs.

M.S. 422. Operations, Logistics, Chemical Corps Tactics and Techniques and Internal Defense
4-1-3. Prerequisite: Senior standing.
A study of the command and staff organization and its functions, including estimate of the situation, combat orders, troop movements, supply and evacuation. Explanation of the United States policies and actions which assist friendly foreign nations subjected to internal attack.

M.S. 404. Leadership Laboratory (Drill)
0-1-0. Prerequisite: Senior standing.
Participation as a cadet commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of “S” will be awarded for satisfactory completion of this course.

Corps of Engineer Section

Admission to the Corps of Engineer Unit is in general limited to those students who are enrolled in an academic course leading to an engineer-
ing, technical, or scientific degree. However, students enrolled in other courses than these may be admitted if marked ability, aptitude, or interest in technical fields of endeavor is demonstrated. Instruction in technical subjects supplements that of the engineering school, with particular attention to the military application of such subjects.

M.S. 331. Leadership, Military Teaching Principles and Infantry Tactics 4-1-3. Prerequisite: Junior standing.
An analysis of the principles of leadership by the case study method. Examination of the fundamentals, techniques, and methods of instruction. A study of small unit infantry tactics with emphasis on low intensity warfare.

M.S. 332. Military Structures, Explosives and Demolitions, Mine Warfare, Infantry Tactics and Summer Camp Orientation 4-1-3. Prerequisite: Junior standing.

M.S. 304. Leadership Laboratory (Drill) 0-1-0. Prerequisite: Junior standing.
Participation as a cadet non-commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitudes observed for selective advancement within the group. A grade of "S" will be awarded for satisfactory completion of this course.

Infantry Section
Any qualified student enrolled in any academic course may make application.

M.S. 341. Leadership, Military Training Principles and Infantry Tactics 4-1-3. Prerequisite: Junior standing.
An analysis of the principles of leadership by the case study method. Examination of the fundamentals,
techniques, and methods of instruction. A study of small unit infantry tactics with emphasis on low intensity warfare.

M.S. 342. Infantry Tactics and Techniques and Summer Camp Orientation
4-1-3. Prerequisite: Junior standing.
Organization of Infantry units to include the Division. Techniques of tactical estimates and preparation of combat orders. Communication principles, techniques and equipment. Tactical employment of Infantry units to include the Company. Preparation for the annual Army ROTC summer camp.

M.S. 304. Leadership Laboratory (Drill)
0-1-0. Prerequisite: Junior standing.
Participation as a cadet non-commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of “S” will be awarded for satisfactory completion of this course.

M.S. 441. Army Administration, Military Justice, Role of the U.S. in World Affairs and Review of Map Reading
4-1-3. Prerequisite: Senior standing.
Basic concepts of military administration. Fundamentals of military justice and court procedures. Orientation on geographical, economic, political and military factors which influence the role of the United States in world affairs.

M.S. 442. Operations, Logistics, Infantry Tactics and Techniques and Internal Defense
4-1-3. Prerequisite: Senior standing.
A study of the command and staff organization and its functions, including estimate of the situation, combat orders, troop movements, supply and evacuation. Explanation of the United States policies and actions which assist friendly foreign nations subjected to internal attack.

M.S. 404. Leadership Laboratory (Drill)
0-1-0. Prerequisite: Senior standing.
Participation as a cadet commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of “S” will be awarded for satisfactory completion of this course.

M.S. 351. Leadership, Military Teaching Principles and Infantry Tactics
4-1-3. Prerequisite: Junior standing.
An analysis of the principles of leadership by the case study method. Examination of the fundamentals, techniques, and methods of instruction. A study of small unit infantry tactics with emphasis on low intensity warfare.

M.S. 352. Ordnance Tactics and Techniques. Infantry Tactics and Summer Camp Orientation
4-1-3. Prerequisite: Junior standing.
A survey of the purpose, engineer-
ing, and capabilities of current combat material—military vehicles, artillery weapons, explosives, ammunition, guided missiles and nuclear weapons. A study of small unit infantry tactics. Preparation for the annual Army ROTC summer camp.

M.S. 304. Leadership Laboratory (Drill) 0-1-0. Prerequisite: Junior standing.

Participation as a cadet non-commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of “S” will be awarded for satisfactory completion of this course.

M.S. 451. Army Administration, Military Justice, Role of the U.S. in World Affairs, and Review of Map Reading 4-1-3. Prerequisite: Senior standing.

Basic concepts of military administration. Fundamentals of military justice and court procedures. Orientation on geographical, economic, political and military factors which influence the role of the United States in world affairs.

M.S. 452. Ordnance Tactics and Techniques, and Internal Defense 4-1-3. Prerequisite: Senior standing.

A survey of the various tools of military management used to accomplish the Ordnance logistics mission. Staff procedures; Combat Service Support in an operational combat environment. Explanation of the United States policies and actions which assist friendly nations subjected to internal attack.

M.S. 404. Leadership Laboratory (Drill) 0-1-0. Prerequisite: Senior standing.

Participation as a cadet commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of “S” will be awarded for satisfactory completion of this course.

Signal Corps Section

Application for admission to the advanced course of the Signal Corps Unit is in general limited to those students enrolled in one of the academic fields leading to a degree in engineering, electronics, or physics. However, students enrolled in courses other than these may be accepted if marked ability, aptitude, or interest in technical fields of endeavor is demonstrated.

M.S. 361. Leadership, Military Teaching Principles and Infantry Tactics 4-1-3. Prerequisite: Junior standing.

An analysis of the principles of leadership by the case study method. Examination of the fundamentals, techniques and methods of instruction. A study of small unit infantry tactics with emphasis on low intensity warfare.

M.S. 362. Signal Corps Tactics and Techniques, Infantry Tactics and Summer Camp Orientation 4-1-3. Prerequisite: Junior standing.

A study of the various means of communication to include telephony, telegraphy, carrier, HF, VHF and microwave systems. An introduction to the global communication network of the U. S. Army. A study of small unit infantry tactics. Preparation
for the annual Army ROTC summer camp.

**M.S. 304. Leadership Laboratory (Drill)**
0-1-0. Prerequisite: Junior standing.
Participation as a cadet non-commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of "S" will be awarded for satisfactory completion of this course.

**M.S. 461. Army Administration, Military Justice Role of the U.S. in World Affairs and Review of Map Reading**
4-1-3. Prerequisite: Senior standing.
Basic concepts of military administration. Fundamentals of military justice and court procedures. Orientation on geographical, economic, political and military factors which influence the role of the United States in world affairs.

**M.S. 462. Signal Corps Operations, Logistics, and Internal Defense**
4-1-3. Prerequisite: Senior standing.
A study of the command and staff organization and its functions, including estimate of the situation, combat orders, troop movements, supply and evacuation. Explanation of the United States policies and actions which assist friendly foreign nations subjected to internal attack.

**M.S. 404. Leadership Laboratory (Drill)**
0-1-0. Prerequisite: Senior standing.
Participation as a cadet commissioned officer in the cadet military organization. Application of leadership principles learned in departmental and extra-departmental courses. Effective oral communication and informal methods of instruction are stressed. Performance and attitude observed for selective advancement within the group. A grade of "S" will be awarded for satisfactory completion of this course.
Department of Modern Languages

Department Head—James D. Wright; Professor Emeritus—Joseph A. Campoamor; Professors—George F. Walker, Louis J. Zahn; Associate Professor—Carl E. Steinhofer; Assistant Professors—Richard L. Hawkey, Delford L. Santee, Roy O. Wyatt; Instructors—David E. Blackburn, Gunilla H. Driver, Tatjana Gregory, Rebecca B. Holman, Charles L. Johnston, Maria S. Venable.

General Information

The Department of Modern Languages seeks first to give the student sufficient mastery of a foreign language to enable him to read and understand with reasonable facility the scientific and technical literature of that language. Further, it seeks to inform the student, through the medium of the foreign language, of the civilization and literature of the countries where that language is spoken. In facilitation of the effort to attain these goals the Department attempts to section, according to ability and/or preparation, its first- and/or second-year students of those languages which attract enrollments either large enough to support such sectioning or specifically qualified to do so.

A student taking a language in which he has two or more years of high school credit is encouraged to register initially for a course not lower in number than the first course of the 200 series in that language. However, if such a student is convinced that his knowledge of the language in question is inadequate for successful participation in this 200 series course, then he may, instead, register for any less advanced course in the same language which is available and to which his preparation is believed to be equal. Beginning with that less advanced course, he may then take for full credit toward graduation the entire complement of language courses recommended for his program of study. A student who elects to take courses in a language which he speaks as a native language must schedule a course not lower in number than the first course of the 200 series—if the language in question is German or Russian. If the language in question is French, such a student must schedule the available course of the series, M.L. 307-308-309. If the language in question is Spanish, such a student must schedule the available course of either the regular series, M.L. 413-414-415, or the alternate series, M.L. 416-417-418. Otherwise the student in either of these situations may schedule the beginning course of another language.

Credit for courses of the 100 series is given only after completion of all three courses of the series, if the initial course is taken; only after completion of the remaining one(s) of the series, if the first course taken is a more advanced one of the 100 series. Credit for courses above the level of the 100 series is given on a quarterly basis.

Students who are registered under the Co-operative Plan and who study the elementary course of a foreign language are required to study German. This requirement is made necessary by the fact that German is the only foreign language in which all three elementary courses are normally offered each quarter—a situation which usually makes possible the scheduling of any first-year German course during any quarter
and which, in the study of the other languages, usually makes possible the scheduling of only that first-year course which is reserved for the quarter in question. Accordingly students who are enrolled only every other quarter can easily complete the first year of their language study in German but might do so only with great loss of time in the other languages.

Courses of Instruction

NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

Chinese

In our program of instruction in Chinese, the effort is made to prepare the student, in both the spoken and the written language, well enough to enable him to continue his study, without professional assistance, after his completion of the program. This effort is naturally facilitated by the admission of chiefly those students who have had such formal language training as that prescribed in the course descriptions below and who have demonstrated in that training innate ability for language study. It is also facilitated, however, by the admission of those students who do not have these formal prerequisites to offer but who possess exceptional specific motivation. Students belonging to the former group are admittedly more numerous and more easily identified than are those belonging to the latter. But recognition of the value of each group prevents a natural preference for the former from excluding the latter.

M.L. 141. Introduction to Chinese
3-2-4. Prerequisite: One year college-level foreign language study, or equivalent, and permission of instructor.
Emphasis on the spoken language; during three class hours - to be scheduled at registration - conventional study and testing of grammar; during two laboratory hours - to be scheduled after registration - intensive study of spoken language patterns.

M.L. 142. Introduction to Chinese
3-2-4. Prerequisite: M.L. 141.
Continuation of M.L. 141; introduction to the Chinese writing system.

M.L. 143. Introduction to Chinese
3-2-4. Prerequisite: M.L. 141 and 142.
Continuation of M.L. 142; proportionately more emphasis on written Chinese.

French

Those students who have had two years of high school training in French and those who have had more than two are encouraged to register initially for a course not lower in number than M.L. 207. The gradation of the series M.L. 207-208-209 and the instructional variety within that series are such that qualified students from both groups can profitably take the courses.

With permission of the instructor, exceptionally well prepared matriculating freshmen who have had three or more years of high school training in the language may be admitted to the series M.L.
307-308-309. This series is intended primarily, however, for students who have had two years of college training or the equivalent.

**M.L. 17. Elementary French for Graduate Students**
5-0-0. Prerequisite: None. (Available in summer quarter only.)

Pronunciation; minimum grammar; acquisition of vocabulary, both basic and scientific, from appropriate reading; translation of scientific literature into English. By preparing the student in one quarter for admission into the first course of the second-year series, M.L. 207, this course affords him an opportunity to shorten the period of time normally required for his preparation for the Ph.D. reading-knowledge examination.

**M.L. 107. Elementary French**
3-0-3. Prerequisite: None.

Essential principles of French grammar; acquisition of vocabulary through simple conversational exercises and the reading of simple selections.

**M.L. 108. Elementary French**
3-0-3. Prerequisite: M.L. 107 or equivalent.

Continuation of M.L. 107; extension of the survey of French grammar; acquisition of a large general vocabulary through conversation and the reading of texts containing the most frequently occurring words and idioms.

**M.L. 109. Elementary French**
3-0-3. Prerequisite: M.L. 107 and 108 or equivalent.

Reading of selected texts; composition; completion of the survey of French grammar.

**M.L. 207. Intermediate French**
3-0-3. Prerequisite: M.L. 107-108-109 or equivalent.

Survey of French civilization and acquisition of a large general vocabulary.

**M.L. 208. Intermediate French**
3-0-3. Prerequisite: M.L. 207 or equivalent.

Continuation of survey of French civilization and concise survey of French literature.

**M.L. 209. Intermediate French**
3-0-3. Prerequisite: M.L. 207 and 208 or equivalent.

Readings from French literature and from the student’s special field.

**M.L. 307-308-309**
Survey of French Literature from circa 1800 to the Present

Class and collateral study of prose, drama, and lyric poetry by representative authors through indicated literary movements; course conducted in French.

**M.L. 307. Period: c. 1800-1850. Romanticism:** the re-appearance of lyric poetry; the importance of the individual, as opposed to classical anonymity.
3-0-3. Prerequisite: M.L. 207-208-209 or equivalent.

**M.L. 308. Period: c. 1850-1900. Parnassianism and Symbolism:** developments in poetry; Realism and Naturalism: trends in prose, with emphasis on the development of the novel.
3-0-3. Prerequisite: M.L. 207-208-209 or equivalent.

**M.L. 309. Period: c. 1900—. Exploration of currents in modern prose, poetry, and drama.**
3-0-3. Prerequisite: M.L. 207-208-209 or equivalent.

**German**

All students, upon their satisfactory completion of M.L. 101, the first course of the elementary German series, are subject to assignment to one or the other of two groups. Those who have completed M.L. 101
with distinction, **may** be assigned to an honors group; those who have not, **are** assigned to the regular group. When this division of the enrollment is made, the students in the honors group are offered the opportunity to complete their study of elementary German under a program of instruction which is more direct in presentation, more intensive in character, and more comprehensive in content than is the one conducted for those in the regular group. The courses which constitute the program offered the honors group are M.L. 105-106; those which constitute the program conducted for the regular group are M.L. 102-103. Participation in the first of these programs is completely voluntary on the part of the students concerned.

Students who have two or more years of high school credit and who are therefore encouraged to register initially for a course not lower in number than M.L. 201, may choose between the series M.L. 201-202-203 and the series M.L. 204-205-206 — if they do elect to enroll in a second-year course. Those who are interested in acquiring a passive knowledge of the language for use as a tool of research are advised to register for M.L. 201-202-203. Those who are interested in acquiring an active knowledge of the language for use not merely as a tool of research but also as a medium of cultural development, may register for the series M.L. 204-205-206. Since enrollment in this latter series is largely derived from the above mentioned M.L. 106, however, the series M.L. 204-205-206 is more highly recommended for students whose prior training has qualified them for instruction through the medium of the German language than it is for others. Each of the two series, M.L. 201-202-203 and M.L. 204-205-206, may be taken for full credit toward graduation; and either series may be taken first.

Of the matriculating freshmen who have three or more years of high school credit, an exceptional few may register initially for the series M.L. 304-305-306. When such students do register initially for this series, they are expected to bring qualifications which are of the kind recommended for M.L. 204-205-206 but which naturally represent a higher level of achievement than do those expected for the lower series. In general, however, the placement of such students in this 300 series will occur after registration; in response to application by the students for transfer to the more advanced level of study; and upon recommendation of this transfer by the staff members concerned.

**M.L. 10. Elementary German for Graduate Students**

5-0-0. Prerequisite: None. (Available in summer quarter only.)

Pronunciation; skeletal presentation of German grammar; translation of scientific literature into English. (By preparing the student in one quarter for admission into the first course of the appropriate second-year series—normally M.L. 201—this course affords him an opportunity to shorten the period of time usually required for his preparation for the Ph.D. reading-knowledge examination.)

**M.L. 101. Elementary German**

3-0-3. Prerequisite: None.

Pronunciation; essential principles of German grammar; rapid acquisition of vocabulary by the reading of simple selections; elementary composition.
M.L. 102. Elementary German
3-0-3. Prerequisite: M.L. 101 or equivalent.
Continuation of M.L. 101.

M.L. 103. Elementary German
3-0-3. Prerequisite: M.L. 101 and 102 or equivalent.
Reading of German scientific and general material and the acquisition of a large scientific vocabulary; continued study of German grammar; composition.

M.L. 105. Intensive Elementary German
3-1-3. Prerequisite: Departmental selection on the basis of achievement in M.L. 101.
Except for intensification, acceleration, regular practice in conversation, and a weekly one-hour laboratory requirement, essentially the same course as M.L. 102.

M.L. 106. Intensive Elementary German
3-1-4. Prerequisite: M.L. 105.
Continuation of M.L. 105.

M.L. 201. Intermediate German
3-0-3. Prerequisite: M.L. 101-102-103 or equivalent.
Reading of German scientific and technical material; individual problems to conform, whenever possible, with the student's special field of study.

M.L. 202. Intermediate German
3-0-3. Prerequisite: M.L. 201 or equivalent.
Continuation of training given in M.L. 201.

M.L. 203. Intermediate German
3-0-3. Prerequisite: M.L. 201 and 202 or equivalent.
Reading of German prose in support of the development achieved in M.L. 201 and 202.

Note: The series M.L. 201-202-203 is a suitable combination of courses for graduate students who have a knowledge of elementary German and who wish to prepare for reading-knowledge examinations for advanced degrees.

M.L. 204. Intensive Intermediate German
3-0-3. Prerequisite: Completion of the intensive courses of the 100 series; otherwise permission of the staff.
Review of grammar; intensive practice in conversation and composition.

M.L. 205. Intensive Intermediate German
3-0-3. Prerequisite: M.L. 204 or equivalent.
Continuation of M.L. 204; study of twentieth-century prose.

M.L. 206. Introduction to Contemporary German Culture
3-0-3. Prerequisite: M.L. 204 and M.L. 205 or equivalent.
Aspects of cultural, intellectual, and social life of modern Germany. Collateral and class readings; written and/or oral reports; class discussion. Course conducted in German.

M.L. 304-305-306
A Survey of German Literature from circa 1830 to the Present
Class and collateral study of prose, drama, and lyric poetry by representative authors through indicated literary movements; course conducted in German.

3-0-3. Prerequisite: M.L. 204-205-206 or equivalent.

3-0-3. Prerequisite: M.L. 204-205-206 or equivalent.

3-0-3. Prerequisite: M.L. 204-205-206 or equivalent.
Russian

Of those students who indicate interest in the study of elementary Russian, only a select few are admitted to the course. Whether they are matriculating freshmen or others, they are restricted in number by the prerequisites for admission which the exacting limits of our Russian program impose. The result of this careful selection is that the competition which the students naturally afford each other makes the Russian program more intensive in character than it otherwise would be.

M.L. 154. Elementary Russian
3-2-4. Prerequisite: For matriculating freshmen and for sophomores, two years or more of high school training in any foreign language(s), ancient or modern, and selection on the basis of departmentally established criteria. For all other students, college credit for at least one year's study of a foreign language. For all students, exceptions at the discretion of the staff.

During three class hours — to be scheduled at registration — conventional study of grammar and illustrative reading. During two laboratory hours — to be scheduled after registration — intensive familiarization with recorded study material.

M.L. 155. Elementary Russian
3-2-4. Prerequisite: M.L. 154 or equivalent.

Continuation of M.L. 154; introduction of additional reading material as progress of class permits.

M.L. 156. Elementary Russian
3-2-4. Prerequisite: M.L. 154 and M.L. 155 or equivalent.

Continuation of M.L. 154 and 155; emphasis on the reading of simple prose.

M.L. 251. Intermediate Russian
3-0-3. Prerequisite: M.L. 154-155-156 or equivalent.

Reading of short literary selections; acquisition of a large vocabulary; oral practice in the language. Review of Russian grammar; analysis of word and sentence structure.

M.L. 252. Intermediate Russian
3-0-3. Prerequisite: M.L. 251 or equivalent.

Continuation of reading and conversation; composition; translation. Reading of Russian newspapers and journals.

M.L. 253. Advanced Russian
3-0-3. Prerequisite: M.L. 251 and 252 or equivalent.

Reading of Russian scientific literature from various sources.

Spanish

The second-year series M.L. 213-214-215 and the third-year series M.L. 313-314-315 are intended for all respectively eligible English-speaking students. Depending upon their qualifications, matriculating freshmen may be eligible for either of these two series: those who have two or more years of high school credit in Spanish are encouraged to register initially for a course not lower in number than M.L. 213; those who have three or more years of high school credit may register initially for the available course of the series M.L. 313-314-315. In general, however, even those matriculating freshmen who have three or more
years of high school credit are advised to consult the staff of the Department of Modern Languages before registering initially for any course in this third-year series.

Each of the two fourth-year series, the regular series M.L. 413-414-415 and the alternate series M.L. 416-417-418 — the six most elementary courses to which Spanish-speaking students are admitted — is so graded as to afford, for those English-speaking students who have completed with adequate distinction the series M.L. 313-314-315 or the equivalent, a logical opportunity for a fourth year of study. Either of these fourth-year series may be taken alone.

**M.L. 113. Elementary Spanish**  
3-0-3. Prerequisite: None.  
Pronunciation; grammar; reading; composition; simple conversational exercises.

**M.L. 114. Elementary Spanish**  
3-0-3. Prerequisite: M.L. 113 or equivalent.  
Continuation of M.L. 113; increased emphasis on reading and conversation.

**M.L. 115. Elementary Spanish**  
3-0-3. Prerequisites: M.L. 113 and 114 or equivalent.  
Continuation of M.L. 114; completion of Spanish grammar.

**M.L. 213. Intermediate Spanish**  
3-0-3. Prerequisite: M.L. 113-114-115 or equivalent.  
Review of grammar; composition; conversation; reading; vocabulary building.

**M.L. 214. Intermediate Spanish**  
3-0-3. Prerequisite: M.L. 213 or equivalent.  
Continuation of review of grammar; composition; conversation; reading.

**M.L. 215. Intermediate Spanish**  
3-0-3. Prerequisites: M.L. 213 and 214 or equivalent.  
Readings from Spanish literature; conversation; composition.

**M.L. 313. Mexican Literature**  
3-0-3. Prerequisite: M.L. 215 or equivalent.  

**M.L. 314. The Spanish-American Essay and Short Story**  
3-0-3. Prerequisite: M.L. 215 or equivalent.  
Selected works reflecting contemporary problems and developments. Emphasis on ideas rather than on form. Lectures, discussions. Conducted in Spanish.

**M.L. 315. Spanish Heritage in the Americas**  
3-0-3. Prerequisite: M.L. 215 or equivalent.  
The cultural heritage of Spain in the Americas as reflected in readings from representative European and Spanish-American writers. Lectures, discussions. Conducted in Spanish.

**M.L. 413. Spanish Drama Since 1700**  
3-0-3. Prerequisite: M.L. 315 or equivalent.  
Spanish culture and significance of Spanish drama in world literature as reflected in representative dramas. Conducted in Spanish. Alternates with M.L. 416.

**M.L. 414. Introduction to Spanish Historical Linguistics**  
3-0-3. Prerequisite: M.L. 315 or equivalent.  
M.L. 415. Spanish Prose Before 1700
3-0-3. Prerequisite: M.L. 315 or equivalent.

M.L. 416. Spanish Drama Before 1700
3-0-3. Prerequisite: M.L. 315 or equivalent.
Spanish culture and significance of Spanish drama in world literature as reflected in representative dramas. Conducted in Spanish. Alternates with M.L. 413.

M.L. 417. Don Quijote
3-0-3. Prerequisite: M.L. 315 or equivalent.
Detailed study of Cervantes' masterpiece as the vortex of Spanish literature, the prototype of the modern novel, and the essence of Renaissance and Baroque literature. Conducted in Spanish. Alternates with M.L. 414.

M.L. 418. Spanish Prose Since 1700
3-0-3. Prerequisite: M.L. 315 or equivalent.

Linguistics

The courses listed below are offered as a contribution to the further development of a rising student interest in the science of linguistics.

M.L. 332. Introduction to Structural Linguistics I
3-0-3. Prerequisite: College credit for one year's study of any language, ancient or modern; exceptions at the discretion of the staff.
Presentation of methodology for scientific analysis of language; examination of data from hypothetical languages of increasing complexity prior to examination of natural languages; emphasis on phonetics and phonemics. Collateral readings; reports.

M.L. 333. Introduction to Structural Linguistics II
3-0-3. Prerequisite: M.L. 332 or equivalent.
Continuation of M.L. 332 with emphasis on morphology and syntax. Collateral readings; reports.
Department of Music

Director—Walter C. Herbert; Band Director—Ben Logan Sisk.

General Information

Musical activities at Georgia Tech have become increasingly important. Courses are offered for credit to those taking part in the Band and the Glee Club.

In addition to strenuous activity during the football season, including at least two out of town trips, the band continues as a symphonic unit during the winter and spring. Each year the Glee Club and the Band join together in an outdoor concert sponsored by the Student Lecture and Entertainment Committee.

The Glee Club, with a history of several trips abroad, annually visits a number of the girls' colleges of Georgia and the Southeast. Some years ago an appearance was made on the Ed Sullivan Show. The club has also visited New Orleans, Miami and Jacksonville numerous times, accompanying the football team to bowl games.

Courses of Instruction

Music 201. Choral Music—History
1-2-1. Prerequisites: 1. Satisfactory completion of three quarters in Glee Club; 2. Approval of the Director of Music.

Course will consist of two hours practical or laboratory work, rehearsing and performing choral music. Third hour will be given to study of the history and development of choral music, from Gregorian chant through Palestrina and Bach to the present.

Text: Stringham, Listening to Music Creatively.

Music 202. Choral Music—Conducting
1-2-1. Prerequisites: 1. Satisfactory completion of three quarters in Glee Club; 2. Approval of the Director of Music.

Laboratory work will consist of rehearsal and performance of choral music. Third hour will include practice conducting by the students.

Text: Bauman, Elementary Musicianship.

Music 203. Choral Music—Appreciation
1-2-1. Sophomore, Junior or Senior Year, Spring Quarter. Prerequisites: 1. Satisfactory completion of three quarters in Glee Club; 2. Approval of the Director of Music.

The theoretical material of this course is a study of the operas presented during the spring quarter in Atlanta by the Metropolitan Opera Association, which can be attended free of charge by the Glee Club members.

Music 301. Marching Band
0-3-1. Junior or Senior Year, Fall Quarter. Prerequisites: 1. Satisfactory completion of three (3) quarters participation in band as a Freshman or Sophomore; 2. Approval of the band director.

Precision drilling. Special Maneuvers. Military Parade Procedure. (Students completing this course are expected to be able to direct as well as participate in these routines).


Music 302. Concert Band
0-3-1. Junior or Senior Year, Winter Quarter. Prerequisites: 1. Satisfactory completion of three (3) quarters participation in band as a Freshman or Sophomore; 2. Approval of the band director.

Precision drilling. Special Maneuvers. Military Parade Procedure. (Students completing this course are expected to be able to direct as well as participate in these routines).

Freshman or Sophomore; 2. Approval of the band director.


Text: "National School Band Manual."

Music 303. Concert and Marching Band
0-3-1. Junior or Senior Year Spring Quarter. Prerequisites: 1. Satisfactory completion of three (3) quarters participation in band as a Freshman or Sophomore; 2. Approval of the band director.

Continuation of all procedures listed under Music 302 plus a resumption of the marching drill and performance which is begun in Music 301.


Music 401. Concert Band
0-3-1. Senior year, Fall Quarter. Prerequisites: Satisfactory completion of Music 303, and approval of the Band Director.

A continuation of the 300-series music courses.

Music 402. Concert Band
0-3-1. Senior year, Winter Quarter. Prerequisites: Satisfactory completion of Music 401 and approval of the Band Director.

A continuation of the 300-series music courses.

Music 403. Concert Band
0-3-1. Senior Year, Spring Quarter. Prerequisites: Satisfactory completion of Music 402 and approval of the Band Director.

A continuation of the 300-series music courses.
Department of Naval Science  
(Established in 1926)

Commanding Officer and Professor of Naval Science—Colonel Lawrence Peyton Harris, USMC; Associate Professor—Commander Robert B. Ulm, USN; Assistant Professors—Major Fitz W. M. Woodrow, Jr., USMC, Lieutenant Commander William O. Fleming, Lieutenant Commander Bernard Crook, Lieutenant Joseph E. Callahan, Lieutenant Donald R. Blakely; Instructors—Chief Quartermaster Lawrence J. Purves, Chief Gunner’s Mate Roy F. Kitts, Master Sergeant Harvey S. Brubeck, USMC, Yeoman First Class John R. Westmoreland, Electrician First Class Herbert C. Dodson, Storekeeper First Class Carl W. Stewart; Secretaries—Mrs. Virginia M. McDonald and Mrs. F. Inez Hale.

General Information

Naval ROTC students are enrolled for the full four-year period, except those students enrolled under the Two Year Contract Program at the junior level. This program, the Two Year Contract Program, is open to college sophomores in good standing at any accredited college, junior college or university, upon admission and transfer to this institution as juniors. Those students interested in this program will be required to attend a special six-week training session at one of three regionally selected NROTC universities, in order to qualify for enrollment as NROTC Contract students at the junior level. Students desiring commissions in the Marine Corps follow a different curriculum during the Junior and Senior years. Students may apply for flight training or for a commission in the Civil Engineer Corps during the Senior year. A Flight Indoctrination Program consisting of ground and flight training is conducted by a civilian flying school during the senior year for those Naval ROTC students qualified for naval flight training. Obligated service for flight training graduates is 42 months after designation as a Naval aviator. The NROTC is composed of two types of students: Regular and Contract.

Regular Students

These students are appointed Midshipman, USNR, after nation-wide competitive examinations. They have their tuition, fees and textbooks paid for by the Navy for a period not exceeding four years, are uniformed at government expense, and receive retainer pay at the rate of $600 per year. Students in this classification will not be entitled to receive simultaneous education benefits under the G. I. Bill. They must obligate themselves to complete the prescribed Naval Science curriculum, to make a cruise of from six to eight weeks each summer, to accept a commission as Ensign, USN, or Second Lieutenant, USMC, upon graduation, and to serve on active duty for four years after commissioning unless earlier released by the Navy Department. At the end of this period their obligation to the Navy or Marine Corps is fulfilled. If they do not desire to remain on active duty in the Regular Navy or Marine Corps, they are ordered to inactive duty in the Naval or Marine Corps Reserve.
Contract Students

These students are enrolled under the provision of Public Law 88-647. They are uniformed at government expense and during their junior and senior years are paid retainer pay of $50.00 per month. They must obligate themselves to complete the prescribed Naval Science curriculum, to make one summer cruise of approximately six weeks during the summer between their junior and senior year; and to accept a commission on graduation as Ensign, USNR or Second Lieutenant, USMCR.

In consideration for the benefits accrued by reason of membership in the Contract NROTC Program, the student is required to enlist in the U. S. Naval Reserve or Marine Corps Reserve for a period of six years prior to starting the junior year. These students are deferred from the draft, but must agree to serve on active duty for not less than three years after appointment to commissioned rank in the U. S. Naval Reserve or Marine Corps Reserve and to retain their commission until the sixth anniversary of receipt of original commission. After receiving their commissions, application may be made for a commission in the Regular Navy or Marine Corps. Students receiving these benefits may receive them in addition to G.I. Benefits to which they are entitled.

Naval Science Students

A limited number of students may enroll as Naval Science students. Normally these students are potential replacements for vacancies among Contract students. Those enrolled as Naval Science students take Naval Science courses as electives and have no contract with the Navy. They have no assurance of ultimate commissioning nor do they derive any of the benefits available to Regular and Contract students. They have no draft deferments.

Selection Procedure

Regular students are selected in nation-wide competitive examinations held in December and the NROTC at Georgia Tech has no part in this selection, although information about the Regular Program is available. In addition, the Professor of Naval Science may annually nominate several Contract students to the Chief of Naval Personnel for a Regular scholarship.

To apply for the Contract Program, a student must:
1. Be enrolled in Georgia Tech, or attending an accredited college or university in the near vicinity.
2. Be at least 17 and not over 21 years of age.

Applicants are selected to fill the quota based on:
1. Physical qualifications.
2. Interview by Naval officers.
3. Score on Navy examination.
4. High School record.

Applicants for the Contract program should apply at the Naval Armory during the first day of Freshman Orientation Week for the Fall Quarter.
Naval Science students are selected in limited numbers only, usually to fill potential vacancies among Contract students.

Three candidates may be nominated each year by the President of the Georgia Institute of Technology for competitive examinations for entrance to the United States Naval Academy. These nominations are normally made during the Winter Quarter. Both Contract and Regular students are eligible.

**Curriculum**

All NROTC students follow the same curriculum during their freshman year, attending three (3) hours of Naval Science class and one (1) hour of associated laboratory or drill each week.

Sophomore students follow the same curriculum, attending three (3) hours of Naval Science class and one (1) hour of associated laboratory or drill each week, except that Mechanical Engineering students in good standing may substitute upon request of the Professor of Naval Science N.S. 233 (0-1-0) for N.S. 221 (3-1-2) without being required to make up the credit hours. Students desiring Marine Corps commissions, submit applications to follow subject curriculum during their junior and senior years.

Junior Line students will attend three (3) hours of Naval Science class and two (2) hours of associated laboratory and drill each week.

Junior Marine Option students will attend three (3) hours of Naval Science class appropriate to the type of commission sought and two (2) hours of associated laboratory and drill each week, except that during the third quarter, General Psychology (Psy. 303) or Industrial Psychology (Psy. 401) will be studied in lieu of Naval Science. Students during this quarter will attend the appropriate laboratory or drill sessions with no additional credit being earned.

