The college, in cooperation with industrial sponsors, established the Minority Engineering Scholarship Program in 1973. The program goal is to increase significantly the number of qualified black engineering graduates.

The college has ten major undergraduate curricula in which a student may specialize: aerospace engineering, chemical engineering, civil engineering, electrical and computer engineering, industrial engineering, materials science and engineering, mechanical engineering, nuclear engineering, engineering physics, and engineering science and mechanics.

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 Agriculture section of this catalog.

FACILITIES

Most of the college’s facilities are on the southwestern corner of The Hill. Administration, Civil Engineering, and Engineering Science are in Perkins Hall (#67). Electrical and Computer Engineering is in Fermi Hall (#403). Industrial Engineering is in the Alumni Memorial Building (#2). Nuclear Engineering is in the Physics Engineering Building (#405). Mechanical and Aerospace Engineering, Chemical and Materials Science are in Dougherty Hall (#8); and the Freshman Engineering Advising Center is in the Houska Library Building (#53). Students refer to the front of this catalog for other facilities.

Other engineering facilities (including the Co-op and Minority Engineering Scholarship Program offices) are in Eastbrook Hall (#33) and East Stadium. The Engineering Physics program is administered through the UI, Knoxville Physics Department in the Nelkin 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, housed on our campus. This honor was earned in part through the untiring efforts of R.C. "Red" Mathewson, who served as secretary-treasurer for the organization from 1905 to 1947. The suite of offices, located in Dougherty Hall, is occupied by Mr. J.D. Froula, 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 Program in the College of Engineering has been in existence since 1905 and is a traditional part of the engineering education offered by the College. Cooperative work assignments differ from part-time or summer employment in that they involve regularly scheduled cycles of full-time academic terms alternating with full-time work periods, resulting in planned, career-related work terms of progressive complexity and responsibility. In introducing the student in this manner to engineering employment, the College and the facilities of 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, and offers an opportunity to apply engineering coursework to 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 subprofessional level not available to an engineer after graduation, yet is of 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.
CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING

CURRICULA IN ENGINEERING
knowledge concerned with humanity and culture, and (2) social sciences are the studies of individual relationships in and to society. Subject areas in the humanities include history, English, philosophy, law, languages, classics, and the history of music, religion, and art. Subject areas in the social sciences include sociology, political economy, economics, criminology, and political science. Accessibility is determined by course content, not by title or administrative home.

Examples of courses not acceptable under this category include: (1) a language course in a student's native language, (2) performance or skill development courses, including those in written or oral communication; (3) military science courses, (4) courses whose basic content is science or mathematics, (5) any college-level course in the humanities that is required for graduation, (6) professional courses in other fields—business, nursing, medicine, etc. Language courses generally must include broad exposure to the language and its literature, and not be limited strictly to grammar as on language tapes. Courses 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 substitution form and submitted to the Records Office. Transfer courses must be so approved, unless a suitable UTK equivalent course number has been assigned as part of the admissions process.

Courses selected to meet the minimum hour requirement in this category must be taken in breadth and depth; at least one of which is in a foreign language. There are non-technical courses which are a required part of the university-level degree requirements which do not fall in this category, such as courses designed to develop written and oral communication skills. Up to six semester-hours may be selected with the advice and approval of the student's major department to meet the required six semester-hours from History 251 and 252, or other courses deemed suitable by the Department of History. These hours may be counted as part of the required block of humanities and social science electives.

American history courses are also included in the humanities and social sciences elective portion of all engineering curricula as follows: 1. The minimum number of semester hours required is six (6). 2. No more than two freshman-level courses (100 number) may be taken. The second semester of a freshman-level foreign language course does not count in this total.

1. The course content must be such that a student must take courses in at least two different subjects. For this purpose, all foreign languages are considered to be a single subject.
Agricultural Engineering

Chemical Engineering

A minimum of 18 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

Chemical engineering students progressing to upper-division courses are competitive and based on capability. 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 may apply for progression to Upper-Division Status after earning 50 semester hours of Lower Division engineering course work with an overall GPA of at least 2.4. The student must include Chemical Engineering 200.

