The college offers degrees in aerospace engineering, chemical engineering, civil engineering, electrical and computer engineering, engineering science, industrial engineering, materials science and engineering, mechanical engineering, nuclear engineering, and engineering physics.

Agricultural engineering is based in the College of Agriculture with facilities located on the Agricultural Campus. The agricultural engineering curriculum is offered cooperatively by the College of Agriculture and the College of Engineering. Details of the curriculum may be found in the College of Agricultural Sciences and Natural Resources section of this catalog.

FACILITIES

Most of the college's facilities are on the southeastern corner of The Hill. Administration, CHW, and Environmental Engineering, and Engineering Science are in Perkins Hall (#17); Electrical and Computer Engineering are in Ferris Hall (#40); Industrial Engineering is in the Alujar Memorial Building (#20); Nuclear Engineering is in the Pasqua Engineering Building, Mechanical and Aerospace, Chemical, and Materials Science are in Dougherty Hall (#28); and the Freshmen Engineering Advising Center is in the Hawkins Library Building (#52). The numbers refer to the map in the front of this catalog.

Advanced engineering facilities (including the Co-op and Minority Engineering Scholarship Program offices) are in Estabrook Hall (#30). The Engineering Physics program is administered through the UT, Knoxville Physics Department in the Niseman Physics Building (#70).

TAU BETA PI NATIONAL HEADQUARTERS

The college is honored to have the National Headquarters of Tau Beta Pi, the National Engineering Honor Society, based on our campus. This honor was earned and maintained in part through the efforts of J. C. "Ted" Mathews, who served as secretary-treasurer of the university chapter from 1950 to 1947. The suite of offices, located in Dougherty Hall, is occupied by Mr. J. D. Foulis, secretary-treasurer, Roger Hawkins, assistant secretary-treasurer, and his staff.

COOPERATIVE ENGINEERING PROGRAM

The five-year Cooperative Engineering Program is offered in order to provide an augmented engineering education that includes significant experience in industry as well as superior academic preparation. The Cooperative Engineering Program was established in 1926. The University of Tennessee was one of the early pioneers in this valuable type of education, which originated at the University of Cincinnati in 1905. The cooperative program is open to all students in good standing in the college.

Cooperative work assignments differ from part-time or summer employment in that they involve regularly scheduled cycles of full-time work periods, resulting in planned, career-related work terms of progressive complexity and responsibility. In introducing students to engineering employment, the College and industry join together to offer a broader and richer preparation for postgraduate employment than can be provided by a conventional academic program. This experience in an industrial and professional environment contributes to the student's maturity, accelerates professionalism, offers an opportunity to apply engineering coursework work in a real-world setting, and enables the student to define more clearly educational and career interests and objectives. Some of the experience is at a subspecialization level not available to an engineer after graduation; yet, to less great significance in achieving a complete education and early effectiveness.

Participation in the Cooperative Engineering Program usually begins with application during the freshman year, and placement with a co-op employer during the sophomore year, after the student has met academic progress and grade qualification requirements of employers and the Co-op Program. An exceptionally well-qualified candidate might begin a field assignment at the end of the freshman year, if符合条件.

A schedule of courses is taught by each engineering department specifically to meet the needs of co-op students, and applicants must be able to fit into that schedule in order to par-
Candidates must be able to project a minimum of twelve months of co-op experience prior to the senior year, within the regular alternating sequence, to qualify for placement. Those planning to transfer to the College of Engineering from other disciplines or schools should begin working as early as possible with an advisor in the department they plan to enter to determine the co-op schedule at an optimum time. Second-degree students, students re-entering college, and other non-traditional students often find the Co-op Program a viable form of education and positions are available for such students in most instances. Very few non-citizens are able to secure co-op positions, however.

Brochures with further details, current employer list, and policies and procedures may be obtained from the Cooperative Engineering Program, 103 Estabrook Hall, University of Tennessee, Knoxville, TN 37996-2350.

INTERNATIONAL ENGINEERING PROGRAM

Since 1936, the College of Engineering has had a unique student exchange program with the Fachhochschule Rheinland-Pfalz, Aduelberg Koblenz (FH Koblenz). Under this program, students visiting and graduating students in all disciplines of the College may apply for a 3 to 6 month educational and practical internship with German industry. In addition to the potential of receiving credit for engineering coursework, those selected for the program will receive a stipend from German industry adequate to cover basic living expenses while in Germany.

Those interested in applying should begin making plans during the freshman year by contacting the Program Coordinator. Language proficiency, proper coursework, and normal application should be made at the beginning of the junior year. Those planning to apply should consult with their academic advisor in the interview, the applications of successful candidates will be forwarded to FH Koblenz, where a final selection will be made. The selection process will take into consideration language proficiency, academic achievement, ability to locate a suitable industrial sponsor in Germany, and personal maturity.

GRADUATE PROGRAM

Since 1936, the College of Engineering has had the degree of Master of Science. Students are offered in all areas of study, and the degree of Doctor of Philosophy is offered in nine major subjects: aerospace engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, mechanical engineering, metallurgical engineering, nuclear engineering, and polymer engineering. Information concerning graduate programs is given in the Graduate Catalog.

CURRICULA IN ENGINEERING

NATIONAL ACCREDITATION

Since 1936, engineering programs at institutions of higher learning have been accredited by a variety of organizations formed by practicing engineers and known as the Accreditation Board for Engineering and Technology (ABET). Currently accredited engineering programs at UT, Knoxville, are in electrical, chemical, civil, electrical, engineering science, industrial, mechanical, materials science, and nuclear. Co-op programs in the above areas are presently ABET accredited.

