

# Samuel Ginn College of Engineering

LARRY D. BENEFIELD, *Dean*  
OLIVER D. KINGSLEY, JR., *Associate Dean*  
NELS MADSEN, *Associate Dean*  
JOE M. MORGAN, *Associate Dean*  
RALPH H. ZEE, *Associate Dean*

ENGINEERS ARE FACED with worldwide problems and expectations awesome in responsibility, yet exciting as professional challenges. These range from the extremes of interplanetary exploration through earth orbiting systems to the problems arising from our population explosion: energy, better productivity, housing, transportation and environmental issues.

As a renewed appreciation develops for the contributions of science and technology, engineering leaders are calling for engineers, who are better equipped to tackle the specific, technical problems of the future. They also are calling for engineers who by breadth of education and understanding of other disciplines can convince others of the role of engineers not only in technical matters but in policy decisions to ensure the use of technology to benefit mankind.

Engineering education at Auburn also provides in a four-year curriculum both the technical knowledge and the broad general education necessary to equip engineers for their problem-solving challenges. Centered on mathematics and the physical sciences, the curricula also stress the importance of social sciences, humanities and communication skills. Auburn's engineering programs enable individuals to develop their natural talents and provide knowledge, skills and understanding that will help them to find their places in society as well as in their vocations.

## Admission

Freshmen eligibility is determined by the Office of Enrollment Services. However, since the requirements for engineering education necessitate high school preparatory work of high intellectual quality and of considerable breadth, the following program is recommended as minimum preparation: English, four units; mathematics (including algebra, geometry, trigonometry, and analytical geometry), four units; chemistry, one unit; history, literature, social science, two or three units. Physics and foreign languages are recommended but not required.

Transfers from other institutions must apply through the Office of Enrollment Services. The exact placement of these students can be determined only upon review of their transcripts by the Samuel Ginn College of Engineering. See "Admission of Transfer Students" in the General Information section for complete requirements.

The college allows credit for courses completed with satisfactory grades provided the courses correspond in time and content to courses offered at Auburn. Courses that are taught at the 3000-level or higher at Auburn are generally not transferable from junior colleges.

Many courses required by the Samuel Ginn College of Engineering are highly specialized in their content and potential transfer students need to select courses with care. Therefore, to ensure maximum transferability of credits, students are encouraged to contact the College as soon as possible about acceptable credits.

Transfers from on-campus must be approved by the Samuel Ginn College of Engineering and the admissions committee of the chosen curriculum, and meet the same academic requirements as off-campus transfer students. The criteria include a minimum overall Auburn grade-point average of 2.2 and the completion of the first mathematics course listed in the chosen curriculum with a grade of C or better.

## Programs

**Pre-Engineering.** The Pre-Engineering Program consists of a freshman program of studies to prepare students for curricula in the Samuel Ginn College of Engineering. It also provides academic and career counseling to assist students in determining the curriculum that best fulfills their personal and educational objectives.

**Professional Programs.** Curricula accredited by the national accrediting agency, the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), lead to the degrees of bachelor of aerospace engineering, chemical engineering, civil engineering, electrical engineering, industrial and systems engineering, materials engineering, mechanical engineering, polymer and fiber engineering, wireless engineering, and biosystems engineering. The

curriculum leading to the bachelor of science in computer science is accredited by the Computing Accreditation Commission of ABET.

These curricula are designed to meet the educational requirements of the engineering professions. The program in the fundamental sciences of mathematics, chemistry and physics is followed by a study of basic engineering sciences. Specialized or departmental courses are taken in the third and fourth years. Flexibility is provided in all degree programs through electives so that the individual may emphasize areas of personal interest.

A forest engineering option is also available under the biosystems engineering degree program. It is offered jointly by the Department of Biosystems Engineering and the School of Forestry and Wildlife Sciences. The environmental science curriculum is offered jointly by the College of Agriculture and the College Sciences and Mathematics.

**Dual-Degree.** The Samuel Ginn College of Engineering has agreements with several predominantly liberal arts institutions to offer an academic program where a student can earn two baccalaureate degrees. Under the terms of this program the first three years of study are devoted to earning a major in any one of the disciplines offered by the institution first entered, while completing the basic sciences and mathematics courses required for pre-engineering at Auburn.

Upon completion of three years of study in the liberal arts the student transfers to the Samuel Ginn College of Engineering. After a minimum of two years of study in an engineering curriculum, the student earns degrees from both institutions. The broad background provided by this program may enable a student to cope more effectively with many of the problems of modern-day society.

Dual degree agreements have also been made with the university's colleges of Agriculture, Liberal Arts and Sciences and Mathematics to provide for dual-degree programs with the Samuel Ginn College of Engineering.

**Graduate.** The Samuel Ginn College of Engineering offers the MS and PhD degrees in aerospace, chemical, civil, computer science and software engineering, electrical and computer, industrial and systems, materials and mechanical engineering and polymer and fiber engineering. The following professional degrees are offered as well: master of aerospace engineering, master of chemical engineering, master of civil engineering, master of electrical and computer engineering, master of industrial and systems engineering, master of materials engineering, master of mechanical engineering, master of polymer and fiber engineering, and master of software engineering. The college also offers a dual-degree master of industrial and systems engineering and master of business administration.

**Cooperative Education.** The Cooperative Education Program is offered in all curricula of the Samuel Ginn College of Engineering. Refer to the program and write to the Director, Cooperative Education, Auburn, AL 36849 for a booklet which gives additional information.

**Continuing Education.** Business and Engineering Continuing Education extends the resources of the Samuel Ginn College of Engineering to the people, businesses and industries of the state. Programs in this service are technical assistance, short courses, conferences, workshops and seminars. For more information, contact: Director, Business and Engineering Continuing Education, 217 Ramsay Hall, Auburn, AL 36849.

**Video-Based Off-Campus Courses.** The college offers graduate-level courses for credit and non-credit to off-campus students through its Graduate Outreach Program. Graduate-level courses are recorded in the classroom on the Auburn campus and mailed to off-campus students on the same day. Alternatively, courses can be delivered via streaming video. Students enrolled in the program are required to do the same homework assignments and take the same exams as the on-campus students enrolled in the course. For information on admission to the program, fees, course offerings and other particulars, write to the Graduate Outreach Program, 202 Ramsay Hall, Auburn, AL 36849 or call (334) 844-5300.

**Scholastic Requirements.** Pre-Engineering students are transferred to the curriculum of their choice in the Samuel Ginn College of Engineering upon meeting the following requirements:

Complete all appropriate freshman courses;  
Earn an overall grade-point average of 2.2 on all required and approved elective course work.

**Recommendation by the Curriculum Admissions Committee.** A student who has not met the above criteria after four resident semesters is dropped from the college. Junior standing will not be granted to any student in the Pre-Engineering Program.

**Degree Requirements.** To earn the bachelor's degree in the Samuel Ginn College of Engineering, students must complete the subjects in the curriculum, have a minimum grade-point average of 2.0 in all work attempted at Auburn University and have a cumulative grade-point average of 2.0 on courses passed in the major at Auburn. The major is defined as all course work shown in bold print on the relevant curriculum model. It is the student's responsibility to keep informed of course requirements and scheduling. Failure to do so may jeopardize graduation.

**Military Science.** All curricula in the Samuel Ginn College of Engineering permit the use of six hours of basic or advanced ROTC courses passed at Auburn University. For the options, see the specific curriculum. For programs that do not have sufficient electives, credit will be determined on an individual basis. ROTC courses cannot be substituted for any university core or ABET-required courses.

**Minors**

**AUTOMOTIVE ENGINEERING AND MANUFACTURING MINOR**

Students in any engineering major may choose to minor in automotive engineering and manufacturing. Two curriculum tracks are available: industrial engineering and mechanical engineering. The courses required for the minor may require prerequisites that will not count toward the student's major.

The minor requires successful completion of 15-16 semester credit hours as shown below:

Industrial Engineering Track: MECH 4430; INSY 5800, 5840, 5850, 5890. With approval, MECH 4450 may be substituted for INSY 5840 or 5890.

Mechanical Engineering Track: MECH 4410, 4420, 4430; INSY 5800, 5850.

**BUSINESS-ENGINEERING-TECHNOLOGY**

Students who minor in Business-Engineering-Technology learn, practice, and integrate entrepreneurship, engineering, and business management skills demanded by the technology-driven global economy, solve real-world case study and design problems, and work in cross-functional teams. The minor is a joint offering by the Colleges of Business and Engineering. Admission to the minor is competitive. Engineering and business majors apply for admission to the Business-Engineering-Technology Program as second semester sophomores. To remain in the program, the cumulative Grade-point average must be equal to or greater than 3.0.

16 semester hours in the minor

Courses required		Cr. Hr.
BUSI 3510	Introduction to Engineering and Business .....	3
BUSI 3520	Integrat Bus. and Engr. Theories in Practice .....	3
BUSI 3550	Cross-Functional Teamwork .....	1
BUSI 3560	Leadership .....	1
BUSI 4540	Entrep & Strat. Mngt. Of Tech. & Innov.....	4
BUSI 4970	Capstone Project I: Design Proposal .....	1
BUSI 4980	Capstone Project II: Design Project .....	3

**COMPUTER SCIENCE MINOR**

19 semester hours in minor

Courses required		Cr. Hr.
COMP 1210	Fundamentals of Computing I .....	3
COMP 2210	Fundamentals of Computing II .....	4
COMP 2710	Software Construction .....	3
COMP 3240	Discrete Structures .....	3
COMP 3270	Introduction to Algorithms .....	3
COMP 3700	Software Modeling & Design .....	3

**INFORMATION TECHNOLOGY MINOR**

15 semester hours in minor (minimum 9 hours at 3000-level or above, selected from the following courses: COMP 3000, COMP 4000, COMP 4730, COMP 5000, COMP 5010, COMP 5020, COMP 5030).

Courses required: NONE

Elective Courses: see advisor for approved course listing.

**Department of Aerospace Engineering**

Aerospace engineers are concerned with the application of scientific principles and engineering concepts and practices to design, build, test and operate aerospace systems. The curriculum is intended to provide students with a broad understanding of fundamental scientific and technological principles, and to develop the ability to use these principles in developing solutions to engineering problems.

The objectives of the aerospace engineering program are: (1) to help students develop written and oral communication skills and to acquire a knowledge of history, literature and society; (2) to provide students a solid foundation in and a sound working knowledge of basic engineering principles; (3) to help students obtain an understanding of the engineering principles and skills specifically needed in the aeronautical and astronautical disciplines; and (4) to assist and encourage each student to develop an enhanced ability to learn and think creatively.

Required courses cover aeronautical and astronautical subjects. Students may also choose to emphasize either aeronautical or astronautical systems. Technical electives allow concentration in such areas as aerodynamics, astronautics, flight dynamics and control, propulsion, structures and structural dynamics. The design of aerospace components and systems is considered to be an integral part of the education of aerospace engineers. Hence, design is included throughout the curriculum, beginning with a sophomore course in aerospace fundamentals and culminating in the senior design course sequence. Students are required to apply their theoretical knowledge of aerodynamics, dynamics, structures and propulsion to solve open-ended problems and to produce portions of preliminary designs.