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 departmental programs after Upper-Division Status students have been accommodated. Provisional students are required to demonstrate their abilities to perform satisfactorily in upper-division courses by attaining a minimum GPA of 2.0 at all 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 Resident Graduate Program at Oak Ridge and Kingsport.

See the Graduate Catalog for detailed information.

Civil Engineering

Including Environmental Engineering

Agricultural Engineering (See College of Agriculture)

Chemical Engineering

Professors: J.W. Frakes (University Professor and Head), Ph.D. Tennessee; P.E.; D.C. Bogd; Ph.D. Delaware; C.H. Byers (Adjunct), Ph.D. California (Berkeley); E.S. Clark, Ph.D. California (Berkeley); R.M. Coursen, Ph.D. Tennessee; L.W. Crawford (Space Institute, Tulallitha); Ph.D. Crenshaw; G.I. Culberson (Emersin), Ph.D. Texas; J.F. Fellers, Ph.D. Alcorn; G.C. Finlar, Jr. (Condra Professor); D. Eng. Jehns Hopkins; J.M. Holm (Emersin); Ph.D. Tennessee; H.W. Hsu, Ph.D. Wisconsin; C.F. Moore (Amuri Professor), Ph.D. Louisiana State; J.J. Pernona, Ph.D. Northeastern. Ph.D. S. Scott (Adjunct), Ph.D. Tennessee; P.E. G. Thomas, Ph.D. Tennessee; J.S. Watson (Part Time), Ph.D. Tennessee.

Associate Professors: Clemons A. Basler (Adjunct), Ph.D. Minnesota; P.R. Bankowski, Ph.D. Purdue; D.B. Brune, Ph.D. Houston; H.R. Crohan (Adjunct), Ph.D. MIT; B.H. Darisch (Adjunct), Ph.D. California. Instr. of Tech.; T.L. Donaldson, Ph.D. Pennsylvania; M.G. Hanson, Ph.D. Wisconsin; Timothy C. Scott (Adjunct), Ph.D. Wisconsin; A.C. Shubat (Space Institute, Tulallitha), Ph.D. Northeastern; T.W. Wang, Ph.D. Massachusetts Institute of Technology, F.E. Weber, Ph.D. Minnesota.

Bachelors of Science Program

Chemical engineering is a discipline dedicated to the development, design, operation, and management of processes and plants for economical conversion of chemical raw materials into useful products. It is a broadly based discipline, with heavy emphasis on chemistry and mathematics, and also including physics, materials and the humanities. Graduates of the program are quite versatile, with careers in fields such as food and pharmaceutical processing, polymer science, biochemical engineering, fuels production and conversion, polymers and semi-conducting materials, and water resources.

The curriculum provides a central core of required courses, which are common 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 18 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

Chemical engineering students progressing to upper-division courses is competitive and based on capability. 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 may apply for progression to Upper-Division Status after earning 50 semester hours of Lower Division engineering course work with an overall GPA of at least 2.4. The student must include Chemical Engineering 200.

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 departmental programs after Upper-Division Status students have been accommodated. Provisional students are required to demonstrate their abilities to perform satisfactorily in upper-division courses by attaining a minimum GPA of 2.0 at all 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 Resident Graduate Program at Oak Ridge and Kingsport.

See the Graduate Catalog for detailed information.

Civil Engineering

Including Environmental Engineering

Professors: G.D. Reed (Head), Ph.D.; D. Arkaness, P.E.; E.G. Budeck (Fred H. Peck Pfiester, Pfiester), Ph.D.; D. Ilensky, P.E.; A. Patterton; Ph.D. North Carolina State; Ph.D. Y.T. Davis (Harold Dean - Graduate School), Ph.D. Tennessee; D. Stobart (Scudder; Ph.D. Illinois; P.E.; Mitakka Ghosh, (Goodrich Chair of Excellence), P.E. Ph.D. Illensky, K.H. Wilmont (Alumni Professor - Research). Ph.D. Northenw., P.E.; J.B. Humphreys, Ph.D.

Tennessee, A.M.; P.E.; H.J. Johnson, M.S.; Illinois, P.E.; W.A. Miller (Associate Dean), Ph.D. Georgia Institute of Technology; P.E.; B.A. Tiscamb (Condra Professor), St. New Mexico State, P.E.; C.R. Walter (Emersin) M.S. Massachusetts Institute of Technology, P.E.; A. Leighton (Environmental and northwestern.