DESIGNATION OF A MINOR

Engineering undergraduates may designate a minor in a non-engineering subject area and have the minor listed on the permanent record under the following conditions:

1. Only one minor may be designated and officially designated.
2. The minor must be officially approved and described in the UT, Knoxville catalog.
3. No unofficial minors will be recognized. Minors exist in Architecture and Business Administration, and in numerous departments in Agriculture and Liberal Arts.

Those engineering students who can minor in another engineering discipline, even if no minor was declared. Completion of a minor often involves the taking of some courses which cannot be used to satisfy the minimum requirement for an engineering degree. A student should notify his or her advisor and major department office when beginning work on a minor. The intention to complete a minor must be declared at the time of application for a degree if the minor is to appear on the final transcript. Degree applications are handled by the UT, Knoxville Records Office.

ADVISING

New freshman students are assigned to the Freshman Engineering Advising Center (FEAC) for academic advising and career counseling until they have completed their freshman curriculum. Freshman students admitted to the College of Engineering are not required to declare their field of study until the end of the freshman year. At that time, students select the program of their choice. As sophomores, students will be assigned a faculty advisor in their selected department.

COURSE LOAD

The maximum number of hours which may be taken by an undergraduate engineering student without special permission is 19.

The Associate Dean for Academic Affairs must give permission to take 20 hours of courses. In general, this decision is based on the student's previous performance, and is handled by the UT, Knoxville.

LATE DROP REQUESTS

Late drop requests, which may be approved for reasons other than academic setbacks, are handled by the Office of Academic Affairs, 118 Perkins Hall. For other procedures refer to "Changes in Registration" in the general section of this catalog.

GENERAL REQUIREMENTS

The College is advised to consult the University's degree requirements as stated in the front section of this catalog as well as departmental requirements.

Transfer Students

Transfer students, including internal UT transfers, must meet the minimum requirements stated below in order to be considered for admission to a major within the College.

1. Must have earned a minimum 3.30 cumulative average over these specific courses, or their equivalent: English 101, 102; Chemistry 101, 102; Physics 101, 102; Calculus I (4 credit hours), 110, 111, 112. A minimum of 12 hours must be earned in the physical sciences.

2. The overall record will be evaluated for quality and seriousness of purpose. An excessive number of withdrawals, incompletes, repeated courses, or failures will result in denial.

3. No unofficial minors will be recognized. Minors exist in Architecture and Business Administration, and in numerous departments in Agriculture and Liberal Arts.

4. Those planning to transfer to the College of Engineering must have a minimum cumulative grade point average of 2.50. A minimum of 24 semester hours must be completed before admission to the College.

5. Students transferring with a grade point average of 2.50 or better will be formally admitted.

6. Students transferring from a lower quality institution may be required to complete additional courses.

7. Students transferring from a lower quality institution may be required to complete additional courses.

8. The overall record will be evaluated for quality and seriousness of purpose. An excessive number of withdrawals, incompletes, repeated courses, or failures will result in denial.

9. Any UT, Knoxville student desiring association with the College of Engineering should go to the departmental office for the desired minor. An interview with the department head or his designee is held, with the major items of consideration being the same as for external transfer students. If association is granted, a College/Major Advisor Change form is processed by the department to officially change the student's academic home.

10. Transfer Credit. Every attempt will be made to give maximum credit for courses taken elsewhere and transferred to the college. Discussions concerning the evaluation of transfer credits should be conducted with the head of the department (or designee) into which the student is to transfer, but only after receiving the evaluation of transfer credits by the Admissions Office.

Program for Second B.S. Degree.

Upon approval by the Dean of Engineering and the Committee on Degrees of a program of study recommended by the major engineering department, a student who already holds a bachelor's degree may obtain a degree in engineering upon completion of the course requirements of the selected engineering program. In no case will the minimum requirements be less than 30 semester credits. The prevailing University regulations shall apply.

Satisfactory/No Credit Courses. Engineering majors may take half of the minimum hours required (9) of humanities-social science electives on a Satisfactory/No Credit (S/NC) grading basis. No other coursework may be considered as part of the minimum degree requirements. Students planning to transfer credit for work elsewhere and transferred to the college. Discussions concerning the evaluation of transfer credits should be conducted with the head of the department (or designee) into which the student is to transfer, but only after receiving the evaluation of transfer credits by the Admissions Office.

No unofficial minors will be recognized. Minors must meet the minimum degree requirements. Students transferring from an institution of lower quality should meet the generally accepted definitions that (1) institutional and the branches of knowledge contended with humanity and culture; and (2) social sciences are the studies of individual relationship in and to society. Subject areas in the humanities include history, English, philosophy, and the natural sciences. Subject areas in the social sciences include sociology, psychology,
economics, anthropology, and political science. Acceptability is determined by course content, not by title or administrative home. Example courses include those in business, communications, etc. Language courses generally must include some cultural aspects, and not be limited to study of the language. A course not on the approved list must be approved by the student's advisor, department head, and the associate dean (in this order), and the approval must be recorded on a departmental form and submitted to the Records Office. Transfers must be approved, unless a suitable UTK equivalent course number has been assigned as part of the admissions process.

The courses selected to meet the minimum hour requirement in this category must provide breadth and depth of coverage, and must not be limited to a selection of unrelated introductory courses. A student is urged to seek guidance from his or her advisor if necessary in choosing these electives, since this is an important part of the learning experience in preparation for engineering practice. Up to 9 hours in this category cannot be taken on an S/NC basis.