Senior Line students will attend three (3) hours of Naval Science class and two (2) hours of associated laboratory and drill each week, except during the first quarter, when General Psychology (Psy. 303) or Industrial Psychology (Psy. 401) will be studied in lieu of Naval Science. Students during this quarter will attend appropriate Naval Science laboratory and drill for which no additional credit will be earned.

Senior Marine Option students will attend three (3) hours of Naval Science class and appropriate laboratory and drill each week.

No more than six (6) hours of credit in Basic Naval Science courses and no more than nine (9) hours of credit in Advanced Naval Science courses may be applied toward a degree.
Courses of Instruction

NOTE: 3-2-3 means 3 hours class, 2 hours laboratory, 3 hours credit.

N.S. 111. Naval Orientation and Introduction to History of Sea Power
3-1-2.
A study of the NROTC program and the Naval Service, its mission, ideals, standards, traditions, customs and the duties required of the midshipman. Also an introduction to the study of the influence of sea power on history.

N.S. 112. History of Sea Power—Part I
3-1-2.
A study of the concepts of sea power from early world history until the rise of the United States as a world sea power stressing: (1) the influence of sea power upon history; (2) the evolution of naval tactics; (3) the rationale of strategic decision; (4) the development of naval weapons; (5) the characteristics of successful leadership; and (6) the evolution of amphibious doctrine.

N.S. 113. History of Sea Power—Part II
3-1-2.
A study of the concepts of sea power from the rise of the United States as a world sea power until the present, stressing: (1) the influence of sea power upon history; (2) the evolution of naval tactics; (3) the rationale of strategic decision; (4) the development of naval weapons; (5) the characteristics of successful leadership; and (6) the evolution of amphibious doctrine.

N.S. 221. Naval Engineering—Part I
3-1-2.
A study of the general physics and chemistry as applied to naval propulsion plants and ship systems. A study of the principles and applications of marine stability. An introduction to the physics of nuclear power. (Mechanical Engineering majors in good standing may be excused from this course upon request.)

N.S. 222. Naval Engineering—Part II and Naval Weapons—Part I
3-1-2.
A study of the principles of nuclear reactors and the problems connected with these power plants. A study of the science of ballistics, stressing the application of physics and trigonometry. A study of the design of naval weapons and the principles of hydraulic and pneumatic systems as applied to weapon design.

N.S. 223. Naval Weapons—Part II
3-1-2.
A study of the principles of electrical and electro-hydraulic systems as applied to the control and operation of naval weapons. Solution of fire control problems by computer systems. A study of the employment of weapon systems in fleet operations with special emphasis on guided missiles. A study of future trends and an introduction to space technology.

N.S. 233. Naval Science Laboratory
0-1-0.
Naval laboratory exercises and military drill. No preparation is required and no tests will be given. The grade of “S” will be given for satisfactory completion of this course. Aptitude marks will be assigned.

N.S. 344. Navigation—Part I
3-2-3.
A study of the sciences and mathematical techniques involved in determining position through the use of navigational aids, instruments, tables, and almanacs. Introduction to celestial navigation.

3-2-3.
A study of the science of celestial navigation by application of the theory and principles of nautical astronomy and spherical trigonom-
etry. Introduction to the elements and principles of operations at sea.

N.S. 346. Naval Operations—Part II
3-2-3.
A study of the elements and principles of operations at sea designed to provide an understanding of command responsibility and to develop command capabilities. The following studies are emphasized: (1) international and U.S. regulations governing waterborne traffic, (2) current tactical doctrine, (3) relative motion problems, and (4) offensive and defensive employment of naval forces, (5) fleet communications and electronic countermeasures, and (6) the relationship of meteorological phenomena to operations at sea.

N.S. 443. Naval Science Laboratory
0-2-0.
Naval laboratory and military drill. Laboratory exercises cover case studies of situations requiring exercise of human understanding and leadership; military drill emphasizes leadership. No preparation is required and no tests will be given. The grade of "S" will be given for satisfactory completion of this course. Aptitude marks will be assigned. This course must be taken by all Line Senior Midshipmen during the Fall Quarter. Psychology 303 or 401 should be scheduled concurrently with this course, unless previously scheduled due to requirements of major.

N.S. 444. Principles and Problems of Leadership — Part I
3-2-3.
This course is divided into two phases. Phase one is a study of the fundamental functions of management—planning, organizing, activating, and controlling; and emphasis upon the responsibility of naval officers in connection therewith. Phase two is a study of the naval judicial system and the role of discipline in leadership.

N.S. 445. Principles and Problems of Leadership—Part II
3-2-3.
A study of concepts of leadership, effective group communication, relationships between the leader and the group, motivation of a group, and the role of mental health in management of personnel.

Marine Corps Option
N.S. 361. Naval Science Laboratory
0-2-0.
Marine Corps laboratory exercises and military drill, emphasizing leadership. No preparation is required and no tests will be given. The grade of "S" will be given for satisfactory completion of this course. Aptitude marks will be assigned. This course must be taken by all Junior Marine Corps Option Midshipmen during the Spring Quarter. Psychology 303 or 401 should be scheduled concurrently with this course.

N.S. 362. Modern Basic Strategy and Tactics
3-2-3.
A study of the science of modern strategy and tactics, emphasizing the nine Principles, four Strands, and three Variables of military operations.

N.S. 363. Evolution of the Art of War—Part I
3-2-3.
A study of military history, emphasizing the development of the Art of War from the earliest recorded time through World War I.

N.S. 461. Evolution of the Art of War—Part II and Amphibious Warfare—Part I
3-2-3.
A study of the evolution of the Art of War from the end of World War I to the present, with particular emphasis on amphibious operations.
N.S. 462. Amphibious Warfare—Part II
3-2-3.

A study of the current U. S. amphibious warfare doctrine with particular emphasis on strategic decision in relation to amphibious warfare and the tactical employment of amphibious weapons.

N.S. 463. Principles and Problems of Leadership
3-2-3.

A study of the basic principles, problems and techniques of military leadership. Includes case studies of leadership situations. The midshipman is also given an introduction to military law, the administration of courts-martial and the role of discipline in leadership.
School of Nuclear Engineering

(Established in 1962)

Director—C. J. Roberts; Professor—G. G. Eichholz, D. S. Harmer; Associate Professors—F. W. Chambers, Jr., J. D. Clement; Assistant Professors—W. W. Graham, R. J. Johnson, J. H. Rust; Research Engineer—J. A. Alderman, Jr.; Collaborating staff members of other schools and departments—R. W. Fink, H. M. Neumann, Chemistry; R. H. Fetner, Applied Biology; L. J. Gallaher, Rich Electronic Computer Center; Special Lecturers—J. I. Berlin, J. R. Williams.

General Information

The School of Nuclear Engineering administers programs leading to degrees of Master of Science and Doctor of Philosophy. Students with undergraduate degrees in engineering, science or mathematics are eligible to apply for admission. The intent of these degree programs in nuclear engineering is to provide suitable educational experience to carefully selected students for careers which require a knowledge of nuclear energy and its applications. The programs at the M.S. level provide three areas of emphasis—reactor technology; radiation utilization, and radiological science—and the respective curricula are constructed from various combinations of the nuclear engineering courses listed below, supplemented with courses in other departments as needed:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>N.E. 601</td>
<td>Reactor Technology I</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 602</td>
<td>Reactor Technology II</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 610</td>
<td>Radiation Detection</td>
<td>2-6-4</td>
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<tr>
<td>N.E. 611</td>
<td>Nuclear Engineering Laboratory I</td>
<td>1-6-3</td>
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<tr>
<td>N.E. 612</td>
<td>Nuclear Engineering Laboratory II</td>
<td>1-6-3</td>
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<tr>
<td>N.E. 613</td>
<td>Radiation Technology Laboratory</td>
<td>1-6-3</td>
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<tr>
<td>N.E. 620</td>
<td>Nuclear Engineering Design</td>
<td>2-6-4</td>
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<tr>
<td>N.E. 625</td>
<td>Reactor Calculations</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 630</td>
<td>Reactor Control</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 632</td>
<td>Radioisotopes Engineering</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 640</td>
<td>Radiation Protection</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 641</td>
<td>Particle Accelerators</td>
<td>2-3-3</td>
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<tr>
<td>N.E. 647</td>
<td>Fundamentals of Nuclear Engineering</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 676</td>
<td>Reactor Physics I</td>
<td>5-0-5</td>
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<tr>
<td>N.E. 677</td>
<td>Reactor Physics II</td>
<td>5-0-5</td>
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<tr>
<td>N.E. 679</td>
<td>Radiation Attenuation</td>
<td>3-3-4</td>
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<tr>
<td>N.E. 680</td>
<td>Advanced Reactor Theory</td>
<td>5-0-5</td>
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<tr>
<td>N.E. 681</td>
<td>Environmental Surveillance and Radioactive Waste Disposal</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 710</td>
<td>Advanced Radiation Detection</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 721</td>
<td>Nuclear Reactor Safety</td>
<td>3-0-3</td>
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<td>N.E. 730</td>
<td>Radiation Effects on Materials</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 732</td>
<td>Radioisotopes Engineering II</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 740</td>
<td>Radiation Dosimetry</td>
<td>3-0-3</td>
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<tr>
<td>N.E. 741</td>
<td>Applied Radiological Physics</td>
<td>2-3-3</td>
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A thesis or equivalent work in special problems is encouraged as part of each M.S. program, but approved courses or satisfactory performance at an approved engineering practice school (e.g., Summer Engineering Practice School conducted by the Associated Midwest Universities at Argonne National Laboratory) may be substituted in place of the thesis.

The Ph.D. program is designed with even greater latitude so as to capitalize on variations in experience as well as interests of each student. The graduate bulletin contains a large number of additional graduate courses closely relevant to nuclear engineering. Conspicuous among these are courses such as: Ch.E. 630, 631, Radiochemical Separation Processes; Chem. 626, Fast-neutron Interactions; Biol. 630, Biological Effects of Radiation; A.E. 782, Space Nuclear Propulsion; and others.

Facilities for the support of these graduate programs are unexcelled on any campus. The Radioisotope and Bioengineering Laboratory and the Frank H. Neely Nuclear Research Center provide Georgia Tech with outstanding research capability in fields of interest to nuclear engineering. Included are a heavy-water moderated, five-megawatt research reactor, a low power training reactor, a sub-critical assembly, a sub-critical assembly, a PDP-8 data acquisition system, hot cells for handling highly radioactive materials remotely, a 12,000 curie cesium-137 radiation source, a one-million-vote Van de Graaff accelerator, and a reactor simulator. Laboratory facilities are being developed for research in fluid flow and heat transfer. Additional assets of extreme importance are the Price Gilbert Memorial Library, with its collection of A.E.C. documents, and the Rich Electronic Computer Center.

Undergraduate students contemplating a future academic program in nuclear engineering are encouraged to take a course in modern physics, such as Physics 319, and their attention is invited to the pertinent senior-level electives, such as N.E. 447 or N.E. 411-2-3, Physics 404 or Met. 403. Those who are not familiar with the use of digital computers will be expected to gain this experience during their first quarter of graduate study.

For further information, please contact the Director, School of Nuclear Engineering or the Dean, Graduate Division.

Undergraduate Courses of Instruction

NOTE: 2-3-3 means 2 hours class, 3 hours laboratory, 3 hours credit.

N.E. 411. Nuclear Reactor Engineering I
2-3-3. Prerequisite: Math. 203, Physics 209.

The sequence N.E. 411-2-3 together constitute a thorough, comprehensive course in nuclear reactor engineering. It is intended for the student of engineering or science whose career may involve the design, operation, evaluation or development of nuclear systems or components. Topics discussed in the first quarter include nuclear reactions, radiation and its interactions, health physics, behavior of neutrons in matter and steady state reactor theory. Laboratory experiments are closely integrated with classroom discussions. Text: Glasstone and Sesonske, Nuclear Reactor Engineering.
N.E. 412. Nuclear Reactor Engineering II
2-3-3. Prerequisite: N.E. 411.

This second course of the sequence covers reactor kinetics, control of nuclear reactors, reactor materials and fuels, and nuclear radiation shielding. Laboratory experiments utilize a subcritical assembly and the critical reactors.

N.E. 413. Nuclear Reactor Engineering III
3-0-3. Prerequisite: N.E. 412.

The final course emphasizes the reactor system as a whole. Topics include energy removal and conversion, reactor safeguards and siting, preliminary reactor design, reactor systems and nuclear power costs.

N.E. 447. Elements of Nuclear Engineering
3-0-3. Prerequisites: Math. 203, Physics 209.

An introductory course which presents a general survey of radiation, fission, fusion and other nuclear transformations with examples of how these phenomena may be exploited in industrial and engineering applications. Material covered includes an engineering treatment of pertinent areas of nuclear physics, simplified reactor theory, and a survey of radiation, its measurement, associated hazards and uses. Text: Murphy, Elements of Nuclear Engineering.
Department of Physical Training

Department Head—John McKenna; Professor—Lyle Welser; Associate Professors—Norris C. Dean, Byron Gilbreath, John C. Hyder, James H. McAuley, Tommy Plaxico; Assistant Professor—Robert Nelson; Instructor—Douglas L. Fowlkes, David W. Houser; Secretary—Mrs. Forest H. McGeary.

General Information

All male students entering Georgia Institute of Technology as freshmen or sophomores are required to take Physical Training 4 hours per week, receiving 1 hour credit. The schedule will call for two, two-hour periods on alternate days; one hour for physical training, thirty minutes for dressing and thirty minutes for shower. The annual physical examinations (see page 33) will determine any exemptions from physical training. Students bringing certificates of disability from personal physicians must have the certificates endorsed by the school physician before they will be accepted by the department.

All male freshman and sophomore students will be required to take Physical Training, except the following who will be exempt: Students not physically able; students twenty-one years of age, or over, on first admission to the Georgia Institute of Technology; and transfer students who shall receive one quarter exemption for each quarter as a full-time student at another institution. Students may register for only one Physical Training course per quarter. Female students will not be allowed to register for P.T. courses.

NOTE: Men excused from Physical Training are not required to make up the credit hours in additional subjects.

Students taking physical training will be required to purchase a standard uniform consisting of a sweat shirt, gym pants, athletic supporter, socks and shoes. The uniform will be sold at cost and normally should not exceed $12. Locker facilities for those living neither on the campus nor in nearby fraternity houses may be secured by a two-dollar deposit with a refund of $1.50 at the end of the school year if the lock and locker are surrendered in good condition. Dressing room space, showers and towels are provided all students free of charge.

Freshman Physical Training

The object of these courses is to give the students sound basic concepts regarding exercise, physical fitness, and water safety, and to motivate them into achieving and maintaining these goals. One quarter will be devoted to swimming, one to physical fitness, orientation, gymnastics, and one to track. Swimming, tumbling, apparatus work, calisthenics, walking and running are basic to well rounded, sound physical development.
At the end of the year, students who make sufficient progress will be sent on to sophomore physical training.

**P.T. 101. Swimming**
The primary objective of this course is SURVIVAL, and it is designed to “drown-proof” our students. Emphasis is placed on developing the ability to successfully handle typical Armed Forces swimming emergencies, such as cramps, disabling injuries, and long submersions. The application of basic mechanical principles is stressed to make students think for themselves, rather than accept dogmatic statements.

**P.T. 102. Physical Fitness, Orientation, and Gymnastics**
The purpose of the course will be to help orient the student through actual experience to some of the basic factors of physical fitness and to show how these factors tie in with greater achievement, not only in performing gymnastic movements, but with better all around physical performance and with higher social standards through life. Through the medium of 70 carefully chosen skills, it will be the goal to develop an appreciation of the significance of good coordination, efficiency of movement, rhythm, kinesthetic sense, confidence, courage, good form and team work, plus a wholesome, practical philosophy of the real value of exercise and of keeping physically fit. Each student shall earn his grade points and 60 points is essential as a minimum to pass the course. Points shall be distributed as follows:

<table>
<thead>
<tr>
<th>Points</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. First fitness test</td>
<td>10</td>
</tr>
<tr>
<td>2. Second fitness test</td>
<td>20</td>
</tr>
<tr>
<td>3. Sixty of the seventy skills</td>
<td>1 point each</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Attitude, hygienic practices</td>
<td>10</td>
</tr>
<tr>
<td>and sportsmanship</td>
<td></td>
</tr>
</tbody>
</table>

**P.T. 103. Track**
Instruction and practice will be given in starting, striding, use of the arms in running, and body lean. The object of the course is to build strong legs and to increase lung and heart capacity. The minimum score to pass the course is an average grade of 60.

**Grade Scale:**

- **100 Yd. Dash**
  - A 11 to 11.5 sec.
  - B 11.5 to 12 sec.
  - C 12 to 12.5 sec.
  - D 12.5 to 13 sec.

- **220 Yd. Dash**
  - A 26 to 27 sec.
  - B 27 to 28 sec.
  - C 28 to 29 sec.
  - D 29 to 30 sec.

- **Quarter Mile Run (440 Yds.)**
  - A 58 to 63 sec.
  - B 63 to 68 sec.
  - C 68 to 73 sec.
  - D 73 to 78 sec.

- **Half Mile Run (880 Yds.)**
  - A 2 min. 30 sec. to 2 min. 40 sec.
  - B 2 min. 40 sec. to 2 min. 50 sec.
  - C 2 min. 50 sec. to 3 min.
  - D 3 min. to 3 min. 10 sec.

- **Mile Run**
  - A 5 min. 30 sec. to 5 min. 50 sec.
  - B 5 min. 50 sec. to 6 min. 10 sec.
  - C 6 min. 10 sec. to 6 min. 30 sec.
  - D 6 min. 30 sec. to 6 min. 50 sec.

**Sophomore Physical Training**
This is a maintenance course. The condition developed in the freshman year will be maintained and at the same time skills will be taught in games and other events that appeal to young men. One quarter will be
devoted to indoor games, one to outdoor games and one to recreative sports.

P.T. 201. Indoor Games

Basketball will be the game on which the majority of effort will be concentrated. As the physical training facilities are expanded other games may be added. The basic fundamentals of the games will be demonstrated and practiced. After the class has developed some skill, teams will be organized for actual competition.

P.T. 202. Outdoor Games

Softball, touch football and soccer are the basic games for this course. This course is an exact parallel to the Indoor Games in the methods used and in the instruction and play arrangement.

P.T. 203. Recreative Sports

The class will receive instruction in the fundamentals of tennis, volleyball, or paddle ball. The purpose of the course is to provide recreational exercise and to develop an appreciation of these carry-over sports as recreation and as a means of maintaining a moderate level of physical fitness.

The student shall be graded on the proficiency he demonstrates in these sports. Attendance, attitude, and effort—except when inadequate—shall be considered only to the extent that their diligent application invariably results in greater proficiency.
School of Physics  
(Established in 1939)


General Information

Physics has been known primarily as a basic science. Today, fundamental research into the principles of physics continues to occupy the attention of many physicists, but, in addition, the study of physics has become increasingly important as a basis for fundamental research in interdisciplinary areas such as biophysics and chemical physics and as an applied science in government and industry. The increased complexity of much fundamental and applied research frequently dictates that scientists trained in many specialties work side by side; often physicists, mathematicians, chemists, psychologists, biologists, several kinds of engineers, and, perhaps, other kinds of scientists may be found working together towards a common goal. Furthermore, as society becomes more technically oriented a trend may be discerned in the direction of scientifically trained individuals assuming a more important role in management and administrative functions. Evidently, it is becoming increasingly important that scientific personnel have, in addition to a high degree of competence in their specialty, some competence in related fields in order that they may work effectively on problems that cut across traditional disciplines.

The School of Physics offers basic service courses to all sophomores, some advanced service courses for students of engineering, science, or mathematics, and advanced work leading to a bachelor's, master's, or doctor's degree in physics. In order to enable students with a wide variety of interests to work out suitable programs of study leading to a bachelor's degree in physics, the School has restricted its required
courses to the fundamental principles of physics and has provided a large number of elective hours in the junior and senior years. Furthermore, in order to enable students to concentrate their attention on a few subjects at a time, the requirements are such that only four subjects should be scheduled concurrently in most quarters during the junior and senior years. Accordingly, a high level of performance and substantial independent study will be expected in the junior and senior level physics courses.

A requirement for a bachelor's degree in physics is a point average of at least 2.0 in junior and senior physics courses.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem.</td>
<td>101-2-3</td>
<td>General Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
<td>3-3-4</td>
</tr>
<tr>
<td>E.Gr.</td>
<td>113</td>
<td>Engineering Graphics</td>
<td></td>
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<td>0-6-2</td>
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<tr>
<td>Eng.</td>
<td>107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Math.</td>
<td>107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
<td>5-0-5</td>
<td>5-0-5</td>
</tr>
<tr>
<td>M.L.</td>
<td></td>
<td>Modern Language OR</td>
<td></td>
<td></td>
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<tr>
<td>S.S.</td>
<td>111-12-13</td>
<td>Social Science</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>P.T.</td>
<td>101-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
</tr>
<tr>
<td>ROTC **</td>
<td></td>
<td>Basic ROTC (optional)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen.</td>
<td>101</td>
<td>Orientation</td>
<td></td>
<td></td>
<td>1-0-0</td>
</tr>
</tbody>
</table>

Totals (excluding ROTC) 15-7-16 14-7-16 14-13-18

*It is recommended that students who intend to take graduate work schedule French, German, or Russian. The language may be scheduled in the Freshman year, or in any other year as an elective.

**ROTC is an optional requirement, and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
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</thead>
<tbody>
<tr>
<td>Eng.</td>
<td>201-2-3</td>
<td>Survey of the Humanities</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Math.</td>
<td>207</td>
<td>Calculus IV</td>
<td>5-0-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math.</td>
<td>208</td>
<td>Calculus and Linear Algebra</td>
<td>5-0-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math.</td>
<td>209</td>
<td>Ordinary Differential Equations</td>
<td>5-0-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phys.</td>
<td>217-18-19</td>
<td>or General Physics</td>
<td>5-3-6</td>
<td>5-3-6</td>
<td>5-3-6</td>
</tr>
<tr>
<td>P.T.</td>
<td>201-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
</tr>
<tr>
<td>ROTC **</td>
<td></td>
<td>Basic ROTC (optional)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Totals (excluding ROTC) 13-7-15 13-7-15 13-7-15

**ROTC is an optional requirement, and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

**Junior and Senior Years.** The minimum total number of credit hours required for a bachelor's degree in physics is 198. The following list itemizes the courses required of all candidates for the degree, in addition to the courses which have been listed for the freshman and sophomore years. Prior to the senior year it is expected that each student, through attendance at seminars or by independent study, will acquire
the ability to program simple problems for one of the digital computers available on the campus.

**Required Courses for Junior and Senior Years**

Physics 301-2-3 Classical Mechanics, Electricity and Magnetism (5-0-5 each) ........................................ 15 hrs.

Physics 321 Quantum Mechanics I ......................................................... 5 hrs.

Physics 309 Thermal Physics .............................................................. 5 hrs.

Physics Electives, including at least three courses with labs. 20 hrs.

Humanities Electives, selected from list on p. 40 6 hrs.

Electives, to bring total hours to 198 (not more than 9 hrs. in advanced ROTC) 46 hrs.

Total 97 hrs.

An undergraduate program with an emphasis in geophysics, biophysics or chemical physics can be worked out within the Physics curriculum by a proper assignment of the elective courses. Programs with a major in Physics and with a minor in any one of several other disciplines are also possible.

Students preparing for graduate study in physics should elect more than the required 20 hours of physics courses and should also elect additional mathematics courses. These additional hours in physics and mathematics would count toward the required 46 hours of general electives. Students who take the minimum required work in physics and mathematics are not precluded from pursuing graduate study in physics but they should be prepared to accept a prolongation of their graduate programs.

The following courses should be elected by a student who is preparing for graduate study in physics:

Physics courses: 304, 306, 421; two of the following three courses (433, 434, 435); two of the following three courses (423, 436, 441).

Mathematics courses: 309, 412, 413; and nine additional hours of mathematics electives.

**Courses of Instruction**

**Note:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

**Phys. 207. Mechanics**


Physics 207-8-9 together constitute a thorough course in basic physics for engineers. The five hours of class include one or two demonstration lectures per week. The solution of a large number of problems is required, and the course includes applications of the elements of calculus.

The laboratory work is designed to give practice in the art of making precise measurements, proficiency in the manipulation of apparatus and added familiarity with some of the concepts of physics. The theory of errors is stressed enough to give students the ability to decide under what conditions the greater expense of more precise measurement is justified.


**Phys. 208. Electricity**

5-3-6. Prerequisites: Phys. 207, Math. 109.

Electricity and related phenomena taught as a part of the basic physics course described under Physics 207.

Phys. 209. Heat, Sound and Light
5-3-6. Prerequisites: Phys. 208, Math. 109.
Heat, sound, light and atomic physics taught as a part of the basic physics course described under Physics 207.
Text: Richards, Wehr, Sears, Zemansky, Modern University Physics.

Phys. 211, 212, 213. Elementary College Physics
4-0-4. Prerequisite: Phys. 211 is prerequisite to Phys. 212 or 213.
This sequence of courses is designed to meet the needs of the students in the less technical curricula. It includes a basic study of the physical principles of Mechanics, Sound, Heat, Electricity, Light and Modern Physics. Mathematics below the level of calculus is used freely to provide practice in the use of mathematics in logical reasoning. The method of teaching and the subject matter are chosen to give an understanding of the scientific methods and to give a background of scientific information and terminology which is needed today to comprehend the commercial, cultural, and political significance of scientific progress.
Text: Miller, College Physics.

Phys. 217, 218, and 219. General Physics
5-3-6. These courses may be used respectively instead of Physics 207, 208, and 209 by engineering and science students who have a particular interest in physics. They may be taken only with the approval of the School of Physics and are restricted to those who can be expected to make a grade of B or better in mathematics and physics.
Text: The Berkeley Physics Course.

Phys. 244. Introduction to Astronomy
3-0-3. Prerequisite: Math. 109.
A survey of astronomy with special emphasis on the applications of physics to astronomical problems.

The nature and behavior of the earth, the other planets, stars, and stellar systems will be examined.
Text: Struve, Elementary Astronomy.

Phys. 301, 302, 303. Classical Mechanics and Electricity and Magnetism
5-0-5. Prerequisites: Phys. 209 and Math. 209.
A sequence of courses in classical mechanics and electricity and magnetism. Dynamics of particles including oscillations and planetary motion; rotation of rigid bodies; impact; Lagrange’s and Hamilton’s Equations. Electric and magnetic fields; potentials; resistance, inductance, and capacitance, polarization, magnetic materials; development of Maxwell’s Equations and their application to the transmission of electromagnetic waves.
Texts: Constant, Theoretical Physics; and Corson and Lorrain, Introduction to Electromagnetic Fields and Waves.

Phys. 304. Electronics
5-6-7. Prerequisites: Phys. 209 and Math. 209.
Basic principles of vacuum tube amplifiers, transistor amplifiers, and some a.c. circuit theory. Special attention is given to systems frequently encountered in experimental physics, such as timing, counting, switching, and shaping circuits.
Text: Korneff, Introduction to Electronics.

Phys. 306. Optics
3-6-5. Prerequisites: Phys. 209, Math. 209 or concurrent.
Principles of wave optics: interference, diffraction, polarization and dispersion. Some of the laboratory experiments will illustrate the principles discussed in class; others will use optical techniques to investigate physical problems of more general interest.
Text: Jenkins and White, Fundamentals of Optics.
Phys. 308. Intermediate Electricity and Magnetism
3-0-3. Prerequisites: Phys. 208 and Math. 209.
This course is for non-physics majors and covers the basic concepts of electric and magnetic fields leading to the formulation of Maxwell’s equations. These fundamentals are treated with the free use of differential and integral calculus.
Text: Jifemenko, *Electricity and Magnetism*.

Phys. 309. Thermal Physics
5-0-5. Prerequisites: Phys. 209 and Math 209.
Text: Sears, *Thermodynamics, the Kinetic Theory of Gases and Statistical Mechanics*.

Phys. 319. Modern Physics for Engineers
3-0-3. Prerequisites: Phys. 207-8-9 with a minimum grade of C.
This course covers the more recent developments of physics which are of particular importance for engineers. It includes the structure of bulk matter, the structure of atoms, the properties of elementary particles, the fundamentals of nuclear physics, and the interaction of radiation with matter.

Phys. 321. Quantum Mechanics I
5-0-5. Prerequisite: Phys. 301.
Historical introduction, postulational approach to wave mechanics. Discussion of the eigenfunction-eigenvalue problem and solutions to Schroedinger’s equation: free particle, particle in a box, the square well, harmonic oscillator, rigid rotator, and hydrogen atom.
Text: Park, *Introduction to Quantum Theory*.

Phys. 404. Electronic Instruments for Nuclear Research
2-3-3. Prerequisites: Phys. 304 or E.E. 306, or equivalent.
An intermediate course in electronic instruments and instrumentation as employed in research and general laboratory measurements. Instruments employing both analog and digital techniques are treated from both the design and application points of view. The factors affecting precision, accuracy, resolution, and stability are discussed. Special emphasis is placed on the instruments of nuclear physics.
Text: The course will draw heavily from the following texts: Trimmer, *Response of Physical Systems*; Litauer, *Pulse Electronics*; Chase, *Nuclear Pulse Spectrometry*.

Phys. 421. Quantum Mechanics II
5-0-5. Prerequisite: Phys. 321.
Introduction to perturbation theory, identical particles, spin, and semi-classical radiation theory. Applications to atomic physics.
Text: Park, *Introduction to Quantum Theory*.

Phys. 423. Nuclear Physics
5-0-5. Prerequisite: Phys. 321.
Basic properties of nuclei, interactions of radiation with matter, particle accelerators, radioactivity, nuclear reactions, models of nuclear structure, and properties of elementary particles.
At level of Leighton, *Principles of Modern Physics*.

Phys. 427. Elementary Quantum Mechanics
3-0-3. Prerequisites: Senior standing.
This course is for non-physics majors. It covers a historical development, Schroedinger’s equation, and the probabilistic interpretation of quantum mechanics. One dimensional solutions of Schroedinger's equation: free particle, wave packets, particle in a box and linear oscillator. Rigid rotator. Applications to atomic structure.
Phys. 428. Topics in Experimental Physics
3-0-3. Prerequisite: Phys. 321.
Selected experiments from various fields of physics will be discussed. This is not a laboratory course and experimental techniques and design of apparatus will be treated only incidentally. Emphasis will be placed on the significance of the experiments, their general design, and the interpretation of the results.

Phys. 429. Special Problems
1-3-2. Prerequisite: The scheduling of this course must be approved by the School of Physics.
Each student is required to give extended study to some problem in physics to develop research technique, and to become familiar with the use of the library in physics.

Phys. 432. Introductory Diffraction Theory
3-0-3. Prerequisites: Senior standing or consent of instructor.
Aspects of crystal symmetry and introductory theory common to electron, neutron, and X-ray diffraction are treated. The reciprocal lattice and geometric portion of the kinematic theory are developed from the Laue-Ewald point of view. Treatment of coherent scattering from continuous distributions is introduced.
Text: Guinier, X-ray Diffraction; and Wilson, X-ray Optics.

Phys. 433, 434, 435. Advanced Laboratory I, II, III
These courses may be scheduled in any order. Experiments of classical and contemporary importance selected from various fields of physics. The experiments frequently deal with topics that have not been treated in other courses; students will be expected to acquire an understanding of the significance of the experiments through independent study. Coding of simple problems for a digital computer may be required.

Phys. 436. Plasma Physics
5-0-5. Prerequisites: Phys. 303 and Phys. 321.
A description and analysis of the plasma state of matter: Definition of a plasma, Orbit theory, Collision phenomena in ionized gases, Sheaths, the kinetic theory of ionized gases, Oscillations and waves in plasmas, Plasma instabilities, Emission and absorption of radiation by plasmas, Astrophysical and atmospheric phenomena.
Text: Holt and Haskell, Plasma Dynamics.

Phys. 438. Vibrations and Wave Motion
3-0-3. Prerequisites: Phys. 303.
Oscillations and wave motion of discrete and continuous mechanical systems. The course will emphasize those aspects of wave motion common to quantum mechanics, classical mechanics, and electromagnetism.

Phys. 439. Introductory Nuclear Reactor Physics
Review of nuclear physics including binding-energy, fission, neutron cross-sections and interactions. Basic theory of neutron chain reactions and the diffusion approximation. Calculations of critical mass and composition of elementary reactor systems.
Text: Murray, Nuclear Reactor Physics, or Jacobs, Kline, and Remick, Nuclear Science and Reactors.

Phys. 440. Special Relativity
3-0-3. Prerequisite: Phys. 303.
The concepts of observer and measurement. Critique of Newton's laws and Maxwell's equations.
Aether theory: the Michelson-Morley experiment, Lorentz contraction. Einstein's postulates and the derivation of Einstein's equations. The Doppler effect and other consequences. Lorentz invariance: non-Euclidean spaces, 4-vector analysis. Relativistic mechanics including mass-energy relations and the Compton effect.