Associate Professors: R.M. Bennett, Ph.D. Illinois, P.E.; E.C. Drum; Ph.D. Arizona; P.E.; J.H. Dastl; Ph.D. Tennessee, P.E.; B.J. Frederick; B.E. Clarkson University, P.E.; J.H. Peis, (Space Institute, Tulallitha), Ph.D. Missouri; T.L. Miller, P.E.; Tennessee, P.E.; A.B. Moore, M.S. Tennessee; K.G. Montana; Ph.D. VPI; R.R. Bronfman (Fishier Professor), Ph.D. Iowa State, P.E.; J.L. Sprog; P.E. Ph.D. VPI; R.F. Try (Emersin), B.S. Marquette, P.E.

Assistant Professor: W.F. King, Ph.D. VPI.

Instructor: C.D. Cox, Ph.D. Penn State.

BACHELORS DEGREE PROGRAM

This 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. The student's career objectives and program accreditation requirements, must be considered. The student must confer with their advisor and have their selections approved.

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 to graduates of recognized undergraduate curricula.

Civil Engineering

The general requirements for the masters' degrees are stated in the Graduate Catalog.

DOCTORAL PROGRAM

Graduate programs in civil engineering and environmental engineering leading to the degree of Doctor of Philosophy with a major in civil engineering is offered. Major fields of study include environmental and geotechnical materials, structural engineering, transportation, and water resources.

The general requirements for the doctoral degree are stated in the Graduate Catalog.
program. These laboratories are devoted to facilitate the undergraduate teaching department maintains a number of laboratory facilities available to students. The curriculum in physics is designed to fulfill the educational requirements for professional work in various fields of applied science which are based upon a thorough understanding of the fundamental principles of physics. The first two years are concerned with fundamental courses in engineering, science, and mathematics. In the upper division, the curriculum allows some choice of courses in engineering and in physics depending upon the interest of the student. This undergraduate program is a complete, professional curriculum, including the knowledge for entry into a variety of work in industry and research. The program also leads to graduate work in either physics or engineering.

**ELECTRICAL AND COMPUTER ENGINEERING**


**Associate Professors:** R.A. Bolz (Space Institute, Tullahoma), Ph.D. Tennessee, B. W. Burton (Space Institute, Tullahoma), Ph.D. Tennessee, R. D. Joseph (Space Institute, Tullahoma), P.E. Case Institute of Technology, A. Puid (Space Institute, Tullahoma), D. Vandelbert, M.J. Rabinowitz (Emeritus), Ph.D. University of Illinois, P.E., D. P. New York, J. R. Hochalla, Ph.D. Tullahoma, M.M. Tirevik, Ph.D. Utah State, J. W. Walker, Ph.D. Tennessee.

**Assistant Professors:** M. Abid, Ph.D. Pennsylvania, D. Brzakova; P. D. Florida, Ph.D. Wisconsin State, D. B. Koch, Ph.D. Missouri, Ruffa.

**Lecturers:** M. S. M. Tennessee, C. D. Martin, M. Tennessee.

**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 broad sciences and the specialized areas of electrical and computer engineering. The program also has sufficient non-technical content to ensure the growth of the students and develop professionals 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 number of laboratory facilities to support the undergraduate teaching program. The curriculum in electrical engineering is concerned with fundamental courses in engineering, science, and mathematics. In the upper division, the curriculum allows some choice of courses in engineering and in physics depending upon the interest of the student. This undergraduate program is a complete, professional curriculum, including the knowledge for entry into a variety of work in industry and research. The program also leads to graduate work in either physics or engineering.
broad needs in engineering science, mathematics, and physical or biological science. This curriculum is rigorous, non-traditional and interdisciplinary. In addition to their selected area of specialty, students receive a solid foundation in mathematics, the engineering sciences, modern computational techniques. This prepares them to go directly into engineering practice at the baccalaureate level or to continue formal engineering education in a Master's or Ph.D. program.