The requirements in this section are not intended to inhibit in any way the selection of courses to be taken by a student, provided the student is taking courses which are relevant to the engineering program and are not non-technical courses which are required for a major degree in that subject and which would not count in this category, such as music, art, or foreign language courses which are not a part of the student's educational experience at UTK. The requirements are designed to help the student understand the social and humanistic sciences. Of the 12 hours required of an engineering student, at least 9 hours must be taken in the social and humanistic science elective portion of all engineering degree programs.

1. The minimum number of semester credit hours of approved electives must be taken. The second semester of a freshman year course in a foreign language course does not count in this total.
2. To count as a course of depth, a student must take at least: a. Two courses in the same subject, one of which is a 100-level course (listed in the catalog) of the other; or b. Two related courses in the same subject, at least one of which is numbered 300 or above.
3. A course in an area of depth to be considered a satisfactory foreign language course is to be used to support satisfactory proficiency in that subject and at least two courses in the same subject must be taken and (2) the student can be the native language of the student.

APPROVED HUMANITIES/SOCIAL SCIENCE ELECTIVES

Any course included on the list below has been approved by the faculty as a suitable H/SS elective. An elective course not on this list must be approved by the major department and in advance of enrollment in the course. If the student finds a course to be unsatisfactory, the student may appeal his or her decision to the appropriate faculty member(s).


Portuguese 111-112, 211-212, 300, 311, 411

Psychology 110 (117), 200, 300, 310, 330, 350, 350, 370, 470, 474, 480


Russian Studies 360


Sociology 300, 301, 303, 304, 305, 306, 370, 380, 382, 383, 384, 387, 390, 393, 445, 446

University Honors 118-128, 237, 337, 434, 437

University Studies 310-320

Urban Studies 313, 323, 441, 444, 446

Zoology 310, 370

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. Students who have not met the required year of American history in high school may choose the approved courses listed below. A student must complete 25 and or 26 courses and must complete both classes for any one semester to be counted as part of the student's graduate program in the humanities and social sciences.

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. These students must complete 21 courses in American history.

American History Requirement. Engineering students, regardless of their major, the American history requirement described elsewhere in this catalog. These students must complete 18 courses in American history.

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. These students must complete 15 courses in American history.

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. These students must complete 12 courses in American history.

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. These students must complete 9 courses in American history.

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. These students must complete 6 courses in American history.

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. These students must complete 3 courses in American history.

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. These students must complete 1 course in American history.

American History Requirement. Engineering students, regardless of their major or the American history requirement described elsewhere in this catalog. These students must complete 0 courses in American history.
AGRICULTURAL ENGINEERING
(School of College of Agriculture)

CHEMICAL ENGINEERING

Professors:
J.W. Pratts (University Professor and Head),
Ph.D. Tennessee, P.E.; D.C. Bogart, Ph.D. Delaware; C.H. Byers (Adjunct), Ph.D. California (Berkeley); E.B. Clark, Ph.D. Califormia (Berkeley); R.M. Couto, Ph.D. Tennessee; L.W. Crawford (Space Institute, Tullahoma); Ph.D. Cincinnati; O.L. Culberston (Emeritus); Ph.D. Texas; J.F. Feltus, Ph.D. Akron; G.C. Freazer, Jr. (Condra Professor), D. Eng. Johns Hopkins; M.G. Horace, Ph.D. Wisconsin; J.M. Holmes (Emeritus), Ph.D. Tennessee; H.W. Hsu, Ph.D. Wisconsin; C.F. Moore (Alumni Professor). Ph.D. Louisiana (State); J.J. Penney, Ph.D. Northwestern; P.E. C.D. Scott (Adjunct), Ph.D. Tennessee; P.E.; C.D. Thomas, Ph.D. Tennessee, J.S. Watson (Part-time), Ph.D. Tennessee.

Associate Professors:
Osami A. Basaran (Adjunct), Ph.D. Minnesota; P.R. Blakewell, Ph.D. Purdue; D.B. Bruns, Ph.D. Houston, H.D. Cochran (Adjunct), Ph.D. M.I.T; B.H. Davison (Adjunct), Ph.D. California Inst. of Tech.; T.L. Donaldson (Adjunct), Ph.D. Pennsylvania; Timothy C. Scott (Adjunct), Ph.D. Wisconsin; A.C. Seth (Space Institute, Tullahoma); Ph.D. Northwestern; T.W. Wang, Ph.D. Massachusetts Institute of Technology; F.W. Weber, Ph.D. Minnesota.

BACHELOR OF SCIENCE PROGRAM

Chemical engineering is a discipline dedicated to the design, development, operation, and management of plants and processes for economical conversion of natural resources to useful products. It is a broadly based discipline, with heavy emphasis on chemistry and mathematics, but also including physics, materials and the humanities. Graduates of the program are quite versatile, with careers in fields such as food and pharmaceutical processing, biochemical engineering, fuels production and conversion, pulp and paper, polymers and plastics, process control, and instrumentation. The curriculum provides a central core of required course work with flexibility in the upper-division years to permit emphasis on preparation for graduate school or professional employment. A minimum grade point average of 2.0 for all departmental courses is required for graduation. A minimum of 16 semester hours of humanities-social science courses are required, which are to be selected from the list under "Curricula in Engineering".