**Curriculum in Aerospace Engineering**

FR	F	S		F	S
CHEM	1030		Fundamentals of Chemistry I.....	3	**
CHEM	1031		Fundamentals of Chemistry I Lab.....	1	**
ENGL	1100	1120	English Composition I & II .....	3	3
PHYS		1600	Engineering Physics I.....	**	4
MATH	1610	1620	Calculus I & II .....	4	4
			Core History .....	3	3
ENGR	1100		Engineering Orientation.....	0	**
ENGR		1110	Introduction to Engineering.....	**	2
COMP	1200		Introduction to Computing .....	2	**
				<b>16</b>	<b>16</b>
<b>SO</b>					
PHYS	1610		Engineering Physics II .....	4	**
ENGL	2200	2210	World Literature I & II.....	3	3
MATH	2630		Calculus III.....	4	**
MATH		2650	Linear Diff Equations.....	**	3
			Core Philosophy.....	3	**
			Core Social Science Group I.....	**	3
ENGR		2010	Thermodynamics.....	**	3
ENGR	2050		Statics .....	3	**
ENGR		2070	Mechanics of Materials .....	**	3
<b>AERO</b>	<b>2200</b>		<b>Aero Fundamentals.....</b>	<b>**</b>	<b>2</b>
				<b>17</b>	<b>17</b>
<b>JR</b>					
			Core Fine Arts .....	3	**
ENGR	2350		Dynamics.....	3	**
MATH	2660		Topics in Linear Algebra.....	3	**
ELEC	3810		Fundamentals of EE .....	3	**
<b>AERO</b>	<b>3110</b>	<b>3120</b>	<b>Aerodynamics I &amp; II .....</b>	<b>3</b>	<b>3</b>
<b>AERO</b>	<b>3130</b>		<b>Aerodynamics Lab .....</b>	<b>**</b>	<b>2</b>
<b>AERO</b>	<b>3220</b>		<b>Aerospace Systems .....</b>	<b>**</b>	<b>3</b>
<b>AERO</b>	<b>3230</b>		<b>Flight Dynamics.....</b>	<b>**</b>	<b>4</b>
<b>AERO</b>	<b>3310</b>		<b>Orbital Mechanics .....</b>	<b>**</b>	<b>3</b>
<b>AERO</b>	<b>3610</b>		<b>Aerospace Structures I.....</b>	<b>2</b>	<b>**</b>
				<b>17</b>	<b>15</b>
<b>SR</b>					
			Core Social Science Group II.....	**	3
<b>AERO</b>	<b>4140</b>		<b>Aerodynamics III.....</b>	<b>3</b>	<b>**</b>
<b>AERO</b>	<b>4510</b>		<b>Aerospace Propulsion.....</b>	<b>4</b>	<b>**</b>
<b>AERO</b>	<b>4620</b>	<b>4640</b>	<b>Aerospace Structures II &amp; III .....</b>	<b>3</b>	<b>2</b>
<b>AERO</b>	<b>4630</b>		<b>Aero Structural Dynamics .....</b>	<b>**</b>	<b>3</b>
<b>AERO</b>	<b>4AA0</b>		<b>Program Assessment.....</b>	<b>0</b>	<b>**</b>
			<b>Design Option I &amp; II .....</b>	<b>3</b>	<b>3</b>
			<b>Aero/Astro Elective .....</b>	<b>3</b>	<b>3</b>
UNIV	4AA0		EN1 Undergraduate Graduation.....	**	0
				<b>16</b>	<b>14</b>

**TOTAL HOURS - 128**

Design Option - see adviser for approved course listing.  
Aero/Astro - see adviser for approved course listing.

## Department of Biosystems Engineering

The mission of the Department of Biosystems Engineering is to develop and disseminate engineering knowledge to solve problems in agriculture, food, forestry, natural resources and the environment. It meets the resident instruction portion of that mission through the offering of a degree program which leads to a bachelor of biosystems engineering. A forest engineering option is also available under the biosystems engineering degree program.

### Biosystems Engineering

The department offers the only accredited degree in Biosystems Engineering in Alabama. It is committed to preparing students for productive professional careers in the biosystems industries and related natural resource and environmental systems sectors. Specific educational objectives of the Biosystems Engineering Degree program are to produce graduates with: (1) the skills necessary to solve engineering problems associated with the environment and natural resources, and the production, processing, storage, manufacture, utilization, and recycling of biological products; (2) a fundamental understanding of engineering and biological sciences and the ability to combine knowledge from both domains to develop solutions to problems; (3) the ability to analyze critically and conduct scientific experimentation and engineering analysis that leads to development of environmentally and economically feasible design solutions that can be practically implemented; and (4) the ability to understand and expand the role of engineering in society; communicate, work, and provide leadership in multidisciplinary environments; and continue developing professionally and ethically throughout their career. The curriculum is coordinated by the Samuel Ginn College of Engineering and the College of Agriculture. Students should apply for admission to the Samuel Ginn College of Engineering and complete the Pre-Biosystems Engineering program.

#### Curriculum in Biosystems Engineering

FR	F	S		F	S
CHEM	1030		Fundamentals of Chemistry I	3	**
CHEM	1031		Fundamentals of Chemistry I Lab	1	**
ENGL	1100	1120	English Composition I & II	3	3
PHYS		1600	Engineering Physics I	**	4
MATH	1610	1620	Calculus I & II	4	4
			Core History	3	3
ENGR	1100		Engineering Orientation	0	**
ENGR		1110	Introduction to Engineering	**	2
COMP	1200		Introduction to Comp for Engrs & Sci	2	**
				<b>16</b>	<b>16</b>
<b>SO</b>					
BIOL	1020		Principles of Biology & Lab (1021)	4	**
BIOL		1030	Organismal Biology & Lab (1031)	**	4
CHEM	1040		Fundamentals of Chemistry II	3	**
CHEM	1041		Fundamentals of Chemistry II Lab	1	**
ENGR	2050		Statics	3	**
ENGR	2350		Dynamics	**	3
ENGR		2070	Mechanics of Materials	**	3
ENGR		2010	Thermodynamics	**	3
MATH		2630	Calculus III	4	**
MATH		2650	Differential Equations	**	3
			Core Fine Arts	3	**
				<b>18</b>	<b>16</b>
<b>JR</b>					
AGRN	2040		Basic Soil Science	4	**
STAT	3010		Statistics for Engrs & Sci	3	**
CIVL	3110		Hydraulics	4	**
BIOL		3200	General Microbiology	**	4
ELEC	3810		Fundamentals of Electrical Engr.	3	**
ECON		2020	Microeconomics	**	3
<b>BSEN</b>	<b>3210</b>		<b>Mech Power for Biosystems</b>	<b>3</b>	<b>**</b>
<b>BSEN</b>	<b>3230</b>		<b>Natural Resource Conserv Eng</b>	<b>**</b>	<b>3</b>
<b>BSEN</b>	<b>3240</b>		<b>Thermal Process Ops in Biosys</b>	<b>**</b>	<b>3</b>
			<b>Biosystems Engr Elective</b>	<b>**</b>	<b>3</b>
				<b>17</b>	<b>16</b>
<b>SR</b>					
ENGL	2200	2210	World Literature I & II	3	3
			Core Social Science Group I	**	3
			Core Philosophy	**	3
<b>BSEN</b>	<b>3260</b>		<b>Engr for Precision Ag &amp; Fy</b>	<b>**</b>	<b>**</b>
<b>BSEN</b>	<b>4210</b>		<b>Irrigation Systems Design</b>	<b>3</b>	<b>**</b>
<b>BSEN</b>	<b>4230</b>		<b>Waste Mgt &amp; Utilization Eng for Biosys</b>	<b>**</b>	<b>3</b>
<b>BSEN</b>	<b>4240</b>		<b>Mech &amp; Elec Process Ops in Biosys</b>	<b>**</b>	<b>**</b>
<b>BSEN</b>	<b>4310</b>		<b>Engr Design for Biosystems</b>	<b>**</b>	<b>4</b>
			<b>Biosystems Engr Elective</b>	<b>**</b>	<b>3</b>
UNIV		4AA0	EN1 Undergraduate Graduation	**	0
				<b>15</b>	<b>16</b>

**TOTAL HOURS - 130**

Biosystems Electives: see adviser for approved course listing.

## Forest Engineering Option

The Department of Biosystems Engineering in conjunction with the Samuel Ginn College of Engineering and School of Forestry and Wildlife Sciences offers an option in forest engineering as a part of the bachelor of biosystems engineering degree. It is committed to preparing students for productive professional careers in the forest products industry and related natural resource and environmental systems sector.

The forest engineering option is coordinated by the Samuel Ginn College of Engineering and the School of Forestry and Wildlife Sciences. Beginning students should apply to the Samuel Ginn College of Engineering and complete the forest engineering option portion of the pre-biosystems engineering program. Students pursuing the forest engineering option must meet School of Forestry and Wildlife Sciences requirements for admission to the Forestry Summer Field Practicum.

#### Curriculum in Forest Engineering

FR	F	S		F	S
CHEM	1030		Fundamentals of Chemistry I	3	**
CHEM	1031		Fundamentals of Chemistry I Lab	1	**
ENGL	1100	1120	English Composition I & II	3	3
PHYS		1600	Engineering Physics I	**	4
MATH	1610	1620	Calculus I & II	4	4
			Core History	3	3
ENGR	1100		Engineering Orientation	0	**
ENGR		1110	Introduction to Engineering	**	2
COMP	1200		Introduction to Comp for Engrs & Sci	2	**
				<b>16</b>	<b>16</b>
<b>SO</b>					
BIOL	1020		Principles of Biology & Lab (1021)	4	**
ENGL	2200	2210	World Literature I & II	3	3
ENGR		2010	Thermodynamics	**	3
ENGR		2070	Mechanics of Materials	**	3
ENGR	2050		Statics	3	**
ENGR		2350	Dynamics	**	3
MATH	2630		Calculus III	4	**
MATH		2650	Differential Equations	**	3
STAT	3010		Statistics for Engr & Sci	3	**
				<b>17</b>	<b>15</b>
<b>SUMMER PRACTICUM</b>					
			<b>FOEN 3000</b>	<b>Intro to Forest Operations</b>	<b>2</b>
			<b>FOEN 3040</b>	<b>Forest Surveying</b>	<b>3</b>
			<b>FORY 3020</b>	<b>Forest Biology</b>	<b>2</b>
			<b>FORY 3050</b>	<b>Field Mensuration</b>	<b>3</b>
			<b>FORY 3060</b>	<b>Intro to Forest Management</b>	<b>2</b>
					<b>12</b>
<b>JR</b>					
ECON		2020	Microeconomics	**	3
			Core Fine Arts	**	3
FORY	3100		Dendrology (F) OR	3	**
FOPR	3390		Wood Science (P)	3	**
CIVL	3110		Hydraulics	4	**
FORY	3180		Measurements I	3	**
ELEC	3810		Fund of Elect Engr (P) OR	3	**
CIVL	3310		Geotechnical Engr (F)	4	**
<b>BSEN</b>	<b>3210</b>		<b>Mech Power for Biosystems</b>	<b>3</b>	<b>**</b>
<b>BSEN</b>	<b>4250</b>		<b>Hydraulic Control Sys Des</b>	<b>**</b>	<b>3</b>
<b>BSEN</b>	<b>3230</b>		<b>Natural Resource Conserv Engr</b>	<b>**</b>	<b>3</b>
<b>BSEN</b>	<b>3240</b>		<b>Therm Process Ops in Biosys (P) OR</b>	<b>**</b>	<b>3</b>
<b>BSEN</b>	<b>5220</b>		<b>Intro to Spatial Tech for Biosys (F)</b>	<b>**</b>	<b>3</b>
				<b>16/17</b>	<b>15</b>
<b>SR</b>					
			PHIL 1020 or 1040 Ethics	3	**
			Core Social Science Group I	**	3
<b>FOEN</b>	<b>4220</b>		<b>Low Vol Road Design (F) OR</b>	<b>3</b>	<b>**</b>
<b>BSEN</b>	<b>4240</b>		<b>Mech &amp; Elect Proc Ops in Biosys (P)</b>	<b>3</b>	<b>**</b>
FOPR	4200		Forest Products Utilization (P) OR	3	**
FORY	5230		Silviculture (F)	4	**
<b>BSEN</b>	<b>4310</b>		<b>Engr Design for Biosystems</b>	<b>**</b>	<b>4</b>
<b>FOEN</b>	<b>5230</b>		<b>Engr Wood Structures Design</b>	<b>3</b>	<b>**</b>
<b>FOEN</b>	<b>5710</b>		<b>Timber Harvest Analy Methods</b>	<b>**</b>	<b>3</b>
			<b>Forest Engineering Elective</b>	<b>**</b>	<b>3</b>
UNIV		4AA0	EN1 Undergraduate Graduation	**	0
				<b>12/13</b>	<b>13</b>

**TOTAL HOURS - 132/134**

Forest Engineering Elective: see adviser for approved course listing.