The first two years of study are similar to other engineering disciplines which require students to take fundamental courses in the basic sciences, engineering science, and mathematics. At the junior and senior level, the engineering science program contains the required courses necessary for the modern practice of engineering. In addition, selected groups of technical electives provide the opportunity to develop special interests that connect their course work in other traditional engineering disciplines. Examples of special interest elective groups available are engineering mechanics, biomedical engineering, computational mechanics, and engineering materials. Other elective groups may be developed upon request.

The engineering mechanics elective group focuses on analytical methods used to investigate practical engineering problems. It is designed especially to develop engineers who are capable of functioning in an industrial environment or research laboratory. Because such preparation involves emphasis on the link between the basic sciences and engineering fundamentals, the electives emphasized in this elective group provides an excellent background for students wishing to pursue engineering graduate studies. The biomechanical engineering elective group provides the student an opportunity to contribute to the fields of biology and medicine in such applications as the design of prostheses, development of artificial organs, and the application of biomechanical engineering sciences to further the basic understanding of biological systems. Qualification minimums for this program as a background for graduate study in engineering or the life sciences. The program can include courses required for entrance into most medical school, including The University of Tennessee Center for Health Sciences in Memphis.

Engineering materials play a primary role in all structures such as bridges and buildings, modern types of machines and apparatus, or structures of the future such as space stations and artificial organs. All these structures must be both safe and economical. The engineer designing these structures must be familiar with materials ranging from classical metals like steels to the newest materials such as ceramics, polymers and composites.

The undergraduate program in engineering materials gives the student the opportunity oriented program in the use of materials for the design of engineering structures. The student can learn to analyze structures such as bridge, fatigue, and service environments. By choosing the technical electives to provide an area emphasis, the student can emphasize metals, polymers, composite materials, or non-destructive testing. Because many of the elective courses are selected from the engineering science program, faculty advising plays an essential role in the process of developing the student's course of study. Students are expected to have advising conferences with their faculty advisor each semester. The advising conference should focus on the broader aspects of the student's career objectives and provide guidance in the selection of appropriate elective courses to help achieve those objectives. Each student, in conjunction with his/her faculty advisor, is required to develop a program of study no later than their junior year. Our program is accredited by the Accreditation Board for Engineering and Technology (ABET).

MASTER OF SCIENCE AND DOCTORAL PROGRAMS

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in engineering science are available to graduates of recognized curricula in engineering. Graduate courses are open to all students. Graduates of recognized curricula in mathematics, computer science or one of the physical or biological sciences may also qualify for admission depending upon their background or willingness to enroll in selected engineering courses. Each applicant is advised as to any prerequisite courses needed to enroll in a program. Program options include solid and fluid mechanics (with emphasis toward computational techniques), biomaterial engineering, artificial intelligence applications, composite materials and fracture mechanics. Interdisciplinary programs are arranged to meet individual needs or interests. The student's program of study must be approved by his or her advisory committee, and must comply with the requirements of the Graduate School. The student's major professor may be selected from a department other than the Department of Mechanical Engineering.

The Graduate School provides courses and minor requirements leading to the Master's degree and the Doctor of Philosophy degree. The student is advised with regard to the broader aspects of the student's career objectives and provides guidance in the selection of appropriate elective courses to help achieve those objectives. Each student, in conjunction with his/her faculty advisor, is required to develop a program of study no later than their junior year. Our program is accredited by the Accreditation Board for Engineering and Technology (ABET). The undergraduate curriculum in industrial engineering provides a strong background in both fundamental engineering principles and the analytic methods necessary for solving the multi-faceted problems associated with traditional 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.

The 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 facility 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 the major discipline.

The solid, broad basis in engineering, combined with the technical and non-technical methodology to traditionally non-engineering problem areas as provided through the industrial engineering curriculum, leads to professional engineering graduates who take an approved list of program courses that are approved in 30 to 36 hours of coursework. The graduate program in industrial engineering is designed to meet individual needs or interests, and provides guidance in the selection of appropriate courses to help achieve those objectives. The student is advised with regard to the broader aspects of the student's career objectives and provides guidance in the selection of appropriate elective courses to help achieve those objectives. Each student, in conjunction with his/her faculty advisor, is required to develop a program of study no later than their junior year. Our program is accredited by the Accreditation Board for Engineering and Technology (ABET).