PROGRESSION TO UPPER-DIVISION

Progression of chemical engineering students to departmental Upper-Division courses is competitive and is based on capacity. Faculty considered include overall grade point average, performance in selected lower division courses and evidence of satisfactory and orderly progress through the prescribed curriculum.

UPPER-DIVISION STATUS: A Lower-Division student may apply for progression to Upper-Division engineering curriculum course work with an overall GPA of at least 2.4. This must include Chemical Engineering 200.

PROVISIONAL STATUS: Students who have completed 30 semester hours of Lower-Division engineering curriculum course work with an overall GPA between 2.0 and 2.4 may apply for provisional status. The granting of Provisional Upper-Division Status is based on the availability of space in the departmental programs. After Upper-Division Status students have been admitted, Provisional students are required to demonstrate their abilities to perform satisfactorily in upper-division courses by attaining a minimum GPA of 2.0 in at least 9 hours of 200 and 300 level required courses specified by the department. Further progression to upper-division courses is dependent upon this minimum level of performance. Any student with an overall GPA below 2.0 will not be admitted to upper-division Chemical Engineering courses. Students who have not been admitted to an Upper-Division Status will be dropped from departmental class rolls. Transfer students at the Upper-Division level are admitted on a Provisional Status basis only.

GRADUATE STUDY PROGRAM

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in Chemical Engineering are offered. The University's Graduate School operates a Graduate Program in Chemical Engineering leading to the degrees of Master of Science and Doctor of Philosophy. Information.

CIVIL AND ENVIRONMENTAL ENGINEERING

Professors:
(D.D. Reed (Head), Ph.D. Arkansas; E.G. Burdette (Fred N. Peebles Professor), Ph.D. Illinois, A. Chatterjee, Ph.D. North Carolina State; W.A. Davis, Ph.D. Tennessee; D.W. Goodpasture, Ph.D. Illinois, J.E. Ghosh, (Goodrich Chair of Excellence), P.E., Ph.D. Illinois, K. W. Huntington (Emeritus), Ph.D. Northwestern; J.B. Humphrey, Ph.D. Texas A&M; H.L. Johnson, M.S. Tennessee, R.E. Miller (Alumni Distinguished Professor), Ph.D. Georgia Institute of Technology; R.B. Robinson (Atwater Professor), Ph.D. Iowa State; A. Tischendorf (Condra Professor), Sc.D New Mexico State; C.R. Walker (Emeritus) M.S. Massachusetts Institute of Technology; J. Waymire, Ph.D. Northwestern.

Associate Professors:

Assistant Professor:
C.D. Cox, Ph.D., Penn State; M. Mauldin, Ph.D. California (Berkeley); K.G. Robinson, Ph.D. VPI.

BACHELOR OF SCIENCE PROGRAM

The curriculum in civil engineering is designed to provide training in fundamental engineering sciences and in certain basic subjects in various civil engineering fields to serve as a basis for entrance into civil engineering practice and/or for graduate study. By use of technical electives a student can emphasize areas of study in construction, environmental engineering, geotechnical/materials, structures, transportation, or water resources.

ELECTIVES

Electives are chosen to meet student career objectives and program accreditation requirements. Students must consult with their advisor and have their selections approved.

MASTER OF SCIENCE PROGRAM

Graduate programs in civil engineering and environmental engineering leading to the degrees of Master of Science are offered in Graduate programs in Civil Engineering, Environmental Engineering, and Environmental Engineering Science. The general requirements for the masters degrees are stated in the Graduate Catalog.

DOCTORAL PROGRAM

Graduate work leading to the degree of Doctor of Philosophy with a major in civil engineering is offered. Major fields of study include structural engineering, environmental geotechnical/materials, structural engineering, transportation, and water resources. The general requirements for the doctoral degrees are stated in the Graduate Catalog.

ELECTRICAL AND COMPUTER ENGINEERING

Professors:
J.M. Googe (Head), Ph.D. Georgia Institute of Technology; P.E.; J. Angel, Ph.D. Wisconsion, P.E.; J.M. Bailey, Ph.D. Georgia Institute of Technology; J.D. Brandeis, Ph.D. Massachusetts Institute of Technology; A. Bishop, Ph.D. Iowa State; J.D. Birdwell, Ph.D. Massachusetts Institute of Technology; K.G. Robinson (Distinguished Professor), Ph.D. Pennsylvania, B.E. Bube (Condra Chair of Excellence), Ph.D. Califormia, Ph.D. New York, P.E.; J.W. Cunningham (Space Institute, Tullahoma), Ph.D. Tennessee; R.C. Gonzalez (Distinguished Professor), Ph.D. Florida, W.L. Green, Ph.D. Texas A&M; R.G. Hammers (Distinguished Professor), Ph.D. New York, P.E.; E.J. Kenney, Ph.D. Pennsylvania, P.E.; J.S. Lawler, Ph.D. Michigan

College of Engineering/Agricultural Engineering
BACHELOR OF SCIENCE PROGRAM

The course of study for the degree of Bachelor of Science in Electrical Engineering is structured to provide a foundation in both the basic sciences and the specialized areas of electrical engineering. The program also has sufficient technical content to enable the cultural growth of the students and to develop professional with a strong social awareness. The faculty seeks to keep classes small enough to allow effective interaction with students.

The Electrical and Computer Engineering department maintains a complete range of computer facilties to support the undergraduate teaching program. These laboratories are devoted specifically to circuits, communications, digital systems, electronics, electro-optics, image processing, machinery, microwaves, plasma, and power electronics and drives. Microcomputer, minicomputer and personnel computer facilties are also provided within the department.