### Graduate Courses Offered

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phys. 613</td>
<td>Physical Crystallography</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 614</td>
<td>Introductory Solid State Physics</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 616</td>
<td>Statistical Mechanics I</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 621</td>
<td>Theoretical Mechanics</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 624</td>
<td>Nuclear Physics</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 627</td>
<td>Introduction to Quantum Mechanics</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 628</td>
<td>Electromagnetic Theory I</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 631</td>
<td>Principles of Modern Physics II</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 633</td>
<td>An Introduction to Collision Theory</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 675</td>
<td>Principles of Nuclear Physics</td>
<td>3-3-4</td>
</tr>
<tr>
<td>Phys. 676</td>
<td>(See N.E. 676)</td>
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<tr>
<td>Phys. 679</td>
<td>Radiation Attenuation</td>
<td>3-3-4</td>
</tr>
<tr>
<td>Phys. 680</td>
<td>(See N.E. 680)</td>
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<tr>
<td>Phys. 682</td>
<td>Plasma Physics and Thermonucleonics</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 714</td>
<td>Optical Properties of Solids</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Phys. 715</td>
<td>Quantum Mechanics of Many-Particle Systems</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 724</td>
<td>Theoretical Nuclear Physics</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 727</td>
<td>Quantum Mechanics II</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 728</td>
<td>Electromagnetic Theory II</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 731</td>
<td>Molecular Spectra and Structure</td>
<td>5-0-5</td>
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<tr>
<td>Phys. 734</td>
<td>Introduction to Relativity</td>
<td>5-0-5</td>
</tr>
<tr>
<td>Phys. 736</td>
<td>Quantum Field Theory</td>
<td>5-0-5</td>
</tr>
</tbody>
</table>

(Complete details about these courses are contained in the Graduate Bulletin, a copy of which is available upon request.)
School of Psychology
(Established in 1959)

Director—Edward H. Loveland; Regents' Professor Emeritus—Joseph E. Moore; Professors—M. Carr Payne, Jr., Sam C. Webb; Associate Professor—William W. Ronan; Assistant Professors—E. Jo Baker, John V. Manatis, Edmond Marks, *M. Jackson Marr, Richard W. Olshavsky, C. Michael York; Secretary—Mrs. Dorris F. Jenkins; Clerk-Typist—Charlene F. Bean.

General Information

The School of Psychology serves a dual function in the Institute. First, it offers courses which permit the student majoring in architecture, engineering, industrial management, and natural sciences to gain training in the basic and applied aspects of the science of behavior. Second, it offers programs of studies leading to the degrees, Bachelor of Science in Applied Psychology and Master of Science in Psychology. The general objective of all courses is to provide an understanding of behavior within an experimental and scientific frame of reference.

The undergraduate curriculum in psychology stresses fundamentals, providing opportunity for broad training in mathematics, chemistry, physics, biology, and a number of basic engineering, management, and humanities subjects. The large number of elective courses which the student takes enables the curriculum to fulfill a wide variety of educational and vocational needs. A small portion of elective courses are restricted; the student must choose these from lists of grouped engineering and management courses prescribed by the psychology faculty. The student is encouraged to broaden his educational development by choosing at least a portion of his unrestricted elective courses from course offerings in the humanities and the social sciences.

The graduate of the Bachelor of Science curriculum in applied psychology will be prepared to work in personnel and training departments in industry, and to serve with a human factors research team investigating human requirements in equipment design. The curriculum provides an excellent preparation for graduate study in psychology as well as in other fields, such as medicine, labor relations, and law.

The Master of Science program is intended to prepare the student for either or both of two activities: continuation of graduate work toward the doctorate and/or employment in business, educational, industrial or governmental positions. The program involves intensive study of the experimental and theoretical foundations of psychology to which those students who are interested in applied psychology may add study of applications of psychology to industrial, business and/or engineering problems.

*On leave.
## Freshman Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
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<tr>
<td>Chem. 101-2-3</td>
<td>Inorganic Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
<td>3-3-4</td>
</tr>
<tr>
<td>E.Gr. 113-14-15</td>
<td>Engineering Graphics</td>
<td>0-6-2</td>
<td>0-6-2</td>
<td>0-6-2</td>
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<tr>
<td>Eng. 107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Math. 107-8-9</td>
<td>Calculus I, II, III</td>
<td>5-0-5</td>
<td>5-0-5</td>
<td>5-0-5</td>
</tr>
<tr>
<td>M.L. 111-12-13</td>
<td>Modern Language OR</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>S.S. 111-12-13</td>
<td>Social Science</td>
<td>0-4-1</td>
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</tr>
<tr>
<td>P.T. 101-2-3</td>
<td>Physical Training</td>
<td>1-0-0</td>
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<tr>
<td>Gen. 101</td>
<td>Orientation</td>
<td></td>
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</tr>
</tbody>
</table>

Totals (excluding ROTC)* 15-13-18 14-13-18 14-13-18

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

## Sophomore Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eng. 201-2-3</td>
<td>Survey of the Humanities</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>Math. 207</td>
<td>Calculus IV</td>
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<tr>
<td>Math. 208</td>
<td>Calculus and Linear Algebra</td>
<td>3-3-4</td>
<td>5-0-5</td>
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<tr>
<td>Bio. 201-2</td>
<td>Introduction to Biology</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>2-6-4</td>
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<tr>
<td>Bio. 203</td>
<td>Comparative Anatomy</td>
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<tr>
<td>Psych. 303-4</td>
<td>General Psychology</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>2-6-4</td>
</tr>
<tr>
<td>Psych. 401</td>
<td>Industrial Psychology</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>P.T. 201-2-3</td>
<td>Physical Training</td>
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<td>Electives</td>
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</table>

Totals (excluding ROTC)* 14-7-16 14-7-16 14-10-17

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

## Junior Year

<table>
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<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
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<tbody>
<tr>
<td>Math. 205-6</td>
<td>Elementary Statistical Analysis</td>
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<tr>
<td>Psych. 403</td>
<td>Introduction to Psychological Testing</td>
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<td>3-0-3</td>
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<tr>
<td>Psych. 405</td>
<td>Psychological Aspects of Personnel Management</td>
<td>3-0-3</td>
<td></td>
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</tr>
<tr>
<td>Psych. 406</td>
<td>Psychological Statistics</td>
<td></td>
<td>2-3-3</td>
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<tr>
<td>Psych. 407</td>
<td>Experimental Psychology</td>
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<tr>
<td>Psych. 410</td>
<td>Social Psychology</td>
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<td>3-0-3</td>
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<tr>
<td>Phys. 207</td>
<td>Mechanics</td>
<td>5-3-6</td>
<td>5-3-6</td>
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<tr>
<td>Phys. 208</td>
<td>Electricity</td>
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<tr>
<td>Phys. 209</td>
<td>Heat, Sound, Light</td>
<td>6-0-6</td>
<td>6-0-6</td>
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<tr>
<td>Electives **</td>
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Totals 17-3-18 17-3-18 15-9-18

**A total of not more than 9 hours of electives may be in advanced ROTC."
Courses of Instruction

NOTE: 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

Psy. 303. General Psychology A
3-0-3. Prerequisite: None.
This course is an intensive coverage of the methods and findings of contemporary psychology. Emphasis will be placed upon the scientific approach to the study of behavior and upon topics of maturation and development, learning, and motivation.

Psy. 304. General Psychology B
3-0-3. Prerequisite: Psy. 303.
This is a continuation of Psychology 303. Such topics as individual differences, emotion, perception, and personality will be discussed.

Psy. 400. Developmental Psychology
3-0-3. Prerequisite: Psy. 303.
A comprehensive study of the behavior and development of the child from infancy through adolescence. Emphasis will be given to the results of empirical research on experiences and processes which affect child behavior.

Psy. 401. Industrial Psychology
3-0-3. Prerequisite: None.
This course introduces the student to scientific methods of inquiry as they are utilized in the study of human behavior in industry. Emphasis is on scientific and experimental study of individual differences, human relations, psychological aspects of equipment design, learning, and motivation.

Psy. 402. Psychology of Adjustment
3-0-3. Prerequisite: Psy. 303.
This course will deal with the typical individual and the social adjustment problems of normal people. Its chief aim will be to assist the student better to understand himself and his fellow man. The primary approach will be from the viewpoint of objective psychology.

Psy. 403. Introduction to Psychological Testing
3-0-3. Prerequisite: Psy. 401.
This course deals with psychological tests and measurement. Uses and abuses, advantages and limitations of the more commonly used types of tests are discussed. Students have opportunities to administer, take, score, interpret, construct, and evaluate certain tests. Individual problems are assigned. The aim of the course is to provide the student with sufficient background so that, as a businessman or engineer, he will be able to exercise sound judgment concerning the uses of tests and measurements in the management of men.

Psy. 404. Psychology of Advertising
3-0-3. Prerequisites: Psy. 303 and 401.
An analysis of the psychological factors which govern buying activities of consumers. These and other facts are combined to establish the psychological foundations of effective advertising and selling. The psychological aspects of such topics as product testing, advertising media research, copy testing, and consumer and audience research will be discussed.

Psy. 405. Psychological Aspects of Personnel Management
3-0-3. Prerequisite: Psy. 401.
This is a seminar-type course designed to provide students with a knowledge of the techniques employed by industrial and personnel psychologists in industry. Topics such as the measurement and prediction of work performance, job satisfaction and morale, learning and training, the social psychology of industry, and interviewing and counseling of employees are explored in depth through discussion, presentation of critical reports, and group projects.

Psy. 406. Psychological Statistics
2-3-3. Prerequisite: Permission of the instructor.
A study of the applications of statistical techniques to the description, prediction, and control of human behavior. Emphasis will be placed upon the logical aspects of the statistics studied.

Psy. 407. Experimental Psychology I
2-3-3. Prerequisite: Psy. 303.
An introduction to psychological measurement and laboratory techniques. Students will plan, conduct, evaluate, and report experiments dealing with such topics as visual, auditory, tactual, and kinesthetic perception; sensorimotor coordination; and human feedback systems. Emphasis will be placed on the applications of the methods of science to the experimental study of human behavior.

Psy. 410. Social Psychology
3-0-3. Prerequisite: Psy. 303.
The behavior of the individual in society is the main concern of this course. Emphasis will be placed on the scientific study of the individual in relation to other individuals and groups.

Psy. 411. Experimental Psychology II
3-3-4. Prerequisites: Psy. 304 and 407, and permission of the instructor.
This course is concerned with the experimental findings in the areas of learning, motivation, and emotion. Students will be required to design and execute several experimental investigations of pertinent problems.

Psy. 412. Psychology of Learning
3-3-4. Prerequisite: Psy. 411, and permission of the instructor.
This course is concerned with an empirical and theoretical analysis of learning. Applications of learning principles to the understanding of human behavior will be considered.

Psy. 413. Applied Experimental Psychology
3-3-4. Prerequisites: Psy. 406 and 412, and permission of the instructor.
Consideration of the applications of the methods and data of experimental psychology to practical behavior problems.

Psy. 414. Special Problems
0-3-1. Prerequisites: Psy. 406 and 411, and permission of the instructor.
The student will, under the direction of a staff member, do semi-independent work in literature review and/or experimental design.

Psy. 415. Special Problems
3-3-4. Prerequisite: Permission of instructor.
Students will work, under the direction of the instructor, on projects adding to their development beyond the scope of existing courses.
**Psy. 421. Physiological Psychology**
3-0-3. Prerequisites: Psy. 304 and Bio. 203.

This course is designed to acquaint the student with the physiological bases of human and animal behavior. Among the topics to be covered are neurophysiological, endocrinological, and biochemical factors as they relate to sensory and motor functioning, learning, memory, motivation, and behavior disorders.

**Graduate Courses Offered**

**NOTE:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Psy. 601</td>
<td>Advanced Industrial Psychology</td>
<td>3-0-3</td>
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<td>Psy. 602</td>
<td>Applied Experimental Psychology</td>
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<tr>
<td>Psy. 603</td>
<td>Social Psychology</td>
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<td>Psy. 604</td>
<td>Human Information Processing</td>
<td>3-0-3</td>
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<td>Psy. 605, 6, 7</td>
<td>Proseminar in General Psychology</td>
<td>3-0-3</td>
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<tr>
<td>Psy. 608</td>
<td>Human Motivation</td>
<td>3-0-3</td>
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<td>Psy. 621, 2</td>
<td>Foundations of Psychology</td>
<td>3-0-3</td>
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<tr>
<td>Psy. 623, 4</td>
<td>Design of Psychological Experiments</td>
<td>2-3-3</td>
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<tr>
<td>Psy. 625</td>
<td>Experimental Methods in Psychology</td>
<td>2-3-3</td>
</tr>
<tr>
<td>Psy. 626</td>
<td>Response Evaluation</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Psy. 627</td>
<td>Human Learning</td>
<td>3-0-3</td>
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<tr>
<td>Psy. 700</td>
<td>Master's Thesis</td>
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<tr>
<td>Psy. 704</td>
<td>Special Problems in Industrial Psychology</td>
<td>Credit to be arranged</td>
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<tr>
<td>Psy. 710</td>
<td>Seminar in Industrial Psychology</td>
<td>3-0-3</td>
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</table>

For requirements for the graduate degree in Psychology, consult the Graduate Bulletin.
Department of Social Sciences


General Information

The Department of Social Sciences gives freshman courses describing contemporary society and the American government. To upperclassmen, it offers courses in sociology, history, government, philosophy and logic. Its courses in industrial sociology examine the community of the factory and the social roles of professional men, especially engineers. The department participates in the graduate City Planning program.

Freshmen are required to take either Social Sciences 111, 112 and 113, or Modern Languages. Transfer students may substitute for SS 111 and 112 any two of the following: SS 305, 306, 319, 327, 328.

Courses of Instruction

NOTE: 3-0-3 means 3 hours class, 0 hours laboratory, 3 hours credit.

General Social Sciences

S.S. 111. Contemporary American Society
3-0-3. Prerequisite: None.
  Description of contemporary society, with comparative and theoretical examination of developments in society.
  Text: Selected paperback books on personality and culture.

S.S. 112. Contemporary American Society
3-0-3. Prerequisite: None.
  Continuation of S.S. 111.
  Text: Selected paperback books on contemporary institutions.

S.S. 119. History of the South
3-0-3. Prerequisite: Junior or Senior standing.
  The growth of the South's economic, social, and political life. Special emphasis is given to those factors which have played an im-

S.S. 305. Nineteenth Century Europe
3-0-3. Prerequisite: Sophomore, Junior or Senior standing.
  Modern European History and its impact on world civilization.
  Text: Thomson, Europe Since Napoleon.

S.S. 306. World Problems Since 1914
3-0-3. Prerequisite: Sophomore, Junior or Senior standing.
  A continuation of S.S. 305.
  Text: Hughes, Contemporary Europe.

S.S. 307. American Economic History
3-0-3. Prerequisite: Junior or Senior standing.
  Special attention is given to the rise of technology, our industrial system, the westward movement, the development of our banking system, and government regulation of industry.
  Text: Robertson, History of the American Economy.

S.S. 319. History of the South
3-0-3. Prerequisite: Junior or Senior standing.
  The growth of the South's economic, social, and political life. Special emphasis is given to those factors which have played an im-
important part in the progress of Georgia. Current regional problems are considered. Exemption from United States and Georgia history examination.

S.S. 325. American Diplomatic History
3-0-3. Prerequisite: Junior or Senior standing.
An historical analysis of United States diplomacy from the Revolutionary War to the present. Emphasis is placed upon the political, economic, and social factors of American history influencing foreign policy and upon the role of the South in world affairs. Exemption from United States and Georgia History Examination.
Text: Ferrell, American Diplomacy.

S.S. 326. The American Civil War
3-0-3. Prerequisite: Junior or Senior standing.
A survey of the major political, economic, and military events occurring in both the Union and the Confederacy during the American Civil War.
Text: Randall and Donald, The Civil War and Reconstruction.

S.S. 327. American Political and Social History to 1876
3-0-3. Prerequisite: Junior or Senior standing.
Readings on colonial America, the American Revolution, the framing of the Constitution, Jeffersonian democracy, sectionalism, the slavery question, secession, the Civil War, and Reconstruction. Attention is given to the place of Georgia in the history of the United States. Exemption from United States and Georgia history examination.
Text: Faulkner, American Political and Social History.

S.S. 328. American Political and Social History Since 1876
3-0-3. Prerequisite: Junior or Senior standing.
A continuation of S.S. 327. Readings on the restoration of home rule in the South, the Granger movement, business and politics, tariff and trust problems, imperialism and party politics, foreign relations, and international affairs. Exemption from United States and Georgia history examination.

S.S. 329. History of Georgia
3-0-3. Prerequisite: Junior or Senior standing.
Through the social, economic and political life of Georgia, the problems which have confronted the state are examined in their historical setting. The relating of Georgia's history to the national scene gives the student a broader perspective of the state's place in the nation. Exemption for the United States and Georgia history examination.
Text: Coulter, A Short History of Georgia.

S.S. 360. Recent Latin American History
3-0-3.
Historical evolution of Latin America in recent times, with particular attention to social change.
Text: To be selected.

S.S. 428. The United States Since 1917
3-0-3. Prerequisite: Senior standing. Open to graduate students.
Social, political, economic and diplomatic history of the United States in the middle of the 20th Century is examined as to causes, results and social movements.

Philosophy

S.S. 331, 332. Introductory Philosophy
3-0-3. Prerequisite: Junior or Senior standing.
Ancient and modern systems of philosophy as related to political government, social ethics, economics, and comparative religion.

S. S. 332 concentrates on deductive and inductive logic.
Text for S. S. 331: To be selected.
Text for S. S. 332: To be selected.

S. S. 333. Types of Ethical Theory
3-0-3.
Critical examination of traditional and modern ethical theories; consideration of the theoretical problems of ethics; definitions of "good," the nature and presuppositions of ethical judgments, the justification of ethical standards.
Text: To be selected.

S. S. 334. Symbolic Logic
3-0-3. Prerequisite: Junior or Senior standing.
An approach to basic logical notions through use of special symbols.
Text: Copi, Symbolic Logic.

S. S. 337. The History of Ancient Philosophy
3-0-3. Prerequisite: Junior or Senior standing.
A study of the development of philosophy from the early scientific writings of presocratics to Christian thought. The works of Plato and Aristotle will be stressed.
Text: To be selected.

S. S. 338. The History of Modern Philosophy
3-0-3. Prerequisite: Junior or Senior standing.
The development of Western thought from Bacon to Kant, with emphasis on the philosophic dimensions of the rise of modern science.
Text: To be selected.

S. S. 339. Contemporary Philosophy
3-0-3. Prerequisite: Junior or Senior standing.
A study of the diverse movements in philosophy from Hegel to Russell with emphasis on the philosophic response to the development of modern scientific inquiry.
Text: To be selected.

S. S. 370. Comparative Religion
3-0-3. Prerequisite: Junior or Senior standing.
A study of the major faiths and religious institutions of the east and west through an analysis of original texts and secondary works.
Text: To be selected.

S. S. 371. Contemporary Religious Thought
3-0-3. Prerequisite: Junior or Senior standing.
An introduction to the development of the most important concepts in modern religious systems. Particular emphasis will be placed on the contributions of both recent philosophical analysis and contemporary theological debate.
Text: To be selected.

S. S. 431. Theories of Knowledge
3-0-3.
Critical examination of problems related to perception, verification, logic, a priori and a posteriori knowledge; the meaning and criteria of truth; the presuppositions and cognitive significance of common-sense, scientific, and philosophical propositions.
Text: To be selected.

S. S. 432. Philosophy of Science
3-0-3.
Examination of selected theoretical problems such as: causality, induction, the nature of scientific explanation and the status of inferred entities; consideration of the cultural and philosophical import of certain scientific theories.
Text: To be selected.

Political Science

S. S. 113. Government of the United States
3-0-3. Prerequisite: None.
A study of the structure and functions of the United States and Georgia governments. It gives exemption from the United States and Georgia constitution examination.
S.S. 313. The Problems of Public Opinion
3-0-3. Prerequisite: Junior or Senior standing.
A study of the processes of opinion formation and opinion diffusion in large-scale urban societies. These processes will be examined with reference to situations in which the stimuli for opinion formation are produced (a) planfully, as by propaganda; or (b) without plan, as in the contexts of disaster or mass hysteria. Text: Childs, *Public Opinion*.

S.S. 323. American Constitutional Problems
3-0-3. Prerequisite: Junior or Senior standing.
This is an advanced course in the government of the United States and Georgia, taught largely through the medium of constitutional law. Such significant problems as federalism, separation of powers, and civil liberties are studied. Exemption from United States and Georgia constitution examination. Text: Cushman, *Leading Constitutional Decisions*.

S.S. 347, 348. Foundations of National Power and International Relations
3-0-3. Prerequisite: Junior or Senior standing.
This course is designed to acquaint the student with the United States' power position in world affairs, relative to that of other powers, and with the events in the world today which have an impact on that position. International relations are emphasized. Text for S.S. 347: Palmer, *International Relations*. Text for S.S. 348: To be selected.

S.S. 361. Latin American Governments and Politics
3-0-3.
Survey of governmental and political processes in the Latin American countries. Text: To be selected.

S.S. 401. Municipal and County Government
3-0-3. Prerequisite: Junior or Senior standing.
An analysis of local government, with particular emphasis on the mechanics and functions of city and urban county governmental units. Text: To be selected.

S.S. 402. State and Local Government
3-0-3. Prerequisite: S.S. 113.
An analysis of the structure and functions of state, county, and municipal governments. Problems of local governmental units receive particular attention—mass transportation, reapportionment, financing. Text: To be selected.

S.S. 405, 406. Political Theory
3-0-3. Prerequisite: Senior standing. Open to Graduate students.
Beginning with the classical political thought of Plato and Aristotle, this course traces the development of political theory through the Middle Ages to the present. Special attention is given to the rise of ideology and the theories of Communism and Fascism. Text: To be selected.

S.S. 407. Communist Political Systems
3-0-3. Prerequisite: Senior standing.
An analysis of the governmental and political processes in the Communist governments. Text: To be selected.

Sociology

S.S. 208. Basic Sociology
3-0-3. Prerequisite: Sophomore standing.
While discussing the various sociological aspects of the modern family, the church, the factory, and other contemporary institutions, this course will provide an introduction to the theory of social organization. Text: Young and Mack, *Systematic Sociology*. 
S.S. 301. Social Problems of Industry
3-0-3. Prerequisite: Junior standing or Sophomore with permission of instructor.
This course analyzes the factory, and the business enterprise as social institutions, with particular attention to the contrasting functions of formal and informal organization, and to the significance of cooperation, authority, communication, status and group norms in the work situation.
Text: Dubin, *Human Relations in Administration*.

S.S. 314. Individual and Society
3-0-3. Prerequisite: Junior standing or Sophomore with permission of instructor.
A study of interpersonal relations in the small or informal group, seen in a variety of contexts, such as the family, and in educational, military, or industrial organizations.
Text: Cohen, *Social Structure and Personality*.

S.S. 351. Statistics for Planning
3-0-3.
Statistical principles for analysis of economic, social, and population data; sampling; measures of central tendencies; normal curve; testing of findings; correlation and arriving at conclusions.

S.S. 412. Technology and Society
3-0-3. Prerequisite: Senior or Graduate standing. Open to Graduate students.
This course analyzes the social conditions which promote or retard technological activity. Particular emphasis is placed on the historical development of technology in Western Society, and on the social role of the scientific and engineering professions in that development.

S.S. 415. Urban Sociology
3-0-3. Prerequisite: Senior or Graduate standing. Open to Graduate students.
A study of the problems of economic, religious, and social institutions in modern urban life. Field experience and research illustrate and apply the theoretical materials of the course.
Text: To be selected.

**Graduate Courses Offered**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>S.S. 601</td>
<td>Governmental Aspects of Planning</td>
<td>3-0-3</td>
</tr>
<tr>
<td>S.S. 605</td>
<td>Planning for People</td>
<td>3-0-3</td>
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</table>
Systems Engineering Program
(Established in 1965)

The Systems Engineering program is administered by the School of Industrial Engineering, in conjunction with a campus-wide Committee which advises on the interrelationship between systems engineering and other engineering programs. It is an interdisciplinary activity dealing with systems implications of engineering, and may be elected as a planned option to supplement and complement curricula in any of the engineering schools. Dr. Pranas Zunde, Associate Professor of Systems Engineering and Information Science, serves as Chairman, Systems Engineering, and is available for consultation and advising students in planning Systems Engineering course work. A designated major in Systems Engineering is currently being planned.

What is Systems Engineering?

Systems engineering emphasizes the coordination of man and machines in complex arrangements. It is largely a development of the last 25 years and has received impetus from the building of defense systems and the rapid development of other forms of modern technology. Computers and automated equipment play a role in virtually all systems engineering efforts.

The concepts of systems engineering are as important today for civil engineers designing complicated highway systems as they are for electrical engineers devising sophisticated communication systems. Teams of engineers and scientists use systems engineering principles to build the systems that make possible flights of missiles, to develop transportation systems and many other complex jobs.

Planned Systems Engineering Programs

Two elective programs in systems engineering are offered. Program A consists of 10 quarter credit hours of course work. This program has been tailored for students who have a limited number of elective hours and who wish to obtain a basic knowledge of systems engineering. Program B involves a minimum of 15 quarter credit hours of course work and has been tailored for students who want to study more about the mathematical bases of systems engineering and who would like to go on to more advanced work in the field. An additional 20 quarter credit hours of advanced work is also available as part of this program.

Case Studies in Systems Engineering (Sy.E. 425) is contained in both Programs A and B. This course gives the student an opportunity to design a system as a member of a design team, and illustrates the important team approach required in the solution of systems engineering problems.
## Program A

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>Sy.E. 380 Systems Engineering I</td>
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<tr>
<td>Sy.E. 381 Systems Engineering II</td>
<td>3-0-3</td>
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<tr>
<td>Sy.E. 425 Case Studies in Systems Engineering</td>
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## Program B

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<td>Sy.E. 380 Systems Engineering I</td>
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<tr>
<td>Sy.E. 410 Systems Analysis I</td>
<td>4-0-4</td>
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<tr>
<td>Sy.E. 411 Systems Analysis II</td>
<td>4-0-4</td>
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<tr>
<td>Sy.E. 425 Case Studies in Systems Engineering</td>
<td>2-6-4</td>
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## Additional Courses

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<tbody>
<tr>
<td>Sy.E. 390 Computer Methods in Systems Engineering</td>
<td>2-3-3</td>
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<tr>
<td>Sy.E. 412 Systems Analysis III</td>
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<tr>
<td>Sy.E. 413 Systems Analysis IV</td>
<td>4-0-4</td>
</tr>
<tr>
<td>Sy.E. 416 Optimization Methods</td>
<td>3-3-4</td>
</tr>
<tr>
<td>Sy.E. 417 Modeling and Measurement</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Sy.E. 420 Physical Systems Laboratory</td>
<td>1-3-2</td>
</tr>
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<td><strong>Total</strong></td>
<td><strong>17-9-20</strong></td>
</tr>
</tbody>
</table>

## Courses of Instruction

**Note:** 2-3-3 means 2 hours class, 3 hours laboratory, 3 hours credit.

**Sy.E. 380. Systems Engineering I**
2-3-3. Prerequisite: Math. 304, or concurrent.

As an introduction to the theory of systems engineering, this course is designed to acquaint the student with the scope of activities and the fundamental concepts and definitions involved in systems engineering. Basic theoretic notions necessary for analytical treatment of engineering systems are presented. The concepts of systems, sub-systems, and components are defined; and illustrative systems, both deterministic and nondeterministic, from several fields are presented and analyzed.
Sy.E. 381. Systems Engineering II
3-0-3. Prerequisite: Sy.E. 380.
A continuation of Sy.E. 380. Topics in engineering economy, decision, theory, optimization of systems, system reliability evaluations, and network planning will be discussed. The construction of state equations for systems will be emphasized.

2-3-3. Prerequisite: Math. 304.
An introduction to the operational characteristics of analog and digital computers will be presented. Fundamental machine operations are discussed and related to the numerical solution of equations. Emphasis is placed on problem formulation. Elementary principles of machine programming will be given.

Sy.E. 410, 411, 412, 413. Systems Analysis I, II, III, IV
4-0-4. Prerequisite: Sy.E. 380 or consent of instructor.
This sequence of courses presents a unified treatment of analytical techniques for the analysis, design, and reliability evaluation of systems. Mathematical models will be developed which describe the characteristics of classes of linear and nonlinear, deterministic and non-deterministic systems. Analytical and numerical techniques for treatment of those models will be presented. Application will be made of such topics as linear algebra, operational mathematics, probability, statistics, and approximation methods. Input-output analysis, response and stability characteristics of systems will be stressed. (Sy.E. 411 is cross-listed with I.E. 335 Applications of Probability.)

Sy.E. 416. Optimization Methods
3-3-4. Prerequisite: Sy.E. 411.
Techniques for system and sub-system optimization are presented with emphasis on methods yielding practical numerical procedures. Specific topics include: linear and dynamic programming, steepest ascent or descent procedures, procedures using the calculus of variations, miscellaneous search techniques. (Sy.E. 416 is cross-listed with I.E. 334 Optimization Methods.)

Sy.E. 417. Modeling and Measurement
3-0-3. Prerequisite: Sy.E. 411.
Construction of mathematical models for systems using measured data will be discussed. The characteristics and use of physical measuring instruments and the statistical theory of measurements will be presented in a unified manner. The effect on the models of measuring instruments and errors in measurement will be studied.

Sy.E. 420. Physical Systems Laboratory
1-3-2. Prerequisite: Sy.E. 417.
This is a laboratory course designed to give the student experience with systems composed of components from several fields. The work will include experiments with mechanical, electrical, hydraulic, chemical, pneumatic, and human elements. The experiments will be designed to illustrate important concepts of systems engineering covered in prerequisite courses.

2-6-4. Prerequisite: Sy.E. 381 and Sy.E. 390 or equivalent and senior standing.
Selected engineering problems are to be solved using systems procedures and concepts. A multidisciplinary team will be assigned to each problem. Specific knowledge in component design and analysis techniques is required. The laboratory periods will be used for the design of a system and the lecture periods will be used to present specific systems engineering topics.
The A. French Textile School
(Established in 1899)

Director—James L. Taylor; Professors—Herman A. Dickert, Raymond K. Flege; Associate Professors—Winston C. Boteler, Gerald B. Fletcher, J. Weldon McCarty; Research Associate Professor—R. B. Belser; Assistant Professors—Ralph C. Lathem, Rick A. Porter; Principal Research Technician—J. R. Kilgore; Principal Secretary—Patricia A. Hawkins; Secretaries—Mrs. Linda M. Phillips, Wanda A. Beason; Technicians—Howard G. Adams, Ramsey C. Freeman, James H. Lackey.

General Information

This school, housed in the modern Harrison Hightower Building, offers courses leading to the degrees of Bachelor of Textile Engineering, Bachelor of Science in Textile Chemistry and Bachelor of Science in Textiles. Each degree may be taken as a regular four-year course, or in accordance with the five-year cooperative plan.

Graduate courses are also provided leading to the degrees of Master of Science in Textile Engineering, and Master of Science in Textiles.

The school is vitally interested in serving the expanding textile industry, and the courses provided have as their objective the training of students for employment in this industry and its related branches.

During the first two years the work is largely fundamental, including the basic courses of Mathematics, Physics, and Chemistry, followed by more specialized training in the field of Textiles during the Junior and Senior years.

Instruction through classroom, library, and experimental laboratory practice is arranged to give both a theoretical and practical understanding of textile procedure. Original work on the part of the student is encouraged in both regular and graduate courses.

Supervised visits to textile plants in this area are made periodically by Junior and Senior classes, thus giving the student contact with industry, and textile operations on a production scale.
Program for B. of Textile Engineering Degree

Freshman Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
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<tbody>
<tr>
<td>Chem. 101-2-3</td>
<td>General Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<td>E.Gr. 113-14-15</td>
<td>Engineering Graphics</td>
<td>0-6-2</td>
<td>0-6-2</td>
<td>0-6-2</td>
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<tr>
<td>Eng. 107-8-9</td>
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<td>3-0-3</td>
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<td>Math. 107</td>
<td>Calculus I</td>
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<td>Math. 108</td>
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<td>M.L. *</td>
<td>Modern Language OR</td>
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<tr>
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<td>Social Science</td>
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<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>P.T. 101-2-3</td>
<td>Physical Training</td>
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<td>Basic ROTC (optional)</td>
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<tr>
<td>Gen. 101</td>
<td>Orientation</td>
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</table>

Totals (excluding ROTC)** 15-13-18 14-13-18 14-13-18

NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*Choice of M.L. 101-2-3 German; M.L. 107-8-9 French; or M.L. 113-14-15 Spanish.

Three Quarters of either M.L. or S.S. are required.

**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

Sophomore Year

<table>
<thead>
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<th>Subject</th>
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<td>Survey of the Humanities</td>
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<td>Math. 207</td>
<td>Calculus IV</td>
<td>5-0-5</td>
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<tr>
<td>Math. 208</td>
<td>Calculus and Linear Algebra</td>
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<td>5-0-5</td>
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<tr>
<td>Phys. 207-8-9</td>
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<td>Mech. 305</td>
<td>Statics</td>
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<td>I.M. 204</td>
<td>Survey of Economics</td>
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Totals (excluding ROTC)** 13-7-15 16-7-18 16-7-18

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

Junior Year

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<tr>
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<td>Survey of Fiber Processing</td>
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<td>Tex. 402</td>
<td>Fiber Processing Systems</td>
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<td>Tex. 301-302</td>
<td>Fabric Structures I and II</td>
<td>5-3-6</td>
<td>5-3-6</td>
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<td>Tex. 470</td>
<td>Fiber Science</td>
<td>3-0-3</td>
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<tr>
<td>Tex. 471</td>
<td>Fiber Processing Principles</td>
<td>4-3-5</td>
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<td>Mech. 308</td>
<td>Dynamics</td>
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<td>Mech. 421</td>
<td>Mechanical Vibrations</td>
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<td>Eng. 320</td>
<td>Technical Writing</td>
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<tr>
<td>C.E. 324</td>
<td>Fluid Mechanics</td>
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<td>M.E. 320</td>
<td>Thermodynamics</td>
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Totals 16-3-17 17-6-19 16-6-18
### Senior Year

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<tbody>
<tr>
<td>Tex. 417</td>
<td>Quality Evaluation I</td>
<td>3-3-4</td>
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<td>Tex. 421</td>
<td>Engineering of Text. Structures</td>
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<td>2-3-3</td>
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<td>Tex. 453</td>
<td>Textile Plant Engineering</td>
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<td>2-3-3</td>
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<td>Tex. 454</td>
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<td>Tex. 455</td>
<td>Textile Engineering Problems</td>
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<td>Tex. 462</td>
<td>Engineering Analysis Dyeing Sys</td>
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<td>3-3-4</td>
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<tr>
<td>I.E. 339</td>
<td>Eval. of Engineering Data</td>
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<td>I.E. 425</td>
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<td>Ch.E. 350</td>
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<td>M.E. 467</td>
<td>Machine Design</td>
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<td>S.S. 328*</td>
<td>American Pol. &amp; Sc. History 1876</td>
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<tr>
<td>E.E. 325</td>
<td>Electrical Circuits and Fields</td>
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<tr>
<td>E.E. 326 or 327</td>
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<td>14-9-17</td>
<td>14-9-17</td>
<td>12-9-15</td>
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</tbody>
</table>

*S.S. 319, 325 or 317 may be substituted for S.S. 328.