(F) denotes courses for Forest Emphasis.

(P) denotes courses for Products Emphasis.

## Department of Chemical Engineering

Chemical engineers contribute to society through the useful application of knowledge and understanding of chemistry, physics, biology, and mathematics. Chemical engineers traditionally have participated in many decisions crucial to the preservation and improvement of society, including energy, fuel, commodity chemical and food production, resource management, and the design of necessary pollution control measures. Emerging new areas such as biotechnology, space technology, nanofabrication technology, semiconductor devices and modern construction materials also utilize the unique capabilities of the chemical engineer. Many technologies to improve public health depend significantly on chemical engineering such as biomaterials, biomedical devices, medical diagnostics, the chemical design and synthesis of drugs, the genetic engineering of therapeutic materials, drug delivery systems and medical imaging technology. Finally, chemical engineering plays an essential role in important environmental technologies such as atmospheric chemistry, product life cycle analysis, bioremediation, environmental risk and impact analysis, environmental friendly manufacturing technology and products, separation and conversion technologies for waste reduction and the cleanup of contaminated sites.

The instructional mission of the department is to provide its chemical engineering graduates with the tools, skills and competencies necessary to understand and apply today's technologies and, through life-long learning, successfully develop and employ tomorrow's technologies.

The program education objectives of the Chemical Engineering program are:

Our graduates are able to apply their technical proficiency for the professional practice of chemical engineering or any other career path that they choose.

Utilize practical engineering skills for productive, gainful, and ethical careers in chemical and related industries and organizations;

Have a background that allows and encourages those who are qualified to pursue advanced technical and professional degrees; and

Have sufficient breadth to make successful transitions into other professional areas, including for example, medicine, law, business, and management.

Our graduates are able to contribute to the professional practice of their chosen field through leadership, teamwork, and service, while exhibiting high ethical and professional standards.

Our graduates are able to clearly and concisely communicate their ideas and decisions to the technical, professional and broader communities in written, verbal, and visual formats.

Our graduates are able to apply high standards in the performance of their professional work regarding global and societal issues including health, safety, and the protection of the environment.

Our graduates are able to engage in life-long learning through professional activities and training, the pursuit of higher educational degrees, and individual professional improvement.

Because of their broad training and education, chemical engineers contribute to society in many functions, such as pure research, development, environmental protection, process design, plant operation and manufacturing, marketing, sales, and corporate or government administration.

The program is specially designed to assure all students have demonstrated capabilities in the core chemical engineering topics including material and energy balances, thermodynamics, chemical equilibria, heat, mass and momentum transfer, chemical reaction engineering, continuous and stagewise separation operations, process dynamics, statistics and control. The design experience is interwoven throughout the curriculum from elementary design principles in material and energy balances to the capstone senior process design and process control sequence employing advanced computer process and control simulators and experimental control systems.

The curriculum is specifically designed to enable graduates to model and design chemical and physical processes, design and conduct experiments, analyze and interpret chemical engineering data, and to determine capital and operating costs for chemical and physical processes. The curriculum prepares graduates to understand the need for professional integrity and ethical decision making in the practice of chemical engineering as well as providing an understanding of contemporary issues including business practices, environmental, health, and safety and other public interests. Students are also prepared for graduate study in chemical engineering, medicine, business and law.

Because of the breadth of chemical engineering opportunities, the department offers a number of specially designed program specializations that provide unique training and course selection to those students who wish to concentrate in a particular area or technology. The current program specializations are biochemical engineering, biomedical engineering, computer-aided chemical engineering, environmental chemical engineering, pre-medicine specialization and pulp, paper and bio-resource engineering.

### Curriculum in Chemical Engineering

FR	F	S		F	S
CHEM	1110	1120	General Chemistry I & II .....	3	3
CHEM	1111	1121	General Chemistry Lab I & II .....	1	1
COMP		1200	Computer Science .....	**	2
ENGL	1100	1120	English Composition I & I .....	3	3
ENGR		1100	Engineering Orientation .....	**	0
ENGR	1110		Introduction to Engineering .....	2	**
MATH	1610	1620	Calculus I & II .....	4	4
PHYS		1600	Engineering Physics I .....	**	4
			Core History .....	3	**
				<b>16</b>	<b>17</b>
<b>SO</b>					
BIOL	1020		Principles of Biology .....	3	**
BIOL	1021		Principles of Biology Lab .....	1	**
CHEM		2070	Organic Chemistry I .....	**	3
CHEM		2071	Organic Chemistry Lab I .....	**	1
<b>CHEN</b>		<b>2AA0</b>	<b>Progress Assessment I .....</b>	<b>**</b>	<b>0</b>
<b>CHEN</b>	<b>2100</b>		<b>Principles of Chemical Engineering .....</b>	<b>4</b>	<b>**</b>
<b>CHEN</b>		<b>2610</b>	<b>Transport I .....</b>	<b>**</b>	<b>3</b>
ENGL		2200	World Literature I .....	**	3
ENGR		2010	Thermodynamics .....	**	3
MATH	2630		Multivariate Calculus .....	4	**
MATH		2650	Differential Equations .....	**	3
PHYS	1610		Engineering Physics II .....	4	**
				<b>16</b>	<b>16</b>
<b>JR</b>					
CHEM	2080		Organic Chemistry II .....	3	**
<b>CHEN</b>		<b>3AA0</b>	<b>Progress Assessment II .....</b>	<b>**</b>	<b>0</b>
<b>CHEN</b>	<b>3370</b>		<b>Phase &amp; Reaction Equil .....</b>	<b>3</b>	<b>**</b>
<b>CHEN</b>	<b>3600</b>		<b>Computer - Aided Chemical Engineering .....</b>	<b>3</b>	<b>**</b>
<b>CHEN</b>	<b>3620</b>		<b>Transport II .....</b>	<b>3</b>	<b>**</b>
<b>CHEN</b>		<b>3650</b>	<b>Applied ChE Analysis .....</b>	<b>**</b>	<b>3</b>
<b>CHEN</b>		<b>3660</b>	<b>ChE Separations .....</b>	<b>**</b>	<b>3</b>
<b>CHEN</b>		<b>3700</b>	<b>Chemical Reaction Engineering .....</b>	<b>**</b>	<b>3</b>
<b>CHEN</b>		<b>3820</b>	<b>ChE Lab I .....</b>	<b>**</b>	<b>2</b>
ENGL	2210		World Literature II .....	3	**
			Core History .....	**	3
				<b>15</b>	<b>14</b>
<b>SUMMER</b>					
<b>CHEN</b>		<b>4860</b>	<b>ChE Lab II .....</b>	<b>2</b>	
PHIL		1040	Business Ethics .....	3	
			<b>CHEN Technical Elective 1 .....</b>	<b>3</b>	
			Core Social Science Group II .....	3	
				<b>11</b>	
<b>SR</b>					
<b>CHEN</b>	<b>4170</b>		<b>Digital Process Control .....</b>	<b>3</b>	<b>**</b>
<b>CHEN</b>	<b>4450</b>		<b>Process Economics &amp; Safety .....</b>	<b>3</b>	<b>**</b>
<b>CHEN</b>	<b>4460</b>		<b>Process Simulation &amp; Optimization .....</b>	<b>2</b>	<b>**</b>
<b>CHEN</b>		<b>4470</b>	<b>Process Design Practice .....</b>	<b>**</b>	<b>3</b>
			<b>CHEN Technical Elective 2 .....</b>	<b>3</b>	<b>**</b>
			<b>CHEN Technical Elective 3 or ROTC .....</b>	<b>**</b>	<b>3</b>
			<b>CHEN Technical Elective 4 or ROTC .....</b>	<b>**</b>	<b>3</b>
			Advanced Chemistry Elective .....	3	**
			Core Fine Arts .....	**	3
			Core Social Science Group I .....	**	3
UNIV		4AA0	EN1 Undergraduate Graduation .....	**	0
				<b>14</b>	<b>15</b>

### TOTAL HOURS - 134

Electives, Technical Electives, Advanced Chemistry Elective: See adviser for approved course listing.

## Biochemical Engineering Specialization

Chemical engineers trained in biochemical engineering and biotechnology are the key to successful commercialization of new biologically based processes ranging from high value pharmaceuticals to new food processes. This program specialization provides a strong biology and chemistry fundamental background for graduate work in biochemical engineering and a plan of study to meet these objectives.

Students in this specialization take BCHE 5180, CHEN 5800, and Biochemical Engineering Technical Elective\* (9 hours). These courses replace Technical Elective I-IV and the Advanced Chemistry Elective.

**Biomedical Engineering Specialization**

This specialization provides the necessary preparation for students wanting to do graduate work in biomedical engineering or work in a career with an emphasis of medical applications of chemical engineering.

Students in this specialization take PHIL 1030, CHEM 2081, BCHE 5180, CHEN 5810, and a Biomedical Engineering Technical Elective\* (8 hour). These courses replace Technical Elective I-IV, the Advanced Chemistry Elective and PHIL 1040.

**Computer-Aided Chemical Engineering Specialization**

Chemical engineers with expertise in the application of advanced computer-aided tools in areas like process systems engineering, process control, and advanced process technology are highly sought after by all process industries. The program specialization provides appropriate courses for an individual with interests in advanced use of computers for solving chemical and biological engineering problems.

Students in this specialization take BCHE 5180 and a Computer-Aided Chemical Engineering Technical Elective\* (12 hours). These courses replace Technical Elective I-IV and the Advanced Chemistry Elective.

**Environmental Chemical Engineering Specialization**

The environmental specialization in chemical engineering prepares students for careers in the expanding environmental arena. Students specializing in this area learn about the chemical processes and reactions that affect the environment, pollution prevention, the latest standards for air, water and land quality, as well as, hazardous materials management. This specialization prepares students for environmental positions in a broad range of manufacturing and service industries all of which must comply with increasingly complex environmental standards, and in various state and federal agencies.

Students in this specialization take BCHE 5180, CHEN 5650 and Environmental Chemical Engineering Technical Elective\* (9 hours). These courses replace Technical Elective I-IV and the Advanced Chemistry Elective.

**Pre-Medicine Specialization**

This specialization provides the necessary preparation for students wanting to go to medical school. A Pre-Med series of courses, when completed, provides a chemical engineering degree while simultaneously meeting medical school requirements.

Students in this specialization take PHIL 1030, CHEM 2081, BCHE 5180, CHEN 5810, BIOL 1030/1031 and a Pre-Medicine Technical Elective\* (4 hour). These courses replace Technical Elective I-IV, PHIL 1040 and the Advanced Chemistry Elective. Students in this program specialization who are interested in medical school must also work with the director for Pre-Health Professions in the College of Science and Mathematics.

**Pulp, Paper and Bio-Resource Engineering Specialization**

This specialization prepares students for challenging and rewarding careers in the pulp, paper and bio-resource industries. These industries are unique in being capable of sustainable development with a renewable raw material base, recyclable products, and processing technology able to achieve energy self-sufficiency and environmental compatibility. This specialization prepares students for a broad range of career paths in process engineering, product development, bio-technology and sustainable engineering.

Students in this specialization take CHEM 2081, BCHE 5180, CHEN 3090, CHEN 4100, CHEN 5110, CHEN 4560, and CHEN 4570. These courses replace Technical Elective I-IV, CHEN 4460, CHEN 4470 and the Advanced Chemistry Elective.