Students in the senior year have the freedom to choose from a wide spectrum of courses covering engineering and non-engineering fields. A student can select a program with focus in five different areas, or may take a number of courses to obtain a broad technical exposure. It is required that the design content of these senior level ECE courses at least 8 hours. Students are encouraged to discuss an appropriate senior year program with their advisors. The selection of Humanities/ Social Science electives is left to each individual student but must be made in accordance with established College of Engineering guidelines. General engineering and junior level courses of the department are offered every term. Senior level courses will normally be offered either in the Fall or the Spring semester. This arrangement allows flexibility with respect to the student may select the normal four year schedule, may choose an accelerated schedule, or may participate in the Cooperative Engineering Program. No senior level course can be counted for both the Engineering and the Science curriculum for another, the first course of the sequence will be offered in the Fall semester. In all courses where prerequisites are indicated, they must be strictly followed.

Graduation: In the Electrical Engineering program the minimum of 124 credit hours is required for the degree of Bachelor of Science in Electrical Engineering. The Electrical and Computer Engineering Department offers an Accelerated Bachelor's degree program in which students can earn their Bachelor degree and Master's degree in Electrical Engineering in a total of five years.

ENGINEERING PHYSICS

Professor W.M. Bugg (Head); Professor Edward L. Hart, Coordinator. The curriculum in engineering physics is designed to fulfill the educational requirements for professional. The Bachelor of Science degree is based on a thorough grounding in physics. The first two years are concerned with fundamental courses in the fields of mathematics, science, and mathematics. In the upper division, the courses in engineering physics and in physics depend upon the interest of the student. The undergraduate program is a complete, professional program, preparing the student for entry into a variety of work in industry and research. The program also leads to graduates in either physics or engineering.

ENGINEERING SCIENCE AND MECHANICS

Professors: T.G. Gartley (Acting Head); Ph.D. Illinois, P.E.; B. Antar (Space Institute, Tullahoma); Ph.D. Tekler; A.J. Baker, Ph.D. New York, P.E.; J.H. Forestier, Ph.D. Iowa State, P.E.; W. Fortey (Emeritus), P.E. Electorate de Universitat de Barcelona (France); R. Jendrucko, Ph.D. Virginia, P.E.; A.R. Kerff (Space Institute, Tullahoma); Ph.D. Poquis; A.K. Klopman; Ph.D. North Carolina State; R.D. Kriag, Ph.D. New Mexico; J.D. Landis, Ph.D. Lehigh; P.E.; C.W. Lee (Emeritus), Ph.D. Illinois Institute of Technology; T.D. McClay (Space Institute, Tullahoma); Ph.D. Autman, G. Selman, Ph.D. Tennessee; P.E.; N. E. Hynans, Ph.D. Illinois Institute of Technology, P.E.; C.J. Remenyi (Emeritus), Ph.D. Johns Hopkins; R.M. Ander (Associate Dean and Space Institute, Tullahoma); Ph.D. Air Force Institute of Technology; W.E. Scott, Ph.D. Johns Hopkins; F. Shatnawi (Space Institute, Tullahoma); Ph.D. Michigan; L.R. Sholes (Emeritus), M.S. Kansas State; P.E.; W.T. Snyder (Northwestern); Ph.D. Northwsmers; J.E. Browning (Acting Dean); Ph.D. Illinois, P.E.; J.F. Walskrad, P.M. Cincinnati, P.E.; V.J. Wieland, Ph.D. Rensselaer Poly Inst.

Assistant Professors: G.N. Brooks, Ph.D. Stanford; L.L. Cazaux, Ph.D. Rems; C.D. Dora, Ph.D. Georgia Tech, N. Yu, Ph.D. Rensselaer Poly Inst.; D.C. Dora, Ph.D. Georgia Tech, N. Yu, Ph.D. University of California (San Diego).

BACHELOR OF SCIENCE PROGRAM

The engineering science degree is primarily intended for students who choose to major in electrical engineering, chemical engineering and mechanical engineering. The curriculum is designed to be flexible and provide students an opportunity to specialize in areas of interest. Students must achieve a minimum of 120 credit hours, including 105 credit hours of core courses and 15 credit hours of electives.

The program course and research programs for the degrees of Master of Science and Doctor of Philosophy in Electrical Engineering are offered for students with careers such as advanced design, research and teaching. Students admitted to the graduate program are expected to have a minimum point average of 3.0 for all undergraduate study, and for the senior year. Students with a B.S. or B.A. degree in a field other than Electrical Engineering are required to take certain ECE graduate courses before beginning the graduate program. See the Graduate Catalog for complete details on the graduate program.
The student's career objectives and provide advising conferences with their faculty to have a major in engineering and Technology (ABET). Accredited by the Accreditation Board for Engineering and Technology (ABET), the solid, broad base in engineering, chemical, and biological sciences is required to develop a program of study no later than their junior year. Our program is accredited by the Accreditation Board of Engineering and Technology (ABET). The undergraduate curriculum in industrial engineering provides a strong background in both fundamental engineering principles and the analytical methods necessary for solving the multi-faceted problems associated with the production, maintenance, and delivery of goods and services. In particular, this curriculum emphasizes the knowledge and skills necessary to design integrated systems of people, materials, equipment, and energy wherever they are found, such that the overall system functions at an optimal level and such that the needs of the human components of the system are adequately met. This curriculum, which is built upon a strong background in mathematics and statistics includes fundamental course work in all of the engineering sciences, introductory economics and accounting, training in fundamental human factors which influence engineering design, the economic analysis of alternative design choices, quality control techniques, manufacturing processes and materials, production and inventory system design and control, material handling systems and toxics design, the mathematical modeling and simulation of complex systems, and the design and installation of information acquisition and control systems. The technical and non-technical electives further allow the student to specialize in an area(s) which meets particular needs. The solid, broad base in engineering, combined with training in applying engineering methodology to traditionally non-engineering problems as well as provided through the industrial engineering curriculum, leads to participation by industrial engineers in an unlimited range of fields, including, among others, retail distribution, banking, health care delivery, corporate management, municipal management, aerospace systems, research groups, and government as well as in the traditional area of manufacturing.
MATERIALS SCIENCE AND ENGINEERING