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 facility 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 the major discipline.

The solid, broad basis in engineering, combined with the technical and non-technical methodology to traditionally non-engineering problem areas as provided through the industrial engineering curriculum, leads to professional engineering graduates who take an approved list of program courses that are approved in 30 to 36 hours of coursework. The graduate program in industrial engineering is designed to meet individual needs or interests, and provides guidance in the selection of appropriate courses to help achieve those objectives. The student is advised with regard to the broader aspects of the student's career objectives and provides guidance in the selection of appropriate elective courses to help achieve those objectives. Each student, in conjunction with his/her faculty advisor, is required to develop a program of study no later than their junior year. Our program is accredited by the Accreditation Board for Engineering and Technology (ABET).

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 facility 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 the major discipline.

The solid, broad basis in engineering, combined with the technical and non-technical methodology to traditionally non-engineering problem areas as provided through the industrial engineering curriculum, leads to professional engineering graduates who take an approved list of program courses that are approved in 30 to 36 hours of coursework. The graduate program in industrial engineering is designed to meet individual needs or interests, and provides guidance in the selection of appropriate courses to help achieve those objectives. The student is advised with regard to the broader aspects of the student's career objectives and provides guidance in the selection of appropriate elective courses to help achieve those objectives. Each student, in conjunction with his/her faculty advisor, is required to develop a program of study no later than their junior year. Our program is accredited by the Accreditation Board for Engineering and Technology (ABET).
Main Stream of Engineering Program

This professional degree program is intended as a culminating year in a five-year baccalaureate-master program which emphasized engineering design and professional practice. Admission requirements include those presented above plus the requirement of a Bachelor's degree from an ABE-T-accredited Industrial Engineering program. This 30-semester hour program requires 12 hours of course work in an industrial engineering core, 6 hours of technical methods electives, 6 hours of industrial engineering design electives and 6-hour thesis or design project.

MATERIALS AND ENGINEERING

Professors:
E. J. Sproul (Head), Ph. D. Tomnose, K. G. Ashline, Ph. D. Birmingham (Engle); D. C. Boger, Ph. D. Delaware; S. B. Boll (Part-time); D. P. Massachusetts Institute of Technology; C. P. Brooks, Ph. D. Pennsylvania; R. A. Buchanan, Ph. D. Vanderbilt; E. S. Clark, Ph. D. California (Berkeley); D. A. Caron (Adjunct Status); D. P. Lehman, J. F. Petras, Ph. D. Akron; J. S. Lin (Adjunct Status); Ph. D. Kansas; D. H. Lowry (Part-time); Ph. D. Colorado; C. D. Lundin, Ph. D. Pennsylvania State Technical, C. O. L. Marquette (Part-time); Ph. D. Kentucky; B. F. Oliver, Ph. D. Pennsylvania State University; J. P. J. Rezak, Ph. D. National University (Argentina); P. J. Rillkis, Ph. D. Liverpool (England); E. E. Stambaugh (Emeritus); Ph. D. Cincinnati.

Associate Professors:
W. T. Becker, Ph. D. Robert S. Benson, Ph. D. Florida State University; C. T. Lin (Adjunct Status); Ph. D. Brown University; T. M. Moeck, 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 proper metals, ceramics and composites, and develop processes for improvement of materials and/or material 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 studies.

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in materials science and engineering or polymer engineering are offered.

Detailed information about graduate programs in materials science and engineering and the requirements for all M.S. or Ph.D. degrees are given in the Graduate Catalog.
TRANSFER STUDENTS: At the upper class rolls, space engineering courses. Students who will not be admitted to mechanical or aeronautical division courses is dependent upon this department. Further progression to upper division courses by attaining a minimum GPA of 2.0 in at least 11 semester hours in upper division courses by attaining a demonstrated ability to perform satisfactorily and orderly progress through the complex engineering programs of the real world. A major design project in the senior year builds upon this background in a capstone experience.

PROGRESSION TO UPPER-DIVISION PROGRAMS

Progression to upper Division Programs is competitive and is based on departmental grade point average, performance in selected lower division courses, and evidence of satisfactory and orderly progress through the preliminary engineering programs. A minimum cumulative grade point average of 2.4 is required in all courses attempted at UT Knoxville for graduation.