**Department of Civil Engineering**

Civil engineers conceive, plan, design, construct, operate, and maintain the facilities and systems that serve the basic needs of society. Auburn University's Department of Civil Engineering strives to prepare students, through high quality programs, to practice civil engineering professionally in a competitive global environment. The department's objectives include preparing graduates to play an active role in the civil engineering profession by functioning as effective team members while developing leadership skills in the profession and in the community, communicating ideas and information effectively, and expanding their body of knowledge and experience as they make progress towards licensure as professional engineers. Graduates should be able to successfully engage in one or more

of the following activities: planning and design of new civil infrastructure systems, or rehabilitation of existing systems; monitoring and analysis of the performance of existing infrastructure systems to assess their safety, efficiency, or remaining usefulness; management of natural resources and processes; management of construction or rehabilitation processes; and graduate or professional studies.

The first two years focus on basic principles, which are applied in the last two years in required and elective courses in major specialty areas including construction, geotechnical, transportation, hydraulics, structural, pavements, and environmental engineering. Engineering science and design are integrated throughout, with the design emphasis shifting from introduction of fundamental concepts, principles and tools in the early courses to increasingly realistic situations. The experience culminates in the capstone senior design project. Graduates are prepared for a variety of entry-level civil engineering positions.

**Curriculum in Civil Engineering**

FR	F	S		F	S
ENGL	1100	1120	English Composition I & II .....	3	3
PHYS	1600	1610	Engineering Physics I & II .....	4	4
MATH	1610	1620	Calculus I & II .....	4	4
			Core History .....	3	3
ENGR	1100		Engineering Orientation .....	0	**
ENGR		1110	Introduction to Engineering .....	**	2
COMP	1200		Introduction to Computing .....	2	**
				<b>16</b>	<b>16</b>
<b>SO</b>					
CHEM	1030	1040	Fund of Chemistry I & II .....	3	3
CHEM	1031		Fund of Chemistry I Lab .....	1	**
ENGL	2200		World Literature I .....	3	**
ENGR	2050		Statics .....	3	**
ENGR		2070	Mechanics of Materials .....	**	3
ENGR		2200	Thermo/Fluids/Heat .....	**	3
ENGR		2350	Dynamics .....	**	3
MATH	2630		Calculus III .....	4	**
MATH		2650	Linear Diff Equations .....	**	3
<b>CIVL</b>	<b>2010</b>		<b>SURVEYING .....</b>	<b>3</b>	<b>**</b>
				<b>17</b>	<b>15</b>
<b>SUMMER</b>					
ENGL	2210		World Literature II .....	3	
			Core Social Science .....	3	
STAT	3010		Stat Meth Sci & Engineering .....	3	
				<b>9</b>	
<b>JR</b>					
<b>CIVL</b>	<b>3010</b>		<b>Civil Engineering Analysis .....</b>	<b>4</b>	<b>**</b>
<b>CIVL</b>	<b>3110</b>		<b>Hydraulics .....</b>	<b>4</b>	<b>**</b>
<b>CIVL</b>		<b>3230</b>	<b>Introduction to Environmental Engineering .....</b>	<b>**</b>	<b>4</b>
<b>CIVL</b>	<b>3310</b>		<b>Geotechnical Engineering I .....</b>	<b>4</b>	<b>**</b>
<b>CIVL</b>		<b>3410</b>	<b>Construction Engineering .....</b>	<b>**</b>	<b>3</b>
<b>CIVL</b>		<b>3510</b>	<b>Transportation Engineering .....</b>	<b>**</b>	<b>4</b>
<b>CIVL</b>	<b>3610</b>		<b>Structural Analysis .....</b>	<b>4</b>	<b>**</b>
<b>CIVL</b>		<b>3810</b>	<b>Civil Engineering Materials .....</b>	<b>**</b>	<b>4</b>
				<b>16</b>	<b>15</b>
<b>SR</b>					
PHIL	1020		Introduction to Ethics .....	3	**
			Core Fine Arts .....	**	3
			Core Social Science .....	3	**
<b>CIVL</b>			<b>Specialty Elective .....</b>	<b>6</b>	<b>6</b>
<b>CIVL</b>			<b>Technical Elective .....</b>	<b>3</b>	<b>3</b>
<b>CIVL</b>			<b>Senior Design Project .....</b>	<b>**</b>	<b>3</b>
UNIV	4AA0		EN1 Undergraduate Graduation .....	**	0
				<b>15</b>	<b>15</b>

**TOTAL HOURS - 134**

Specialty Elective, Technical Elective: see adviser for approved course listing.

**Environmental Science**

The Environmental Science program, like the rather broad field of environmental science, is by its very nature highly interdisciplinary. Although, the Samuel Ginn College of Engineering administers the program through the Department of Civil Engineering, the College of Agriculture and the College of Sciences and Mathematics are equal partners in developing the curriculum, guiding student development and providing instruction.

Environmental quality issues tend to be complex and often a significant level of expertise in physics, chemistry, biology, and geology is needed just to understand and appreciate a specific problem. Moreover, formulating solutions often requires mathematical expertise as well as specific knowledge of the air, water, and soil environments. Thus, the program is structured to educate environmental scientists quite broadly, but also with considerable depth.

The program is specifically tailored to produce graduates who can enter and have a reasonable expectation of success in a field that is continually changing. The principal educational goals are to provide each student with a broad-based general education, a solid background in mathematics, physical science, and biological science, breadth of exposure to the environmental science field, and depth of knowledge in a specific area of environmental science of choice.

The curriculum is organized around a core of courses that are required of all students. Students desiring to specialize may select from groups of courses, called professional tracks, that emphasize environmental applications of biological science, physical science, soils science, or engineering science. A general environmental science track is also available.

**Curriculum in Environmental Science**

FR	F	S		F	S
BIOL		1020	Principles of Biology .....	**	4
CHEM	1030	1040	Fund. of Chemistry I & II and Labs (1501, 1511).....	3	3
CHEM	1031	1041	Fundamentals of Chemistry I & II Lab.....	1	1
ENGL	1100	1120	English Composition I & II.....	3	3
MATH	1610		Calculus I.....	4	**
			Core History .....	3	**
AGEC	2100		Microcomputer Application.....	3	**
<b>ENVI</b>	<b>1010</b>		<b>Intro to Environmental Science.....</b>	<b>0</b>	<b>**</b>
<b>ENVI</b>		<b>1020</b>	<b>Fund of Environmental Science.....</b>	<b>**</b>	<b>2</b>
				<b>17</b>	<b>16</b>
<b>SO</b>					
BIOL	1030		Organismal Biology .....	4	**
PHYS	1500	1510	General Physics I & II .....	4	4
ENGL	2200	2210	World Literature I & II.....	3	3
GEOL	1100		Physical Geology.....	4	**
CHEM		2030	Survey of Organic Chemistry .....	**	3
STAT		2510	Introduction to Statistics.....	**	3
<b>ENVI</b>	<b>2010</b>		<b>Environ Science Seminar.....</b>	<b>1</b>	<b>**</b>
<b>GEOL</b>		<b>2100</b>	<b>Environmental Geology.....</b>	<b>**</b>	<b>4</b>
				<b>16</b>	<b>17</b>
<b>JR</b>					
CHEM		3050	Analytical Chemistry.....	**	3
CHEM		3051	Analytical Chemistry Lab.....	**	1
FORY	4470		GIS Applications.....	2	**
<b>AGRN</b>	<b>3040</b>		<b>Basic Soils.....</b>	<b>4</b>	<b>**</b>
<b>BIOL</b>		<b>3060</b>	<b>Ecology.....</b>	<b>**</b>	<b>4</b>
<b>BIOL</b>	<b>3200</b>		<b>General Microbiology.....</b>	<b>4</b>	<b>**</b>
<b>CIVL</b>		<b>3220</b>	<b>Water &amp; Waste Treatment.....</b>	<b>**</b>	<b>4</b>
			<b>Professional Track.....</b>	<b>6</b>	<b>**</b>
			<b>Professional Track.....</b>	<b>**</b>	<b>4</b>
				<b>16</b>	<b>16</b>
<b>SR</b>					
			Core Fine Arts .....	**	3
			Core Philosophy.....	3	**
			Core Social Science Group I & II.....	3	3
<b>FORY</b>	<b>3440</b>		<b>Environmental Law.....</b>	<b>**</b>	<b>3</b>
			<b>Professional Track.....</b>	<b>7</b>	<b>7</b>
			Elective.....	**	1
UNIV		4AA0	EN1 Undergraduate Graduation.....	**	0
				<b>16</b>	<b>14</b>

**TOTAL HOURS - 128**

Professional Track - see adviser for approved course listing.

**Department of Computer Science and Software Engineering**

**Computer Science**

The computer science curriculum, which leads to the bachelor of science in computer science degree, provides an excellent preparation for students seeking careers as software professionals and in computing-related fields, as well for those planning to pursue graduate study. The curriculum builds on a strong foundation in science, mathematics, social sciences, humanities and computer science with advanced course work in theoretical computer science, human-computer interaction, and net-centric computing. Course work ensures that students receive hands-on exposure to a variety of computer systems, tools and techniques. Elective courses allow students to specialize in core areas of computer science such as networking, database systems, and artificial intelligence. In addition, students select a concentration of 9 semester credit hours outside computer science (e.g., business, mathematics, physics, etc.). This concentration enriches students' educational experience and adds breadth of knowledge by providing an opportunity to explore a second field of study to which computer science can be applied. The curriculum

also emphasizes oral and written communication skills, the importance of ethical behavior, and the need for continual, lifelong learning.

Specific educational objectives of the Computer Science program are to: (1) Develop within graduates the level of technical proficiency needed for the professional practice of computer science; (2) Develop within graduates the ability to effectively communicate their ideas to other practicing professionals and the general public; (3) Instill within graduates an appreciation for and the ability to engage in life-long learning; (4) Instill within graduates an appreciation for and an understanding of the need to maintain high ethical standards both as professionals as well as individuals; (5) Prepare graduates to compete for positions in the job market and in graduate schools.

The Computer Science degree program is accredited by Computing Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 C telephone: 410-347-7700.

**Curriculum in Computer Science**

FR	F	S		F	S
ENGL	1100	1120	English Composition I & II.....	3	3
HIST			Core History .....	3	3
MATH	1610	1620	Calculus I & II.....	4	4
ENGR	1110		Introduction to Engineering.....	2	**
			Core Science Sequence I & II.....	4	4
<b>COMP</b>	<b>1210</b>		<b>Fundamentals of Computing I.....</b>	<b>**</b>	<b>3</b>
				<b>16</b>	<b>17</b>
<b>SO</b>					
ENGL	2200	2210	World Literature I & II.....	3	3
			Core Social Science Group I & II.....	3	3
COMM	1000		Public Speaking .....	3	**
ELEC		2200	Digital Logic Circuits .....	**	3
MATH	2660		Linear Algebra .....	**	3
			Science Elective.....	4	**
<b>COMP</b>	<b>2710</b>		<b>Software Construction.....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>2210</b>		<b>Fundamentals of Computing II.....</b>	<b>4</b>	<b>*</b>
				<b>17</b>	<b>15</b>
<b>JR</b>					
PHIL			PHIL 1020 OR PHIL 1040 .....	**	3
STAT	3600		Probability and Statistics .....	3	**
			Concentration.....	**	3
<b>COMP</b>	<b>3220</b>		<b>Principles of Programming Languages.....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>3240</b>		<b>Discrete Structures .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>3270</b>		<b>Introduction to Algorithms .....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>3350</b>		<b>Comp Org &amp; Assemb Lng Prog.....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>3500</b>		<b>Introduction to Operating Systems .....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>3700</b>		<b>Software Modeling and Design.....</b>	<b>**</b>	<b>3</b>
			Core Fine Arts .....	3	**
				<b>15</b>	<b>15</b>
<b>SR</b>					
			Free Elective or ROTC.....	3	**
			Concentration.....	3	**
			Concentration.....	**	3
<b>COMP</b>	<b>4200</b>		<b>Formal Languages .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>4320</b>		<b>Introduction to Computer Networks .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>4640</b>		<b>Intelligent &amp; Interactive Systems .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>4730</b>		<b>Computer Ethics.....</b>	<b>**</b>	<b>1</b>
			<b>COMP Elective.....</b>	<b>**</b>	<b>6</b>
			Math Elective.....	**	3
UNIV		4AA0	EN1 Undergraduate Graduation.....	**	0
				<b>15</b>	<b>13</b>

**TOTAL HOURS - 123**

COMP Elective, Math/Science Elective: See adviser for approved course listing.