Professors: J.E. Spruiell (Head), Ph.D. (Tennessee); D.C. Bogue, Ph.D. (Duke); D. M. D. Bok, Ph.D. (Massachusetts Institute of Technology); R. Brooks, Ph.D. (North Carolina State); R.A. Buechel, Ph.D. (Vanderbilt); E.S. Clark, Ph.D. (California (Berkeley)); D.A. Caveness, Ph.D. (Adair State); D. M. Kramis, D. L. Lowmire, Ph.D. (Purdue); Ph. D. L. C. Lund, Ph.D. (Pennsylvania State); M. B. Maloney, Ph.D. (Purdue); B. S. Bode, Ph.D. (National University (Argentina)); J. Phillips, Ph.D. (Pennsylvania State); E. Stansbury (Emeritus), Ph.D. (Cincinnati).

Associate Professors: W. E. Becker, Ph.D. (Illinois); Roberto S. Benson, Ph.D. (Florida State); C. T. Liu (Adjunct Status), Ph.D. (Brown University); T. T. Meek, Ph.D. (Ohio State).

BACHELOR OF SCIENCE PROGRAM

Materials Science and Engineering is concerned with the science and technology needed to develop and apply materials for the benefit of society. The undergraduate program is designed to provide education and training in the fundamental and engineering sciences with special attention given to the production, development, and utilization of materials. Emphasis is placed on developing the expertise needed to participate in selection, development, and production of materials for major engineering systems. The program strives to develop in its graduates the ability to specify materials requirements, select from existing materials, conceive and characterize new materials and applications, and the data base required for use of materials (including an understanding of failure modes and phenomena); and develop processes for improvement of materials (and/or) materials systems. It is anticipated that some of the program's graduates will continue their education in graduate school; hence, it is important that the program prepare those students for advanced study.

The field of materials science and engineering is quite broad, encompassing metallic, ceramic, and polymeric materials as well as composites made from combinations of materials. Consequently, the curriculum contains a central core of courses that are applicable to all material types with variability in the upper division years to permit concentration and in-depth coverage of specific materials categories. By judicious choice of electives the student may develop a broad perspective or may develop a specialty area.

A minimum of 18 semester hours of humanistic, social science, and technical courses must be taken from the specified list of courses. Graduates with an automobile engineering major require a minimum grade point average of 2.00 for all collegiate courses.

PROGRESSION TO UPPER-DIVISION PROGRAMS

Progression of students to departmental Upper-Division courses is competitive. Factors considered include overall grade point average, performance in selected lower-division courses and evidence of satisfactory and orderly progress through the prescribed curriculum.

UPPER-DIVISION STATUS: A Lower-Division student formally applies for Upper-Division Status after completing 30 semester hours of Lower-Division Engineering curriculum course work with an overall GPA of at least 2.4. This must include Materials Science and Engineering 201.

PROVISIONAL STATUS: Students who have completed 50 semester hours of Lower-Division Engineering curriculum course work with an overall GPA between 2.0 and 2.4 may apply for provisional status. The granting of Provisional Upper-Division Status is based on the availability of space in the upper-division programs after Upper-Division Status students have been accommodated. Provisional students are required to demonstrate their ability to perform satisfactorily in upper-division courses by obtaining a minimum GPA of 2.0 or at least 8 hours of 300-level required coursework specified by the department. Further progression to upper-division courses is dependent upon this minimum level of performance.

TRANSFER STUDENTS: At the Upper-Division level students are advised on a Provisional Status basis only. Any student presenting more than 28 hours of Lower-Division Engineering curriculum course work for credit is considered to be a transfer student.

GRADUATE STUDY PROGRAMS

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in materials engineering and in other materials science programs require a minimum of 30 semester hours beyond the Bachelor of Science degree. Students are encouraged to take a broad spectrum of graduate courses which will provide the necessary background to prepare for a specific research program.

MECHANICAL AND AEROSPACE ENGINEERING

Professors: D. R. Paul (Head), Ph.D. (Georgia Institute of Technology); R. V. Arinilli, Ph.D. (Virginia Polytechnic Institute and State University); J. F. Bai, Ph.D. (University of Pennsylvania); D. M. D. Bok, Ph.D. (Massachusetts Institute of Technology); A. E. Biolow (Space Institute, Tullahoma); D. M. D. Bok, Ph.D. (California (Berkeley)); P. E. B. C. Breuer (Space Institute, Tullahoma); D. M. D. Bok, Ph.D. (Tennessee); A. J. D. Bron (Space Institute, Tullahoma); D. M. D. Bok, Ph.D. (Space Institute, Tullahoma); D. M. D. Bok, Ph.D. (Florida State); T. T. Meek, Ph.D. (Ohio State); T. H. Moulden (Space Institute, Tullahoma); D. M. D. Bok, Ph.D. (Tennessee); P. E. A. Vialle (Space Institute, Tullahoma).