**Not more than 9 hours of electives may be in Advanced ROTC.

I.E. 304 and 315; or Math. 407 and 425 and one hour electives; or Chem. 340, 341 and 342 may be substituted for Mech. 421 and M.E. 467.

### Program for B.S. in Textile Chemistry

#### Freshman Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
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<tr>
<td>Chem. 107-8-9*</td>
<td>General Chemistry</td>
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<td>E.Gr. 105-15</td>
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<tr>
<td>Eng. 107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
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<tr>
<td>Math. 107-8-9</td>
<td>Calculus I, II, III</td>
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<td>5-0-5</td>
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<td>M.L. **</td>
<td>Modern Language OR</td>
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<td>S.S. 111-12-13</td>
<td>Social Science</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>P.T. 101-2-3</td>
<td>Physical Training</td>
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<tr>
<td>Gen. 101</td>
<td>Orientation</td>
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<td>15-7-16</td>
<td>14-13-18</td>
<td>14-13-18</td>
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NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.

*Chem. 101, 102, 103 may be scheduled. However, a minimum grade of C is required for Chem. 101 and 102 and the prerequisite for Chem. 214 is Chem. 103 with a grade of C or better or Chem. 109.

**Choice of M.L. 101-2-3 German; M.L. 107-8-9 French; or M.L. 113-14-15 Spanish. Three Quarters of either M.L. or S.S. are required.

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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
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<tbody>
<tr>
<td>Chem. 214-15</td>
<td>Analytical Chemistry</td>
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<td>Calculus IV</td>
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<td>Math. 208</td>
<td>Calculus and Linear Algebra</td>
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<td>Math. 209</td>
<td>Differential Equations</td>
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<td>Phys. 207-8-9</td>
<td>Physics</td>
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<td>Survey of the Humanities</td>
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<td>3-0-3</td>
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<tr>
<td>P.T. 201-2-3</td>
<td>Physical Training</td>
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<tr>
<td>ROTC *</td>
<td>Basic ROTC (optional)</td>
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*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

**Totals (excluding ROTC)* 12-13-16 12-13-16 13-7-15

**Junior Year**

<table>
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<th>Course No.</th>
<th>Subject</th>
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<tbody>
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<td>Physical Chemistry</td>
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<td>Chem. 334-35-36</td>
<td>Physical Chemistry Laboratory</td>
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<td>Chem. 340-41-42</td>
<td>Organic Chemistry</td>
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<td>Tex. 202</td>
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<td>Tex. 470</td>
<td>Fiber Science</td>
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<td>Tex. 471</td>
<td>Fiber Processing Principles</td>
<td>4-3-5</td>
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**Totals** 15-9-18 16-9-19 18-6-20

**Senior Year**

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<td>Tex. 301-303</td>
<td>Fabric Structures I and III</td>
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<td>Tex. 417-418</td>
<td>Quality Evaluation I and II</td>
<td>3-3-4</td>
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<td>Dyeing Systems</td>
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<td>Seminar</td>
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</tr>
<tr>
<td>Tex. 461</td>
<td>Textile Chemistry III</td>
<td>3-0-3</td>
<td></td>
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</tr>
<tr>
<td>Chem. 406</td>
<td>Instrumental Analysis</td>
<td></td>
<td>1-6-3</td>
<td></td>
</tr>
<tr>
<td>I.E. 339</td>
<td>Eval. of Engineering Data</td>
<td>3-0-3</td>
<td></td>
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<tr>
<td>Eng. 320</td>
<td>Technical Writing</td>
<td>3-0-3</td>
<td></td>
<td></td>
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<tr>
<td>Elective</td>
<td></td>
<td>6-0-6</td>
<td>3-0-3</td>
<td></td>
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</tbody>
</table>

**Totals** 16-9-19 16-6-18 14-12-18

**Not more than nine hours of electives may be in advanced ROTC.**

C.E. 457, Chem. 405 or Math. 425 are acceptable substitutes for Biol. 413 or Tex. 461.
# Program for B.S. in Textiles

## Freshman Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
<th>2nd Q.</th>
<th>3rd Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 101-2-3</td>
<td>General Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<tr>
<td>E.Gr. 105-15</td>
<td>Engineering Graphics</td>
<td>0-6-2</td>
<td>0-6-2</td>
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</tr>
<tr>
<td>Eng. 107-8-9</td>
<td>Introduction to Literature</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
</tr>
<tr>
<td>Math. 101</td>
<td>Algebra</td>
<td>5-0-5</td>
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</tr>
<tr>
<td>Math. 102</td>
<td>Trigonometry</td>
<td>5-0-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math. 107</td>
<td>Calculus I</td>
<td></td>
<td>5-0-5</td>
<td></td>
</tr>
<tr>
<td>M.L. *</td>
<td>Modern Language OR</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>S.S. 111-12-13</td>
<td>Social Science</td>
<td>3-0-3</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>P.T. 101-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
</tr>
<tr>
<td>ROTC **</td>
<td>Orientation</td>
<td>1-0-0</td>
<td></td>
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</tbody>
</table>

**Totals (excluding ROTC)** 15-7-16 14-13-18 14-13-18

*NOTE: Under Quarters, 3-3-4 means 3 hours class, 3 hours lab., 4 hours credit.
*Choice of M.L. 101-2-3 German; M.L. 107-8-9 French; or M.L. 113-14-15 Spanish. Three quarters of either M.L. or S.S. are required.
**ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

## Sophomore Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
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<th>3rd Q.</th>
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<tbody>
<tr>
<td>Chem. 305-6</td>
<td>Organic Chemistry</td>
<td>3-3-4</td>
<td>3-3-4</td>
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<tr>
<td>Eng. 201-2-3</td>
<td>Survey of the Humanities</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 201-2</td>
<td>Economic Principles &amp; Problems</td>
<td>3-0-3</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 220</td>
<td>Industrial Organization</td>
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<td>3-0-3</td>
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<tr>
<td>Tex. 213-214</td>
<td>Fiber Processing I &amp; II</td>
<td>5-3-6</td>
<td>5-3-6</td>
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<tr>
<td>I.E. 349</td>
<td>Elementary Quality Control</td>
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<td>3-0-3</td>
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<td>Elective</td>
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<td>6-0-6</td>
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<tr>
<td>P.T. 201-2-3</td>
<td>Physical Training</td>
<td>0-4-1</td>
<td>0-4-1</td>
<td>0-4-1</td>
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<tr>
<td>ROTC *</td>
<td>Basic ROTC (optional)</td>
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</table>

**Totals (excluding ROTC)** 14-10-17 14-10-17 15-4-16

*ROTC is an optional requirement and those students not scheduling ROTC courses are required to earn 6 credit hours in elective courses as a substitute. Only 6 credit hours in basic ROTC may be applied toward the requirements for a degree.

## Junior Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
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<tbody>
<tr>
<td>Phys. 211-2-3</td>
<td>Physics</td>
<td>4-0-4</td>
<td>4-0-4</td>
<td>4-0-4</td>
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<tr>
<td>Tex. 301-02-03</td>
<td>Fabric Structures I-II-III</td>
<td>5-3-6</td>
<td>5-3-6</td>
<td>5-3-6</td>
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<tr>
<td>Tex. 442</td>
<td>Textile Chemistry I</td>
<td>3-0-3</td>
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<td>3-0-3</td>
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<tr>
<td>Tex. 480-1</td>
<td>Man Made Fibers I and II</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 329</td>
<td>Survey in Business Law</td>
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<td>3-0-3</td>
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<tr>
<td>I.M. 340</td>
<td>Anal. of Financial Data</td>
<td>3-2-4</td>
<td></td>
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<tr>
<td>I.E. 416</td>
<td>Motion &amp; Time Study</td>
<td>2-3-3</td>
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<tr>
<td>Eng. 315</td>
<td>Public Speaking</td>
<td>3-0-3</td>
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**Totals** 17-6-19 18-5-20 18-3-19

**Not more than 9 hours of elective may be in advanced ROTC.**
### Senior Year

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Subject</th>
<th>1st Q.</th>
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<th>3rd Q.</th>
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<tbody>
<tr>
<td>Tex. 452</td>
<td>Textile Chemistry II</td>
<td>5-3-6</td>
<td></td>
<td></td>
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<tr>
<td>Tex. 464</td>
<td>Dyeing Systems</td>
<td></td>
<td>0-3-1</td>
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<tr>
<td>Tex. 402</td>
<td>Fiber Processing Systems</td>
<td></td>
<td>0-3-1</td>
<td></td>
</tr>
<tr>
<td>Tex. 424</td>
<td>Textile Costing</td>
<td></td>
<td></td>
<td>5-3-6</td>
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<tr>
<td>Tex. 417</td>
<td>Quality Evaluation I</td>
<td>3-3-4</td>
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<tr>
<td>Tex. 418</td>
<td>Quality Evaluation II</td>
<td>3-3-4</td>
<td></td>
<td></td>
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<tr>
<td>Tex. 451</td>
<td>Tex. Plant Design &amp; Layout</td>
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<td>3-0-3</td>
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<tr>
<td>Tex. 454</td>
<td>Seminar</td>
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<td>1-0-1</td>
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<tr>
<td>I.M. 316</td>
<td>Finance Survey for Engr.</td>
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<td>3-0-3</td>
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<tr>
<td>I.M. 317</td>
<td>Industrial Marketing</td>
<td>3-0-3</td>
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<tr>
<td>I.M. 459</td>
<td>Industrial Relations in The Piedmont Region</td>
<td>3-0-3</td>
<td></td>
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<tr>
<td>Eng. 320</td>
<td>Technical Writing</td>
<td>3-0-3</td>
<td>6-0-6</td>
<td>6-0-6</td>
</tr>
<tr>
<td>Elective</td>
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<td></td>
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<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>17-6-19</td>
<td>13-9-16</td>
<td>17-3-18</td>
</tr>
</tbody>
</table>

### Courses of Instruction

**Note:** 4-3-5 means 4 hours class, 3 hours laboratory, 5 hours credit.

**Tex. 201. Survey of Fibrous Materials**
3-0-3.
A thorough survey of natural and synthetic fibers used in the Textile Industry.

**Tex. 202. Survey of Fiber Processing**
3-0-3.
A survey course in Yarn Manufacturing covering the theory and principles of processing natural and synthetic fibers.

**Tex. 213. Fiber Processing I**
5-3-6.
The first of two courses designed to cover the fundamental theory and practice of fiber processing. This course covers the processing system from opening through roving on all fibers with emphasis on blends.

**Tex. 214. Fiber Processing II**
5-3-6. Prerequisite: Tex. 213.
Goes further into detail on theory of processing, and methods of process control. Covers machine systems and calculations for both conventional and long draft equipment.

**Tex. 251. Survey of Fabric Production**
3-0-3.
A survey course in the design, construction and utilization of fabrics made from both natural and synthetic fibers. (Not open to Textile Students.)

**Tex. 252. Survey of Dyeing and Finishing of Textile Materials**
3-0-3.
A survey course covering dyeing and finishing of textile materials made from both natural and synthetic fibers. (Not open to Textile Students.)

**Tex. 301. Fabric Structures I**
5-3-6. Prerequisite: Sophomore Textile standing.
Course covers basic weaves and the fabrics in which they are used. A study is also made of cam loom weaving theory and practice.

**Tex. 302. Fabric Structures II**
5-3-6. Prerequisite: Tex. 301.
Course covers a study of fancy automatic looms such as dobby mechanisms, box mechanisms, jacquards, and leno attachments. A study is also made of warp preparation.

**Tex. 303. Fabric Structures III**
5-3-6. Prerequisite: Tex. 301.
A study of advanced textile design, dissecting fabrics to determine
weaves, analysis of fabrics for weight, yarn numbers and construction.

**Tex. 402. Fiber Processing Systems**

0-3-1. Prerequisite: Tex. 214.
Special problems involving analytical or experimental investigations in the field of fiber processing.

**Tex. 417. Quality Evaluation I**

3-3-4. Prerequisite: Senior standing and/or consent of instructor.
Physical testing and evaluation of both natural and synthetic fibers and the yarns and fabrics made from the various fibers. Effective use of the developed data is stressed.

**Tex. 418. Quality Evaluation II**

3-3-4. Prerequisite: Quality Evaluation I.
Familiarizes the student with chemical and microscopic methods of testing and evaluating the quality of both natural and synthetic fibers with particular emphasis on fiber blends.

**Tex. 421. Engineering of Textile Structures**

2-3-3. Prerequisite: Senior standing in Textile Engineering.
Covers the application of engineering principles to processing and design of textile materials. Basic fiber properties and translation characteristics are studied.

**Tex. 422. Jacquard Design and Weaving**

2-3-3. Prerequisite: Tex. 301.
A course covering the designing of Jacquard patterns and the techniques involved in the transfer of design to the fabric.

**Tex. 424. Textile Costing**

5-3-6. Prerequisite: Senior Textile standing.
Covers basic principles, material, labor, overhead, departmental costs, depreciation and machinery replacement, marketing costs, and financial statements. This is to be supplemented by practical problems in costing.

**Tex. 442. Textile Chemistry I**

3-0-3. Prerequisite: Chem. 305.
Designed to give the student specific, working knowledge, using the concepts and principles of Chemistry as related to the composition, properties, manufacture, use and care of textiles.

**Tex. 451. Textile Plant Design and Layout**

3-0-3. Prerequisite: Tex. 214 and 302.
Includes problems of mill organization, equipment and layout of machinery, equipment cost, problems of conversion when changing machinery to manufacture a different product.

**Tex. 452. Textile Chemistry II**

5-3-6. Prerequisite: Tex. 480 and Tex. 442 or Chem. 342.
Structure and properties of dyes and fibrous materials are studied. Reaction mechanisms of dyes with fibers and engineering principles employed in the application of dyes are considered.

**Tex. 453. Textile Plant Engineering**

2-3-3. Prerequisites: Tex. 214 and E.E. 325.
This course acquaints the students with the selection and cost of process equipment, organization programs, plant layouts and the proper equipment for air-conditioning, lighting, power and material handling.

**Tex. 454. Seminar**

1-0-1. Prerequisite; Senior standing.
Specific topics concerned with scientific literature; what industry expects of graduates in textiles and similar subjects are covered by experienced speakers.

**Tex. 455. Textile Engineering Problems**

1-6-3. Prerequisite: Senior standing in Textile Engineering.
Special problems involving analytical or experimental investigations in the field of Textile Engineering.
Tex. 456. Special Problems in Textiles
1-6-3. Prerequisites: Senior standing in Textiles.
Special problems involving analytical or experimental investigations in the field of textiles and/or textile chemistry.

Tex. 461. Textile Chemistry III
3-0-3. Prerequisite: Tex. 442 or Chem. 342.
Chemical principles used in the development of process formulae are discussed. Chemical aspects of finishing processes are considered.

Tex. 462. Engineering Analysis of Dyeing and Finishing Systems
3-3-4. Prerequisites: Ch.E. 350 and C.E. 324.
Design and operating principles of systems employed are covered.

Tex. 464. Dyeing Systems
0-3-1. Prerequisite: Tex. 452.
Application of dyestuffs to fibers, yarns and fabrics in pilot scale equipment. Principles of machine operation, application problems, and costs are emphasized.

Tex. 470. Fiber Science
3-0-3. Prerequisite: Phys. 207 and Senior standing.
The physical structure and mechanical properties of fibers are studied. Methods for evaluating fiber properties and relating them to performance characteristics of yarn and fabric structures are covered.

Tex. 471. Fiber Processing Principles
4-3-5. Prerequisite: Phys. 211 and Senior standing.
Operational methods and physical principles employed for conversion of fibers into yarns and related structures are analyzed and evaluated. Analytical methods for characterizing the yarn and intermediate products are studied.

Tex. 472. Fabric Construction—Analysis and Design
4-3-5. Prerequisite: Tex. 471.
Principles embodied in the design and operation of machines for weaving and knitting are studied. Properties and performance characteristics of fabrics are also covered.

Tex. 473. Chemical Processing of Textile Materials
3-0-3. Prerequisite: Chem. 103 and Senior standing.
Acquaints students with those basic chemical principles that are made use of in fiber manufacturing and textile processing.

Tex. 480. Man-Made Fibers I
3-0-3. Prerequisite: Senior textile standing.
This course is designed to give the student an understanding and a working knowledge of man-made fibers in the textile field.

Tex. 481. Man-Made Fibers II
3-0-3. Prerequisite: Tex. 480.
Properties, structure, manufacturing methods, and applications of all important synthetic fibers are covered. Theories and practices for texturizing and other methods for modifying fibers are considered.
Graduate Courses Offered

Tex. 601, 602, 603 Dynamics of Fiber Processing Systems .......... 3-0-3
Tex. 607, 608 Problems in Fiber Processing Systems .............. 0-6-2
Tex. 611 Physical Methods of Investigating Textiles .............. 3-6-5
Tex. 612 Process Control in the Textile Industry .................. 3-0-3
Tex. 616 Engineering Properties of Fibrous Materials ............ 3-0-3
Tex. 636 Origin, Preparation and Structure of Fibrous Substrates ........................................ 5-0-5
Tex. 637 Fundamental Aspects of Dyeing Processes ................ 3-0-3
Tex. 638 Chemical Technology of Stabilization Processes ........ 3-0-3
Tex. 681 Special Topics ........................................ 3-0-3
Tex. 700 Master's Thesis ....................................... 1-0-0
Tex. 701, 702, 703 Seminar ..................................... 1-0-0
Tex. 704, 705, 706 Special Problems in Textiles and Textile Engineering ........................................... Credit to be arranged

(Complete details about these courses are contained in the Graduate Bulletin, a copy of which is available upon request.)
THE CO-OPERATIVE DIVISION
(Established in 1912)

Co-operative Courses in Aerospace, Chemical, Civil, Electrical, Industrial, Mechanical, and Textile Engineering; Chemistry, Engineering Mechanics, Industrial Management, Physics, Textile Chemistry, and Textiles

(A Special Bulletin is available and will be mailed on request)

Director—James Gordon Wohlford; Associate Director—William Henry Hitch; Assistant Director—William Thomas Lee; Principal Secretary—Nancy Lee; Secretary—Eddie Pelfrey.

The engineering and science graduate must have an educational background of sound scientific and economic principles, and he must be acquainted with industrial practices in his field of employment before he can assume responsibility for industrial projects. The interlocking of theory and practice is provided in the co-operative plan of education by the integration of technical theory and practical industrial experience. The Georgia Institute of Technology recognizes the value of this plan and has since 1912 offered a Co-operative Course for those students who desire to acquire their education under the co-operative plan. The correlation of the scientific and engineering practices of classroom and laboratory work and practical industrial experience is accomplished in a five-year course. Co-operative students complete twelve academic quarters and their scheduled industrial quarters. The alternation between campus and industry continues until the student has completed the second or third quarter (depending on the student's section) of the junior year curriculum, at which time the students are scheduled to attend classes continuously until graduation.

Thirteen courses are available to students under this plan. Originally only Mechanical and Electrical Engineering were offered, but Civil, Textile (including Textile Chemistry and Textiles), and Chemical Engineering were added between 1920 and 1928, and in 1946 Aeronautical (now Aerospace) and Industrial Engineering were included. Chemistry, Physics, and Engineering Mechanics were added in 1963, and Industrial Management in 1967.

Students in the Co-operative Division are selected from those who are in the upper third of their high school or preparatory class, or who have made better-than-average records in the Georgia Tech regular course or at some other accredited institution of higher learning. The entrance requirements for the Co-operative Courses include all "Specified or Required Units" on page 20. Only those students who expect to graduate under the Co-operative Division are accepted for these courses. A co-operative student, of course, must make a creditable scholastic record before being recommended for work in industry, and is allowed to continue under the co-operative plan only if he maintains a good record. Upon graduation a Bachelor's Degree, Co-operative Plan, is awarded to a co-operative student in his particular field.
Students in the Co-operative Division are divided into two sections, the first beginning classes in June and the second in September. While Section One is at college three months, Section Two is at work in industry for the same length of time. The two sections alternate or exchange places with each other every three months until the fifth school year, when they merge and remain at college continuously until graduation. A co-operative student gets three weeks' vacation during each calendar year—one week at Christmas and two weeks during the summer.

The Institute is co-operating with more than two hundred and thirty firms, including power companies, electric and electronic equipment manufacturers, oil companies, airlines, railroads, manufacturers of machinery and mechanical equipment, pulp and paper mills, chemical industries, textile mills, foundries, steel mills, construction and engineering firms, and state and federal agencies. The area covered by those industries includes the Southeastern States and many sections of the Middle Atlantic and Western Central States.

After satisfactory completion of at least three months' classroom work in the Co-operative Division, a student is recommended for work with an industrial company. Since the firms employing co-operative students offer a wide variety of practical training and many lines of specialization, students are afforded the opportunity to secure work in the field in which they are most interested. Although the Co-operative Division does not guarantee work nor stipulate any certain amount of compensation, every effort is made to place students to their best educational and financial advantage.

The co-operative students receive wages for their work at the prevailing rate in the shops in which they are employed, and the employers pay the wages directly to the students. At the present time the average beginning wage for a freshman is around $350.00 per month. The wages increase as the student remains on the job assigned him until he is advanced to a higher grade of work by the company which employs him or by the Co-operative Division. By the time he graduates, a co-operative student will have received training in practically all departments of an industry. A high percentage of students trained in this way follow and succeed in their chosen profession. At the conclusion of the course the co-operative graduate is not obligated to accept employment with the co-operating company; neither is the company obligated to offer employment. In many instances, however, such employment is offered by the company and accepted by the student.

The Director of the Co-operative Division makes frequent visits to employing companies. Through interviews with company officials and shop foremen he brings about co-ordination of industrial work with school curricula and takes care of any adjustments in types of work, wages, and other relevant matters. Before freshmen are sent to work, they attend orientation classes in which they are acquainted with the various aspects of their industrial work and receive pointers on how
to succeed on the job, how to make friends with regular shop employees, how to save wisely, and other important factors.

A Georgia freshman should have about $1,000.00 and an out-of-state student about $1,450.00 for the total expenses of his first two academic quarters. Anyone interested in making application for admission into the Co-operative Division should write to J. G. Wohlford, Director, Co-operative Division, for a bulletin which gives full particulars about fees, courses, living expenses, wages paid the students while at work, discipline, school activities, and other pertinent information.
THE GRADUATE DIVISION

(The Bulletin of the Graduate Division will be sent upon request)

Acting Dean—Karl M. Murphy; Secretaries—Hazel Beach, Joyce Caldwell, Loretta Pharris, Alicia Williams.

Graduate Council
Karl M. Murphy, Ph.D. .................................................. Chairman
William L. Carmichael, M.S. ......................................... Secretary
Ex-Officio
E. A. Trabant, Ph.D. .................................................... Vice President for Academic Affairs
A. G. Hansen, Ph.D. ...................................................... Dean of the Engineering College
S. C. Webb, Ph.D. ....................................................... Acting Dean of the General College
Wyatt C. Whitley, Ph.D. .......... Director, Engineering Experiment Station
Mrs. J. H. Crosland .................................................. Director, Libraries

Appointment Expiring June 30, 1968:
*Vernon Crawford, Ph.D., Director, School of Physics
*Geoffrey G. Eichholz, Ph.D., Professor of Nuclear Engineering
*Raymond K. Flege, M.S., Professor of Textile Engineering
*James D. Wright, Ph.D., Head, Department of Modern Languages

Appointment Expiring June 30, 1969:
*Homer V. Grubb, Ph.D., Acting Director, School of Chemical Engineering
*F. Kenneth Hurd, Ph.D., Professor of Electrical Engineering
Edward H. Loveland, Ph.D., Director, School of Psychology
Vladimir Slamecka, D.L.S., Director, School of Information Science

Appointment Expiring June 30, 1970:
Robert E. Green, D.B.A., Associate Director, School of Industrial Management
Robin B. Gray, Ph.D., Professor of Aerospace Engineering
Donald O. Covault, Ph.D., Professor of Civil Engineering
Robert H. Fetner, Ph.D., Director, School of Applied Biology

Appointment Expiring June 30, 1971:
Hermenegild A. Flaschka, Ph.D., Professor of Chemistry
Michael C. Bernard, Ph.D., Assistant Professor of Engineering Mechanics
David E. Fyffe, Ph.D., Associate Director, School of Industrial Engineering
Bertram M. Drucker, Ph.D., Director, School of Mathematics
Stothe P. Kezios, Ph.D., Director, School of Mechanical Engineering

Degrees and Fields of Study
The degree of Master of Science is offered with or without designation in the following fields: Aerospace Engineering, Applied Mathematics, Applied Biology, Ceramic Engineering, Chemical Engineering, Chemistry, Civil Engineering, Electrical Engineering, Engineering Mechanics, Geophysical Sciences, Industrial Engineering, Information Science, Industrial

*Executive Committee of Graduate Council.
Management, Mechanical Engineering, Metallurgy, Nuclear Engineering, Nuclear Science, Physics, Public Health and Public Health Engineering, Psychology, Safety Engineering, Sanitary Engineering, and Textile Engineering. It may be awarded without designation when the student does not major in the field in which he has earned his bachelor's degree. The degrees of Master of Architecture and Master of City Planning are also offered.


In addition to the fields of study listed above for the Master of Science degree, collateral study of an advanced nature is available in Modern Languages and Sociology.

**Fellowships**

**Atlantic Steel Company**
A fellowship in Chemical, Civil or Mechanical Engineering; $1,800 stipend, plus tuition and matriculation fees; total grant of $3,000.

**Automotive Safety Foundation**
A fellowship in Highway Engineering; $1,800 stipend, plus tuition and matriculation fees. Awarded on basis of national competition.

**Callaway Educational Association Fellowship**
A fellowship at the Master's level in Industrial, Chemical, Mechanical or Textile Engineering; stipend, $3,600.

**J. H. Carpenter Foundation**
A fellowship in Ceramic Engineering; $3,600 stipend; $400 for the School of Ceramic Engineering.

**Celanese Corporation**
A fellowship in Textiles or Textile Engineering in the amount of $2,500, including tuition and matriculation fees and other expenses incidental to research.

**E. I. Du Pont de Nemours & Company, Inc.**
A Postgraduate Teaching Assistant Award in Chemistry; $1,200 stipend, plus tuition and matriculation fees; $500 for the School of Chemistry.

**Ethyl Corporation**
A fellowship in Chemical or Mechanical Engineering; $2,500 stipend, plus tuition and fees; $700 to the Department of Instruction.

**General Electric Foundation**
A $5,000 grant to the School of Mechanical Engineering.

**Gulf Oil Corporation Graduate Fellowship**
A fellowship in Chemical Engineering; $2,500 stipend plus tuition and matriculation fees.

**Humble Oil & Refining Company Education Foundation Grant**
A grant to the School of Chemical Engineering of $3,500.

**Jefferson Chemical Company Award**
A $500 teaching assistantship to be alternated each year between the Chemistry and Chemical Engineering Schools.

**Loula D. Lasker Fellowship Trust**
Graduate Fellowships in City Planning. Awarded on a basis of National competition.

**Richard King Mellon Charitable Trusts**
Fellowships for graduate work in City Planning. Preference is given to men and women who are working in
the field of City Planning and who recognize a need of further graduate training.

Edward Orton, Jr., Ceramic Foundation
A fellowship in Ceramic Engineering; $1,800 stipend for 12 months.

Pittsburgh Plate Glass Foundation Fellowship
A fellowship in City Planning; tuition and matriculation fees, plus $1,800 for academic year; $500 for City Planning Program.

Procter and Gamble Company
A fellowship in Chemical Engineering; up to $2,100 stipend, plus tuition and matriculation fees, with an unrestricted grant to the School of Chemical Engineering up to $1,200.

The Rayonier Foundation
A fellowship in the field of Chemistry; $1,800 stipend, $500 for tuition and matriculation fees and $500 for supplies and equipment for the recipient's research.

The Robert and Company Associates Fellowships for Advanced Study in Architecture
A fellowship in Architecture; $1,200 stipend. Recipient must be a native of Georgia.

The Robert and Company Fellowship
A fellowship to be used in Civil, Electrical or Mechanical Engineering; $1,200 stipend. Recipient must be a native of Georgia.

Schlumberger Foundation
A fellowship in Electrical Engineering; $2,100 stipend with support for tuition, matriculation fees and research needs.

Shell Companies Foundation
A fellowship for graduate study in Civil Engineering; $2,000 stipend academic year, $2,500 calendar year (married students $2,600 and $3,200 respectively) plus tuition and matriculation fees; $1,000 to the School of Civil Engineering.

Standard Oil Company of California
A fellowship in Chemical Engineering; tuition and matriculation fees, plus $2,000 to the student if single or $2,600 if student has one or more dependents; $1,000 unrestricted grant to the School.

Mary White Staton Fellowship
Mr. Albert H. Staton has established a graduate fellowship for advanced study by a native of Colombia. $2,000 stipend.

T. Earle Stribling Textile Memorial Fellowship Fund
A fellowship for advanced study and research in problems pertaining to the Textile industry has been established in memory of the late T.E. Stribling, an alumnus of Georgia Tech. This fellowship carries a stipend of $2,000 for the calendar year, plus tuition and matriculation fees. Applications are encouraged from men whose preparation has been in the fields of Textile Engineering, Textile Chemistry, Chemical Engineering, Mechanical Engineering, Chemistry or Physics.

Union Camp Fellowship
A $5,000 fellowship in Chemistry and Chemical Engineering; tuition and matriculation fees, plus a minimum of $250 a month to the student for a period of at least nine months, the remaining money to be used for department needs.

United States Steel Foundation
A fellowship in Physics; up to $3,900 per year stipend. The award is made for two years.

Whirlpool Corporation
Two graduate fellowships in engineering; $2,400 stipend, plus tuition and fees.

National Fellowship Programs
National Programs are available through the Institution, including Fellowships — National Science Foundation, NDEA Title IV, Atomic Energy Commission Special Fellowships in Nuclear Science and Engi-
neering, Oak Ridge Graduate Fellowship, Traineeships—Atomic Energy Commission, National Aeronautics and Space Administration, National Science Foundation, Public Health Service.

FOR FURTHER INFORMATION CONCERNING ANY OF THE FELLOWSHIPS, WRITE THE DEAN OF THE GRADUATE DIVISION.

Graduate Fellowships

Fellowships may be made available through grants to the Institute from National Aeronautics and Space Administration, National Science Foundation, National Institutes of Health, the Atomic Energy Commission, and the National Defense Education Act Title IV Program. These are in addition to the fellowships listed on preceding page.

Instructors and Assistants

A number of part-time instructorships and teaching or research assistantships are available for qualified graduate students through the Schools, Departments, and the Engineering Experiment Station. These appointments are normally for one-third full time and carry stipends ranging from $2,000 for the academic year.

Admission

In general, applicants for admission to graduate study should hold a bachelor's degree from a recognized university, school, or college and should have graduated with academic standing in the upper half of their class. Those applicants who plan to become candidates for the doctorate should have had academic standing in the upper quarter of their baccalaureate class or must have demonstrated, or be prepared to demonstrate, outstanding ability in their work toward a master's degree.

Length of Study and Graduate Requirements

Thirty-three quarter hours of advanced study past the bachelor's degree plus a thesis, or fifty quarter hours of advanced study past the bachelor's degree without a thesis are necessary in fulfillment of the requirements for the master's degree. At least one full academic year in residence past the bachelor's degree must be completed on campus before the master's degree can be awarded.

At least three full academic years of advanced study past the bachelor's degree are necessary for the award of the doctorate. Ordinarily between 67 and 90 quarter hours of advanced course work will be undertaken, the balance of the required time being devoted to research and the preparation of the dissertation. At least three full quarters of the doctorate program must be spent in residence at the Georgia Institute of Technology and unless special permission is obtained, these must be the three immediately preceding the award of the degree.

Graduate Bulletin

A copy of the Graduate Bulletin, discussing requirements for advanced degrees in detail and listing advanced work in courses available in the various departments, may be obtained on request from the Dean of the Graduate Division.
ENGINEERING EXPERIMENT STATION

Directional Staff

Chief and Head, Research Branch—John P. McGovern; Assistant Chief for Technical Planning—A. P. Jensen; Head, Systems Effectiveness Office—S. P. Lenoir, Jr.; Head, Operations Branch—W. A. Bezaire; Assistant to the Director—Howard E. Bedell; Head, Fiscal Planning—Thomas F. Jones; Head, Reports and Procedures—Jon C. Barbour; Head, Project Development Industrial Research—Roy A. Martin; Head, Photographic and Reproduction Services—James E. Garrett; Head, Supply Services—Everett O. Posey; Head, Mechanical Services—Dan W. Thomas; Head, Publications Services—Robert B. Wallace, Jr.; Division Secretaries—CS&M Division—Patricia D. Hardage; Elec. Division—Voncile H. Patrick; HTM Division—Jean Williams; ID Division—Margaret Textor; NS Division—Nelle McFather; PS Division—Betty R. Jaffe; REC Center

Purposes

The Georgia Tech Engineering Experiment Station is one of the agencies of the University System of Georgia which is designed to enhance the general welfare of the people of Georgia by coordinating and conducting investigations in all fields of engineering and in many aspects of the physical, chemical and biological sciences. The Station is charged with: the promotion of research in the Georgia Institute of Technology, the development of a program of assistance to industry and agriculture, and the study and utilization of the natural resources in the State.