FULL STATUS: A Lower Division student in the department may apply for progression to upper Division Program after completing 32 semester hours of Lower Division engineering curriculum course work with an overall GPA of at least 2.4.

PROVISIONAL STATUS: Students who have completed 32 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 Status is based on the availability of space in departmental programs after full status students have been accommodated. Provisional Status students are required to demonstrate their abilities to perform satisfactorily in upper Division courses by attaining a minimum GPA of 2.0 or in at least 11 semester hour of Upper Division courses (included 8 specified hours in 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 mechanical or aeronautical engineering courses. Students who have not been progressed to an Upper Division Program will be dropped from departmental class rolls.

TRANSFER STUDENTS: At the Upper Division level students are admitted on a Provisional Status basis only. Any student presenting more than 6 semester is considered a Trnslnt Student.

LOSS OF FULL STATUS: Students who progress to upper Division Program are expected to maintain an overall GPA of at least 2.0 in departmental courses. Failure to maintain these minimum levels of performance will result in a review of the overall progress of the student through the prescribed curriculum and probable loss of Full Status.

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 curricula in mechanical or aerospace engineering and to graduates of the curricula who satisfy the necessary prerequisite courses. The general requirements for advanced degrees are summarized in the Graduate Catalog.

NUCLEAR ENGINEERING

Professors: T.W. Kerlin (Head), Ph.D., Tennessee; H.L. Dodds, Ph.D., Tennessee; P.E., J.T. Milhollin (Part-time), Ph.D., Tennessee; P.E. Pasqua (Emratis), Ph.D., Northwestern; P.E., R.B. Persson, Ph.D., Madison (Spain); P.M. Stover, Ph.D., Northwestern; P.E.; J.E. Turner (Part-time), P.D., Ph.D., (Vanderbilt); P.E., N. Urban (Part-time), Ph.D., Michigan (Part-time), Ph.D. Michigan; Distinguished Professor, Ph.D., Iowa State, P.E., B.R., Indian Ocean, California, P.E.

Associate Professors: E.M. Katz, Ph.D., Pennsylvania; P.E.; L.F. Miller, Ph.D., Texas A&M; P.E.; T.H. Scott, Ph.D., Florid., P.E.

BACHELOR OF SCIENCE PROGRAM

The curriculum is designed to provide a thorough educational experience for students interested in careers in nuclear engineering. The first 2 years are concerned with the fundamental courses needed as preparation for upper division courses. In the last two years students take scientific and engineering courses which equip them for entry into industry, research, or graduate studies.

MASTER OF SCIENCE PROGRAM

A graduate program leading to a degree of Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before enrolling in the program. The general requirements of the masters' degree are summarized in the Graduate Catalog.

DOCTORAL PROGRAM

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

CURRICULA

Course requirements for the various engineering curricula are listed on the following pages. The numbers in each column 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 (five for the cooperative program), 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 a particular curriculum should be directed to the major department.

Prerequisites: Before registering for any engineering course, a student should take certain that all necessary background work has been completed. In addition to specific prerequisites listed, it is assumed that a student taking sophomore engineering courses has completed all freshman courses, whether specifically listed as a prerequisite or not.

When this is not the case, a student should seek advice from the advisor or department responsible for the course in question before registration so as to minimize the chances of academic difficulty. Students who do not have prescribed prerequisites may be dropped from a course at any time during a semester when the lack of prerequisites is discovered.

FRESHMAN YEAR

The freshman year is common to all engineering programs, except for engineering physics. (See curriculum display which follows.)