Assistant Professors: G. Kawalick, Ph.D. (Wisconsin); J. H. Lyne, M.D. (Wisconsin); H. A. Kim, Ph.D. (Texas); D. M. D. Bok, Ph.D. (California); R. L. Roach (Space Institute, Tullahoma); D. M. D. Bok, Ph.D. (Georgia Tech).

BACHELOR OF SCIENCE PROGRAM

Separate curricula are offered in aerospace engineering and mechanical engineering; however, the first two years of these curricula are identical. During the first two years, the curricula provide for training and study in the basic sciences of physics, chemistry, and engineering and common to these fields. The third year of both programs continues with the development of the particular engineering sciences of the aerospace and mechanical engineering fields. In the senior year an opportunity is provided for the student to choose the fundamental knowledge to mechanical and aerospace engineering problems. Both curricula are arranged in the upper-division years to prepare the student for graduate study or for technical employment.

Aerospace engineering has scientific foundations to a large extent in mechanical engineer- ing. The aerospace engineer, however, deviates attention particularly to the disciplines: design, development, testing, and production of aerospace vehicles - aircraft, spacecraft, missiles; auxiliary systems - heating, cooling, etc.
GRADUATE STUDY PROGRAMS

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with specialization in mechanical engineering or aerospace engineering are available to graduates of recognized undergraduate universities. The fruits in mechanical and aerospace engineering and in graduate students who wish to specialize in aerospace engineering courses will be a capstone experience. The general requirements for advanced degrees are summarized in the Graduate Catalog.

NUCLEAR ENGINEERING

Professors: T.W. Kerlin (Head), Ph.D., Pennsylvania; L. M. McDonald, Ph.D., Tennessee; J. M. Mitalac, Ph.D., Tennessee; J. E. Miller, Ph.D., Texas A&M; G. E. B. President, Ph.D., Madison (Special); R. N. Stearns, Ph.D., Northwestern; P. E.; J. E. Turner (Tan) (Part-time); G. D.,indhoven, P. E.; N. L. U. (Part-time), Ph.D., Michigan, P. E.; (Distinguished Professor), Ph.D., Iowa State, P. E.; H. U. L. U. California, P. E.; G. R. H. University, P. E.; S. L. U. California, P. E.;

Associate Professors: P. J. Gropp, Ph.D., Virginia (Austria); M. E. Kaht, P. E.; J. D. McNamar, Ph.D., Iowa State, P. E.; T. H. Scott, Ph. D. Florida, P. E.;

Assistant Professor: A. E. Ruggles, Ph.D., Rensselaer.

BACHELOR OF SCIENCE PROGRAM

The curriculum is designed to provide a broad educational experience and to prepare students interested in careers in nuclear engineering. The required coursework is divided into three parts: the fundamentals courses needed as preparation for the professional engineering courses and the elective courses which equip for entry into industry, research, or graduate study.

MACHINE OF SCIENCE PROGRAM

The program leading to a degree of Master of Science is available to graduates of recognized undergraduate universities in engineering and physics. Each student will be advised as to the necessary prerequisite courses offered at Rensselaer institution. The general requirements of the masters' degree are summarized in the Graduate Catalog.

DOCTORAL PROGRAM

The program leading to the Ph.D. degree is available in nuclear engineering. For details, see the Graduate Catalog.

CURRICULUM

Course requirements for the various engineering curricula are listed on the following pages. The numbers in the columns indicate the number of semester hours of credit for each course. Individual course prerequisites should be strictly adhered to, even if courses are not taken in the semester indicated. Although the requirements for each degree can be completed in four academic years (plus for the cooperative programs), the quality of the learning experience is much more important than the speed with which the curricula are completed. Questions about individual courses should be directed to the department responsible for the course. Questions about the requirements of this program should be directed to the department in charge of the major department. Pursuant to the requirements of this program, the major department.

AEROSPACE ENGINEERING

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credit</th>
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<tbody>
<tr>
<td>English</td>
<td>11.0</td>
</tr>
<tr>
<td>Mathematics</td>
<td>11.0</td>
</tr>
<tr>
<td>Physics</td>
<td>11.0</td>
</tr>
<tr>
<td>Engineering</td>
<td>11.0</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>11.0</td>
</tr>
<tr>
<td>Engineering Economics</td>
<td>11.0</td>
</tr>
<tr>
<td>Social Sciences</td>
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CHEMICAL ENGINEERING

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>11.0</td>
</tr>
</tbody>
</table>
### CIVIL ENGINEERING

**Sophomore**
- Mathematics 241, 251, 200
- Physics 231
- Basic Electrical Engineering 201
- Engineering and Mechanics 231
- Chemical Engineering 215
- Mechanical Engineering 391
- Humanities/Social Science Elective

**Junior**
- Electrical and Computer Engineering 301
- Civil Engineering 381, 382, 390, 305
- Civil Engineering and Mechanics 313, 383, 395
- Humanities/Social Science Elective

**Senior**
- Civil Engineering 445, 471, 483, 400, 435, 442
- Engineering Electives
- Humanities/Social Science Elective

**Total:** 136 hours

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### ELECTRICAL AND COMPUTER ENGINEERING