Georgia Tech believes that a progressive technological institution should carry on, conjointly, a strong educational program and a coordinated fundamental and applied research program. Teaching and research are complementary. At Georgia Tech, this philosophy is carried out by a full-time Engineering Experiment Station staff composed of competent engineers, scientists, technicians, a large number of associated faculty members, and a strong supporting Graduate Division.

During the year, 1966-67, the Station utilized the full-time services of an average of 410 persons and part-time services of an average of 325 persons in the prosecution of 446 research projects. Included in this personnel total were 57 shared faculty members, 100 graduate students, and 100 undergraduate students.

Many research activities of great potential value to the State and the South are now underway. Some of these studies concern: the development of Georgia's industrial economy; new processes and uses of Georgia's ceramic clays and other minerals; nuclear reactor engineering; applications of nuclear physics and chemistry to the health sciences; factors affecting the aerial transmission of disease; applications and development of electronic computers; new methods of electrical power system analysis; the effects of river impoundments on water quality; and protective treatments for cotton textiles.

A number of projects also concern the basic nature of matter and energy. Among these are studies in atmospherics, solid state, and nuclear physics, microwave radar, organic chemistry, microbiology, and mathematical statistics.
The results of most of these investigations are made available to the public by publication in technical periodicals, in the bulletins, reprints, and special reports of the Station, and through Georgia Tech's bimonthly newsletter, *Tech Topics*.

The Station's budget for 1967-68 is approximately $7,150,000. In both facilities and finances, it is one of the largest state engineering experiment laboratories in the nation. The principal sources of this support are: the United States Government, by means of research contracts administered through the Georgia Tech Research Institute; private industry (mostly in Georgia) through contracts for specific research projects; the State of Georgia, by means of appropriations through the Board of Regents; and gifts, grants-in-aid, and endowments.

Advanced undergraduate and graduate students are employed on projects in the Engineering Experiment Station whenever feasible to afford them direct experience and training in research and development work.

**Research Staff**

Station faculty members and professional staff are listed among the General Faculty beginning on page 302.
THE ENGINEERING EXTENSION DIVISION

Director—Lawrence V. Johnson; Director Emeritus—*Roger S. Howell; Administrative Assistant—Mrs. Minnie N. Mavity; Administrative Secretary—Mrs. Jane H. Whitner; Registrar Emeritus—Mrs. Blanche B. Turner; CONTINUING EDUCATION: Director—Richard Wiegand; Associate Director—Robert S. Herndon; Assistant Director—Ewing E. Hunter; Principal Clerk—Edward J. Sprole; Principal Secretary—Louise R. Johns; Senior Secretary—Sandra L. Humphries; Secretaries—Susan F. Turner, Diane S. Graves, Colleen Harris, Jane E. Rackley, Rosalyn E. Goldstein; Clerks—Otis Bryant, Barbara Jane Rayburn; INDUSTRIAL EDUCATION: Director—Dallas B. Cox; Director Emeritus—Thomas H. Quigley; Head of Plant Training—Emory L. Moore; Research and Instructional Materials Specialist—Charles A. Duke; Fire Service Training Supervisor—Harold G. Thompson; Instructor, Georgia Fire Institute—Walter F. Parker; Senior Secretary—Mrs. Elizabeth C. Severance; Secretaries—Mrs. Ruth S. Anderson, Mrs. Marjorie G. Martin, Elizabeth M. Bittenbender.

The Engineering Extension Division is designed both as a campus and an off-campus educational program to serve the people and industry of Georgia where a need exists for industrial training. The scope of its work includes specialized programs in adult education, two-year college Engineering Technology courses designed to train those who wish to qualify as engineering technicians, short courses and conferences, and in cooperation with the State Department of Education, a training program in trade and industrial education within the industries, the fire service and other public services of the state, including supervisory and foremanship conferences.

The Engineering Extension Division consists of three units—Continuing Education, Industrial Education and Southern Technical Institute.

CONTINUING EDUCATION

The industrialist and the educator share the responsibility of keeping the professional college graduate abreast of the forward strides being made by the dynamic and burgeoning technology of this twentieth century. The Department of Continuing Education conducts over 200 programs annually in various subjects to help college graduates and others keep pace. All offerings of the Department are non-credit.

These added courses are conducted in specially equipped classrooms on the campus. In addition to these special facilities, the Department has access to regular Georgia Tech classrooms and laboratories which have been made available through the cooperation of the various schools and departments.

Skilled and experienced teaching personnel—and specialists from industry—are secured to provide the best in instruction.

Courses though scheduled for a short duration of time are very intensive in subject coverage. Special technical and industry-management short courses, as well as conferences and institutes, train key industry

*Deceased, December 8, 1967.
personnel by providing information and instruction on new developments and best methods. In addition to these courses, other short courses prepare the engineering and/or professional graduate for state professional examinations.

Short course work emphasizes close cooperation with industry, trade associations, technical and scientific and business organizations in planning and presenting these special educational programs.

INDUSTRIAL EDUCATION

In conformity with the provisions of the various vocational education acts, this department, in cooperation with the State Department of Education, has a responsibility for training industrial, fire service, and related technical teachers for the following.

1. Evening and part-time classes in public schools and industrial and fire service organizations.
2. All day public trade schools.
3. Supervision courses.

The activities of the department include research to determine specific industrial and fire service education needs of a community, industry or plant; developing courses of study to meet these needs; selecting teachers of the required occupational experience; training these teachers for specialized service; developing specialized instructional materials for use by such teachers; training local teacher trainers in the larger centers; and improving teachers in service after placement.

Because of the specialized local character of this extension work all activities are conducted under special arrangements between the Georgia Institute of Technology, the Georgia State Department of Education, local boards of education, and industrial and fire service organizations. The following courses and other activities are conducted at many localities in the state: principles and organization of industrial education, conference leading, methods of teaching, industrial education psychology, course planning, practice teaching, industrial plant surveys, teaching related subjects, and occupational analysis.

The Georgia Fire Institute

The Georgia Fire Institute was established in the Industrial Education Department in 1958 by the Board of Regents through a special appropriation by the State. It is a coordination of both the Georgia Institute of Technology and the State Department of Education, cooperating with local boards of education and fire departments, for amplifying the program of fire service training that has been in development for many years by these agencies. Its aim is the optimum training of Georgia firemen, paid and volunteer, public and private,
to reduce and hold to the minimum Georgia's loss of life and property by fire.

Throughout the State the Fire Institute conducts short and long-time classes in local fire departments, short intensive zone fire schools in the special fire service problems of various sections of the State, and short intensive statewide fire schools. In the latter it is successor to the former Georgia State Fire College. The training includes the techniques and technologies of fire prevention, inspection, extinguishment, rescue, and investigation, and fire department officership and administration.
SOUTHERN TECHNICAL INSTITUTE
Marietta, Georgia


General Objectives

The Southern Technical Institute is that unit of the Engineering Extension Division of the Georgia Institute of Technology designed for the student who desires to become an Engineering Technician.

Eleven two-year engineering technology programs leading to the Associate in Engineering degree are offered: Air Conditioning Engineering Technology, Architectural Engineering Technology, Civil Engineering Technology (Surveying and Construction Option), Civil Engineering Technology (Structural Materials and Design Option), Electrical Engineering Technology (Electronics Option), Electrical Engineering Technology (Electronic Computer and Control Option), Industrial Engineering Technology, Industrial Engineering Technology (Management Option), Mechanical Engineering Technology, Textile Engineering Technology, and Textile Engineering Technology (Apparel Manufacturing Option).

*On leave.
**Deceased, February 12, 1968.
These curricula are designed to provide the basic scientific training, the specialized technical "know-how," and the supervisory and management training needed by the engineering technician. The courses are briefer, more intensive, and more specific in purpose than those of the professional engineering curricula, although they lie in the same fields of industry and engineering. Their aim is to prepare the individual for specific technical positions or lines of activity rather than for broad sectors of engineering practice.

**Engineering Technician and Engineering Technology**

An engineering technician is one whose education and experience qualify him to work in those areas of engineering which require the application of established scientific and engineering knowledge and methods, combined with technical skills, in the support of engineering or scientific activities toward the accomplishment of engineering objectives.

The engineering technician is the newest member of the Engineering Team. This team is composed of the scientist, the engineer, the engineering technician, and the craftsman. His addition to the team resulted from what may be called the impatience of the 20th century. Prior to World War II the lapse-time between a scientific discovery and its application was of the order of 6 to 10 years. Today our technology is moving so fast that this time is now of the order of 3 to 6 months or less.

This increasing pressure to move more quickly from experiment to product requires engineers to witness, interpret, and make use of scientific discoveries almost as they occur. This change in engineer's work requires engineering education to be more and more in the area of advanced mathematics and the physical sciences, and less and less in applied or operational engineering fields. Today an engineer's work is generally concerned with development and design rather than with applied or operational engineering work.

Because the engineering arts and skills are essential to industry, the American Society for Engineering Education has sponsored the Engineering Technology Program with curricula designed to fill the educational gap caused by the change in the engineer's work and to train men qualified to take over much of the operational engineering work formerly done by large segments of the engineering profession, thus freeing engineers for engineering work requiring a much more scientific and mathematical background.

The engineering technician is concerned with the production and operational aspects of engineering and industry, and he performs specific tasks which usually embrace a specialized field of research, design, development, or construction; or of control and operation of production facilities and manpower.

Graduates from engineering technology courses are in great demand. Engineering Technicians with several years' experience have advanced to top positions in Engineering, Management, and Architectural areas.
A full-time day program is available at the new Southern Technical Institute campus at Marietta, Georgia. Two academic years or six quarters are required to complete the various courses at Southern Technical Institute. For complete information regarding this school write for special catalog.

Southern Tech also makes six of its eleven curricula available on a part-time schedule in evening classes on the Southern Tech campus. These are Architectural Engineering Technology, Civil Engineering Technology, Electrical Engineering Technology, Industrial Engineering Technology, Industrial Engineering Technology (Management Option), and Mechanical Engineering Technology. Those who work in Atlanta's metropolitan area may thus avail themselves of the opportunity of obtaining this type of training through evening study.

The job opportunities for engineering technicians are numerous. Studies made by the American Society for Engineering Education reveal that two engineering technicians are needed for every engineer. The Associated Industries of Georgia estimates that there are, in Georgia alone, 5000 well-paying positions for trained engineering technicians, at salaries ranging upward from $6500 per year.

The work offered qualifies the engineering technician graduate for a rapidly expanding number of technical jobs in engineering. His work is closely related to that of the graduate engineer and, in fact, the two usually work as a team.

A special bulletin containing complete information will be sent upon request. Direct such requests to the Registrar, Southern Tech, Marietta, Georgia.

**Entrance Requirements**

Applicants must be high school graduates or equivalent and must have two credits in algebra, one credit in geometry, two credits in science, and four credits in English. Applicants must have also taken the College Entrance Examination Board Scholastic Aptitude Test (Verbal and Mathematical), and the College Entrance Examination Board Achievement Tests in English and Mathematics (Level I—Standard).

**Veteran's Program**

Veterans are eligible to enter the Institute under the G. I. Bill of Rights, as established under Public Laws 89-358, 634, 815, and 90-77.

**Tuition and Fees**

The rates for fees, board, and room are subject to change at the end of any quarter.
DAY CLASSES AND EVENING CLASSES

Full-Time Schedule (12 or More Hours)

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<tr>
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<th>Matriculation Fee per Quarter</th>
<th>Tuition Fee per Quarter</th>
<th>Medical Activity Fee per Quarter</th>
<th>Student Activity Fee per Quarter</th>
<th>TOTAL FEES Per Quarter</th>
<th>TOTAL FEES Per Academic Year</th>
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<tr>
<td>Resident of Georgia</td>
<td>$95.00</td>
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<td>Non-Resident</td>
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<td>of Georgia</td>
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<td>$652.50</td>
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Part-Time Schedule (Fewer Than 12 Hours)

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<tr>
<td>Resident of Georgia</td>
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<tr>
<td>Non-Resident</td>
<td>$17.00 per hour</td>
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Day and Evening School students carrying fewer than 12 hours are not required to pay the $3.50 medical fee nor the $5.00 activity fee. Part-time students, however, do not benefit from the medical services that the full-time students do.

Above rates subject to change without notice.
STUDENT HEALTH SERVICE

Director of Health—John B. Riggsbee, M.D.; Director Emeritus—Leslie Morris, M.D.; Assistant Director—Philip J. W. Junot; School Physicians—Robert Y. Lambert, M.D., John Michaels, M.D.; Medical Consultant and Physician to Athletic Association—Lamont Henry, M.D.; Psychiatrist—George P. Dillard, M.D.; Radiologists—Albert A. Rayle, Jr., M.D.; J. Frank Walker, M.D.; Residents—Frank Schuler, III, Richard Springstead, L. D. Stacy, M.D., Fred Stoddard; Nurse Supervisor—Mrs. Jane F. Akers, R.N.; Night Supervisor—Mrs. Leslie Beavers, R.N.; Nurses—Mrs. Juel Clark, R.N., Mrs. Winifred Cooper, R.N., Mrs. Anne Hogan, R.N., Miss Patricia Hunter, R.N., Mrs. Mildred Moore, R.N., Mrs. Elizabeth Morris, R.N., Mrs. Martha Trnasky, R.N.; Technicians—Miss Lynda Black, Virgil E. Lloyd, Mrs. Linda Green, Miss Brenda Richey; Receptionists—Mrs. Evelyn Guthrie, Mrs. Sheila Warner; Infirmary Consulting Staff: Dentists—Irwin T. Hyatt, D.D.S., and Aaron L. King, Jr., D.D.S.; Allergy—Dr. Carl Jones; Dermatology—Dr. Chenault Hailey, and Dr. Fred F. Hardin; Hematology—Dr. Spencer Brewer, Jr.; Internal Medicine—Dr. T. J. Anderson, Jr., Dr. Max M. Blumberg; Neurology—Dr. William A. Smith, Dr. Richard Wilson; Neuro-surgery—Dr. Charles Dowman, Dr. Exum Walker; Ophthalmology—Dr. William L. Eubanks, Dr. Jess C. Lester, Dr. Jack J. Stokes; Orthopedic Surgery—Dr. Grady Clinkscales, Dr. H. Walker Jernigan, Dr. Ladd Jones; Otalaryngology—Ponce de Leon Infirmary Staff, Dr. Ethan Staats; Proctology—Dr. Edgar Boling; Surgery—Dr. Jack Thompson; Thoracic Surgery—Dr. L. N. Turk, III; Urology—Dr. Reece C. Coleman, Jr.

The Health Service is located in the Joseph Brown Whitehead Memorial Hospital located on Fifth Street adjoining Rose Bowl Field. The hospital contains the offices of the medical staff, examination and treatment rooms, clinical laboratory, X-ray and physiotherapy departments, plus wards and rooms for seventy patients. Food for patients is normally obtained from the college dining hall but special diets are prepared in the hospital.

The Infirmary staff consists of three full-time physicians, two regularly visiting consultants in Internal Medicine and Psychiatry, four young doctors from Emory University, nine registered nurses, four technicians, two secretaries, three orderlies and three maids. We also have thirty physicians, representing the various medical specialties, on our consulting staff who are available when their services are needed.

Infirmary policy is determined by a committee composed of the Dean of Students, the Assistant Athletic Director, the Dean of Faculties, the Athletic Association physician, the Director of Health, and a student appointed by the Student Council.

The facilities of the Health Service are available to all students who take twelve or more credit hours of classes. The Health Service is financed by student fees and only those who have paid a health fee for the current quarter are eligible for treatment. Co-op students on their work
quarter and students with less than 12 credit hours are not charged
a health fee and are not entitled to any treatment at the Infirmary.
Faculty members and Institute employees are entitled only to emergency
first aid treatment. Part-time students may be treated on a “fee-for-
service” basis.

For those eligible, the Health Service provides unlimited free office
treatment. This includes necessary medical care, and such minor surgery
as deemed necessary and provided by the school physicians. If the illness
or injury is of such complexity or severity that consultation with a spe-
cialist is deemed advisable, this will be arranged by the Health Service.
Up to 14 days hospitalization in the school Infirmary each quarter with
nursing care, drugs, laboratory, and x-ray service is provided free except
for a charge of one dollar for each meal served, and one dollar per day
to cover laundry of linens used. If the illness or injury requires treat-
ment in a private hospital, arrangements can be made by the school
physician for such care.

All students who are sick or injured are expected to report to the
Infirmary for treatment. If the student does not desire treatment by one
of the school employed physicians, he may arrange for another physician
to care for him at the Infirmary.

Medical care is available at the Infirmary 24 hours a day when school
is in session but not at all on authorized vacation periods or between
quarters. Physicians are on duty for regular clinic visits from 7:30
a.m. to 7:30 p.m. Monday through Friday and from 8:00 a.m. to 1:00
p.m. on Saturdays; and from 3:00 p.m. to 6:00 p.m. on Sundays.

Emergency visits are possible at any hour of the day or night. An
emergency is an illness or injury that is likely to become worse if treat-
ment is delayed until the next regularly scheduled clinic period — it has
nothing to do with class schedule or convenience of the patient. Students
are expected to make their clinic visits during their free periods or be-
fore classes begin in the morning.

School regulations prohibit any student staying in his room in a dormi-
tory or fraternity house with a contagious disease. If the school phy-
sicians feel that the illness of the student is contagious or is severe
enough to justify absence from classes, the student will be put to bed
in the Infirmary until such time as he is able to return to classes with
safety. The Health Service does not provide any care for students in the
home nor do the physicians make house calls.

Free service is limited to care in the Infirmary, and for injuries re-
ceived in class. Free service does not apply to elective surgery, specialist
treatment, orthopedic appliances, special nurses, or hospitalization. The
Health Service will assume no financial responsibility for the treatment
of chronic diseases or injury present prior to enrollment, nor will it be
responsible for elective surgery such as wart removal, hernia repair,
tonsillectomy, pilonidal cyst removal, etc. The Health Service provides
no dental care except for the repair of teeth injured in P.T. class, provided
such injury is reported within one hour of the injury. It does not pay for eye refraction or for glasses. Only if glasses are broken in P.T. class while wearing protective goggles, will the glasses be replaced by the Health Service. All students who must wear glasses should keep an extra pair on hand and a copy of their prescription for glasses.

The Health Service will provide financial assistance for medical care rendered by physicians outside the Infirmary only for: (1) on-campus injuries sustained in the classroom, laboratory, physical training, going to and from classes, or while participating in school-sponsored activities, or (2) off-campus injuries while participating in school-sponsored activities. The Health Service will provide full financial coverage for those injuries sustained in the classroom, laboratory, and physical training classes. For the other injuries defined above, the financial responsibility of the Health Service for any one injury will be limited to $200 for the physician's fees, and if treatment in a hospital outside the Infirmary is required, $10 per day for room and board plus $100 toward other hospital charges. In all cases the Health Service will assume this financial responsibility only if such service is deemed necessary and authorized in writing by one of the school physicians.

Health and Accident Insurance written especially for Georgia Tech to supplement the service provided by the School Infirmary is offered to all students at the beginning of each quarter. Excellent coverage for physical and mental illness, on a twelve month basis, is provided at a most reasonable premium. Full details will be mailed to all prospective students in late August so that coverage may be secured prior to leaving home. Another opportunity to enroll will be provided at registration at the beginning of each quarter.

All students are required to have immunization against tetanus (toxoid), small pox, and polio prior to enrollment. Boosters for tetanus, small pox and polio will be given as needed. Tech does not require typhoid vaccine but advises it for those who intend to do water skiing, skin diving, or other fresh water sports.

Entrance physical examination forms are mailed to students with the notice of their acceptance for enrollment. These forms are to be completed by the prospective student and his personal physician and mailed to the Director of Health in sufficient time to be received prior to the date of initial registration. After review of the medical history and physical examination report, the school physicians determine the assignments to R.O.T.C. and Physical Training. Any student who desires special consideration because of mental or physical disability should have his physician write an explanatory letter to the Director of Health giving full details of the disability and any desired limitations on physical activity. This letter is to be attached to the physical examination form. Any special examinations or reports needed to determine eligibility for enrollment or assignment are at the expense of the student, not the school. Any student who fails to submit the required physical examination and immunization record prior to registration will have the examination ordered by the school at the expense of the student.
The Director of Health as representative of the Institute reserves the right to exclude students with certain infirmities or disabilities which he feels may be detrimental either to the individual or to other students. He also reserves the right to require certain treatment of students in order to qualify for enrollment or to remain in school.
On November 21, 1953, the new Price Gilbert Memorial Library was dedicated. It is an impressive structure of contemporary design. The cost, including equipment and furniture, was more than $2,000,000. The building, completely air-conditioned, has five floors on the South wall and three on the North wall.

The interior of the building follows the contemporary design of the exterior. Twenty colors have been used throughout the building, giving a feeling of warmth. Comfortable lounge furniture has been interspersed between the large natural birch reading tables. All stacks, except those on the ground floor, are open.

The building has a capacity of about 450,000 volumes and will seat 800. An adjoining graduate addition which will be completed in 1968 will more than double the present capacity. The Music Room on the ground floor contains more than 7,600 recordings, a collection which continues to grow because of the generous gifts of alumni. The Music Room offers much enjoyment to both students and faculty. When the folding partition between them is open, the Music Room and Wilby Room together can serve as an auditorium seating almost 300.
The Library collection now numbers more than 460,000 volumes and approximately 350,000 reports, three-fourths of which are microtext. The greater part of these, which are scientific and technical, are used for study and research. The Library subscribes to the journals of the leading engineering and scientific societies and to the outstanding scientific and technical periodicals in this country and abroad. There is an author and title and a subject catalog for all books and periodicals.

In August 1962 the Tech Library was designated as one of twelve Regional Technical Report Centers, where unclassified U.S. Government Scientific Technical Reports are deposited to serve users in Alabama, Florida, Georgia, Mississippi, South Carolina, Tennessee, and Puerto Rico. To expedite service, the Center has a TWX System, several copying machines, and microfilm reader-printers.

The Library is primarily for the use of students and members of the faculty. All books, not reference or held on reserve, may be withdrawn for home use in accordance with the rules of the Library. The General Library is open from 8:00 a.m. to 11:30 p.m. Monday through Friday. On Saturday the building closes at 6:00 p.m. It is open on Sundays from 2:00 p.m. to 10:00 p.m. Printed Library regulations are given the freshmen at the time of matriculation.

A $3,793,875 Graduate Addition is expected to open by summer quarter 1968 that will provide seats for 2,000 students. With the seven-floor addition, the two buildings will accommodate a collection of one million volumes.
WATER RESOURCES CENTER

Director—Carl E. Kindsvater, Regents' Professor; Assistant Director—Clarence M. Conway, Lecturer; Secretary—Willie G. Gibson; Executive Council—Harry L. Baker, Jr., Arthur G. Hansen, Karl M. Murphy, Sam C. Webb, Wyatt C. Whitley, Carl E. Kindsvater (Chairman).

The Water Resources Center at the Georgia Institute of Technology was established in 1963, by action of the Board of Regents of the University System of Georgia. The purpose of the Center is to initiate, facilitate, and coordinate efforts designed to bring the full competence of the Institute to bear on all facets of water resources education and research. Its activities and policies are developed and carried out under the guidance of the Executive Council, which is composed of appropriate administrative officers. Contact with related research and training programs is maintained through School Directors and Department Heads, with assistance from ad hoc task committees composed of faculty and staff representatives.

Typical of the activities of the Center are the following:

1. Coordinate course offerings on a campus-wide basis.
2. Coordinate search for interdisciplinary staff.
3. Coordinate proposals for interdisciplinary research.
4. Coordinate a water resources publication series.
5. Coordinate contacts with outside individuals and agencies with respect to interdisciplinary activities.
6. Collect, review, and circulate information regarding legislative activities, research, technical reports, etc.
7. Coordinate conferences, seminars, and short schools.
8. Allocate unrestricted funds appropriated or donated to the Institute for water resources activities.
9. Coordinate reviews and expressions of opinion or position regarding matters of public or professional interest.
10. In general, to serve as the focal point of Georgia Tech's image as a regional center for water resources education and research.

In 1965 the Center was authorized by the General Assembly of Georgia to administer Title I of the federal Water Resources Research Act in the State. To advise the Center in carrying out this responsibility, the Board of Regents appointed a Joint Tech-Georgia Advisory Committee on Water Resources Research comprised of representatives of both Georgia Tech and the University of Georgia.
OFFICE OF DEAN OF STUDENTS

Dean of Students—James E. Dull; Dean of Students Emeritus—George C. Griffin; Associate Dean of Students—W. Eugene Nichols; Assistant Deans—James L. Clegg, Edwin P. Kohler, II, Jerry D. Purser; Director of Counseling and Guidance—James A. Strickland; Assistant Director—Eugene C. McLaughlin; Counselors—Truman T. McMurrain, Johnny A. Bonanno; Psychometric Assistants—Miss Carole N. Robertson, Miss Melinda Peterson; Assistant to the Coordinator of Housing—C. O. Mckinder; Principal Clerk—Mrs. Mary Lou Smith; Principal Secretary—Mrs. Alesha Steen; Secretaries—Miss Linda Marlow, Mrs. Linda Brown, Mrs. Judith T. Mitchell, Mrs. Gaye Jackson, Mrs. Sandra Burns, Miss Patti Staudenmaier, Miss Artenious E. Taylor.

The Dean of Students Office supervises extracurricular activities and student services. It is the focal point in the administration of affairs concerning the life and activities of students in all but the academic field. It stresses the importance of the student as an individual.

It is the headquarters for student life including social fraternities, student government, student housing, student publications, international student affairs, selective service and veterans affairs, counseling and guidance services, religious affairs, and health services.

Every effort is made to draw all students to this office who need assistance or advice in solving problems or who desire to participate in extracurricular activities. The goal of the Dean of Students Office is to assist the student in making the best possible adjustment to college life and to gain the best possible benefit from being a member of the college community.

The Counseling and Guidance Service, located in the Dean of Students Building, provides vocational, educational, and personal counseling services for all enrolled Georgia Tech students. Each year, more than a thousand Tech students avail themselves of this service. These students work with professional counselors in such areas as choosing a vocation, improving study habits, and personal adjustment to college life. The counselor does not attempt to make up the student's mind for him. On the other hand, the counselor encourages each student to make his own decision. A variety of interest, personality, and ability tests are available to help both the student and the counselor in their work together.

The Office of the Dean of Students attempts to preserve the atmosphere of informality and friendliness, such as is found at a small school, and to assist the student in making the transition from high school to college as easy as possible. The Dean of Students and his staff are eager to cooperate with the parents of students in an effort to solve any problems affecting the welfare of Georgia Tech students.
STUDENT ACTIVITIES

Student Council—1967-1968

The Student Council, which was first established in 1922, is the student government organization of Georgia Tech. Through its elected representatives, it exercises supervisory authority over all extracurricular student activities except YMCA and Athletics.

The Student Council officially represents and acts as principal liaison agent between the general student body and the faculty. It controls the use of student activity fees and handles all financial matters involving the general student body.

Also the Student Council has charge of the chartering of all student organizations. Through a series of standing committees and some temporary committees, the work of the Council is carried on in every field of student activity.

The Student Council is composed of representatives from each class at Georgia Tech. There are six freshman representatives, eight sophomore representatives, six junior representatives, and twenty-one senior representatives (representing and elected by the seniors in the individual Departments). Supplementing this group are the senior class officers. The Dean of Students is Faculty Advisor for the Student Council.

Officers:

Samuel A. Williams, President
Ronald L. Turner, Vice President
Larry C. Wyont, Judiciary Cabinet Chairman
Michael L. Sappington, Secretary
S. Eric Ragir, Treasurer
Dean James E. Dull, Faculty Advisor

Senior Class Officers:

John E. (Chip) Akridge, President
James B. Stallings, Vice President
Larry C. Wyont, Secretary-Treasurer

Senior Departmental Representatives:

George A. Stewart, A.E.  George Fauerbach, M.E.
Hugh H. Westberry, Comb.  Jerry O. Phillips, M.E.
Reagan S. McCoy, C.E.  Robert L. Young, Physics
Harold F. Reheis, C.E.  Freddie J. Chasteen, Comb.
Richard M. Crouch, E.E.  Frederick E. Link, Comb.
Thomas E. Feld, E.E.  Joel C. Pittard, Comb.
David L. Whelan, E.E.  Albert W. Culbreth, I.M.
David H. Bassett, I.E.  S. Eric Ragir, I.M.
Carey H. Brown, I.E.  James A. Lyle, I.M.
Junior Class Representatives:
John B. Carter, Chairman
Keith D. Peterson
Thomas A. Chapman

Sophomore Class Representatives:
Paul T. Conte, Chairman
Mark P. Saunders
Frank A. Brown
William H. Harrison

Freshman Class Representatives:
William D. Sumner, Chairman
Ronald W. Davis
William L. Fleming

Members at Large:
Brook H. Byers
James M. Hertenstein
Larry C. Wyont

Honorary Members:
Susan Clemmons, WSA Representative
Philip C. Cook, Technique Editor
Marcus J. Dash, Graduate Student Representative
Yusuf Mussalli, International Student Representative
Peter A. Ross, I.D.C.
Robert M. Corr, I.D.C.

Board of Student Publications
This Board was organized in July, 1945, at the request of the Student Council. The Board is responsible for all student publications on the Georgia Tech campus. Officers of the Board for 1967-68 were:

Chairman and Treasurer: DEAN W. EUGENE NICHOLS; Secretary: JAMES R. COOK

The Technique
PHILIP C. COOK ............................................................ Editor
CHARLES R. SNOW ..................................................... Business Manager
PROFESSOR TOM F. ALMON ............................................ Faculty Advisor

Rambler
CHARLES A. BROWN ................................................... Editor
FRED A. SKELLIE ....................................................... Business Manager
DR. PETER B. SHERRY ................................................ Faculty Advisor
Young Men's Christian Association

Director—Carlton O. Parker; Associate Director—Donald L. Cox; Office Secretaries—Mrs. Robert C. Frost, Jr., Mrs. Edward O. Travis.

The Young Men's Christian Association is a lay Christian movement. It seeks to find forms of lay religious expression that will reflect understanding of the teachings and practices of all the churches to which YMCA members belong.

We welcome as members persons of all religious affiliations who wish to join and cooperate in support of the Christian ideals and values for which we stand. Each member is encouraged to be faithful to the teachings and practices of his own church.

In giving effect to our Christian ideals and values, the Georgia Tech YMCA offers, to those who participate in its activities, opportunities for experiences that will help them

... to develop self-confidence and self-respect and an appreciation of their own worth as individuals

... to develop a faith for daily living

... to grow as responsible members of their families and citizens of their communities

... to appreciate that health of mind and body is a sacred gift and that physical fitness and mental well-being are conditions to be achieved and maintained

... to recognize the worth of all persons, and to help others attain their greatest self-fulfillment

... to develop a sense of world-mindedness, and to work for world-wide understanding

... to develop capacities for leadership and use them responsibly in their own groups and in community life.

The Georgia Tech YMCA sponsors purposeful activities, some of which are: Alpha Y-Phalanx Club, Cabinet, Chess Club, Executive Roundtable, Gamma Psi, Gene Turner Fund, IAESTE (International Association for the Exchange of Students for Technical Experience), Photography Club, Sailing Club, Sigma Y-Phalanx Club, "T" Book Committee, Toastmasters Club, Triangle Club, USA-USSR Cultural Exchange Program, and World Student Fund.

The "T" Book—a handbook of information for new students—contains much of interest and value about the YMCA and other student organizations. A copy is available upon request.
FRATERNITIES

Interfraternity Council—Composed of two representatives from each national fraternity at Georgia Tech, and Assistant Dean of Students as faculty advisor, the Interfraternity Council is the governing body for all social fraternities on the campus. The Council sets such regulations as rush-week rules, house rules, and pledge and membership regulations.