**Software Engineering**

The focus of the software engineering curriculum, which leads to the bachelor of software engineering, is on the analysis, design, verification, validation, construction, application, and maintenance of software systems. The degree program prepares students for professional careers and graduate study with a balance of computer science theory and practical application of software engineering methodology using modern software engineering environments and tools. The curriculum is based on a strong core of topics including software modeling and design, construction, process and quality assurance, intelligent and interactive systems, networks, operating systems, and computer architecture. The curriculum also enriches each student's general education with a range of courses from science, mathematics, the humanities and the social sciences. Through advanced elective courses, the curriculum allows students to specialize in core areas of computer science and software engineering. Engineering design theory and methodology, as they apply to software systems, form an integral part of the curriculum, beginning with the first course in computing and culminating with a comprehensive senior design project, which gives students the opportunity to work in one

or more significant application domains. The curriculum also emphasizes oral and written communication skills, the importance of ethical behavior, and the need for continual, life-long learning.

Specific educational objectives of the Software Engineering program are to: (1) Develop within graduates the level of technical proficiency needed for the professional practice of software engineering; (2) Develop within graduates the ability to effectively communicate their ideas to other practicing professionals and to the general public; (3) Instill within graduates an appreciation for and the ability to engage in lifelong learning; (4) Instill within graduates an appreciation for and an understanding of the need to maintain high ethical standards both as professionals as well as individuals; (5) Prepare graduates to compete for positions in the job market and in graduate schools.

The software engineering program is accredited by the Engineering Accreditation Commission of ABET, 11 Market Place, Suite 1050, Baltimore, MD 21202-4012 (telephone: 410-347-7700).

**Curriculum in Software Engineering**

FR	F	S		F	S
ENGL	1100	1120	English Composition I & II .....	3	3
HIST			Core History .....	3	3
PHYS	1600	1610	Physics I & II .....	4	4
MATH	1610	1620	Calculus I & II .....	4	4
ENGR	1100		Engineering Orientation.....	0	**
ENGR	1110		Introduction to Engineering.....	2	**
<b>COMP</b>		<b>1210</b>	<b>Fund of Computing I .....</b>	<b>**</b>	<b>3</b>
				<b>16</b>	<b>17</b>
<b>SO</b>					
ENGL	2200	2210	World Literature I & II.....	3	3
			Core Social Science Group I & II.....	3	3
			Core Fine Arts .....	3	**
ELEC		2200	Digital Logic Circuits .....	**	3
MATH	2630		Calculus III.....	**	**
MATH		2660	Linear Algebra .....	**	3
<b>COMP</b>		<b>2710</b>	<b>Software Construction.....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>2210</b>		<b>Fund of Computing II .....</b>	<b>**</b>	<b>4</b>
				<b>17</b>	<b>15</b>
<b>JR</b>					
PHIL			PHIL 1020 OR PHIL 1040 .....	**	3
ENGR	2100		Fund of Engr Mechanics .....	3	**
MATH	2650		Linear Differential Equations .....	3	**
STAT		3600	Probability and Statistics .....	**	3
<b>COMP</b>	<b>3220</b>		<b>Principles of Programming Languages.....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>3240</b>		<b>Discrete Structures .....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>3270</b>		<b>Introduction to Algorithms .....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>3350</b>		<b>Comp Org &amp; Assemb Lng Prog.....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>3500</b>		<b>Introduction to Operating Systems .....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>3700</b>		<b>Software Modeling and Design.....</b>	<b>**</b>	<b>3</b>
				<b>15</b>	<b>15</b>
<b>SR</b>					
<b>COMP</b>	<b>4300</b>		<b>Computer Architecture .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>4320</b>		<b>Introduction to Computer Networks .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>4640</b>		<b>Intelligent &amp; Interactive Systems .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>		<b>4710</b>	<b>Senior Design Project.....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>		<b>4730</b>	<b>Computer Ethics.....</b>	<b>**</b>	<b>1</b>
<b>COMP</b>	<b>5700</b>		<b>Software Process .....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>		<b>5710</b>	<b>Software Quality Assurance.....</b>	<b>**</b>	<b>3</b>
			<b>COMP Elective.....</b>	<b>3</b>	<b>3</b>
			Free Elective or ROTC.....	**	3
UNIV	4AA0		EN1 Undergraduate Graduation.....	**	0
				<b>15</b>	<b>13</b>

**TOTAL HOURS - 123**

COMP Electives: See adviser for approved course listing.

**Department of Electrical and Computer Engineering**

The Electrical and Computer Engineering curricula produce well-educated graduates prepared to practice engineering at a professional level in an era of rapid and challenging technological development. The educational objectives of the Electrical Engineering curriculum include developing within our graduates a basic foundation in seven fundamental areas of electrical engineering (circuits and systems, electromagnetics, electronics, digital systems, communications and signal processing, control systems, and power engineering) to provide the technical proficiency needed for the professional practice of electrical engineering. The educational objectives of the Computer Engineering Option include developing within our graduates a basic foundation in both electrical engineering (circuits and systems, electronics, and digital systems) and computer science to provide the technical proficiency needed for the professional practice of computer engineering, including the design

and application of computer components and systems. In addition, both curricula have as educational objectives to develop within our graduates the ability to communicate their ideas effectively within the technical community and to the general public, to prepare them to take their places in society as responsible citizens, and to provide them with the basis for, and instill within them an appreciation of and enthusiasm for, lifelong scientific inquiry, learning and creativity.

The goal of the professional portion of each curriculum is to emphasize basic areas of study while providing the flexibility to accommodate a diversity of interests and talents. To this end, each curriculum emphasizes engineering design, hands-on laboratory experience, knowledgeable use of digital computer systems, oral and written communication skills, the importance of business, economic, social and global forces on engineering, appreciation of the need to maintain the highest ethical standards, and the maintenance of professional competence through continued self-improvement after graduation.

Each curriculum builds upon a solid foundation in mathematics and science. In the Electrical Engineering curriculum, topics in the seven fundamental areas of electrical engineering are introduced early and are carefully coordinated to provide the principles necessary for the practice of electrical engineering. In the Computer Engineering Option, fundamental topics in both electrical engineering and computer science are introduced early and are carefully coordinated to provide the principles necessary for the design and application of computer components and systems. In each case, design experience is interwoven throughout the curriculum by introducing basic design concepts early, emphasizing design experiences in the laboratories, and culminating with a capstone design project in the senior year. The senior year elective structure provides students with the flexibility to pursue a range of career options.

**Curriculum in Electrical Engineering**

FR	F	S		F	S
ENGL	1100	1120	English Composition I & II .....	3	3
PHYS	1600	1610	Engineering Physics I & II .....	4	4
MATH	1610	1620	Calculus I & II .....	4	4
			Core History .....	3	3
ENGR	1100		Engineering Orientation.....	0	**
ENGR		1110	Introduction to Engineering.....	**	2
COMP	1200		Intro to Comp Prog for Engr & Sci .....	2	**
				<b>16</b>	<b>16</b>
<b>SO</b>					
CHEM		1030	Fundamentals of Chemistry I.....	**	3
CHEM		1031	Fundamentals of Chemistry I Lab .....	**	1
			Core Social Science Group I .....	3	**
MATH	2630		Calculus III.....	4	**
MATH	2650		Linear Diff Equations .....	3	**
MATH		2660	Topics in Linear Algebra .....	**	3
ELEC	<b>2010</b>	<b>2020</b>	<b>EE Lab I &amp; II.....</b>	<b>1</b>	<b>1</b>
ELEC	<b>2110</b>		<b>Electric Circuit Analysis .....</b>	<b>3</b>	<b>**</b>
ELEC		<b>2120</b>	<b>Linear Signals &amp; Systems Analysis.....</b>	<b>**</b>	<b>3</b>
ELEC		<b>2210</b>	<b>Digital Electronics.....</b>	<b>**</b>	<b>3</b>
ELEC	<b>2200</b>		<b>Digital Logic Circuits.....</b>	<b>3</b>	<b>**</b>
ELEC		<b>2220</b>	<b>Computer Systems.....</b>	<b>**</b>	<b>3</b>
				<b>17</b>	<b>17</b>
<b>JR</b>					
ENGL	2200	2210	World Literature I & II.....	3	3
ELEC	<b>3030</b>	<b>3040</b>	<b>EE Lab III &amp; IV .....</b>	<b>1</b>	<b>1</b>
ELEC	<b>3310</b>		<b>Fundamentals of Electromagnetics.....</b>	<b>3</b>	<b>**</b>
ELEC		<b>3320</b>	<b>Electromagnetics for Wireless App.....</b>	<b>**</b>	<b>3</b>
ELEC		<b>3400</b>	<b>Communication Systems.....</b>	<b>**</b>	<b>3</b>
ELEC		<b>3500</b>	<b>Control Systems .....</b>	<b>**</b>	<b>3</b>
ELEC	<b>3600</b>		<b>Electric Power Engineering .....</b>	<b>3</b>	<b>**</b>
ELEC	<b>3700</b>		<b>Analog Electronics .....</b>	<b>3</b>	<b>**</b>
ELEC	<b>3800</b>		<b>Random Signals and Systems .....</b>	<b>3</b>	<b>**</b>
			Fine Arts Elective.....	**	3
				<b>16</b>	<b>16</b>
<b>SR</b>					
PHIL		1040	Business Ethics .....	**	3
			Core Social Science Group II .....	3	**
ENGR	2100		Fundamentals of Engr Mechanics.....	3	**
ENGR		2200	Introduction Thermo Fluids & Heat .....	**	3
INSY	3600		Engineering Economics.....	3	**
ELEC		<b>4000</b>	<b>Senior Design Project .....</b>	<b>**</b>	<b>3</b>
			<b>ELEC Elective .....</b>	<b>3</b>	<b>3</b>
			Math/Science Elective.....	**	3
			Elective.....	**	3
UNIV	4AA0		EN1 Undergraduate Graduation.....	**	0
				<b>15</b>	<b>15</b>

**TOTAL HOURS - 128**

ELEC Elective, Math/Science Elective: see adviser for approved course listing.