<table>
<thead>
<tr>
<th>Credits</th>
<th>Course</th>
<th>Year</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>101,102</td>
<td>English</td>
<td>1st</td>
<td>Fall</td>
</tr>
<tr>
<td>201,202</td>
<td>Physics</td>
<td>1st</td>
<td>Winter</td>
</tr>
<tr>
<td>111,112</td>
<td>Basic Engineering</td>
<td>1st</td>
<td>Fall</td>
</tr>
<tr>
<td>113,114</td>
<td>Basic Engineering</td>
<td>1st</td>
<td>Winter</td>
</tr>
<tr>
<td>115,116</td>
<td>Basic Engineering</td>
<td>2nd</td>
<td>Fall</td>
</tr>
<tr>
<td>117,118</td>
<td>Basic Engineering</td>
<td>2nd</td>
<td>Winter</td>
</tr>
</tbody>
</table>

Total: 36 hours

AEROSPACE ENGINEERING

Sophomores

<table>
<thead>
<tr>
<th>Credits</th>
<th>Course</th>
<th>Year</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>231,241</td>
<td>Mathematics</td>
<td>2nd</td>
<td>Fall</td>
</tr>
<tr>
<td>232,231</td>
<td>Physics</td>
<td>2nd</td>
<td>Winter</td>
</tr>
<tr>
<td>321,322</td>
<td>Engineering Mechanics and Mathematics</td>
<td>2nd</td>
<td>Fall</td>
</tr>
<tr>
<td>201</td>
<td>Basic Engineering</td>
<td>2nd</td>
<td>Winter</td>
</tr>
<tr>
<td>202</td>
<td>Basic Engineering</td>
<td>2nd</td>
<td>Fall</td>
</tr>
<tr>
<td>301,302</td>
<td>Mechanical Science and Engineering</td>
<td>2nd</td>
<td>Winter</td>
</tr>
<tr>
<td>303</td>
<td>Mechanical Engineering</td>
<td>2nd</td>
<td>Winter</td>
</tr>
<tr>
<td>311,312</td>
<td>Materials Science and Engineering</td>
<td>2nd</td>
<td>Fall</td>
</tr>
<tr>
<td>401,402</td>
<td>Aerospace Engineering</td>
<td>2nd</td>
<td>Winter</td>
</tr>
<tr>
<td>403</td>
<td>Aerospace Engineering</td>
<td>2nd</td>
<td>Fall</td>
</tr>
<tr>
<td>404</td>
<td>Aerospace Engineering</td>
<td>2nd</td>
<td>Winter</td>
</tr>
<tr>
<td>405,406</td>
<td>Aerospace Engineering</td>
<td>3rd</td>
<td>Fall</td>
</tr>
<tr>
<td>407,408</td>
<td>Aerospace Engineering</td>
<td>3rd</td>
<td>Winter</td>
</tr>
</tbody>
</table>

Total: 30 hours

DOCTORAL PROGRAM

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

GRADUATE STUDY

Graduate study 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 curricula in mechanical or aerospace engineering and to graduates of the curricula who satisfy the necessary prerequisite courses. The general requirements for advanced degrees are summarized in the Graduate Catalog.

A graduate program leading to a degree of Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before enrolling in the program. The general requirements of the masters' degree are summarized in the Graduate Catalog.
CHEMICAL ENGINEERING

Sophomore

Chemical Engineering 200, 240...........2
Engineering Science and Mathematics 201.............4
Mathematics 200, 231, 241 ...........5
Physics 231 ........................................1

Junior

Chemical Engineering 230, 340, 310 ..............17
Chemistry 473, 493, 494, 450 ..................16
Chemistry Option .................................1
Humanities/Social Science .....................3

Senior

Chemical Engineering Electives 450, 440, 445, 480, 410, 490 .......16
Technical Electives ..............................2

Total: 137 hours

ENGINEERING PHYSICS

Sophomore

Physics 231, 232, 237, 238 ......................8

Junior

Physics 231, 232 (231), 238 (232) ..........7

Senior

Physics 411 ........................................1

Total: 138 hours

INDUSTRIAL ENGINEERING

Sophomore

Mathematics 200, 231, 241 ....................8
Physics 231, 232 ....................................7
Electrical and Computer Engineering 201, 242, 251 ............10

Junior

Mathematics and Engineering 201 ...............9
Biological/Engineering 201 ....................2

Senior

Mathematics and Engineering 310, 320 ................3
Mathematics and Engineering 311, 321 ...........4

Total: 136 hours

ELECTRICAL AND COMPUTER ENGINEERING

Sophomore

Electrical and Computer Engineering 201, 241 ...............8
Physics 231, 232 ....................................7