Officers 1967-1968

I. F. C.

<table>
<thead>
<tr>
<th>Fraternity</th>
<th>Faculty Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Epsilon Pi</td>
<td>Leon Zalkow</td>
</tr>
<tr>
<td>Alpha Tau Omega</td>
<td>Paul T. O'Connor</td>
</tr>
<tr>
<td>Beta Theta Pi</td>
<td>Harry Baker</td>
</tr>
<tr>
<td>Chi Phi</td>
<td>Peter Sherry</td>
</tr>
<tr>
<td>Chi Psi</td>
<td>Aristides F. Abril</td>
</tr>
<tr>
<td>Delta Sigma Phi</td>
<td>Walter H. Tripod</td>
</tr>
<tr>
<td>Delta Tau Delta</td>
<td>James J. Bynum</td>
</tr>
<tr>
<td>Delta Upsilon</td>
<td>B. A. Gilbreath</td>
</tr>
<tr>
<td>Kappa Alpha</td>
<td>W. A. Flinn</td>
</tr>
<tr>
<td>Kappa Sigma</td>
<td>John Stepp</td>
</tr>
<tr>
<td>Lambda Chi Alpha</td>
<td>Gordon Davis</td>
</tr>
<tr>
<td>Phi Delta Theta</td>
<td>Mrs. J. H. Crosland</td>
</tr>
<tr>
<td>Phi Epsilon Pi</td>
<td>Paul Mayer</td>
</tr>
<tr>
<td>Phi Gamma Delta</td>
<td>Francis C. Bragg</td>
</tr>
<tr>
<td>Phi Kappa Sigma</td>
<td>Samuel C. Ketchin</td>
</tr>
<tr>
<td>Phi Kappa Tau</td>
<td>Bud Williams</td>
</tr>
<tr>
<td>Phi Sigma Kappa</td>
<td>Howard E. Bedell</td>
</tr>
<tr>
<td>Pi Kappa Alpha</td>
<td>Tommy Plaxico</td>
</tr>
<tr>
<td>Pi Kappa Phi</td>
<td>Neil DeRosa</td>
</tr>
<tr>
<td>Sigma Alpha Epsilon</td>
<td>James D. Landrum</td>
</tr>
<tr>
<td>Sigma Chi</td>
<td>Ewing Hunter</td>
</tr>
<tr>
<td>Sigma Nu</td>
<td>H. G. Carmichael</td>
</tr>
<tr>
<td>Sigma Phi Epsilon</td>
<td></td>
</tr>
<tr>
<td>Tau Kappa Epsilon</td>
<td></td>
</tr>
<tr>
<td>Theta Chi</td>
<td>L. Hugh Moore</td>
</tr>
<tr>
<td>Theta Xi</td>
<td>Leroy A. Woodward</td>
</tr>
<tr>
<td>Phi Kappa Theta Colony</td>
<td>Charles Liotta</td>
</tr>
</tbody>
</table>

Sorority

<table>
<thead>
<tr>
<th>Sorority</th>
<th>Faculty Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Xi Delta</td>
<td>R. E. Stiemke</td>
</tr>
</tbody>
</table>
# PROFESSIONAL AND TECHNICAL SOCIETIES

<table>
<thead>
<tr>
<th>Departmental Societies</th>
<th>Faculty Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Association of Textile Colorists and Chemists</td>
<td>Raymond Flege</td>
</tr>
<tr>
<td>American Ceramic Society</td>
<td>Lane Mitchell</td>
</tr>
<tr>
<td>American Chemical Society</td>
<td>Drury S. Caine</td>
</tr>
<tr>
<td>American Institute of Architects</td>
<td>John A. Kelly</td>
</tr>
<tr>
<td>American Institute of Chemical Engineers</td>
<td>H. Clay Lewis</td>
</tr>
<tr>
<td>American Institute of Industrial Engineers</td>
<td>Nelson K. Rogers</td>
</tr>
<tr>
<td>American Society of Civil Engineers</td>
<td>Richard King</td>
</tr>
<tr>
<td>American Society of Mechanical Engineers</td>
<td>Phil Sexton</td>
</tr>
<tr>
<td>American Nuclear Society</td>
<td>W. W. Graham</td>
</tr>
<tr>
<td>ANAK Society</td>
<td>W. Roane Beard</td>
</tr>
<tr>
<td>Arnold Air Society</td>
<td>Harold Sattler</td>
</tr>
<tr>
<td>Association of Industrial Design Students</td>
<td>Robert F. Rablin</td>
</tr>
<tr>
<td>Georgia Tech Planner's Society</td>
<td>Malcolm G. Little</td>
</tr>
<tr>
<td>Institute of Electrical and Electronics Engineers</td>
<td>Thomas M. White</td>
</tr>
<tr>
<td>Psi Society (Psychology)</td>
<td>E. Jo Baker</td>
</tr>
<tr>
<td>Society for Advancement of Management</td>
<td>James Caldwell</td>
</tr>
<tr>
<td>Society of American Military Engineers</td>
<td>J. Sterling Merrell</td>
</tr>
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</table>

**Departmental Honorary Societies**

<table>
<thead>
<tr>
<th>Society</th>
<th>Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha Pi Mu (Industrial Engineering)</td>
<td>Cecil G. Johnson</td>
</tr>
<tr>
<td>Chi Epsilon</td>
<td>James R. Fincher</td>
</tr>
<tr>
<td>Delta Kappa Phi</td>
<td>Gerald B. Fletcher</td>
</tr>
<tr>
<td>Eta Kappa Nu</td>
<td>Frank Nottingham</td>
</tr>
<tr>
<td>Industrial Management Honor Society</td>
<td>George Maddox</td>
</tr>
<tr>
<td>Kappa Kappa Psi</td>
<td>Ben L. Sisk</td>
</tr>
<tr>
<td>Keramos</td>
<td>Lane Mitchell</td>
</tr>
<tr>
<td>Phi Psi</td>
<td>Frank L. Clarke</td>
</tr>
<tr>
<td>Pi Mu Epsilon</td>
<td>James M. Osborn</td>
</tr>
<tr>
<td>Pi Tau Sigma</td>
<td>Harold L. Johnson</td>
</tr>
<tr>
<td>Scabbard and Blade</td>
<td>John F. Malone</td>
</tr>
<tr>
<td>Sigma Gamma Tau</td>
<td>D. W. Dutton</td>
</tr>
<tr>
<td>Sigma Pi Sigma</td>
<td>A. L. Stanford, Jr.</td>
</tr>
<tr>
<td>Tau Sigma Delta</td>
<td>James H. Grady</td>
</tr>
</tbody>
</table>

**Honorary Organizations**

<table>
<thead>
<tr>
<th>Society</th>
<th>Advisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Briaerean Society, Section I</td>
<td>I. E. Perlin</td>
</tr>
<tr>
<td>Briaerean Society, Section II</td>
<td>I. E. Perlin</td>
</tr>
<tr>
<td>Koseme</td>
<td>Peter Sherry</td>
</tr>
<tr>
<td>ODK</td>
<td>W. L. Carmichael</td>
</tr>
<tr>
<td>Phi Eta Sigma</td>
<td>A. H. Bailey</td>
</tr>
<tr>
<td>Phi Kappa Phi</td>
<td>Sherman F. Dallas</td>
</tr>
<tr>
<td>Tau Beta Pi</td>
<td>Donnell W. Dutton</td>
</tr>
</tbody>
</table>
Religious

Baptist Student Union  Rev. Calvin Zongker
Campus Crusade for Christ  Earl M. Wheby
Canterbury Association  Rev. Harwood Bartlett
Christian Science Organization  George Pilkington
Lutheran Student Association  H. Bruce Dull
Newnan Club  Rev. Alvin Matthews
Wesley Foundation  Rev. William Landiss
Westminster Fellowship  Rev. Alvin S. Jepson

Miscellaneous

Alpha Kappa Psi  John R. Stepp
Alpha Phi Omega  Robert L. Hull
American Marketing Association (Collegiate Chapter)  Ramon Gamoneda
Georgia Tech Band  Ben L. Sisk
Bulldog Club  Tommy Plaxico
Cheerleaders  James E. Dull
Chinese Club  James C. Wu
Circle K Club  James A. Strickland
Co-op Club, Section I  Frank Roper
Co-op Club, Section II  Frank Crossley
Counter-Insurgency Unit of Georgia Tech  John C. Snodgrass
Dames Club  William A. Flinn
Drama Tech  C. W. Tooles
Flying Club  R. B. Logan
Foil and Mask  Robert F. Grossman
Gamma Beta Phi  Kenneth W. Haynes
Georgia Tech Aqua Jackets  Wallace C. Ryan
Georgia Tech Political Forum  Roger D. Johnson
Georgia Tech Sailing Club  Reiner J. Gerdes
Georgia Tech Soccer Club  Robert Nelson
Georgia Tech Sports Car Association  Jose Villanueva
Georgia Tech Student Center  James E. Dull
Georgia Tech Student Center Program Board  James L. Clegg
Georgia Tech Student FM Radio Station  James A. Strickland
Glee Club  Walter C. Herbert
Graduate Student Senate  Karl Murphy
International Students Organization  Sandra W. Thornton
Inter-Varsity Christian Fellowship  Carl Steinhauser
Pan-American Union  Louis Zahn
Pershing Rifles  John F. Malone
Radio Club  Roy A. Martin
Rambling Reck Club  James E. Dull
Society of Women Engineers  Paul Eaton
T Club  Robert Thalman
Veterans Club  F. W. Ajax
Women's Student Association  Helen H. Naugle
Young Americans for Freedom  Phil Sexton
YMCA Groups

Alpha-Y-Phalanx ................................................................. Donald L. Cox
Barbell Club ................................................................. Jerry D. Purser
Chess Club ................................................................. Donald L. Cox
Executive Roundtable ................................................... Robert E. Winn
Gamma Psi ................................................................. Donald L. Cox
IAESTE ................................................................. Donald L. Cox
Photography Club ......................................................... Terry S. Moore
Sigma-Y-Phalanx .......................................................... Terry S. Moore
T Book Staff ................................................................. Terry S. Moore
Triangle Club ............................................................... Terry S. Moore
USA-USSR Cultural Exchange Program ......................... Donald L. Cox
World Student Fund ....................................................... Donald L. Cox
Y.M.C.A. Cabinet .......................................................... Donald L. Cox
UNDERGRADUATE FINANCIAL AID

Financial aid at the Georgia Institute of Technology is intended to assist students in meeting normal college expenses, and it is our intention to help as many students as possible. Our hope is that no student will fail to consider Georgia Tech as a college he might wish to attend because of financial reasons. It is our desire to help, either through our own funds, or by directing the student to other sources. The financial aid applicant should realize, however, that the amount of aid which can be granted seldom meets all the educational expenses, and financial assistance will have to be supplemented by the student, family or other outside sources.

The financial aid office has the responsibility of administering all funds provided to Georgia Tech for the assistance of undergraduate students. Not only does this office award all financial assistance the institution has for the use of undergraduate students, but it also receives and assigns awards forwarded to the institution for the use of individual students from outside agencies. All students wishing to receive scholarships, loans, or any other type of monetary aid, should contact this office for information and service.

FOREIGN STUDENTS may apply for scholarship aid, but due to limited funds and other restrictions, should not normally expect assistance. TRANSFER STUDENTS will be considered for scholarships after one quarter's attendance (they will be considered as other entering students for loans and work opportunities). However, transfer students should adhere to the April 1 deadline, if they wish assistance for any quarter of the year beginning with the subsequent fall quarter, since all scholarships for enrolled and transfer students are awarded during the summer.

Although the Co-operative program at Georgia Tech is not a financial aid program, many of those who attend are able to assist themselves with their college expenses through this program. One-fifth of the undergraduate enrollment attends under the Co-operative plan and earn from $1,500 to $2,400 per year. Co-op enrollment is restricted to students in the fields of engineering, science and industrial management. Financial need is not a prerequisite for consideration, consequently, a student attending under the Co-operative plan will not be denied consideration for other aid because of his enrollment. Students desiring other information on the Co-operative program should write to the Director of the Co-operative Division, Georgia Institute of Technology, Atlanta, Georgia 30332.

Many students obtain institutional part-time employment or part-time employment in the Atlanta area. Our Placement Center attempts to keep an up-to-date listing on opportunities and most students will be able to help themselves through part-time employment, if they so desire.

The following is a summary of financial aid activity for the 1966-67 academic year:
INSTITUTIONALLY GRANTED AID

<table>
<thead>
<tr>
<th>Number</th>
<th>Type of Aid</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>309</td>
<td>*Undergraduate Scholarships</td>
<td>$165,000</td>
</tr>
<tr>
<td>75</td>
<td>Educational Opportunity Grants</td>
<td>34,000</td>
</tr>
<tr>
<td>519</td>
<td>National Defense Student Loans</td>
<td>302,000</td>
</tr>
<tr>
<td>23</td>
<td>College Work-Study Jobs</td>
<td>6,600</td>
</tr>
<tr>
<td>36</td>
<td>Cuban Loans</td>
<td>27,000</td>
</tr>
<tr>
<td>53</td>
<td>Out-of-State Tuition Waivers</td>
<td>12,000</td>
</tr>
<tr>
<td>916</td>
<td>Short Term Loans</td>
<td>330,000</td>
</tr>
</tbody>
</table>

ESTIMATED NON-INSTITUTIONALLY GRANTED AID

<table>
<thead>
<tr>
<th>Number</th>
<th>Type of Aid</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>232</td>
<td>Undergraduate Scholarships</td>
<td>$105,000</td>
</tr>
<tr>
<td>153</td>
<td><strong>Georgia Higher Education Assistance</strong> Corporation Loans</td>
<td>134,000</td>
</tr>
</tbody>
</table>

Request for Specific Assistance

Submission of an application for financial aid to the Financial Aid Office will insure consideration for all programs of aid. However, applicants desiring specific types of aid should check the appropriate spaces on their applications. All students should indicate the quarters for which they are applying.

Basic Principle of Financial Aid

We subscribe to the principle that the primary purpose of financial aid is to provide assistance to students, who, without such aid, would be unable to attend college.

The primary responsibility for financing an education rests with the student and his family. Any financial aid is, therefore, awarded according to individual need and individual college costs. Financial aid includes scholarships, loans, and employment, which may be offered to students singly or in combination.

Determination of Award

The family of the applicant is expected to make a maximum effort to assist the student with college expenses. Financial assistance from colleges and other sources should be viewed only as supplementary to the efforts of the family.

*The majority of upperclassmen receiving scholarship assistance have a grade point average of 2.8 or better, and to be considered for a scholarship as an entering freshman, a student should have a predicted grade point average of 2.8 or better. The average non-resident entering freshman who receives scholarship assistance has a predicted grade point average of 2.3, and the average resident has a predicted grade point average of 2.7. About 15% of the incoming freshmen receive funds from the institutional aid program.

**The above statistics estimate the number of students who received loans from the Guaranteed loan program that are residents of the State of Georgia and in attendance at Georgia Tech. We have no adequate records of students from other states who attended Georgia Tech and received a Guaranteed loan. We would, however, assume that an amount equal to the Georgia Higher Education Assistance Corporation loans or greater were granted through other states.
The student also has a responsibility of contributing to his college expenses. His resources may include savings, summer earnings, contributions from friends and relatives, etc. Summer earnings are normally calculated to be $300.00 prior to the freshman year and are expected to increase for upper-class years at the rate of $50.00 per year. Applicants are expected to contribute at least 1/5 of their savings toward each year's college expenses.

**Obtaining and Submission of Application**

Applications for financial aid may be obtained by calling or writing:

Financial Aid Officer  
Georgia Institute of Technology  
Atlanta, Georgia 30332  
(404) 873-4211  

Requests for further information on any programs of aid should also be directed to the above address.

**Rules and Regulations Governing Undergraduate Scholarships**

1. The majority of the scholarships which are available through the Georgia Institute of Technology are restricted to those undergraduates who have high academic ability and good character, but lack sufficient funds to begin or continue their college education.

2. A Georgia Institute of Technology scholarship application is required of each applicant. These forms are available from the Financial Aid Office and must be completed by entering freshmen and returned no later than February 15. All other students must submit their application between November 1 and April 1 of the year preceding the term for which the funds are desired. An interview is required when the application is submitted (except for entering freshmen and transfer students who would be required to make a special trip to the campus).

3. The Georgia Institute of Technology is a member of the College Scholarship Service (CSS). Participants in CSS subscribe to the principle that the amount of financial aid granted a student should be based on financial need. The CSS assists colleges and universities and other agencies in determining the student's need for financial assistance. Therefore, all applicants for financial aid must also submit the Parents' Confidential Statement (PCS), designating the Georgia Institute of Technology as one of the recipients in accordance with the following:

   a. The parents of all students under 25 years of age must complete the Parents' Confidential Statement (PCS) each year or sign a statement on a form provided by the Financial Aid Office that they did not contribute to the students' financial support for the previous year and did not claim him as a dependent for income tax purposes.

   b. If a student is over 25 and has received any financial support from his parents during the preceding year and/or been declared as a dependent for income tax purposes, the parents must like-
wise complete the PCS each year. If not, the financial resources of the individual student over 25 will be used in determining the amount of the award.

c. All married students, whatever age, must also complete the Married Students Supplement to the PCS.

d. Any exception to the PCS requirements will be considered as individual cases by the Financial Aid Officer.

Entering freshmen may obtain PCS forms from their high schools or from the Financial Aid Office, Georgia Institute of Technology, Atlanta, Georgia 30332, and must submit them to CSS no later than February 1. All other students must obtain the Parents’ Confidential Statement from the Office of Financial Aid and submit them to CSS no later than April 1.

4. Certain scholarships are renewable provided the recipients continue to demonstrate high scholastic ability, outstanding character and financial need. A renewal application is required of students for all renewal scholarships. It is the student’s responsibility to complete this and provide any other information that may be required by the institution or sponsor during the deadline periods as established by the Financial Aid Officer.

5. All entering freshmen are required to take the College Entrance Examination Board Scholastic Aptitude Test and “certain” Achievement Tests (dependent upon field of study) prior to acceptance at the Georgia Institute of Technology. Results of these tests will be considered by the Financial Aid Officer in granting awards to entering freshmen.

6. An application for a scholarship cannot be considered until the student has been accepted for admission or is enrolled as a student at the Georgia Institute of Technology. Entering freshmen will be notified of awards not later than June 1; all others will receive notification not later than August 15.

7. A student need not apply for a particular scholarship since his eligibility for any scholarship is established upon receipt of the scholarship application and the Parents’ Confidential Statement.

8. Scholarship payments are made in equal quarterly installments during the academic year. Payments are made to the individual recipient who in turn may apply the payment against his expenses.

9. The proceeds of financial aid awards shall be used for the payment of tuition and required fees, board and room, and similar living expenses and for instructional equipment, material and books.

10. The Financial Aid Office must be notified of any unusual changes in family or personal financial situation. We must also be notified of any additional financial assistance which is received from other sources and it is understood that such assistance may cause a change in awards that have been offered by Georgia Tech.
11. Financial aid awards may be received only by the student while in school and carrying a full load (12 or more hours) unless special permission is received. If a student accepts funds after being dropped or after withdrawing, the student shall be liable for repayment.

12. If a student or parents of a student intentionally falsify any information, the award may be immediately withdrawn and the student will be liable for repayment of funds already received.

13. When, in the opinion of the Financial Aid Officer, a student commits any act that may be reason for disciplinary action, the award may be discontinued. Unusually poor academic achievement, such as academic probation, may also be reason for reconsideration of an award during the academic year.

14. By accepting a scholarship, the student gives approval for the institution to provide transcripts of grades and other records that may be requested by the sponsor.

Allied Chemical Foundation Scholarships (FAO-010)
A grant of $1,500 to be awarded to students in the A. French Textile School. The amount of each award will be left to the discretion of the Financial Aid Officer, subject to concurrence by the A. French Textile School.

Aluminum Company of America Scholarships (FAO-015)
Five $750 engineering scholarships to any student. Need, ability, and scholastic standing are the prime factors in the selection of candidates. Scholarships are renewable.

American Association of Textile Chemists and Colorists (FAO-020)
Two scholarships in the amount of $500 each to juniors or seniors in the School of Textile Chemistry. Selection is by the Financial Aid Officer, subject to sponsor approval.

Anonymous Alumnus Scholarship (Class of 1926) (FAO-025)
An $800 annual scholarship to an entering freshman cooperative student. Recipient must acknowledge receipt of the award to the Financial Aid Office.

David J. Arnold Scholarships (FAO-040)
Scholarships to be awarded from the interest on a fund established by Robert O. Arnold in memory of his brother. Award is unrestricted as to field of study and is awarded on the basis of financial need. Preference to residents of Spalding County, Georgia.

Atlanta Federal Savings Scholarships (FAO-045)
Two annual $500 scholarships, one made to an entering freshman and one to a senior. The freshman selection is made on the basis of financial need and high school academic excellence. The senior selection is made from students who rank in the upper 25% of their class and on the basis of financial need. Recipients must be male graduates of Atlanta, Fulton County, or DeKalb County high schools, and must be enrolled or accepted for admission in the School of Industrial Management.

Atlanta Textile Club Scholarship (FAO-050)
One $300 scholarship to be awarded to a junior or senior in the A. French Textile School. Preference will be given to students from the Atlanta area.
Avondale Educational & Charitable Foundation Scholarship (FAO-060)

An annual scholarship of $750, renewable for three additional years provided the student remains academically eligible. The recipient of this award should be from Butts County Georgia or the child of an employee of the Avondale Mills in Jackson, Georgia. Preference will be given to students in Textiles, Textile Engineering or Textile Chemistry.

Babcock and Wilcox Fund

A fund established by the Babcock and Wilcox Aid - to - Education program at Georgia Tech. Receipts are used to provide assistance to outstanding students enrolled in any school. Selection by Financial Aid Officer.

Eugene O. Batson Scholarship Fund (FAO-440)

This fund of $10,000 was created by Mr. E. O. Batson in memory of his son, the income to be given to deserving students. Unrestricted as to field of study.

Borden Freshman Prize (FAO-070)

An award of $200 to the student finishing the freshman year with the highest average.

Burlington Industries Foundation Scholarships (FAO-075)

Two annual $500 scholarships to a rising junior and a rising senior. Selection on basis of leadership, scholarship, and financial need. Prefer Textiles, Industrial Management, Industrial Engineering and related fields. Scholarship awarded junior recipient is renewable.

Callaway Scholarships (FAO-080)

One annual $500 scholarship to be awarded a rising junior in the upper third of his class and majoring in Textile Engineering, Textiles, or Textile Chemistry. Award is renewable. Selection by Financial Aid Officer and Callaway Scholarship Plan Committee. Scholarship is renewable provided recipient maintains satisfactory class standing.

Callaway Educational Association Scholarships (FAO-657)

Six general scholarships are awarded annually in the maximum amount of $300 per quarter to applicants who are employees or children of employees of Callaway Mills Company. A maximum of six Co-Operative Scholarships may also be awarded to any applicant in the following fields: Chemical, Electrical, Industrial, Mechanical or Textile Engineering. Selection is by the Callaway Scholarship Plan Committee. For further information write: Callaway Mills Company, Scholarship Plan Committee, LaGrange, Georgia.

Louis Jones Cassels Scholarship (FAO-087)

An annual scholarship of $350 to $500 to be given to a deserving student. Funds are provided by Mrs. Halie J. Cassels, in honor of her late husband and The R. K. Whitehead Foundation. Selection by Financial Aid Officer.

Cincinnati Milling Machine Company Scholarship (FAO-666)

A $500 scholarship for a student from the Greater Cincinnati, Ohio area. Student should be a co-operative student in either Mechanical, Electrical, or Chemical Engineering. Award is renewable.

Coats & Clark, Inc. Scholarships (FAO-095)

Two $500 scholarships to be awarded each year. These scholarships are renewable for three additional years, provided student maintains proper requirements. Award will be made to a high school graduate entering Georgia Tech for his freshman year in Chemical, Mechanical, Textile, Industrial, Electrical Engineering, as well as Chemistry, Textiles, and Textile Chemistry. If possible, one award will be made to an applicant from North Georgia and one to an
applicant from South Georgia with preference to children of employees of Coats & Clark, Inc. Awards will be made on basis of academic ability and financial need.

Columbus High School Class of 1912 (FAO-587)
Scholarships to be awarded by the Columbus High School in the maximum amount of $400 to their graduates. For further information write the Office of the Principal, Columbus High School, Columbus, Georgia.

Crown Zellerbach Foundation Scholarship (FAO-105)
Two scholarship grants of $600 each unrestricted as to field of study for a junior or senior. Merit and ability are the primary considerations without regard to financial need. Scholarships are non-renewable.

Damar, Incorporated Scholarship (FAO-110)
One $600 scholarship awarded to a Cobb County, Georgia, resident. Award is made on basis of need and ability.

Blanche Mohr Davis Scholarships (FAO-449)
One (or more) scholarship to any student who desires and deserves a college education.

John Benton Dickey Memorial Scholarship Fund (FAO-550)
Annual income from an endowment fund of $10,000 to be used to provide one or more scholarships or loans to students of Georgia Tech. Available to students in any field who are academically outstanding and need financial assistance in order to attend college. These funds were left to Georgia Tech by the late Mrs. Kate McCalley Dickey in her Last Will and Testament.

Robert B. Dodds Unit Fund Scholarships (FAO-115)
Scholarships to be awarded from the income on a capital stock fund to any student selected by the Financial Aid Officer. Preference will be given to qualified applicants from the State of Arkansas.

Douglas Aircraft Company (A Component of McDonnell Douglas Corporation) Scholarship (FAO-120)
One $750 scholarship awarded to a senior student in Aerospace, or Electrical (electronics) Engineering. Selection by Financial Aid Officer subject to approval of Douglas Scholarship Board.

Ethyl Corporation Scholarship (FAO-125)
One scholarship for any student majoring in Industrial Engineering. The amount of the award is determined by the Financial Aid Officer and may be renewed.

Ferro Corporation Scholarship (FAO-130)
One annual scholarship of $300.00 to be provided to the Ceramic Engineering student who has the highest academic average at the end of the second quarter of his Sophomore year. Award to be granted during the Spring Quarter for use in the following Fall Quarter.

Louise M. Fitten Memorial Fund (FAO-155)
The interest on approximately $1,000,000 annually awarded to deserving students as scholarships. This endowment was provided to the institution from the estate of Miss Louise M. Fitten. Income is available for unrestricted scholarship purposes.

Floyd County Scholarships (FAO-736)
A scholarship fund to assist needy students without reference to politics, religion, or athletic ability. Recipients, as well as at least one of their parents, shall have been born in Floyd County or Rome City, Georgia. Selection is by the Floyd County School Board and the Rome City School Board. For further informa-
tion write Trust Officer, The National City Bank of Rome, Rome, Georgia.

Franklin Foundation Scholarships (FAO-135)
Three thousand dollars annual scholarship fund established to aid worthy students from the State of Georgia. Awards are made on the basis of need, ability, evidence of good character and scholastic standing.

Fulton Federal Savings Scholarship (FAO-140)
Three scholarships of $250 each for students majoring in the School of Architecture who are residents of Georgia. Ordinarily one award will go to a sophomore, one to a junior, and one to a senior.

Geigy Dyestuffs Scholarship (FAO-145)
A $500 scholarship for a student, preferably a junior, majoring in Textile Chemistry. This award will be granted on the basis of financial need, academic ability and evidence of good character.

General Motors Scholarships (FAO-150)
Two scholarships are awarded each year to entering freshmen of demonstrated academic excellence and leadership potential. Unrestricted as to field of study. Stipends range from $200 to $2,000 per year, depending on financial need. Renewable for four years subject to fulfillment of academic and leadership promise.

Georgia Highway Department Engineers Association Scholarship (FAO-155)
A tuition scholarship to any entering freshman in the School of Civil Engineering. Recipient must be a Georgia resident. Selection is subject to final approval by the Georgia Highway Department Engineers Association.

Georgia Institute of Technology Merit Scholarships (FAO-558)
Four scholarships. For finalists seeking to enroll at the Georgia Institute of Technology. Preference will be given Georgia residents.

Gilman Foundation Scholarship (FAO-160)
An award of $1,000 for an entering freshman, renewable for three additional years. Preference will be given in the order indicated:
1. Male resident of St. Marys, Georgia who is employed by, or who is a son of an employee of, St. Marys Kraft Corp., St. Marys Railroad Co., or Kraft Bag Company.
2. Any male employee or son of an employee of above mentioned companies, Gilman Paper Co., The Cellucord Corp., or Gilman Electric Light and Power Co., regardless of residence.

E. Barron Glenn Memorial Scholarship Fund (FAO-163)
An annual award of $1,000 to be provided to students enrolled at Georgia Tech who excel academically and need funds in order to remain in school. This money is given in memory of the founder of Glenn Associates, Inc., E. Barron Glenn and his wife Grace who met an untimely death on June 3, 1962 in the air crash at Orly, France.

Goodyear Foundation Scholarship (FAO-165)
An award of $1,000 for a junior or senior majoring in Mechanical or Chemical Engineering. Selection on basis of need, leadership, scholarship and ability.

Dean George C. Griffin Scholarships (FAO-175)
Income from property amounting to $1,000 a year has been made available for 99 years by Mr. Lonnie Allen Morris, Class of 1936, a resident of Miami, Florida, to set up in honor of George C. Griffin, Dean of Students Emeritus at Ga. Tech. First preference for award of the scholarships will be given to residents of Miami or Dade County, Florida. Second preference will be
to those from other sections of Fla. The main qualifications for the scholarships will be academic ability and financial need.

**George C. Griffin Scholarship (FAO-564)**
A scholarship fund created from the interest on approximately $35,000 contributed by Georgia Tech alumni and friends honoring Dean Griffin on his retirement as Dean of Students. The scholarships are unrestricted as to field of study and awarded on the basis of financial need.

**Col. Frank F. Groseclose Scholarship (FAO-180)**
One scholarship in the amount of $200 to a senior in the School of Industrial Engineering. The recipient must be a member of the Georgia Tech Chapter of the A.I.I.E. The scholarship will be awarded on the basis of financial need rather than scholastic ability alone.

**The Robert E. Gross/Lockheed Aircraft Corp. Scholarship (FAO-185)**
Income from $30,000 to be awarded annually by the Scholarship Committee to any student in scientific, engineering, economic or other fields applicable to the aerospace, electronic, marine, manufacturing, or construction industries. Recipient must be U. S. citizen.

**The John P. Holmes Scholarships Honoring Ben Z. and Sallie P. Holmes (FAO-567)**
This scholarship was set up by John P. Holmes in memory of his parents to provide one or more scholarships annually to undergraduates on the basis of academic ability and financial need.

**Interfraternity Council Scholarship (FAO-195)**
An annual $150 scholarship to a fraternity pledge or member who is a full-time student. Selection is by the Financial Aid Officer.

**Mark V. Larned Scholarships (FAO-560)**
A scholarship fund to be awarded to outstanding entering freshmen with financial need. Selection is by the Financial Aid Officer.

**C. D. LeBey Memorial Scholarship (Class of 1922) (FAO-563)**
One scholarship each year, unrestricted as to field of study, has been established in memory of Mr. C. D. LeBey, President, Class of 1922. First preference to residents of Florida, Alabama, and Tennessee. Value, approximately $250.

**Lockheed Leadership Fund (FAO-200)**
One four-year scholarship awarded annually covering tuition and fees plus $500 a year for expenses to a student majoring in science, engineering, or other fields applicable to the aerospace-electronic industry. Selection on basis of leadership, scholarship, and ability. Recipient must be a U. S. citizen, under 25, and a senior in an accredited public, private, or parochial secondary school.

**Julian L. Looney Scholarship Fund (FAO-566)**
A trust fund of approximately $30,000 given by Hazel Betts Looney in honor of her husband. Income from the fund is available for unrestricted scholarship purposes.

**Lowry Memorial Scholarship Fund (FAO-569)**
This scholarship was set up by Colonel Robert J. and Emma C. Lowry for the purpose of assisting legal residents of the State of Georgia to obtain a college education, who, because of lack of funds, might otherwise be deprived of this opportunity. The interest on approximately $500,000 is distributed as gift or loan scholarships, depending on the individual needs of the students.

**R. L. "Bob" MacDougall Scholarship (FAO-205)**
One scholarship each year, unre-
stricted as to field of study, has been established in the name of R. L. MacDougall by the Class of 1925 and friends. Value, approximately $300.

**Martin-Marietta Freshman Tuition Scholarships (FAO-215)**

One or more annual scholarship grants to cover full tuition for entering freshmen for the cooperative plan during the freshman year. Recipients must be from the Maryland, District of Columbia, or Orlando, Florida areas. Preference will be given to those students in Aerospace Engineering.

**McLendon Scholarship Fund (FAO-220)**

Fund of $500 established to be awarded to qualified students of good character, in financial need, and who would be otherwise unable to pursue their education. Unrestricted as to field of study.

**Minnesota Mining and Manufacturing Company Scholarship (FAO-230)**

$1,200 per year scholarship fund awarded to any undergraduate student in the field of Chemical, Mechanical or Industrial Engineering.

**Monsanto Chemical Company (FAO-240)**

Two $500 scholarships to be awarded to an outstanding student for his senior year of study in the School of Chemical Engineering and to an outstanding student in the A. French Textile School. Selection of recipient will be made by the Financial Aid Officer on the basis of leadership, need and ability.

**Muscogee Foundation Scholarship (FAO-842)**

One scholarship in the amount of $600 to an entering freshman in the field of textiles. Selection is by the Muscogee Scholarship Committee. For further information contact Secretary, Muscogee Scholarship Committee, Columbus, Georgia.

**NOPCO Chemical Company Scholarship (FAO-245)**

One $500 award to a junior or senior enrolled as a regular student in the School of Chemical Engineering. The selection will be on the basis of financial need and academic ability.

**Northside Optimist Club Scholarship (FAO-250)**

A scholarship fund in the amount of $2,000 to be awarded entering freshmen from the Greater Atlanta geographic area. Recipients must have high character, leadership potential, and academic ability. Preference will be given to those students with financial need.

**Owens-Illinois Scholarship (FAO-255)**

One scholarship for a Georgia resident to be awarded each year. Each scholarship will cover tuition, other college fees, and the cost of required textbooks and laboratory supplies. Award will be made to a male high school graduate and will be renewable for three additional years under certain conditions. Recipients must major in Electrical, Chemical, Civil, Ceramic, Mechanical or Industrial Engineering.

**Patterson and Dewar Engineers, Inc. (FAO-260)**

A fund of $400 per year, established by Patterson and Dewar Engineers, Inc., to be awarded to a deserving senior. The scholarship is made in behalf of the clients of the firm in lieu of the Christmas gifts of earlier years. The recipient is requested to assume the responsibility to repay voluntarily to the scholarship the funds received if practical in the future.

**Pennsylvania Glass Sand Corporation Merit Award Scholarship (FAO-265)**

An award covering tuition and fees for the senior year to the student in Ceramic Engineering who completes the junior year with the highest average.
Annie Laura Galloway Phillips Scholarship (FAO-270)
A $200 annual scholarship established to help deserving boys. Award will be made on the basis of scholastic record and financial need.

Jack Phinizy Educational and Charitable Foundation Fund (FAO-275)
Awards of $200 each for a freshman and a sophomore student in engineering. Restricted to students from Florida, Georgia, or North Carolina. Boys from Richmond County, Georgia, all things being equal, will have preference. Granted on the basis of academic ability, engineering aptitude, and financial need.

Piping Promotion Trust Scholarship (FAO-873)
A scholarship awarded annually to students entering Georgia Tech who are children of employees of Piping Promotion Trust contributors. Annual amount is $800. Applicants should apply to Trust directly.

The Rayonier Scholarships (FAO-290)
Two scholarships of $500 each established by The Rayonier Foundation. One of the scholarships is available for a senior in the School of Chemical Engineering and the other for a senior in the School of Industrial Management.