**Curriculum in Electrical Engineering**  
(Computer Engineering Option)

FR	F	S		F	S
ENGL	1100	1120	English Composition I & II .....	3	3
PHYS	1600	1610	Engineering Physics I & II .....	4	4
MATH	1610	1620	Calculus I & II .....	4	4
			Core History .....	3	3
<b>COMP</b>		<b>1210</b>	<b>Fund of Computing I .....</b>	<b>**</b>	<b>3</b>
ENGR	1110		Introduction to Engineering .....	2	**
ENGR	1000		Engineering Orientation .....	0	**
				<b>16</b>	<b>17</b>
<b>SO</b>					
MATH	2630		Calculus III .....	4	**
MATH	2650		Linear Diff Equations .....	3	**
MATH		2660	Topics in Linear Algebra .....	**	3
<b>COMP</b>		<b>2710</b>	<b>Software Construction .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>2010</b>	<b>2020</b>	<b>EE Lab I &amp; II .....</b>	<b>1</b>	<b>1</b>
<b>ELEC</b>	<b>2110</b>		<b>Electric Circuit Analysis .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>		<b>2120</b>	<b>Linear Signals &amp; Systems Analysis .....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>2210</b>		<b>Fundamentals of Computer Sci II .....</b>	<b>4</b>	<b>**</b>
<b>ELEC</b>		<b>2210</b>	<b>Digital Electronics .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>2200</b>		<b>Digital Logic Circuits .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>		<b>2220</b>	<b>Computer Systems .....</b>	<b>**</b>	<b>3</b>
				<b>18</b>	<b>16</b>
<b>JR</b>					
CHEM		1030	Fundamentals of Chemistry I .....	**	3
CHEM		1031	Fundamentals of Chemistry I Lab .....	**	1
ENGL	2200	2210	World Literature I & II .....	3	3
			Core Fine Arts .....	**	3
<b>ELEC</b>	<b>3050</b>		<b>Computer Systems Design Lab .....</b>	<b>1</b>	<b>**</b>
<b>COMP</b>	<b>3240</b>		<b>Discrete Structures .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>		<b>3270</b>	<b>Introduction to Algorithms .....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>	<b>3500</b>		<b>Introduction to Operating Systems .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>	<b>3700</b>		<b>Analog Electronics .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>		<b>4200</b>	<b>Digital System Design .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>3800</b>		<b>Random Signals &amp; Systems .....</b>	<b>3</b>	<b>**</b>
				<b>16</b>	<b>16</b>
<b>SR</b>					
			Core Social Science Group I & II .....	3	3
PHIL		1040	Business Ethics .....	**	3
INSY	3600		Engineering Economics .....	3	**
<b>ELEC</b>		<b>4000</b>	<b>Senior Design Projects .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>5200</b>		<b>Computer Arch &amp; Design .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>	<b>5220</b>		<b>Information Communication .....</b>	<b>3</b>	<b>**</b>
			<b>ECE Elective .....</b>	<b>**</b>	<b>5</b>
			Elective .....	3	**
UNIV		4AA0	EN1 Undergraduate Graduation .....	**	0
				<b>15</b>	<b>14</b>

**TOTAL HOURS - 128**

ECE elective - see adviser for approved course listing.

**Joint Program in Wireless Engineering**

The wireless engineering curriculum is a joint offering of the Department of Electrical and Computer Engineering and the Department of Computer Science and Software Engineering, leading to the bachelor of wireless engineering (BWE). To meet the need for engineers that can improve life and business in these times of a mobile society, the educational objectives of this curriculum are (1) to develop within our graduates a basic foundation in wireless technology and either electrical engineering or software engineering and network design and operation that will provide the technical proficiency needed for the professional practice of engineering in the wireless telecommunications industry, (2) to develop within our graduates the ability to communicate their ideas effectively within the technical community and to the general public, (3) to provide our graduates with the basis for, and instill within them an appreciation of and enthusiasm for, lifelong scientific inquiry, learning and creativity, and (4) to prepare our graduates to take their places in society as responsible citizens, with an appreciation of and understanding for the need to maintain the highest ethical standards in their personal and professional lives. Graduates of this program will be able to analyze, develop, design, test, administer and support wireless network systems, communication devices, and other components used in wireless computer and telecommunication networks.

The BWE curriculum has two formal options - wireless electrical engineering (WIRE), emphasizing a hardware design-oriented approach to wireless engineering, and wireless software engineering (WIRS), emphasizing a software-oriented approach. There is a network specialization within each option. Students interested in designing wireless hardware, such as integrated circuit chips, wireless communication devices, and wireless network switching equipment, should choose the WIRE hardware specialization option. Students interested in application

software development, including server-side, client-side, and embedded applications, should choose the WIRS software specialization option. Students interested in pursuing a career with wireless service providers and other companies that develop and maintain wireless networks and sell service, can choose the Network Specialization within either the WIRE option or the WIRS option.

Each curriculum builds upon a solid foundation in mathematics, science, and electrical or software engineering fundamentals to introduce wireless communications theories, devices, circuits, systems, networks, standards, management, and applications. Design experience is interwoven throughout the curriculum by introducing basic design concepts early, emphasizing hands-on design experiences in the laboratories, including effective use of computers and other modern engineering tools, and culminating with a capstone design project in the senior year. In addition to its technical aspects, the curriculum emphasizes oral and written communication skills, the importance of business, economic, social and global forces on engineering, appreciation of the need to maintain the highest ethical standards, and the maintenance of professional competence through continued self-improvement after graduation.

**Wireless Electrical Engineering Option**

FR	F	S		F	S
			Core History .....	3	3
ENGL	1100	1120	English Composition I & II .....	3	3
MATH	1610	1620	Calculus I & II .....	4	4
COMP	1200		Introduction to Computing .....	2	**
ENGR	1100		Engineering Orientation .....	0	**
ENGR		1110	Introduction to Engineering .....	**	2
PHYS	1600	1610	Engineering Physics I & II .....	4	4
				<b>16</b>	<b>16</b>
<b>SO</b>					
			Core Social Science .....	3	**
CHEM		1030	Fund. of Chemistry I .....	*	3
CHEM		1031	Fund. of Chemistry I Lab .....	*	1
MATH	2630		Calculus III .....	4	**
MATH	2650		Linear Differential Equations .....	3	**
MATH		2660	Linear Algebra .....	**	3
<b>ELEC</b>	<b>2010</b>	<b>2020</b>	<b>EE Lab I &amp; II .....</b>	<b>1</b>	<b>1</b>
<b>ELEC</b>	<b>2110</b>		<b>Electric Circuit Analysis .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>		<b>2120</b>	<b>Linear Signals &amp; Systems Analysis .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>2200</b>		<b>Digital Logic Circuits .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>		<b>2210</b>	<b>Digital Electronics .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>		<b>2220</b>	<b>Computer Systems .....</b>	<b>**</b>	<b>3</b>
				<b>17</b>	<b>17</b>
<b>JR</b>					
ENGL	2200	2210	World Literature I & II .....	3	3
COMP	3000		Object-Oriented Programming .....	3	**
INSY		3600	Engineering Economics .....	**	3
<b>ELEC</b>	<b>3030</b>		<b>Electrical Engineering Lab III .....</b>	<b>1</b>	<b>**</b>
<b>ELEC</b>	<b>3310</b>		<b>Fund of Electromagnetics .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>		<b>3320</b>	<b>Electromagnetics for Wireless Applications .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>		<b>3400</b>	<b>Communication Systems .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>3700</b>		<b>Analog Electronics .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>	<b>3800</b>		<b>Random Signals &amp; Systems .....</b>	<b>3</b>	<b>**</b>
			Fine Arts Elective .....	**	3
				<b>16</b>	<b>15</b>
<b>SR</b>					
			Core Social Science .....	3	**
PHIL		1040	Business Ethics .....	**	3
<b>ELEC</b>	<b>3060</b>		<b>Wireless Comm Lab .....</b>	<b>1</b>	<b>**</b>
<b>ELEC</b>		<b>4000</b>	<b>Senior Design Projects .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>5100</b>		<b>Wireless Comm Systems .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>		<b>5110</b>	<b>Wireless Networks .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>5130</b>		<b>RF Devices &amp; Circuits * OR .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>	<b>5220</b>		<b>Information Networks &amp; Tech ** .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>5120</b>		<b>Telecomm Networks ** OR .....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>	<b>5410</b>		<b>Digital Signal Processing * .....</b>	<b>**</b>	<b>3</b>
<b>INSY</b>	<b>3410</b>		<b>Deterministic Operations Research ** OR .....</b>	<b>3</b>	<b>**</b>
			Math/Science Elective*	**	3
			Wireless Elective/ROTC .....	**	3
			Free Elective/ROTC .....	**	3
UNIV		4AA0	EN1 Undergraduate Graduation .....	**	0
				<b>16</b>	<b>15</b>

**TOTAL HOURS - 128**

\* Hardware Specialization requires ELEC 5130, ELEC 5410, and a Math/Science Elective  
 \*\* Network Specialization requires ELEC 5120, ELEC 5220, and INSY 3410

**Wireless Software Engineering Option**

FR	F	S		F	S
HIST			Core History .....	3	3
ENGL	1100	1120	English Composition I & II .....	3	3
MATH	1610	1620	Calculus I & II .....	4	4
<b>COMP</b>		<b>1210</b>	<b>Fundamentals of Computing I.....</b>	<b>**</b>	<b>3</b>
ENGR	1100		Engineering Orientation.....	0	**
ENGR	1110		Introduction to Engineering.....	2	**
PHYS	1600	1610	Engineering Physics I & II .....	4	4
				<b>16</b>	<b>17</b>
<b>SO</b>					
			Core Social Science .....	**	3
MATH	2630		Calculus III.....	4	**
MATH	2650		Linear Differential Equations .....	3	**
MATH		2660	Linear Algebra .....	**	3
<b>COMP</b>	<b>2210</b>		<b>Fundamentals of Computing II.....</b>	<b>**</b>	<b>4</b>
<b>COMP</b>		<b>2710</b>	<b>Software Construction.....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>		<b>3240</b>	<b>Discrete Structures .....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>		<b>2010</b>	<b>EE Lab I .....</b>	<b>**</b>	<b>1</b>
<b>ELEC</b>	<b>2110</b>		<b>Electric Circuit Analysis.....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>		<b>2120</b>	<b>Linear Signals &amp; Systems Analysis.....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>2200</b>		<b>Digital Logic Circuits.....</b>	<b>3</b>	<b>**</b>
				<b>17</b>	<b>16</b>
<b>JR</b>					
			Core Social Science .....	3	**
ENGL	2200	2210	World Literature I & II.....	3	3
<b>COMP</b>	<b>3270</b>		<b>Introduction to Algorithms .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>	<b>3350</b>		<b>Computer Organization &amp; Assembly Language .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>		<b>3510</b>	<b>Embedded Systems Software.....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>		<b>3710</b>	<b>Wireless Software Engineering .....</b>	<b>**</b>	<b>3</b>
INSY		3600	Engineering Economics.....	**	3
<b>ELEC</b>		<b>3400</b>	<b>Communication Systems.....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>3800</b>		<b>Random Signals &amp; Systems .....</b>	<b>3</b>	<b>**</b>
				<b>15</b>	<b>15</b>
<b>SR</b>					
PHIL			PHIL 1020 OR PHIL 1040 .....	3	**
<b>INSY</b>	<b>3410</b>		<b>Deterministic Operations Research ** OR.....</b>	<b>3</b>	<b>**</b>
			Math/Science Elective*		
<b>COMP</b>		<b>4730</b>	<b>Computer Ethics.....</b>	<b>**</b>	<b>1</b>
<b>COMP</b>	<b>4320</b>		<b>Introduction to Computer Networks .....</b>	<b>3</b>	<b>**</b>
<b>COMP</b>		<b>4710</b>	<b>Senior Design Project.....</b>	<b>**</b>	<b>3</b>
<b>ELEC</b>	<b>3060</b>		<b>Wireless Design Lab .....</b>	<b>**</b>	<b>1</b>
<b>COMP</b>	<b>5700</b>		<b>Software Process * OR.....</b>	<b>3</b>	<b>**</b>
<b>ELEC</b>	<b>5120</b>		<b>Telecommunication Networks **</b>		
<b>COMP</b>		<b>5710</b>	<b>Software Quality Assurance * OR.....</b>	<b>**</b>	<b>3</b>
<b>COMP</b>		<b>5340</b>	<b>Network Quality Assurance **</b>		
<b>COMP</b>		<b>5360</b>	<b>Wireless &amp; Mobile Networks .....</b>	<b>**</b>	<b>3</b>
			Wireless Elective/ROTC.....	**	3
			Free Elective/ROTC.....	**	3
			Fine Arts Elective.....	**	3
UNIV		4AA0	EN1 Undergraduate Graduation.....	**	0
				<b>16</b>	<b>16</b>

**TOTAL HOURS - 128**

\* Software Specialization requires COMP 5700, COMP 5710, and a Math/Science Elective  
 \*\* Network Specialization requires INSY 3410, COMP 5340, ELEC 5120  
 Wireless Elective, Math/Science Elective: See adviser for approved course listing.