**Sophomore**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 241, 241</td>
<td>Engineering and Mechanics 201</td>
<td>3</td>
</tr>
<tr>
<td>Physics 231</td>
<td>Electrical and Computer Engineering 201</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Engineering 391</td>
<td>Chemical Engineering 215</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>Mechanical Engineering 391</td>
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**Junior**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical and Computer Engineering 301</td>
<td>Structural Engineering Electives</td>
<td>3</td>
</tr>
<tr>
<td>Civil Engineering 381, 382, 390, 305</td>
<td>Mechanical Engineering 391</td>
<td>3</td>
</tr>
<tr>
<td>Chemical Engineering 215, 310, 360</td>
<td>Humanities/Social Science Elective</td>
<td>3</td>
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</table>

**Senior**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering 445, 471, 483, 400, 435, 442</td>
<td>Engineering Electives</td>
<td>18</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>Humanities/Social Science Elective</td>
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</table>

**Total:** 136 hours

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### ENGINEERING PHYSICS - HONORS CONCENTRATION

**Freshman**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Physics 137, 138</td>
<td>Physics 137, 138</td>
<td>10</td>
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<td>Mathematics 141, 142</td>
<td>Mathematics 141, 142</td>
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<td>Chemistry 120, 130</td>
<td>Chemistry 120, 130</td>
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<tr>
<td>Physics 231, 232</td>
<td>Physics 231, 232</td>
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<tr>
<td>Engineering and Mechanics 231, 321, 312</td>
<td>Mechanical Engineering 391</td>
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<td>Electrical and Computer Engineering 301</td>
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<tr>
<td>Electrical and Computer Engineering 301</td>
<td>Electrical and Computer Engineering 301</td>
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</tr>
<tr>
<td>Mechanical Engineering 391</td>
<td>Mechanical Engineering 391</td>
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</tr>
<tr>
<td>Elective</td>
<td>Elective</td>
<td>16</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>Humanities/Social Science Elective</td>
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</tr>
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</table>

**Sophomore**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 241, 251, 200</td>
<td>Engineering and Mechanics 201</td>
<td>3</td>
</tr>
<tr>
<td>Physics 231, 232</td>
<td>Electrical and Computer Engineering 201</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Engineering 391</td>
<td>Chemical Engineering 215</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>Mechanical Engineering 391</td>
<td>3</td>
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</table>

**Junior**

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<tbody>
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<td>Mechanical Engineering 391</td>
<td>3</td>
</tr>
<tr>
<td>Chemical Engineering 215, 310, 360</td>
<td>Humanities/Social Science Elective</td>
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**Senior**

<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>Civil Engineering 445, 471, 483, 400, 435, 442</td>
<td>Engineering Electives</td>
<td>18</td>
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<tr>
<td>Humanities/Social Science Elective</td>
<td>Humanities/Social Science Elective</td>
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</table>

**Total:** 136 hours

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### INDUSTRIAL ENGINEERING

**Sophomore**

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<th>Course Code</th>
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<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Mathematics 241, 251, 200</td>
<td>Engineering and Mechanics 201</td>
<td>3</td>
</tr>
<tr>
<td>Physics 231, 232</td>
<td>Electrical and Computer Engineering 201</td>
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<tr>
<td>Mechanical Engineering 391</td>
<td>Chemical Engineering 215</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>Mechanical Engineering 391</td>
<td>3</td>
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</table>

**Junior**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical and Computer Engineering 301, 302</td>
<td>Structural Engineering Electives</td>
<td>3</td>
</tr>
<tr>
<td>Electrical and Computer Engineering 301</td>
<td>Structural Engineering Electives</td>
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</tr>
<tr>
<td>Chemical Engineering 215</td>
<td>Chemical Engineering 215</td>
<td>3</td>
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</table>

**Senior**

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<tr>
<th>Course Code</th>
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<tr>
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<td>Engineering Electives</td>
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<tr>
<td>Humanities/Social Science Elective</td>
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**Total:** 136 hours

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### PHYSICS 131, 132

**Mathematics 141, 142**

**Chemistry 120, 130**

**English 101, 102**
### Economics 201..........................................................3
### Accounting 201..........................................................3
### Humanities/Social Science Electives........................9

**Total: 140 hours**

### MATERIALS SCIENCE AND ENGINEERING

<table>
<thead>
<tr>
<th>Sophomore</th>
<th>Economics 201</th>
<th>Materials Science and Engineering 201</th>
<th>Physics 200, 201, 241</th>
<th>Mathematics 200, 231, 241</th>
<th>Chemical Engineering 200, 240</th>
<th>Humanities/Social Science Electives</th>
<th>Total: 134 hours</th>
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</thead>
</table>

**MSE electives: 422, 426, 441, 443, 444, 470, 472, 474, 475, 492, 495, 496 (Selection of MSE electives must include a total of at least two credit hours of design content).**

### MECHANICAL ENGINEERING

|-----------|---------------------------|----------------|--------------------------------------|-----------------------------------------------|---------------------------------|-----------------|

*Humanities/social science electives: (See College of Engineering General Requirements).*

### NUCLEAR ENGINEERING

<table>
<thead>
<tr>
<th>Sophomore</th>
<th>Mathematics 200, 201, 241</th>
<th>Physics 231, 232</th>
<th>Basic Engineering 200</th>
<th>Nuclear Engineering 200, 201, 202</th>
<th>Electrical and Computer Engineering 301, 302</th>
<th>Humanities/Social Science Electives</th>
<th>Total: 135 hours</th>
</tr>
</thead>
</table>

*Humanities/social science electives: (See College of Engineering General Requirements).*