Lucia Reeves Scholarship (FAO-295)
One or more scholarships for worthy young men and women to be awarded from the income on a capital stock fund. Selection is by the Financial Aid Officer.

Regents’ State Scholarships (FAO-575)
A fund of approximately $20,000, Georgia Tech’s share of a $200,000 fund appropriated by the General Assembly for the University System in accord with the Board of Regents. Scholarships are for Georgia students with average grades and/or predicted grade point average in the upper 25% who possess superior ability and require financial need. The amount of each scholarship is determined by the Financial Aid Officer up to a maximum of $750 per year. Scholarships are renewable and with the provision that recipients must agree to stay and work in the State of Georgia one year for each $1,000 received under this program.

Rohm and Haas Scholarship (FAO-300)
A $1,000.00 fund to be provided annually to one or two Chemical Engineering students. Recipients must be juniors or seniors and in the upper 20% of their class.

J. D. Rhodes Scholarship (FAO-894)
One or more scholarships to be awarded from the income of the Trust of the late J. D. Rhodes. Selection is by the Financial Aid Officer.

Savannah Gas Company Scholarship (FAO-897)
A $300 scholarship to a student of Armstrong College transferring to the Georgia Institute of Technology. Selection is by the Savannah Gas Company. For further information write Executive Vice-President, Savannah Gas Company, P. O. Box 888, Savannah, Georgia.

Schlumberger Foundation (FAO-315)
Two $500 scholarships. Awards are to be made to students of high academic standing in their junior or senior year in the Schools of Electrical or Mechanical Engineering or Physics. Students must complete, prior to earning his undergraduate degree, at least twelve hours study in electricity.

Schroeter-Ergenzinger Foundation (FAO-320)
Two scholarships in the amount of $1,000 each for entering freshmen in the scientific or engineering fields. Recipients must be of good moral character and scholastic ability with economic or financial need. Scholar-
is renewable and selection is by the Financial Aid Officer.

**Seydel-Woolley & Company Scholarship (FAO-325)**

One $500 scholarship to be given to an outstanding male sophomore, junior or senior in the field of Textiles.

**Shaheen Foundation Scholarship (FAO-330)**

The interest from $5,700 to be awarded to engineering students on the basis of need and ability. Selection by Financial Aid Officer with preference to students from Whitfield County, Georgia.

**Alfred P. Sloan Foundation Scholarships (FAO-335)**

Two awards (amount to be determined) for matriculating male freshmen who plan to major in one of the traditional engineering disciplines or in basic science. The recipients must have established a record of high character, leadership potential, and scholarly promise. The awards may be renewed for three additional years.

**Smith-Turner Memorial Scholarship Fund (FAO-340)**

Scholarships to be awarded from the interest on a $25,000 Trust Fund established by Mr. Ivy Hendrix Smith in honor of Mr. N. S. Turner and Mr. George T. Smith. Selection is by the Scholarship Committee to worthy students without restriction to class, curriculum, sex, or other limitations. Preference will be given to a Jacksonville, Florida student.

**Standard Oil Company Scholarship (FAO-343)**

A Ch.E. Scholarship in the amount of $500 to be provided to an outstanding senior. Leadership, academic achievement and need will be used as criteria for selection by the Director of Chemical Engineering and the Financial Aid Officer.

**Southern Textile Overseer Scholarship (FAO-341)**

An annual award of $250 to worthy students enrolled in the A. French Textile School. Selection is by the Financial Aid Officer.

**Starke Patteson Scholarship (FAO-578)**

One or more annual scholarships to be awarded on the basis of academic ability and financial need. Recipients are to be selected from boys in the Cooperative plan from Memphis or Shelby County, Tennessee, high schools. Awards are made on the basis of academic record and financial need.

**T. E. Stribling Memorial Textile Fellowship/Scholarship Fund (FAO-350)**

Entire annual net income from Stribling Trust Fund for one fellowship to include tuition and fees, not less than $2,000 nor more than $2,500, plus $500 misc. expenses. Any excess income may be used for undergraduate scholarships of not more than $600 to members of the junior and senior classes of the Textile Department.

**Texaco Scholarship (FAO-355)**

A grant of $1,750 to be awarded at the discretion of the Financial Aid Officer. Preference will be given to juniors and seniors in Civil, Chemical, Electrical, Industrial and Mechanical Engineering and juniors and seniors in the Schools of Chemistry and Physics.

**The Textile Engineering Scholarship Plan of the Textile Education Foundation, Inc. (FAO-360)**

The Textile Education Foundation, Inc., of Atlanta, Georgia, established this scholarship plan in 1952 for the purpose of encouraging and assisting worthy young men who seek to obtain an education in Textile Engineering. A maximum of six scholarships will be awarded annually, each scholarship amounting to $750 per
scholastic year for each of four scholastic years provided the recipient maintains the requirements. For further information write to: The Director, A. French Textile School, Georgia Institute of Technology, Atlanta, Georgia 30332.

James F. Towers Scholarship (FAO-365)
Scholarships are to be awarded from the interest on a fund of $15,000 established by James F. Towers. Recipients should major in engineering or science. Preference will be given to male students from Floyd County, Georgia.

Uniform Award-Army ROTC (FAO-947)
A fund of $200 established by the Georgia Society of Daughters of Founders and Patriots of America to provide assistance to deserving Army ROTC students in purchasing advanced ROTC uniforms. Students must reimburse fund at the completion of ROTC and upon receipt of uniform deposit refund.

Union Bag-Camp Paper Corporation (FAO-370)
A $500 scholarship for a junior which is renewable for the senior year. The selection must alternate annually between Industrial and Chemical Engineering students. Scholastic ability and leadership potential are the major considerations.

Union Oil Company of California Scholarship (FAO-376)
An annual award of $500 to be given to a veteran in Ch.E., who is outstanding academically and needs funds in order to complete his education. Selection by Financial Aid Officer.

Uniroyal Foundation Scholarship (FAO-378)
Upperclass scholarship from a fund of $900 to be provided to students who have demonstrated academic ability, leadership and need funds to attend college. Recipient must assume a moral obligation to repay 25% of the scholarship after graduation. Selection by Financial Aid Officer.

Universal Oil Products Company Scholarship (FAO-380)
$1,500 per year scholarship fund established to aid worthy students in their junior or senior years of study. $1,000 will be used for students in Ch.E. and $500 for students in C.E. or M.E. Awards are made on the basis of academic record and financial need.

William T. Walton Memorial Scholarship Fund (FAO-385)
An award to be provided to a student in Chemical Engineering. The widow of William T. Walton, Mrs. Martine Walton, requested on his death that, in lieu of flowers, donations be sent to the Georgia Institute of Technology to establish this fund. The interest from these donations will comprise the scholarship.

Western Electric Fund Scholarships (FAO-400)
Three scholarships awarded to upperclassmen in the field of Engineering. Awards can be given to first or second year students. Scholarship maximum of $1,000 is based upon the cost of tuition, fees and books. Scholarships are renewable. Preference will be given to those students majoring in Electrical, Industrial, or Mechanical Engineering.

Westwood Charitable Foundation Scholarship (FAO-405)
A scholarship fund in the amount of $1,200 to be awarded those students with financial need. Scholarships are unrestricted as to course of study.

R. K. Whitehead Foundation (FAO-410)
$2,500 to $3,000 in scholarships to be awarded to outstanding freshmen with financial need.

Wilcox-Connally Scholarship (FAO-415)
An award of $300 for any junior or the School of Architecture.
Woman's Aero Club of Atlanta Scholarship (FAO-420)
An award of $1,000 for any junior or senior majoring in Aerospace Engineering.

Women's Chamber of Commerce Scholarship (FAO-425)
A $300 per year scholarship fund to be conferred upon any needy Georgia woman student at the Georgia Institute of Technology with the specification that the same student be eligible to receive the fund for more than one year; scholarship is to continue until such time as the organization deems it necessary to withdraw.

R. W. Woodruff Scholarship
Award of $500 established by Mr. R. W. Woodruff to assist students at Georgia Tech. Selection by Financial Aid Officer.

James Wright Memorial Scholarship (FAO-085)
One $500 scholarship to be awarded any student in the A. French Textile School. The funds for this award are provided by the A. B. Carter Company, Inc. in memory of Mr. James Wright, a former Tech student. Although this award is not renewable for subsequent years, the student receiving this award will be given prime consideration for other available awards for his future academic years.

Goodloe Yancey Scholarship Fund (FAO-164)
An annual undergraduate fund of $1,000 to be used at the discretion of the Financial Aid Officer to provide financial assistance to a needy and promising Georgia young man (or men) who are enrolled at Georgia Tech in the School of Civil Engineering.

GEORGIA TECH ALUMNI CLUB SCHOLARSHIPS
Various alumni clubs sponsor scholarship programs for students in their geographic areas. Interested applicants should contact their local high school counselor for further information or contact Mr. W. Roane Beard, Executive Secretary, Georgia Tech Alumni Association, 225 North Avenue, Atlanta, Georgia 30332.

Albany, Georgia Alumni Club (FAO-005)
Two or three scholarships (Co-op) for freshmen from the Albany, Georgia area. Only engineering courses available.

Augusta, Georgia Tech Club (FAO-055)
One, possibly two, $360 scholarships available to freshmen from the Augusta area.

Birmingham, Alabama Georgia Tech Club (FAO-065)
One $1,000 scholarship for freshmen from Birmingham and vicinity.

Chattanooga, Tennessee Georgia Tech Club (FAO-090)
One $400 scholarship available to freshmen from the Chattanooga area pursuing an engineering curriculum under the Co-operative Program. Applicants must rank in the upper ⅓ of their high school class, be of good moral character, and have financial need.

Bobby Dodd Scholarships (FAO-170)
Fifteen or more freshmen scholarships of $300-$450 each for qualified needy students from the Metropolitan Area provided by the Greater Atlanta Georgia Tech Club. Students are urged to attend on the Co-operative plan. Scholarships are extended for the sophomore year to those students who make a point average of 3.0 or better in their first year.

Jacksonville, Florida - Georgia Tech Alumni Club (FAO-197)
One or more scholarships from the Jacksonville, Florida area.
Macon, Georgia Tech Club (FAO-210)
One, possibly two, $360 scholarships available to freshmen from the Macon area.

Middle Tennessee Georgia Tech Club (FAO-225)
A scholarship fund in the amount of $500 to be awarded entering freshmen who require financial assistance. Recipients must be from the Middle Tennessee area.

North Alabama Georgia Tech Alumni Club (FAO-248)
One or more scholarships for students from the North Alabama area.

Pittsburgh Georgia Tech Club (FAO-280)
One $1,000 scholarship for high school students in Allegheny County to be awarded to an entering freshman who needs assistance.

Savannah, Georgia Tech Club (FAO-310)
Two $375 scholarships for students from the Savannah area.

South Texas Alumni Association (Blake R. Van Leer Memorial Scholarship) (FAO-345)
One $700 scholarship (Co-op) for freshmen from Houston, Texas and nearby cities. Only engineering courses available.

Washington, D.C. Georgia Tech Club (FAO-390)
Three scholarships for students from the Washington, D.C. area. Scholarships are designated as: Three Musketeers Scholarship (FAO-361), C. Gale Kiplinger Scholarship (FAO-196), and General Club Scholarship (FAO-390).

Western Carolina Georgia Tech Club (FAO-395)
One or more scholarships for students from the Greenville, South Carolina area.
GEORGIA TECH LOAN FUNDS

Rules and Regulations Governing
Short-Term Student Loans

1. A written application will be required of each applicant for a short-term loan, and an interview will be required when the application is submitted.

2. Each application must be approved by the Financial Aid Office before the loan will be granted.

3. Each student to whom a loan is granted will be required to sign a promissory note covering principal and interest.

4. There will be a set schedule of repayment which will be made a part of the application for the loan, and will also be made a part of the note to be signed by the student. (This schedule will normally consist of 3 equal installments with the entire balance to be repaid not later than 10 days before the end of the quarter in which funds are obtained.)

5. All notes bear interest at the rate of 5% per annum from the date of the note.

6. A student making application for a loan must state the reason for the loan.

7. The parent or guardian of a student applying for a loan will be so notified.

8. In some cases, an endorser may be required and in such instances, the student shall be notified.

9. All sections of the application must be completed in full.

10. A student will not be allowed to have more than one outstanding short-term school loan at a time. (An exception to this rule is a loan made for plant trips.)

11. Students may submit applications for short-term loans at any time during a quarter and expect receipt of funds within a normal processing time of one or two days.

   If, however, students wish to receive funds on a day of registration for payment of fees and tuition, they must anticipate a processing period of two to three weeks before receipt of their checks. Consequently, applications for Short-Term School Loans must be submitted not later than two weeks in advance of any registration day.

12. The only exception to the above time limits are cases of emergency. When such emergencies occur, whether during the quarter, between quarters or on a day of registration, the student should request special consideration from the Financial Aid Officer to receive funds on an emergency basis.
Loan applications submitted on the first day of registration of any quarter before 3:00 p.m. and approved on an emergency basis by the Financial Aid Officer will be processed before late fees apply. Loan applications submitted on the second day of registration will not be processed before late fees apply, and applicants with emergency situations must request waiver of late fees through the Financial Aid Officer.

13. Student short-term loans will be considered for the following purposes:
   a. Tuition, fees, room rent, board, books & supplies.
   b. Plant trips and after-graduation relocation.
   c. Emergency expenses not covered above.

14. A student's repayment record on previous loans of any type will be given prime consideration in the granting of a loan. Late repayment seriously endangers chances for new loans. Students with overdue loans will not be allowed to register for the next quarter until the obligation is cleared.

**Short-Term Loan Funds**

Approved short-term loan applications are assigned to the following funds which have been established through the generous contributions of friends and patrons of the Institute:

<table>
<thead>
<tr>
<th>Loan Fund</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>George W. Adair Loan Fund</td>
<td>$725.00</td>
</tr>
<tr>
<td>John I. Alford Loan Fund</td>
<td>1,500.00</td>
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<tr>
<td>William Ott Alston, Jr. Memorial Loan Fund</td>
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<tr>
<td>American Institute of Architects, Georgia Chapter Loan Fund</td>
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<tr>
<td>American Society of Mech. Engrs.,</td>
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<td>Roger Martin Memorial Fund</td>
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<tr>
<td>J. Baldwin Loan Fund</td>
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<tr>
<td>M. R. Berry Loan Fund</td>
<td>4,650.00</td>
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<td>James G. Boswell Foundation Loan Fund</td>
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<td>S. F. Boykin Loan Fund</td>
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<td>T. P. Branch Memorial Loan Fund</td>
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<tr>
<td>Brittain-Busbin-Jarrell Emergency Loan Fund</td>
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<tr>
<td>J. B. Campbell Loan Fund</td>
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<td>Class of 1934 Loan Fund</td>
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<td>Holland Coleman, Jr., Architectural Memorial Scholarship Loan Fund</td>
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<tr>
<td>William B. Coleman Post #51 of the American Legion Loan Fund</td>
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<tr>
<td>Mrs. Alice Spencer Coon Loan Fund</td>
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<td>Creole Foundation Loan Fund</td>
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<td>Arthur J. Dyer Student Loan Fund</td>
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<tr>
<td>Ford Foundation Loan Fund</td>
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<td>Loan Fund</td>
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<tr>
<td>---------------------------------------------------------------------------</td>
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<tr>
<td>A. French Loan Fund</td>
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<td>Georgia Federation of Labor Loan Fund</td>
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<td>Count Dillon Gibson Memorial Student Loan Fund</td>
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<td>Mary Brotherton Griffin Loan Fund</td>
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<td>Mary D. Gude Loan Fund</td>
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<td>Harrison-Trabant Loan Fund</td>
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<td>Dr. and Mrs. Thomas P. Hinman Loan Fund</td>
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<td>Louis Gholstin Johnson Loan Fund</td>
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<td>Kappa Alpha Educational Foundation, Inc. Loan Fund</td>
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<td>The Clyde L. King, Jr., and John King Memorial Loan Fund</td>
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<td>John King Memorial Loan Fund</td>
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<td>Roy Stevenson King Loan Fund</td>
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<td>Last Sub Class Loan Fund of 1914</td>
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<td>Malta Lodge #641, F. &amp; A. M. Loan Fund</td>
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<td>Lona Mansfield Loan Fund</td>
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<td>Mrs. T. O. Marshall Loan Fund</td>
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<td>E. P. McBurney Loan Fund</td>
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<td>J. A. McFarland Loan Fund</td>
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<td>Thomas E. Mitchell Education Fund of the University of Ga.</td>
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<tr>
<td>Joseph N. Moody Loan Fund</td>
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<td>Scottish Rite Loan Fund</td>
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<td>Stacey-Roberts Loan Fund</td>
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<td>J. P. Stevens Loan Fund</td>
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<td>Lynn Strickland Memorial Loan Fund</td>
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<td>Joseph M. Terrell Loan Fund</td>
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<td>Thomaston Mills Loan Fund</td>
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<td>Clark Thornton Memorial Loan Fund</td>
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<td>E. A. Turner Loan Fund</td>
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<td>Mrs. Fannie B. Wright Loan Fund</td>
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<tr>
<td>Carl B. Whyte Emergency Loan Fund</td>
<td>2,100.00</td>
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</table>

**Rules and Regulations Governing National Defense Student Loans**

1. The student should apply for an annual amount. The maximum allowable per year (3 quarters) is $1,000 for an undergraduate student, and the maximum total amount for one borrower during an undergraduate degree program is limited to $5,000. A student's total maximum amount of loan may be increased to $10,000 for a graduate degree. The maximum
loan a graduate student may be awarded is $600 per quarter. The student should indicate the quarters for which the loan is desired on the application form, as well as the amount desired. The deadline for application for summer only is March 1.

Loans for four consecutive quarters (except for co-op students) will be considered only as special cases. It is expected that students will seek employment during the summer months to help provide funds for college expenses during the following year.

2. The amount awarded to the student will be determined from information on the Parents' Confidential Statement and will take into consideration other awards received from the Georgia Institute of Technology and/or from other organizations.

3. A student's academic record is considered in the granting of the loan. The law requires that special consideration be given to students with superior academic standing.

4. All applicants must complete the Georgia Institute of Technology application each year.

The parents of all students under 25 years of age must also complete the Parents' Confidential Statement (PCS) each year or sign a statement on a form provided by the Financial Aid Office that they did not contribute to the student's financial support for the previous year and did not claim him as a dependent for Federal income tax purposes.

If a student is over 25 and has received any financial support from his parents during the preceding year and/or been declared as a dependent for income tax purposes, the parents must likewise complete the PCS each year. If not, the financial resources of the individual student over 25 will be used in determining the amount of the award.

All married students, whatever age, must also complete the Married Students' Supplement to the PCS.

Any exception to these PCS requirements will be considered as individual cases by the Financial Aid Officer.

5. To insure consideration, applications for loans must be submitted between November 1 and April 1 of the year preceding the academic year for which the loan is desired. Applications received after April 1 will be considered only if funds are available and at the discretion of the Financial Aid Officer. An interview is required when the application is submitted (except for entering freshmen and transfer students who would be required to make a special trip to the campus).

6. The Parents' Confidential Statement should not be sent to the Georgia Institute of Technology, but to the address indicated in the information included with the Parents' Confidential Statement.

7. All applicants will be notified by mail of approval or disapproval of their applications.
8. **PLEASE NOTE** that even though a student may receive notice of approval of an annual amount, he must comply EACH QUARTER with the following three requirements or his loan will not be processed:

   a. **A STUDENT MUST COMPLETE, EACH QUARTER, A CONFIRMATION OF ACCEPTANCE FORM AND RETURN IT TO THE FINANCIAL AID OFFICE BY THE FOLLOWING DEADLINES:**

      | Quarter     | Deadline    |
      |-------------|-------------|
      | Fall quarter| August 15   |
      | Winter quarter | October 21 |
      | Spring quarter  | January 30  |
      | Summer quarter   | April 22    |

   b. A student must remain in **good academic standing** at the Georgia Institute of Technology. If he is placed on academic probation for any quarter covered by the loan, he will be automatically ineligible to receive a loan for that particular quarter and his application for that quarter will be cancelled.

   c. A student must be enrolled as a full-time student at the Georgia Institute of Technology for each quarter covered by the loan unless he has received special approval to receive funds as a half-time student.

9. Prior to the receipt of the funds, the borrower must execute a promissory note. The oath and affidavit must be executed.

10. Funds received from these loans can be used only for legitimate educational purposes; payment of tuition and required fees, books and supplies, room, board and similar living expenses.

11. The borrower must, prior to leaving school, make satisfactory arrangements with the Controller's Office for repayment of the loan; repayment to begin no later than the tenth month from the day of leaving the university or graduation with the following exceptions:

   a. As long as the borrower is pursuing at least a half-time course of study at any institution of higher learning, no interest shall accrue and no payments need be paid.

   b. Payment may also be delayed, not in excess of 3 years, during which the borrower is a member of the Armed Forces of the United States, is in service as a volunteer under the Peace Corps Act, or is a volunteer under VISTA.

   c. An amount, not to exceed 50 per cent of any loan plus interest, shall be cancelled for services as a full-time teacher, at the rate of 10 per cent of the amount of the loan (plus interest), which is unpaid on the first day of teaching service, for each complete year of service.

12. Interest at three per cent is charged on the unpaid balance beginning nine months after the borrower ceases to be at least a half-time student.

13. Repayments shall be made in equal monthly installments of at least $15.00 a month.
The Lewis H. Beck Fund
The Lewis H. Beck Scholarship Fund is a student loan fund created by the late Mr. Lewis H. Beck of Atlanta, for the benefit of students attending Georgia Institute of Technology who are (1) residents of Georgia, (2) unmarried, (3) between the ages of 16 and 25, and (4) upperclassmen who, if sophomores, have completed their freshmen year with a 2.5 or better average or if juniors or seniors, have maintained a 2.0 or better average. The loan is administered by a special Board of Trustees. Applications may be obtained from the Financial Aid Office.

Cuban Students Loan Program
The purpose of this loan is to make available funds to Cuban nationals who are presently unable to receive support from sources within Cuba as a result of actions by the Cuban Government, and who are without sufficient resources in the United States to finance their attendance at institutions of higher education.

Borrowers under the Cuban Loan program who received loans prior to Fall Quarter, 1967, must submit four copies of the application form to the Financial Aid Office each quarter approximately two months before the beginning of the quarter. Effective Fall Quarter, 1967, all new applicants for the Cuban Loan must apply for an annual amount and follow the application procedures and regulations outlined on page 279 for applicants for the National Defense Student Loan.

An undergraduate student may borrow a maximum of $333 per quarter with a yearly maximum of $1,000, and a graduate student may borrow a maximum of $600 per quarter. The total of all loans for an undergraduate student may not exceed $5,000, and the total of all loans for a graduate student may not exceed $10,000.

In order to be eligible for a loan under this plan, a student must:
(1) Be a Cuban national.
(2) Be enrolled in the Institution as a full-time student on either the undergraduate or graduate level.
(3) Be capable, in the opinion of the Institution, of continuing to maintain satisfactory standing.
(4) Be unable, as a result of action by the Cuban Government, to receive support from inside Cuba.
(5) Be in need of the amount of the loan to pursue his course of study at the Institution.

Each student to whom a loan is granted will be required to sign a promissory note.

A borrower has a “year of grace” after he ceases to be enrolled as a full-time student in an institution of higher education during which he does not have to make payments on the loan and during which the interest of 3 per cent a year on the unpaid balance does not accrue. After that year elapses, the borrower will begin to repay the principal plus the interest in ten equal annual installments.

Applications may be secured from the Financial Aid Office at the Georgia Institute of Technology.

Pickett and Hatcher Educational Fund
The late Mr. Claude A. Hatcher of Columbus, Georgia, created an educational loan fund for the purpose of aiding a large number of worthy students in securing courses in broad liberal college training. Loans are available for students of all classes, including graduates. Limitations prevent loans being granted to students of law, medicine and for the ministry.

Applications and requests for additional information should be addressed to Pickett and Hatcher Educational Fund, P. O. Box 2128, Columbus, Georgia.

Georgia Tech Student Council
Emergency Loan Fund
A percentage of the donations to the annual Campus Charity Fund is used to finance this project of the Student Council. Loans may be granted for emergency situations to
any enrolled student. Except in very unusual circumstances, loans will not exceed $100 and must be repaid within 60 days. Applications may be obtained from the Financial Aid Office. Loans bear no interest.

Other Emergency Loan Funds
Generous friends of the institution have established funds of varying amounts which are used for emergency loans. The M. L. Brittain Loan Fund started by a Tech student and Mr. John Jarrell, a leading Atlanta retailer—it was named for the fourth president of Georgia Tech; the Bill Busbin Fund started by Mrs. T. E. Busbin; the Edward W. Navickas Fund; the John Jarrell and Tech Women's Club Fund; the H. O. Henry "Ozzie" Ward Fund; William B. "Billy" Reese Fund; Major General Haywood Shepherd Hansell (U. S. A.) Fund; Bob Eskew Fund; and George C. Griffin Fund. Loans are made from these funds for emergencies only.

United Students Aid Funds Loan Program
USA Funds is a private, non-profit service corporation which endorses long-term loans made by local banks to needy college students. To be eligible for this loan, a student must have completed his freshman year and be a full-time student in good standing.

This loan is normally limited to non-resident students from states which do not offer a State Guaranteed Loan Program.

A student can borrow up to $1,000 a year.

Application forms and additional information may be obtained from the Financial Aid Office.

Student Loan Fund of the American Society of Mechanical Engineers
The Woman's Auxiliary to the American Society of Mechanical Engineers has established a loan fund for students of Mechanical Engineering in good standing who are either juniors, seniors or graduate students. Correspondence should be addressed to Mrs. W. J. Schell, Jr., Chairman, Student Loan Fund, 181 Idlewood Drive, Stamford, Connecticut 06905.

The Methodist Student Loan Fund
This loan is available to students of all classes, including graduates, who have been members of the Methodist Church for one year or more immediately prior to application. In addition, applicants must be citizens of the United States, at least seventeen years of age, have earned at least a 2.0 average during the quarter immediately prior to application and be wholly or partially self-supporting. Interested and qualified students should contact the Reverend William Landiss, Director, Wesley Foundation, 189 Fourth Street, N.W., Atlanta, Georgia, for the necessary application forms and further information.

The General Henry H. Arnold Education Fund
The Air Force Aid Society has created a loan fund to aid unmarried children of Air Force and Army Air Forces personnel in securing an undergraduate college education, with priority being given to students whose fathers are deceased. Additional information and application material should be requested from the Air Force Aid Society, National Headquarters, Washington, D. C. 20333.

Stevens Bros. Foundation, Inc.
The Foundation was incorporated as a nonprofit and charitable corporation which has been primarily engaged in making educational loans to senior and graduate men, provided they are citizens of the United States, in good standing and will commence work at the end of the academic year the loan is requested. Interested students should send a copy of their transcript with full details concerning their status and requirements to The Stevens Bros.
Foundation, Inc., 610-612 Endicott Building, St. Paul 1, Minnesota.

State Guaranteed Loans for College Students

The Guaranteed Loan Program has one simple purpose: to provide the means for you to borrow money for college at low interest cost, with the Federal Government paying part of the interest for qualified students.

a. A student applies for a loan at a bank or other eligible lending institution.
b. The lender makes the loan directly to the student.
c. A state agency or private non-profit agency "guarantees" the loans—that is, protects the lender against loss in case the borrower defaults on his loan.
d. The Federal Government pays a portion of the interest on behalf of eligible students.

These programs, in most states, include any student who is enrolled or accepted for enrollment as eligible to apply for a loan for his educational expenses. The institution may be in any state, Puerto Rico, District of Columbia, Guam, American Samoa, or the Virgin Islands. Graduate and professional students, as well as undergraduates, are eligible to borrow.

Banks, savings and loan associations, insurance companies, credit unions and similarly supervised institutions are lenders under this program.

If a student cannot obtain a loan from one source, he may apply to another. A list of eligible lenders will be supplied by the appropriate guarantee loan agency in your home state. Write for listing of state agencies to the Financial Aid Office.

Georgia's Guaranteed Loan is administered by the Georgia Higher Education Assistance Corporation. Its procedure is described below and should be similar to that in other states.

The Georgia Higher Education Assistance Corporation Loan

The Georgia Higher Education Assistance Corporation was created as an independent, non-profit organization by the Georgia State Legislature in 1965 to operate the loan plan as provided by an amendment to the Constitution of Georgia in 1964.

Under this program guaranteed loans are provided for students who are residents of Georgia in attendance at any accredited post-secondary institution of higher education in the State of Georgia or elsewhere.

Loans are approved on a yearly basis except in the case of part-time students, who must apply for a loan to cover only one quarter at a time. The amount that a full-time student may borrow ranges from $1,000 a year for freshmen students to $1,500 a year for graduate students. Applications for an academic year should be submitted three months in advance of the beginning of the school term. Applications may also be submitted during the school year, and students should check with their local banks or lending institutions for quarterly deadlines.

A prospective borrower under this loan program attending the Georgia Institute of Technology must first submit his application to the Financial Aid Office for certification of enrollment. The student must then place the loan with a participating Georgia lending institution and borrow money from the lending institution on promissory notes.

The family financial statement is important. If the family's adjusted annual income is under $15,000 a year, the Federal Government will pay all interest charges (6% a year) on unpaid principal balances while the student is in school and will pay 3% interest a year on unpaid principal balances during the repayment period. If adjusted family income is over $15,000 a year, the loan may be insured, but the
student must pay all interest from the start.

Repayment is deferred during the time a student continues his studies and might be deferred under various state agency programs while he serves in the Peace Corps or in the armed services. If loans total more than $2,000, they will be repaid in installments ranging from five to ten years, beginning nine to twelve months after the borrower leaves school. If the total is less than $2,000, the lender may require repayment in less than 5 years.

Additional information and applications for the Georgia Higher Education Assistance Corporation Loan can be obtained from the Georgia Higher Education Assistance Corporation, Suite 205, Hartford Building, 100 Edgewood Avenue, N.E., Atlanta, Georgia 30303.

Deferred Payment of Education Costs
For students and parents desiring to pay education expenses in monthly installments, a low-cost deferred payment program is available through Education Funds Inc., a nationwide organization specializing in education financing.

All EFI plans include insurance on the life of the parent and the student, total and permanent disability insurance on the parent, plus trust administration in event of the parent’s death or disability. Agreements may be written to cover all costs payable to the school over a four-year period in amounts up to $14,000.

Parents desiring further information concerning this deferred payment plan should contact the financier of the school or Education Funds Inc., 10 Dorrance Street, Providence, Rhode Island 02901.

Federal Financial Assistance Programs
The Georgia Institute of Technology is a participant in the College Work-Study Program, the Education Opportunity Grant Program, and the National Defense Student Loan Program.

Educational Opportunity Grants
Purpose
To encourage and enable exceptionally needy high school graduates and college undergraduate students, who otherwise would be unable to continue their education, to pursue their studies at institutions of higher education by providing them with educational opportunity grants.

Eligibility
To qualify for an educational opportunity grant a student must be accepted for full-time enrollment at an institution participating in the program or, in the case of a student already attending such an institution, be in good standing and in full-time attendance there as an undergraduate student. In addition, he must show evidence of academic or creative promise and capability of maintaining good standing in his course of study. Finally, he must be in exceptional financial need, and must show that he would not, except for an educational opportunity grant, be financially able to pursue a course of study at the institution.

Limitations
No more than one-half of the total “package” of student financial aid (excluding work-study) given by an institution to a student, up to a maximum of $800, may be in the form of an educational opportunity grant. However, in the case of a student who, during the preceding academic year, ranked in the upper half of his class the educational opportunity grant may be increased by $200.

College Work-Study Program
Purpose
To make part-time employment opportunities available to students, particularly those from low-income families, who are in need of the earnings from part-time employment in order to attend institutions of higher education.
Eligibility
Any student who is in need of the earnings from part-time employment in order to pursue a course of studies at an institution of higher education. Preference for employment must be given to students from "low-income" families, as determined primarily by the level of income and size of family. Formerly, employment under this program was limited exclusively to students from "low-income" families.

Limitations
A. Work done by students:
1. Must not result in the displacement of employed workers or impair existing contracts for services.
2. Must be governed by such conditions of employment as will be appropriate and reasonable in light of such factors as type of work performed, geographical region, and proficiency of the employee.
3. Must not involve the construction, operation, or maintenance of so much of any facility as is used or is to be used for sectarian instruction or as a place for religious worship.

B. Work done for a public or private non-profit organization under an arrangement between the organization and the institution must be in the public interest.

National Defense Loan Program
For information concerning eligibility and limitations for this program, see page 279.
MEDALS AND PRIZES

The Honor Society of Phi Kappa Phi
Among the prizes offered for scholarship by the Georgia Institute of Technology is membership in the honor society, Phi Kappa Phi, to which a limited number of seniors representing all departments are elected annually. Phi Kappa Phi is a national organization with chapters in many of the leading universities and colleges.

The local chapter of Phi Kappa Phi awards annually a scholarship cup to that member of the senior class who, on the basis of all work taken in this institution, ranks scholastically as one of the first two students in the class.

Tau Beta Pi
Tau Beta Pi is a national honorary engineering fraternity with chapters in most of the leading engineering schools of the country. The Alpha Chapter of Georgia offers membership to approximately twenty-five engineering students of each graduating class who can qualify according to the standards of scholarship, character, loyalty, personality, leadership, and school activities. The fact that Tau Beta Pi is the second oldest honorary fraternity in the country and numbers among its members many of our leading engineers, makes membership in the society a coveted honor.

The local chapter of Tau Beta Pi awards annually a scholarship cup to an outstanding engineering senior who ranks among the first five of his class, on the basis of all scholastic work taken in this institution.

Phi Eta Sigma
Phi Eta Sigma is a freshman honor society in which any male student is eligible for membership who has made an average of at least 3.5 on the work of the first term of the freshman year. The society awards a scholarship cup to the freshman who makes the highest average for the first term.