**Department of Industrial and Systems Engineering**

Industrial and Systems Engineers plan, design, implement, and analyze systems. This engineering discipline is where technology, people, business and information intersect. The degree provides graduates with broad, flexible career opportunities with manufacturing, consulting, service or governmental organizations. The degree can also provide the foundation and background for further studies in engineering and business as well as professions such as law or medicine. The curriculum builds on a solid engineering mathematics and science core and adds courses in production and manufacturing, ergonomics and safety, engineering management, operations research, statistics, quality control, and information technologies. The curriculum graduates students who have:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to function on multidisciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.

- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- A recognition of the need for, and an ability to engage in, life-long learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- Be able to design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and energy.
- Be able to integrate systems using appropriate analytical, computational, and experimental practices.

**Curriculum in Industrial and Systems Engineering**

FR	F	S		F	S
ENGL	1100	1120	English Composition I & II .....	3	3
			History I & II .....	3	3
MATH	1610	1620	Calculus I & II .....	4	4
PHYS		1600	Engineering Physics I .....	**	4
CHEM	1030		Fundamentals of Chemistry I .....	3	**
CHEM	1031		Fundamentals of Chemistry I Lab .....	1	**
COMP		1200	Intro. Comp. Prog.....	**	2
<b>ENGR</b>	<b>1100</b>		<b>Eng Orientation.....</b>	<b>0</b>	<b>**</b>
<b>ENGR</b>	<b>1110</b>		<b>Introduction to Engineering.....</b>	<b>2</b>	<b>**</b>
				<b>16</b>	<b>16</b>
<b>SO</b>					
ENGL	2200		World Literature .....	3	**
PHYS	1610		Engineering Physics II .....	4	**
MATH	2630		Calculus III.....	4	**
MATH	2650		Linear Diff Equations .....	3	**
MATH		2660	Topics in Linear Algebra .....	**	3
MATL	2100		Intro. to Material Science .....	**	3
<b>INSY</b>	<b>3020</b>		<b>Occup. Safety &amp; Ergon.....</b>	<b>**</b>	<b>3</b>
<b>INSY</b>	<b>3021</b>		<b>Methods Engr. &amp; Meas.....</b>	<b>**</b>	<b>3</b>
<b>STAT</b>	<b>3600</b>	<b>3610</b>	<b>Prob. &amp; Statistics I &amp; II .....</b>	<b>3</b>	<b>3</b>
<b>STAT</b>		<b>3611</b>	<b>Applied Statistics Lab .....</b>	<b>**</b>	<b>1</b>
				<b>17</b>	<b>16</b>
<b>JR</b>					
ENGL		2210	World Literature II .....	**	3
			Core Social Science Group I & II .....	3	3
<b>COMP</b>	<b>3010</b>		<b>Spreadsheet-Based Apps. w/ Visual Basic.....</b>	<b>3</b>	<b>**</b>
<b>INSY</b>	<b>3400</b>		<b>Stochastic Operations Research.....</b>	<b>3</b>	<b>**</b>
<b>INSY</b>	<b>3410</b>		<b>Deterministic Operation Research .....</b>	<b>3</b>	<b>**</b>
<b>INSY</b>	<b>3800</b>		<b>Manufacturing Processes .....</b>	<b>3</b>	<b>**</b>
<b>INSY</b>		<b>3420</b>	<b>Simulation .....</b>	<b>**</b>	<b>3</b>
<b>INSY</b>		<b>3600</b>	<b>Engineering Economy .....</b>	<b>**</b>	<b>3</b>
<b>INSY</b>		<b>3700</b>	<b>Operations Planning .....</b>	<b>**</b>	<b>3</b>
				<b>15</b>	<b>15</b>
<b>SR</b>					
			Core Fine Arts .....	**	3
ELEC	3810		Fundamentals of Electrical Engineering.....	3	**
PHIL	1040		Ethics.....	3	**
<b>INSY</b>	<b>4330</b>		<b>Quality Control.....</b>	<b>3</b>	<b>**</b>
<b>INSY</b>	<b>4500</b>		<b>Professional Practice.....</b>	<b>1</b>	<b>**</b>
<b>INSY</b>	<b>4700</b>		<b>Manufacturing Systems.....</b>	<b>3</b>	<b>**</b>
<b>INSY</b>		<b>4800</b>	<b>Senior Design Projects .....</b>	<b>**</b>	<b>3</b>
			<b>INSY Electives .....</b>	<b>3</b>	<b>3</b>
			ENGR Elective .....	**	3
			Technical Elective.....	**	3
UNIV		4AA0	EN1 Undergraduate Graduation.....	**	0
				<b>16</b>	<b>15</b>

**TOTAL HOURS - 126**

**Department of Mechanical Engineering**

The curriculum in Mechanical Engineering (MECH) focuses on the analysis, design, manufacturing, and maintenance of mechanical components and systems. Emphasis is placed on the fundamental concepts of engineering science and design needed in a variety of industries, including automotive, aerospace, biotechnology, material and chemical processing, microsystems and sensors, nanotechnology, machinery and robotics, pharmaceutical, energy production and distribution, heating and refrigeration, food production and processing, entertainment, pulp and paper, weapons systems, and many others. Mechanical engineering students take courses in several areas of engineering including: mechanics of rigid and deformable solids, thermo-fluid sciences, energy systems, dynamics systems and controls, design and manufacturing, materials, and electronics.

The educational objectives of the Mechanical Engineering program are to produce graduates who will be:

Engaged in careers where they apply knowledge of the fundamental subject areas of mechanical engineering science to the analysis, design, and manufacture of mechanical devices and systems.

Proficient in a broad array of professional skills, including engineering software tools, oral and written communication, leadership, and teamwork.

Aware of the importance of, and engage in the process of lifelong learning through self-study, continuing education courses, and graduate-level education.

Knowledgeable in a broad range of contemporary issues, particularly as they impact the mechanical engineering profession.

Students are able to concentrate on areas of special interest through technical elective courses taken in the senior year. In addition, specialized concentrations are offered in Automotive Engineering, Business Engineering and Technology, and in Pulp and Paper Engineering.

**Curriculum in Mechanical Engineering**

FR	F	S		F	S
MATH	1610	1620	Calculus I & II .....	4	4
PHYS	1600		Engineering Physics I .....	**	4
ENGL	1100	1120	English Composition I & II .....	3	3
			Core History .....	3	3
CHEM	1030		Fund. of Chemistry I .....	3	**
CHEM	1031		Fund. of Chemistry I Lab .....	1	**
COMP	1200		Introduction to Computing .....	2	**
ENGR	1100		Engineering Orientation .....	0	**
ENGR		1110	Introduction to Engineering .....	**	2
				<b>16</b>	<b>16</b>
<b>SO</b>					
PHYS	1610		Engineering Physics II .....	4	**
MATH	2630		Calculus III .....	4	**
MATH	2650		Linear Differential Equations .....	3	**
MATH		2660	Linear Algebra .....	**	3
ENGR		2010	Thermodynamics I .....	**	3
MATL		2100	Introduction to Materials Science .....	**	3
<b>MECH</b>	<b>2AA0</b>		<b>Mech. Eng. Progress Assessment I .....</b>	<b>0</b>	<b>**</b>
<b>MECH</b>	<b>2110</b>		<b>Statics and Dynamics .....</b>	<b>4</b>	<b>**</b>
<b>MECH</b>		<b>2120</b>	<b>Kinematics &amp; Dynamics of Machines .....</b>	<b>**</b>	<b>4</b>
<b>MECH</b>		<b>2210</b>	<b>Concepts in Design &amp; Manufacturing .....</b>	<b>**</b>	<b>3</b>
				<b>15</b>	<b>16</b>
<b>JR</b>					
INSY		3600	Engineering Economics .....	**	3
ELEC	3810		Fund. Electrical Engineering .....	3	**
<b>MECH</b>	<b>3AA0</b>		<b>Mech. Eng. Progress Assessment II .....</b>	<b>0</b>	<b>**</b>
<b>MECH</b>	<b>3020</b>		<b>Thermodynamics II .....</b>	<b>3</b>	<b>**</b>
<b>MECH</b>	<b>3030</b>		<b>Fluid Mechanics .....</b>	<b>3</b>	<b>**</b>
<b>MECH</b>		<b>3040</b>	<b>Heat Transfer .....</b>	<b>**</b>	<b>3</b>
<b>MECH</b>		<b>3050</b>	<b>Measurement and Instrumentation .....</b>	<b>**</b>	<b>3</b>
<b>MECH</b>	<b>3130</b>		<b>Mechanics of Materials .....</b>	<b>4</b>	<b>**</b>
<b>MECH</b>		<b>3140</b>	<b>System Dynamics and Controls .....</b>	<b>**</b>	<b>3</b>
<b>MECH</b>	<b>3220</b>		<b>Computer-Aided Engineering .....</b>	<b>3</b>	<b>**</b>
<b>MECH</b>		<b>3230</b>	<b>Machine Design .....</b>	<b>**</b>	<b>3</b>
				<b>16</b>	<b>15</b>
<b>SR</b>					
ENGL	2200	2210	World Literature I & II .....	3	3
			Core Social Science Group I & II .....	3	3
			Core Fine Arts .....	**	3
PHIL	1040		Business Ethics .....	3	**
<b>MECH</b>	<b>4240</b>	<b>4250</b>	<b>Comprehensive Design I &amp; II* .....</b>	<b>2</b>	<b>6</b>
			<b>Technical Elective .....</b>	<b>3</b>	<b>2</b>
			Elective .....	3	**
UNIV		4AA0	EN1 Undergraduate Graduation .....	**	0
				<b>17</b>	<b>17</b>

**TOTAL HOURS — 128**

\* May substitute MECH 4440/4450 for MECH 4240/4250 with departmental approval.

**Materials Engineering**

The curriculum in Materials Engineering (MATL) is structured to address problems associated with the design of materials and materials processes to meet specific needs for a variety of industries. Emphasis is on the basic sciences and principles of engineering with applications of these principles to materials behavior. The student must obtain a broad foundation in chemistry, physics and mathematics, which is applied in engineering courses. Within materials engineering courses, students obtain a foundation in the major areas of materials science and to the major classes of engineering materials, which is applied in courses in materials properties and selection, computational methods and in a capstone design course. Students gain in-depth experience in another engineering discipline through coordinated technical elective sequences. Students may design alternative cross-disciplinary sequences, but they must be coordinated and approved by the Materials Engineering Curriculum Committee. The objective of the MATL program is to produce graduates who are engaged in careers through which they apply materials engineering proficiency, effective communication and lifelong learning to provide technical, economic, or other benefits to society.