Junior

Electrical and Computer Engineering 310, 320 ................3
Electrical Engineering 200, 231, 251 .......10
Electrical Engineering 311, 320, 350 ...........9

Senior

Electrical and Computer Engineering 331, 340, 341, 342 ..........6
Electrical and Computer Engineering 351, 360 .........3

Total: 139 hours
### MATERIALS SCIENCE AND ENGINEERING

<table>
<thead>
<tr>
<th>Sophomore</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Engineering 201</td>
<td>2</td>
</tr>
<tr>
<td>Materials Science and Engineering 201</td>
<td>3</td>
</tr>
<tr>
<td>Physics 211, 212</td>
<td>7</td>
</tr>
<tr>
<td>Mathematics 200, 231, 241</td>
<td>6</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>6</td>
</tr>
<tr>
<td>Materials Science and Engineering 300, 301, 302, 303, 304, 360</td>
<td>20</td>
</tr>
<tr>
<td>Chemistry 431 or 300</td>
<td>3</td>
</tr>
<tr>
<td>Electrical Engineering 321</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>6</td>
</tr>
<tr>
<td>Materials Science and Engineering 310, 400, 405, 411, 412, 417</td>
<td>16</td>
</tr>
<tr>
<td>Materials Science and Engineering elective</td>
<td>6</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/Social Science elective</td>
<td>6</td>
</tr>
</tbody>
</table>

Total: 134 hours

*MSE electives: 423, 426, 441, 443, 444, 473, 472, 474, 475, 494, 495, 496 (Selection of MSE electives must include a total of at least two credit hours of design content).

### MECHANICAL ENGINEERING

<table>
<thead>
<tr>
<th>Sophomore</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 211, 241, 260</td>
<td>6</td>
</tr>
<tr>
<td>Physics 211, 212</td>
<td>7</td>
</tr>
<tr>
<td>Engineering Science and Mechanics 231, 321</td>
<td>6</td>
</tr>
<tr>
<td>Basic Engineering 201</td>
<td>2</td>
</tr>
<tr>
<td>Materials Science and Engineering 201</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Engineering 331</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>6</td>
</tr>
<tr>
<td>Mechanical Engineering 391, 344, 363, 366</td>
<td>22</td>
</tr>
<tr>
<td>311, 312, 313</td>
<td>22</td>
</tr>
<tr>
<td>Electrical and Computer Engineering 301, 302</td>
<td>8</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>6</td>
</tr>
<tr>
<td>Mechanical Engineering 451, 466, 475, 499, 431</td>
<td>13</td>
</tr>
<tr>
<td>Mechanical Engineering 459 and 469 or 459 and 479</td>
<td>6</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>6</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>6</td>
</tr>
</tbody>
</table>

Total: 135 hours

### NUCLEAR ENGINEERING

<table>
<thead>
<tr>
<th>Sophomore</th>
<th>Hours Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 200, 231, 241</td>
<td>6</td>
</tr>
<tr>
<td>Physics 211, 212</td>
<td>7</td>
</tr>
<tr>
<td>Basic Engineering 201</td>
<td>2</td>
</tr>
<tr>
<td>Nuclear Engineering 201, 203, 202, 204</td>
<td>8</td>
</tr>
<tr>
<td>Electrical and Computer Engineering 301</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>6</td>
</tr>
<tr>
<td>Mathematics 431</td>
<td>3</td>
</tr>
<tr>
<td>Electrical and Computer Engineering 302</td>
<td>3</td>
</tr>
<tr>
<td>Nuclear Engineering Science and Mechanics 301</td>
<td>3</td>
</tr>
<tr>
<td>Industrial Engineering 435</td>
<td>2</td>
</tr>
<tr>
<td>Material Science and Engineering 391</td>
<td>3</td>
</tr>
<tr>
<td>Humanities/Social Science electives</td>
<td>6</td>
</tr>
<tr>
<td>Senior</td>
<td>18</td>
</tr>
<tr>
<td>Nuclear Engineering 401, 403, 405, 402, 404, 409</td>
<td>6</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>6</td>
</tr>
<tr>
<td>Humanities/Social Science electives</td>
<td>6</td>
</tr>
</tbody>
</table>

Total: 134 hours