Chi Epsilon Award
The Chi Epsilon Award is given annually by the Georgia Tech Chapter. The recipient is chosen from the five highest members, based on scholarship of the senior class. The final choice of the recipient is made from the five candidates on the basis of leadership, sociability, practicality and scholarship. The winner receives a certificate and his name is placed on an honor roll in the Civil Engineering Building.

Textile Scholarship Medals
The Georgia Textile Manufacturers' Association awards a watch annually to a member of the senior textile class, based on scholarship throughout his course, and for original effort in the work of the Textile Department during his senior year. The American Association of Textile Technologists makes an award annually in the form of a suitable plaque to a member of the graduating class of the A. French Textile School. The award is based on scholarship and other personal qualities which indicate an outstanding student.

Briaerean Scholarship Cup
The Briaerean Society of the Georgia Institute of Technology presents annually a scholarship cup to a senior member of the society whose scholastic average for a period of four and one-half years entitles him to rank as one of the highest three members of the class.

Fraternity Scholarship Cup
The Interfraternity Council awards quarterly a scholastic cup to the chapter of that organization which makes the highest scholastic average.
Alpha Chi Sigma Prize
The professional chemical fraternity, Alpha Chi Sigma, presents annually a handbook to the junior who has made the best record in the Chemistry or Chemical Engineering course.

Eta Kappa Nu
The Eta Kappa Nu Association, national electrical fraternity, awards annually an electrical engineering handbook to the regular sophomore Electrical Engineering student (on the basis of four quarters) or to the co-op pre-junior electrical engineering student (on the basis of four quarters) having the highest scholastic average.

Delta Kappa Phi
The Delta Kappa Phi Plaque is awarded annually to the graduating senior selected as the outstanding graduate in the textile department. A certificate is presented at the annual Honors Day exercises. Delta Kappa Phi is the oldest national honorary textile fraternity in the country.

Pi Tau Sigma
Pi Tau Sigma, national mechanical engineering fraternity, elects to membership outstanding mechanical engineering students in the junior and senior years.

An annual award of an engineering handbook is made to the highest ranking sophomore student in Mechanical Engineering (based upon at least four quarters of work).

Aerospace Engineering Medal
The James Edward Oglethorpe Chapter of the Daughters of the American Colonists presents annually a medal to the member of the graduating class in Aerospace Engineering who has made the highest scholastic average, based on the work of at least four complete quarters.

Industrial Management Certificate
The Industrial Management Society, senior honorary organization for I.M. students, awards annually a certificate of scholarship to the senior in the School of Industrial Management who ranks first in his class on the basis of all scholastic work taken at Georgia Tech.

Gordon Gambill Memorial Endowment Award
An annual award of an appropriate book to the athlete with the highest academic grade each year at the sophomore, junior, or senior level from the following sports: baseball, basketball, football, and track. This award is made in honor of the late Gordon Gambill, Class of 1913.

The William Gilmer Perry Award
The Department of English awards annually a fifty dollar bond to the student in his first year who has done the best work in freshman English. This award is made through the courtesy of the Georgia Tech Foundation, Inc. in honor of Dr. William Gilmer Perry, late Professor of English.

Alpha Pi Mu Award
The Alpha Pi Mu Award is presented yearly to extend recognition and honor to that senior student in Industrial Engineering who has exhibited outstanding scholastic achievement tempered with those individual characteristics which the members of Alpha Pi Mu consider necessary for success. The recipient of the award is chosen from the three top seniors scholastically, and the presentation is made at the Annual Honors Day Exercises.

The American Institute of Industrial Engineers, Atlanta Chapter Award
The American Institute of Industrial Engineers, Atlanta Chapter, award is presented to the Industrial Engineering junior who is most outstanding in scholastic attainment and who has demonstrated such personal qualities as leadership, character,
and breadth of interest. The presentation is made annually at the Honors Day Exercises.

**The American Institute of Industrial Engineers, Student Chapter Award**
The American Institute of Industrial Engineers, Student Chapter award is presented to the Industrial Engineering sophomore who is chosen from the top three in his individual engineering class as having the best combination of personal and academic qualities. This presentation is made annually at the Honors Day Exercises.

**Society for Advancement of Management Award**
The S.A.M. Award is presented at the annual Honors Day Exercises to the Industrial Management student who is the most outstanding in scholastic attainment and who has demonstrated such personal qualities as leadership, character, and breadth of interest.

**Georgia Engineering Society Awards**
Four awards consisting of a cash prize and certificate are awarded each year by the Georgia Engineering Society. Three awards are given to Juniors in the College of Engineering who have earned the highest accumulative grade-point average at the end of the Winter Quarter. Not more than one award is given to students in any one of the schools of engineering. One award is given to the junior in the School of Architecture who is judged by a committee to be the most promising all-around student. The recipients must have completed at least six quarters of work at the Institute.

**The American Society of Civil Engineers Award**
The American Society of Civil Engineers Award is given annually by the Georgia Section of the ASCE. The recipient is selected by a committee from a list of three candidates who have the highest point average among the graduating members of the Student Chapter of the ASCE and who have completed at least eight quarters of work at the Institute. The Award consists of the Junior Membership entrance fees and a cash prize of $90.00.

**Army R.O.T.C. Prizes and Trophies**
The Georgia Tech Honor Award is awarded annually to the outstanding Senior Cadet.
The Superior Cadet Ribbon Award is awarded annually to the outstanding cadet in each year for scholastic and military achievements.
The A. B. Steele Trophy, a handsome silver cup, the gift of Mrs. Ray Powers and Mr. A. B. Steele, as a memorial to those "Tech" men who made the supreme sacrifice during World War I, is awarded annually to the best drilled company in the Brigade.
The Professor of Military Science Trophy is awarded annually to the commander of the company which wins the Steele Trophy.
The Beta Theta Pi Fraternity, Georgia Tech chapter, presents annually the McGuire Medal to the outstanding Distinguished Military Student of the Army ROTC.
The Georgia Society of Daughters of Colonial Wars presents annually a medal to the ROTC Senior for excellence in Army ROTC Leadership.
The Joseph Habersham Chapter of D. A. R. presents annually a medal to the ROTC Senior who attains the highest rating in Military Science.
The Third Army Certificate of Meritorious Achievement is awarded annually to the ROTC Senior on the basis of leadership development throughout his ROTC career.
The Armed Forces Communication Association presents an award annually to the outstanding senior Army ROTC Cadet in the field of communications and electronics.
The American Legion Post No. 1 awards annually medals to the Army ROTC Junior and Senior for excellence in scholastic achievement.
The American Legion 5th District
Award is given annually to the Junior and Senior Army ROTC Cadet for excellence in military achievement.

The Professor of Military Science Awards are presented annually to the ROTC Junior and Senior who are outstanding in the performance of daily military duties.

The Society of American Military Engineers presents annually a medal to the outstanding senior engineering student of the Engineer ROTC Branch.

A medal is given annually by the American Ordnance Association to the Senior Ordnance Cadet who attains the highest rating in Leadership and Ordnance scholarship.

The John S. Gage Memorial Award is awarded annually to a Senior Infantry Cadet who displays distinguished leadership.

The Association of the US Army ROTC Medal is awarded annually to the Outstanding ROTC Junior.

The Association of the United States Army presents annually a medal to the Outstanding Infantry Branch Junior.

The American Legion Medal is presented annually by the Fulton County Voiture 217, 40 and 8, Honor Society of the American Legion to the outstanding freshman AFROTC cadet who is outstanding in leadership, academic achievement and military proficiency.

The Howard Shaw Leadership Trophy is annually awarded by Mr. Howard Shaw to the senior AFROTC cadet who has demonstrated the highest qualities of leadership.

The McGuire Medal, presented by Beta Theta Pi, is annually awarded to the distinguished AFROTC senior.

An appropriate award is presented annually to each AFROTC member of the Georgia Tech Rifle Team for proficiency in rifle marksmanship.

Air R.O.T.C. Medals and Trophies

The Air Force Association annually gives a medal to the AFROTC junior who attains the highest rating for proficiency in leadership, scholarship and in Air Science.

The Arnold Air Society presents two medals annually, one to the outstanding AFROTC sophomore, and one to the outstanding member of the Drill Team.

The ANAK Society of Georgia Tech annually awards a medal to the freshman who demonstrates the highest proficiency in Air Science.

The Armed Forces Communications Association award is presented annually to the outstanding AFROTC senior in the field of Electrical Engineering.

The Armed Forces Chemical Association award is presented annually to the junior ROTC cadet having the highest scholastic average in Chemistry or Chemical Engineering at this institution.

The American Legion Medal is presented annually by the Fulton County Voiture 217, 40, and 8, Honor Society of the American Legion, to the outstanding freshman AFROTC cadet who is outstanding in leadership, academic achievement and military proficiency.

The Howard Shaw Leadership Trophy is annually awarded by Mr. Howard Shaw to the senior AFROTC cadet who has demonstrated the highest qualities of leadership.

The McGuire Medal, presented by Beta Theta Pi, is annually awarded to the distinguished AFROTC senior.

An appropriate award is presented annually to each AFROTC member of the Georgia Tech Rifle Team for proficiency in rifle marksmanship.

The Society of American Military Engineers' Eagle Award is presented to the ten outstanding senior engineering students of the nationwide AFROTC program.
Gold, silver, and bronze medals are awarded by the Scabbard and Blade Military Society to cadets who achieve the highest individual rating for excellence in military drill.

Various aviation trophies are presented by the major aircraft manufacturers.

**Naval R.O.T.C. Medals and Awards**

The Georgia State Society "United States Daughters of 1812" awards a gold medal each year to the NROTC senior who achieves the highest rating in Naval Science.

The ANAK Society awards annually two medals; one to the NROTC junior showing highest proficiency in Theoretical and Practical Navigation, and the other to the NROTC freshman showing highest proficiency in Naval Science during his freshman year.

The Scabbard and Blade Society gives annually an award to the outstanding NROTC senior.

The McGuire Medal, awarded by the Beta Theta Pi Fraternity, is presented annually to the distinguished senior regular midshipman and to the distinguished senior contract midshipman.

The Atlanta Chapter of the Reserve Officers of the Naval Service presents annually an award to the sophomore NROTC student showing the greatest proficiency in ordnance, gunnery, and fire control.

An appropriate award is presented each year to each NROTC member of the Georgia Tech Rifle Team for proficiency in rifle marksmanship.

The Armed Forces Chemical Association award is presented annually to the junior ROTC student at each of five NROTC schools, having the highest scholastic average in chemistry or chemical engineering.

The Society of American Military Engineers awards annually 10 engineering medals for the outstanding engineering NROTC seniors and 10 medals for the outstanding engineering NROTC junior, selected from all NROTC schools in the United States.

The United States Naval Institute presents awards annually to the senior Regular NROTC student and the senior Contract NROTC student having the highest cruise aptitude marks for summer training.

The Marine Corps Association presents annually an award to the outstanding senior NROTC student who is a candidate for commission in the U.S. Marine Corps.

The Veterans of Foreign Wars of the United States presents the "General Douglas A. MacArthur $1,000 Award" every third year commencing in 1953 to the outstanding Regular NROTC senior in the United States.

The Georgia Society of Professional Engineers Award

An award in recognition of demonstrated awareness of professional concepts in engineering is made annually by the Georgia Society of Professional Engineers. The most outstanding engineering senior in the State of Georgia is chosen on the basis of interest in the professional aspects of engineering as evidenced by unquestioned personal integrity, participation in technical and professional activities, and scholastic standing.
GEORGIA TECH ATHLETIC ASSOCIATION

Board of Directors

Intercollegiate Staff

College Athletics
College athletics at the Georgia Institute of Technology are managed by a Board of Directors consisting of seven faculty members, three alumni members and three student members. The President is chairman of the Board and appoints the faculty and alumni members. The student members are the captain of the football team, the editor of The Technique, and the president of the Student Council. The Business Manager of Athletics is elected by the Board. The head coaches of the various sports are called into Board meetings from time to time. The Athletic Board holds regular monthly meetings and on occasion called meetings at the discretion of the President. The Board aims to secure cooperation of
the faculty and students in athletic affairs to maintain a high standard of sportsmanship and to create adequate facilities to give every student an opportunity to take part in some athletic activity.

The liberal policy adopted by the faculty towards athletics has resulted in such interest in college sports that the number engaged in some form of exercise is large.

Intercollegiate schedules are played in football, cross country, basketball, swimming, track, golf, tennis, baseball, gymnastics, and wrestling.

**Athletic Plant**

The Hugh Inman Grant Field, the football stadium, is located in the center of the campus and occupies two full city blocks. The closed U-shaped stadium seats 59,600 and surrounds one football field and a quarter-mile cinder track. At the North end of the U are located the Naval Armory building, the gymnasium and swimming pool building and the athletic administration building. Under the East Stand, dressing rooms and showers to accommodate 1,000 men have been constructed.

The completion of the Alexander Memorial Center in September of 1956 has given our basketball, Physical Training and Intramural programs a great impetus. The coliseum will seat approximately 7,000 spectators for basketball. It has two full-size basketball courts. This building is also used for numerous school functions and is owned by the Georgia Institute of Technology.

The Physical Training Building adjoining the coliseum has dressing rooms and lockers for Physical Training, basketball, visiting teams, and officials. A full-size basketball court and offices for our Physical Training faculty (sophomore) are in this building.

The “old” gymnasium seats 2,000 for athletic indoor events and 3,000 when set up as an auditorium. The swimming pool seats 400 for aquatic events. This building has adequate locker rooms and showers for both men and women. Officers for P.T. faculty (freshmen) are in this building.

The Naval Armory houses the Navy R.O.T.C. Unit and in addition furnishes a supplementary gymnasium for intramural and physical training activity.

The athletic administration building houses the athletic and business offices and visitors’ dressing rooms.

The liberality of Mr. John W. Grant and other money furnished by the Georgia Tech Athletic Association, and the government agencies—C.W.A., P.W.A., and W.P.A.—have resulted in a well equipped sports and recreation center worth well over 6.5 million dollars. Acknowledgement is also made of the money loaned by Mr. Fred M. Kaufman which made possible the construction of the Naval Armory.

In addition to Grant Field, the Board of Directors in 1930 purchased a ten-acre tract located four hundred yards north of the main plant.
This field is known as Rose Bowl Field and contains three football fields, two baseball diamonds, and a baseball stand which seats 5,000.

Some excellent tennis courts have been built on school property directly across from the Gymnasium in Peters Park. Also, twelve additional all-weather courts have been constructed bordering Tenth Street.

The land bounded by 8th Street, 10th Street, Fowler and Cherry Streets has been allocated to athletic purposes by Georgia Tech.
NATIONAL ALUMNI ASSOCIATION

Executive Secretary—W. Roane Beard; Associate Secretary—William T. Poteet, Jr.; Assistant Secretary—Belfield H. Carter, Jr.; Editor, The Georgia Tech Alumnus—Robert B. Wallace, Jr.; Administrative Assistant—Mrs. Mary Bowie; Bookkeeper—Mrs. Jennie L. Bradley; Assistant Bookkeeper—Miss Sandra Arthur; Secretaries—Miss Rebecca Dreaden, Mrs. Charlotte Darby; Records Supervisor—James M. Lynch; Records and Clerical—Mrs. Nell Ivey, Mrs. Claudia Elrod.

In 1920, under the leadership of William H. Glenn, B.S. in M.E., '91, the various Georgia Tech Alumni Clubs which had been previously organized in Georgia and other states, were banded together into the present Georgia Tech National Alumni Association. Today Georgia Tech alumni, consisting of graduates and former students, are found all over the world.

Some of the worth-while objectives of the association are to:

1. Maintain an up-to-date record of each alumnus of Georgia Tech.
2. Publish The Georgia Tech Alumnus.
3. Organize and service local Georgia Tech Alumni Clubs.
4. Operate a placement service for Georgia Tech alumni—without cost to either employer or applicant for employment.
5. Organize special events for alumni, such as class reunions, homecoming activities, club officer weekends, TECH TODAY programs, and alumni participation in commencements.
6. Furnish a medium through which alumni may aid and encourage the President of Georgia Tech and his faculty in maintaining and increasing the prestige of the institution, and assist in providing scholarships for worthy students.
7. Furnish visiting alumni with information, and other such personal services.
8. Through the various media of publicity, acquaint the general public; the people of Georgia; civic, state and federal officials; industries of the United States and institutions of secondary and higher education with the achievements of the Georgia Institute of Technology and its alumni.
9. Raise funds for Georgia Tech through the Annual Alumni Roll Call.

The Alumni Secretary acts as a central contact for Georgia Tech men after their graduation. All Georgia Tech men are urged to keep their files in his office up-to-date, giving their location, activities, and other valuable information, in order that they may be consulted without delay on problems of mutual interest.

Officers and trustees of the Alumni Association for 1967-68: Howard Ector, '40, Atlanta, Ga., President; L. L. Gellerstedt, '45, Atlanta, Ga.,
GEORGIA TECH FOUNDATION, INC.

Executive Secretary—Joe W. Guthridge; Bookkeeper—Mrs. Jennie L. Bradley.

The Georgia Tech Foundation, Inc. is a non-profit corporation organized and operated solely for the purpose of soliciting and administering funds for the benefit of the Georgia Institute of Technology and its students. The Georgia Tech Foundation, Inc., is directed by a Board of outstanding alumni business leaders, who administer the funds received in such a way as in their judgment would most effectively improve the standard of the school.

The funds received by the Foundation are used presently for the following purposes:

1. To supplement the compensation of faculty members in order to obtain or retain outstanding faculty members and thus improve the standard of education at the Georgia Institute of Technology.

2. To undertake special programs, which cannot be financed by state funds, for the development of the Georgia Institute of Technology.

3. To enable faculty members to improve their professional qualifications and standing by grants to obtain advanced degrees, etc.

The majority of donations received are unrestricted and are used by the Foundation at the discretion of its Board of Trustees. Some donations are received for designated purposes and are used by the Foundation only for the purpose designated, provided they are for the use of the Georgia Institute of Technology and within the charter purposes of the Foundation.

Members of the Foundation Board of Trustees are: Oscar G. Davis, '22, Atlanta, President; John J. McDonough, '23, Atlanta, Vice President; Henry W. Grady, '18, Atlanta, Treasurer; Joe W. Guthridge, Exec. Secretary; Jack Adair, '33, Atlanta; Ivan Allen, Jr., '33, Atlanta; John P. Baum, '24, Milledgeville, Ga.; Fuller E. Callaway, Jr., '26, LaGrange, Ga.; Robert H. Ferst, '38, Atlanta; Y. Frank Freeman*, '10, Hollywood, Calif.; Jack F. Glenn, '32, Atlanta; Ira H. Hardin, '24, Atlanta; Julian T. Hightower, '19, Thomaston, Ga.; Wayne J. Holman, Jr., '28, New Brunswick, N. J.; Howard B. Johnson, '34, Atlanta; George T. Marchmont*, '07, Dallas, Texas; George W. McCarty, '08, Atlanta; Walter M. Mitchell, '23, Atlanta; Frank H. Neely*, '04, Atlanta; William A. Parker, '19, Atlanta; Hazard E. Reeves, '28, New York, New York; Glen P. Robinson, Jr., '48, Atlanta; I. M. Sheffield, '20, Atlanta; Hal L. Smith, '26, Atlanta; John C. Staton, '24, Atlanta; Howard T. Tellepsen, '34, Houston, Texas; Robert Tharpe, '34, Atlanta; William C. Wardlaw, Jr., '28, Atlanta; Robert H. White*, '14, Atlanta; George W. Woodruff, '17, Atlanta; Charles R. Yates, '35, Atlanta.

*Trustee Emeritus.
Income Tax Provisions of Contributions

Funds held by the Georgia Tech Foundation, Inc. are exempt from taxation by both State and Federal Governments, because it is a non-profit educational organization. Contributions made by individuals and industries to the Foundation are deductible from income for income tax purposes. For full details about limitations and savings in income tax, latest State and Federal tax regulations should be consulted.

Bequests

There are various forms of bequests that can be used. Due to differences in the various state laws, an attorney-at-law should be consulted. A suggested simple form that will serve in some cases is as follows:

I hereby give and bequeath to the GEORGIA TECH FOUNDATION, INC., Atlanta, Georgia, the sum of ________________ dollars to be used by the Board of Trustees in whatever way will best advance the interests of the Georgia Institute of Technology.

If the bequest is intended to leave the Foundation the remainder of any estate, the form may be: All the rest, residue, and remainder of my real and personal property of any kind whatsoever, I give and bequeath to the GEORGIA TECH FOUNDATION, INC., Atlanta, Georgia, et cetera.

All money received by the Foundation will be administered and directed by the Board of Trustees according to the wishes of the donors and in the best interests of the Georgia Institute of Technology.

Georgia Tech Annual Alumni Roll Call

The rising cost of higher education has made it imperative that colleges and universities get all possible aid from outside sources. In 1947, the Foundation originated the Georgia Tech Annual Alumni Roll Call, a vehicle by which all Tech men can contribute to their Alma Mater according to their means. The annual Alumni Roll Call began its twenty-first year, July, 1967.

The results of the first twenty years of the Roll Call have proved the soundness of this plan. The renewed spirit of giving to Georgia Tech by alumni has been very gratifying to all concerned. Additional support is being received from industry and foundations within the state. The Joint Tech-Georgia Development Fund is proving to be very helpful to both Georgia Tech and Georgia.

For four consecutive years, the Georgia Institute of Technology was recognized nationally with the first place award "for sustained alumni support" among all public institutions of higher learning. In 1967, the Institute also received the Alumni Service Award jointly with the University of Georgia for the Joint Tech-Georgia Development Fund.

The aid realized through the Roll Call supports the work of the National Alumni Association as well as the Georgia Tech Foundation, Inc. The only use to which these funds are put by the Foundation is for the advancement and benefit of Georgia Tech. The work of the Georgia Tech Foundation, Inc. continues to be one of the most vital factors in the growth and development of the Georgia Institute of Technology.
Administrative Council—1968-1969*

FRED W. AJAX  
Director of Campus Affairs

JAMIE R. ANTHONY  
Vice President—Controller

HARRY L. BAKER, JR.  
Director of Research Administration

W. ROANE BEARD  
Director of Alumni Affairs

WALTER L. BLOOM  
Assistant to the Vice President for Academic Affairs

WAYNE W. BRIDGES  
Professor of Military Science

WILLIAM L. CARMICHAEL  
Registrar

VERNON D. CRAWFORD  
Director, School of Physics

MRS. J. HENLEY CROSLAND  
Director of Libraries

SHERMAN F. DALLAS  
Director, School of Industrial Management

BENJAMIN J. DASHER  
Director, School of Electrical Engineering

ROBERT L. DODD  
Director of Athletics

BERTRAM M. DRUCKER  
Director, School of Mathematics

ARNOLD L. DUCOFFE  
Director, School of Aerospace Engineering

JAMES E. DULL  
Dean of Students

ROBERT H. FETNER  
Director, School of Biology

JAMES D. FREEMAN  
Professor of Air Force Aerospace Studies

HOMER V. GRUBB  
Acting Director, School of Chemical Engineering

JOE W. GUTHRIDGE  
Vice President for Development

ARTHUR G. HANSEN  
Dean, Engineering College

LAWRENCE P. HARRIS  
Professor of Naval Science

EDWIN D. HARRISON  
President

PAUL M. HEFFERNAN  
Director, School of Architecture

GEORGE HENDRICKS  
Head, Department of Social Sciences

WALTER HERBERT  
Head, Department of Music

R. KENNETH JACOBS  
Head, Department of Engineering Graphics

LAWRENCE V. JOHNSON  
Director, Engineering Extension Division

STOTHE P. KEZIOS  
Director, School of Mechanical Engineering

ROBERT N. LEHRER  
Director, School of Industrial Engineering

EDWARD H. LOVELAND  
Director, School of Psychology

JAMES W. MCCARTY (3)  
Faculty Representative

HOYT L. MCCLURE  
Director, Southern Technical Institute

JOHN H. MCKENNA  
Head, Department of Physical Training

LANE MITCHELL  
Director, School of Ceramic Engineering

KARL M. MURPHY  
Acting Dean, Graduate Division

*Number in parentheses after faculty representative's name indicates years to be served on Administrative Council.
Milton E. Raville  
Director, School of Engineering Mechanics

Carlyle J. Roberts  
Director, School of Nuclear Engineering

W. M. Sangster  
Director, School of Civil Engineering

Vladimir Slamecka  
Director, School of Information Science

William M. Spicer  
Director, School of Chemistry

Rocker T. Staton  
Dean of Undergraduate Division

Robert E. Stiemke  
Vice President for Programs

James L. Taylor  
Director, A. French Textile School

E. A. Trabant  
Vice President for Academic Affairs

Andrew J. Walker  
Head, Department of English

Robert B. Wallace, Jr.  
Director of Information Services and Publications

Sam C. Webb  
Acting Dean, General College

Paul Weber  
Vice President for Planning

Wyatt C. Whitley  
Director, Engineering Experiment Station

James G. Wohlford  
Director, Cooperative Division

J. Dixon Wright  
Head, Department of Modern Languages

L. David Wyly (2)  
Faculty Representative

Waldemar T. Ziegler (1)  
Faculty Representative

Three Student Representatives

Standing Committees of the General Faculty—1968 - 1969*


CEREMONIES—Ajax, Drennon, Freeman, L. P. Harris, Trabant, Holton (2), Hinton (1).

FACULTY COUNCIL—Osborn (3), Snyder (3), W. E. Jones (2), Payne (2), Bauer (1), Ford (1).

INFIRMARY—Riggsbee, Dull, Henry, McKenna, Trabant, Student Representative.

LIBRARY—Stanford (3), Perlin (2), Hooper (1), Crosland.

PUBLIC RELATIONS—Wallace, Chapman (3), Hammond (2), Wiegand (2), Mullen (1).


STATE RESIDENCE—Anthony, Registrar, Dull.

STATUTES—Covault (3), Haman (3), Currie (2), Orr (1), Rupnow (1), Registrar.

TENURE AND ADVANCEMENT—Trabant, Hansen, Webb, Director of the Engineering Experiment Station, Dickert (3), Mason (3), Weatherly (2), Flege (1), Gersch (1).

*Number in parentheses after faculty representative’s name indicates years to be served on the Committee.
Special Committees of the Faculty—1968 - 1969*

CIVIL DEFENSE—Fincher, Caseman, Covault, Rector, Wang, Zimmerman.

FACULTY AWARDS—Carstens, Dallas, T. H. Hall, T. W. Jackson, Whitley.

FOREIGN STUDENTS—Wright, Clegg, Comer, Dull, Hitt, Spillman, Zahn.

INSURANCE—Eichler, Eaton, Fretwell, Marshall, McClure, Starrett.

FOREIGN STUDENTS—Wright, Clegg, Comer, Dull, Hitt, Spillman, Zahn.

NON-ACADEMIC PERSONNEL—Marshall, T. F. Jones, Logan.

NUCLEAR SAFEGUARDS—Zimmerman, Clement, Eichholz, Fleming, Kirkland, McGee, C. J. Roberts.

PARKING—Anthony, Cox, Dull, Orr, Rector, Eichler, 2 Student Representatives.

PRE-MEDICAL ADVISORY—Fetner, Loveland, Spicer.


SAFETY AND FIRE PROTECTION—Cox, Balleine, Fleming, McKinley, Rector, Ratcliff, Schutz.

SKILES COMMITTEE—Ajax, Trabant, Patrick Kelly (3), Flege (2), D. S. Caine (1).

STUDENT ACTIVITIES BUILDING—Dull, Ajax, Anthony, Flinn, Rector, Savini, 3 Student Representatives.

STUDENT RECRUITING—Registrar, Ajax, Beard, Dull, Wohlford.


VISUAL AIDS TO EDUCATION—Staton, Apple, Crosland, Gilman, Grubb, McKinley, E. Jo Baker.

Standing Committees of the Academic Senate—1968 - 1969*

ADMISSIONS—Registrar, Hansen, Webb, Staton, Harmer (3), Schutz (2), Line (1).


EXECUTIVE—Trabant, Registrar, Dull, Staton, Webb, J. L. Hammond (3), J. W. Walker (2), Carlson (1).


HONORS AND PRIZES—Registrar, Zinn (3), G. F. Walker (2), Wray (1).

STANDING—Trabant, Hansen, Webb, Staton, Dull (non-voting).

STUDENT ACTIVITIES—Dull, Ajax, Bynum (3), Gamoneda (2), Sturrock (1), Student Representative.

STUDENT-FACULTY HONOR—Cox (3), Starrett (2), Schutz (1), 3 Student Representatives.

FINANCIAL AID—Registrar, Anthony, Dull, Guthridge, Trabant, Caldwell (3), Williams (2), Peatman (1).

STUDENT RULES AND REGULATIONS—Streitman (3), Durden (2), O'Neill (1), Registrar, Dull.

*Number in parentheses after faculty representative's name indicates years to be served on the Committee.
GENERAL FACULTY
(As of April 1, 1968)

NOTE: After the name of each faculty member is listed his highest degree and the name of the institution conferring it. Professional engineers among the faculty are indicated with the authorized abbreviation of P.E. followed by the name of the state in which they are registered. Practicing architects among the faculty are indicated with the abbreviation of Reg. Arch. followed by the name of the state in which they are registered.

STAN AARONSON, M.S.
(Oklahoma State University)
Assistant Professor, Industrial Engineering

ARTHUR B. ABELING, M.S.
(Georgia Institute of Technology)
Senior Research Engineer
Engineering Experiment Station

ARISTIDES F. ABRIL, D.C.S.
(University of Havana)
Associate Professor, Industrial Management

ADAM ABRUZZI, Ph.D.
(Columbia University)
Professor, Industrial Engineering

HENRY W. ADAMS, M.A.
(Columbia University)
Professor Emeritus, English

JOSEPH DAYTON ADAMS, M.S.
(Emory University)
Research Physicist, Engineering Experiment Station

*JOSEPH W. ADAMS, B.S.
(U. S. Naval Academy)
Assistant Professor, Engineering Graphics

RICHARD R. ADICKS, Ph.D.
(Tulane University)
Assistant Professor, English

PHILIP ADLER, Jr., Ph.D.
(The Ohio State University)
Assistant Professor, Industrial Management

HUGO A. AGUILERA, B.S.
(University of North Dakota)
Assistant Research Engineer
Engineering Experiment Station

R. MARTIN AHRENS, Ph.D.
(Washington University)
Professor, Physics

FRED WESLEY AJAX, M.A.
(Emory University)
Director of Campus Affairs

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Associate Professor, Social Sciences

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Branch

ALLAN C. TOPP, Ph.D.  
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Associate Professor, Chemistry

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Professor Emeritus, Mechanical  
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ERNEST C. TSIVOGLOU, Ph.D.  
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*On leave.
MRS. BLANCHE B. TURNER  
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CHARLES E. S. UENG, Ph.D.  
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Associate Professor, Engineering Mechanics

ROBERT B. ULM (Cdr, USN) B.S.  
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JOSEPH PAUL VIDOSIC, Ph.D.  
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Regents' Professor, Mechanical Engineering

JOSE VILLANUEVA, Ph.D.  
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Assistant Professor, Engineering Mechanics

NEIL H. WADE, Ph.D.  
(University of London)  
Associate Professor, Civil Engineering

HARRISON M. WADSWORTH, JR., Ph.D.  
(Western Reserve University)  
P.E. (Ohio)  
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CHARLES E. WAGNER, M.S.  
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MRS. HELEN S. WALZER, M.S.  
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Catalog Librarian

J. M. WAMPLER, Ph.D.  
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Assistant Professor, Geology

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Engineering Experiment Station

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Mechanics

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EDA Services Section  
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Management
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Nuclear Sciences Division
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ESTELLE ALLEN
Associate Registrar

THOMAS J. BLACK
Professor, Electrical Engineering

WILLIAM C. BLISS
Lecturer, Engineering Graphics

FRANK BOGLE
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FRANK F. GROSECLOSE
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WILLIAM J. LARSON
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FRANCIS J. MEE
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E. E. PERKINS
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MRS. C. T. POTTINGER
Music Librarian

GEORGE W. RAMEY
Associate Professor, Architecture

HARRY C. SAVAGE, JR.
Associate Professor, Engineering Graphics

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ARTHUR J. SHERIDAN
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ROBERT H. SMITH
Assistant Professor, Engineering Graphics

LEROY P. STERLING
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HARRISON W. STRALEY, III
Professor, Geology

RAYMOND N. TROWBRIDGE
Associate Professor, Industrial Engineering

NOAH WARREN
Professor, Industrial Management
### INSTITUTE STATISTICS

**Graduates by Schools and by Years**

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†This degree was not given from 1929 to 1935.
*War emergency degree.

**NOTES:** The M.S. Degrees, Ph.D. Degrees, Professional Degrees, and Certificates shown above are distributed among the departments as follows:


2. Ph.D.: A.E., 7; Ap. Math., 5; Ch.E., 68; Chem., 81; C.E., 13; E.E., 40; I.E., 14; M.E., 34; Mech., 3; Nuc.E., 5; Phys., 39; San.E., 1.

3. Professional Degrees: C.E., 17; Ch.E., 1; E.E., 11; M.E., 15; T.E., 1.

4. Certificates: Arch. 43; C.S., 33; I.Ed., 1; M.T.C., 14; M.T., 1; T.E., 190.

**ABBREVIATIONS:**

- C.S.—Commercial Science
- I.S.—Information Science
- Met.—Metallurgy
- M.T.C.—Motor Transport
- M.T.—Manual Training
- Nuc.E.—Nuclear Engineering
- Nuc.S.—Nuclear Science
- S.E.—Safety Engineering
- San.E.—Sanitary Engineering
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## SUMMARY OF ENROLLMENT 1966-67
### College Day Courses

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Total College Day Courses: 8,689

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Total: 8,689

#### Engineering Extension Division

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Total Engineering Extension Division: 14,211

Total College Day Courses: 8,689

Grand Total: 22,900