**Curriculum in Materials Engineering**

FR	F	S		F	S
CHEM	1030		Fund. of Chemistry I .....	3	**
CHEM	1031		Fund. of Chemistry I Lab .....	1	**
MATH	1610	1620	Calculus I & II .....	4	4
ENGL	1100	1120	English Composition I & II .....	3	3
PHYS		1600	Engineering Physics I .....	**	4
			Core History .....	3	3
COMP	1200		Introduction to Computing .....	2	**
ENGR	1100		Engineering Orientation .....	0	**
ENGR		1110	Introduction to Engineering .....	**	2
				<b>16</b>	<b>16</b>
<b>SO</b>					
CHEM	1040		Fund. of Chemistry I & II .....	3	**
CHEM	1041		Fund. of Chemistry I & II & Lab .....	1	**
ECON	2020		Principles of Microeconomics .....	3	**
PHYS		1610	Engineering Physics II .....	**	4
PHIL	1020		Introduction to Ethics .....	3	**
STAT		3010	Statistics for Engineers & Scientists .....	**	3
MATH	2630		Calculus III .....	4	**
MATH		2650	Linear Differential Equations .....	**	3
ENGR		2050	Engr. Mechanics: Statics .....	**	3
ENGR		2070	Mechanics of Materials .....	**	3
<b>MATL</b>	<b>2100</b>		<b>Intro. To Materials Science .....</b>	<b>**</b>	<b>3</b>
				<b>17</b>	<b>16</b>
<b>JR</b>					
MATH	2660		Linear Algebra .....	3	**
			Core Social Science Group I .....	3	**
			Core Fine Arts .....	**	3
ENGL		2200	World Literature I .....	**	3
ELEC	3810		Fund. Electrical Engineering .....	3	**
ENGR		2200	Thermodynamics, Fluids & Heat Trans. ....	**	3
<b>MATL</b>	<b>3100</b>		<b>Engr. Materials: Metals .....</b>	<b>3</b>	<b>**</b>
<b>MATL</b>	<b>3101</b>		<b>Metallography Lab .....</b>	<b>1</b>	<b>**</b>
<b>MATL</b>	<b>3200</b>		<b>Engr. Materials: Polymers .....</b>	<b>**</b>	<b>3</b>
<b>MATL</b>	<b>3201</b>		<b>Polymer &amp; Comp. Materials Lab .....</b>	<b>**</b>	<b>1</b>
<b>MATL</b>	<b>3300</b>		<b>Engr. Materials: Ceramics .....</b>	<b>3</b>	<b>**</b>
			Technical Elective .....	**	3
				<b>16</b>	<b>16</b>
<b>SR</b>					
ENGL	2210		World Literature II .....	3	**
<b>MATL</b>	<b>4500</b>		<b>Materials Properties &amp; Selection .....</b>	<b>4</b>	<b>**</b>
<b>MATL</b>	<b>4900</b>		<b>Senior Design Project .....</b>	<b>**</b>	<b>3</b>
<b>MATL</b>	<b>5100</b>		<b>Thermodynamics of Materials Syst. ....</b>	<b>3</b>	<b>**</b>
<b>MATL</b>	<b>5200</b>		<b>Crystallography .....</b>	<b>2</b>	<b>**</b>
<b>MATL</b>	<b>5201</b>		<b>X-Ray Diffraction Lab .....</b>	<b>1</b>	<b>**</b>
<b>MATL</b>	<b>5300</b>		<b>Ph. Transformations in Mtl. Process. ....</b>	<b>**</b>	<b>3</b>
<b>MATL</b>	<b>5400</b>		<b>Physics of Solids .....</b>	<b>**</b>	<b>3</b>
<b>MATL</b>	<b>5500</b>		<b>Num. Sim. of Materials Processing .....</b>	<b>**</b>	<b>3</b>
			Technical Electives .....	3	3
UNIV		4AA0	EN1 Undergraduate Graduation .....	**	0
				<b>16</b>	<b>15</b>

**TOTAL HOURS — 128**

Technical electives: see adviser for approved list of courses.

**Department of Polymer and Fiber Engineering**

**Bachelor of Polymer and Fiber Engineering**

Polymers and fibers are high performance materials utilized in such diverse fields as plastics, elastomers (rubber), adhesives, surface coatings (paints), films, paper, packaging, insulation, filtration, aerospace, automotive, biomedical, composite, construction, environmental, industrial, marine, nonwoven, recreational, and safety materials.

Polymer and fiber engineering prepares graduates to work in research and development, product development, process engineering, composite engineering, quality engineering, industrial engineering, or technical sales; or to proceed to advanced studies in engineering, science, medicine, law, computer, business, or related fields.

Research and instruction in polymer and fiber engineering includes:

- Polymer synthesis and processing.
- Characterization and evaluation of structure and properties of polymeric materials using advanced techniques and state-of-the-art instrumentation.
- Modeling of structure-property-performance relationships emphasizing correlation of properties with the structure across nano-, micro-, and macro-length scales.
- Design, analysis, engineering, and assembly of polymeric fibrous materials into advanced engineered materials with novel compositions and tailored microstructures.
- Product, mold, and die design.

Samuel Ginn College of Engineering

A solid foundation in mathematics, chemistry, and physics is applied in engineering and major courses during junior and senior years. Engineering design is integrated throughout the curriculum in major courses, laboratories, and a capstone design project which is completed during the senior year.

To accommodate the broad range of polymer and fiber opportunities, the undergraduate program offers two options leading to the bachelor of polymer and fiber engineering. The polymer option emphasizes polymer characterization, processing, and chemistry. The fiber option emphasizes the mechanics of composite materials and other fibrous structures.

Educational objectives of the bachelor of polymer and fiber engineering are as follows:

- Graduates will be able to analyze and understand processing-structure-property relationships in polymers, fibers and fibrous assemblies - conventional and non-conventional fabrics and composite materials.
- Graduates will have the necessary foundation in mathematics, the physical sciences, and engineering to pursue advanced degrees in polymers, fibers, and related disciplines.
- Graduates will take away from their courses, research projects, and general studies the skills necessary for problem solving, critical thinking, working in teams, and effective communication.
- Graduates will have acquired the skills necessary to learn throughout their careers.

**Curriculum in Polymer and Fiber Engineering**  
(Fiber Option)

FR	F	S		F	S
MATH	1610	1620	Calculus I & II .....	4	4
CHEM	1030	1040	Fund of Chemistry I & II.....	3	3
CHEM	1031	1041	Fund of Chemistry I & II lab.....	1	1
ENGL	1100	1120	English Composition I & II.....	3	3
HIST			Core History I & II .....	3	3
COMP		1200	Introduction to Comp for Engr & Sci.....	**	2
ENGR		1100	Engineering Orientation.....	**	0
ENGR	1110		Introduction to Engineering.....	2	**
				<b>16</b>	<b>16</b>
<b>SO</b>					
			Core Social Science Group I.....	**	3
<b>CHEM</b>		<b>2030</b>	<b>Organic Chemistry Survey.....</b>	<b>**</b>	<b>3</b>
<b>PFEN</b>	<b>2270</b>		<b>Fiber to Fabric Engineering.....</b>	<b>4</b>	<b>**</b>
MATH	2630		Calculus III.....	4	**
MATH		2650	Linear Diff Equations.....	**	3
PHYS	1600	1610	Engineering Physics I & II.....	4	4
STAT	3010		Stats for Engineers & Scientists.....	3	**
ENGR		2050	Statics .....	**	3
				<b>15</b>	<b>16</b>
<b>JR</b>					
ENGL	2200	2210	World Literature I & II.....	3	3
MATH	2660		Topics in Linear Algebra.....	3	**
ENGR	2070		Mechanics of Materials.....	3	**
ENGR		2200	Introduction Thermo Heat & Fluid.....	**	3
INSY		3600	Engr. Ec. Analysis.....	**	3
			Elective or ROTC.....	3	**
<b>PFEN</b>	<b>3100</b>		<b>Fundamentals of Polymers.....</b>	<b>3</b>	<b>**</b>
<b>PFEN</b>	<b>3300</b>		<b>Fibrous Product Test. and Instr.....</b>	<b>3</b>	<b>**</b>
<b>PFEN</b>		<b>3400</b>	<b>Fund of Coloration and Finishing.....</b>	<b>**</b>	<b>4</b>
<b>PFEN</b>		<b>3500</b>	<b>Str and Prop of Polymers and Fibers.....</b>	<b>**</b>	<b>3</b>
				<b>18</b>	<b>16</b>

<b>SR</b>					
			Core Fine Arts .....	3	**
			Core Philosophy.....	**	3
			Core Social Science Group II.....	**	3
ELEC	3810		Fund of Electrical Engineering .....	3	**
<b>PFEN</b>	<b>4300</b>		<b>Engr Fibrous Structure .....</b>	<b>4</b>	<b>**</b>
<b>PFEN</b>	<b>4400</b>		<b>Mech Flexible Structure.....</b>	<b>3</b>	<b>**</b>
<b>PFEN</b>		<b>4500</b>	<b>Fiber Reinf. Material.....</b>	<b>**</b>	<b>3</b>
<b>PFEN</b>	<b>4910</b>	<b>4920</b>	<b>Poly &amp; Fiber Engr Design I &amp; II .....</b>	<b>3</b>	<b>3</b>
			Technical Elective or ROTC.....	**	3
UNIV		4AA0	EN1 Undergraduate Graduation.....	**	0
				<b>16</b>	<b>15</b>

**TOTAL HOURS - 128**

Technical Elective - see adviser for approved course listing.

**Curriculum in Polymer and Fiber Engineering**  
(Polymer Option)

FR	F	S		F	S
MATH	1610	1620	Calculus I & II .....	4	4
CHEM	1030	1040	Fund of Chemistry I & II.....	3	3
CHEM	1031	1041	Fund of Chemistry I & II lab.....	1	1
ENGL	1100	1120	English Composition I & II.....	3	3
HIST			Core History I & II .....	3	3
COMP		1200	Introduction to Comp for Engr & Sci.....	**	2
ENGR		1100	Engineering Orientation.....	**	0
ENGR	1110		Introduction to Engineering.....	2	**
				<b>16</b>	<b>16</b>
<b>SO</b>					
			Core Social Science Group I.....	**	3
<b>CHEM</b>	<b>2070</b>	<b>2080</b>	<b>Organic Chemistry I &amp; II.....</b>	<b>3</b>	<b>3</b>
<b>CHEM</b>	<b>2071</b>	<b>2081</b>	<b>Organic Chemistry I &amp; II lab.....</b>	<b>1</b>	<b>1</b>
MATH	2630		Calculus III.....	4	**
MATH		2650	Linear Diff Equations .....	**	3
PHYS	1600	1610	Engineering Physics I & II.....	4	4
STAT	3010		Stats for Engineers & Scientists.....	3	**
ENGR		2050	Statics .....	**	3
				<b>15</b>	<b>17</b>
<b>JR</b>					
ENGL	2200	2210	World Literature I & II.....	3	3
MATH	2660		Topics in Linear Algebra.....	3	**
ENGR	2070		Mechanics of Materials.....	3	**
ENGR		2200	Introduction Thermo Heat & Fluid.....	**	3
INSY		3600	Engr. Ec. Analysis.....	**	3
			Elective or ROTC.....	3	**
<b>PFEN</b>	<b>3100</b>		<b>Fundamentals of Polymers.....</b>	<b>3</b>	<b>**</b>
<b>PFEN</b>		<b>3200</b>	<b>Polymer Processing.....</b>	<b>**</b>	<b>4</b>
<b>PFEN</b>		<b>3500</b>	<b>Structure and Prop of Polymers and Fibers.....</b>	<b>**</b>	<b>3</b>
<b>CHEM</b>	<b>3160</b>		<b>Survey of Physical Chemistry .....</b>	<b>3</b>	<b>**</b>
				<b>18</b>	<b>16</b>
<b>SR</b>					
			Core Fine Arts .....	3	**
			Core Philosophy.....	**	3
			Core Social Science Group II.....	**	3
ELEC	3810		Fund of Electrical Engineering .....	3	**
<b>PFEN</b>	<b>4100</b>		<b>Polymer Characterization.....</b>	<b>4</b>	<b>**</b>
<b>PFEN</b>	<b>4200</b>		<b>Poly from Renewable Resources.....</b>	<b>2</b>	<b>**</b>
<b>PFEN</b>		<b>4500</b>	<b>Fiber Reinf. Material.....</b>	<b>**</b>	<b>3</b>
<b>PFEN</b>	<b>4910</b>	<b>4920</b>	<b>Poly &amp; Fiber Engr Design I &amp; II .....</b>	<b>3</b>	<b>3</b>
			Technical Elective or ROTC.....	**	3
UNIV		4AA0	EN1 Undergraduate Graduation.....	**	0
				<b>15</b>	<b>15</b>

**TOTAL HOURS - 128**

Technical Elective - see adviser for approved course listing.