Chapter 13 - College of Engineering and Science

Administration

Dean
Stanley A. Napper
Associate Dean, Undergraduate Studies
James D. Nelson
Associate Dean, Graduate Studies
Galen Turner
Associate Dean, Research
Bala Ramachandran
Biomedical Engineering
Paul Hale, Director
Mechanical Engineering
Steven A. Jones, Program Chair
Chemical Engineering
Jenna Carpenter, Director
James D. Palmer, Program Chair
Chemistry
Lee Sawyer, Director
Civil Engineering
Dale Snow, Program Chair
Dale Snow, Program Chair
Computer Science
Hisham Hegab, Director
Per Kjeldsas, Program Chair
Construction Engineering Technology
Mel Corley, Director
Aziz Saber, Program Chair
Cyberspace Science and Engineering
Galen Turner, Program Chair
Electrical Engineering
Hisham Hegab, Director
Mickey Cox, Program Chair
Electrical Engineering Technology
Hisham Hegab, Director
James Eads, Program Chair
Industrial Engineering
Jenna Carpenter, Director
Jun-Ing Ker, Program Chair
Mathematics and Statistics
Ruth Ellen Hanna, Interim Director
Bernd Schroder, Program Chair
Mechanical Engineering
Mel Corley, Director
David Hall, Program Chair
Nanosystems Engineering
Hisham Hegab, Director
Hisham Hegab, Program Chair
Physics
Lee Sawyer, Director
Lee Sawyer, Program Chair

Purpose

The purpose of the College of Engineering and Science is building engineers and scientists for tomorrow.

Vision

We will be the best college in the world at integrating engineering and science in education and research.

Mission

- We provide a quality undergraduate and graduate education that responds to the needs and challenges of our ever-changing world, includes an international perspective, and stimulates social and ecological awareness.
- We promote the knowledge, skills, ethics, creativity and critical thinking necessary for professional competence and life-long learning.
- We conduct quality research throughout the college and world-class research in key focal areas.

Guiding Principles

- We consider the success of our students to be the primary standard for our success.
- We will provide an exciting environment that allows all students, faculty, and staff to attain their maximum potential.
- We will exhibit integrity, respect, and dignity in every aspect of our conduct.
- We will instill a spirit of pride, cooperation, and accountability in all that we do.
- We believe that teaching, research, and professional service are mutually supportive in the search for excellence.

History

Engineering education at Louisiana Tech University began in 1895 with a two-year program in Mechanic Arts. In 1910 this program was expanded to a Bachelor of Industry degree in General Engineering. Four-year engineering curricula developed as follows: 1921-BS in General Engineering; 1927-BS in Mechanical-Electrical and BS in Civil Engineering; 1938-BS in Mechanical and separate BS in Electrical Engineering; 1940-BS in Chemical Engineering; 1948-BS in Petroleum Engineering; 1957-BS in Industrial Engineering; and 1972-BS in Biomedical Engineering.

Other BS degrees developed as follows: 1953-Geology; 1968-Construction Engineering Technology; 1968-Computer Science; and 1972-Electrical Engineering Technology.

In 1996 the School of Science, which included Mathematics, Chemistry, and Physics, was merged with the College of Engineering to form the College of Engineering and Science. In 2005, the University began offering a BS in Nanosystems Engineering (the first in the nation).

Accreditation

All engineering programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), and both four-year engineering technology programs are accredited by the Technology Accreditation Commission of ABET. The Computer Science program is accredited by the Computing Accreditation Commission (CAC) of ABET. The Chemistry program is approved by the Committee on Professional Training of the American Chemical Society.

Address

More information about the College of Engineering and Science can be obtained by writing:

College of Engineering and Science
P.O. Box 10348
Louisiana Tech University
Ruston, LA 71272
(318) 257-2842

and/or visiting our web site at
http://www.coes.latech.edu
Undergraduate Degrees Offered

Bachelor of Science
- Chemistry
- Mathematics
- Physics

Bachelor of Science Biomedical Engineering
Bachelor of Science Chemical Engineering
Bachelor of Science Civil Engineering
Bachelor of Science Computer Science
Bachelor of Science Construction Engineering Technology
Bachelor of Science Electrical Engineering
Bachelor of Science Electrical Engineering Technology
Bachelor of Science Industrial Engineering
Bachelor of Science Mechanical Engineering
Bachelor of Science Nanosystems Engineering

Dual Bachelor of Science Degrees with Grambling State University

Students at Louisiana Tech University and Grambling State University have the opportunity of simultaneously pursuing two Bachelor of Science degree programs, one at Tech and one at Grambling. Grambling's BS degree in Drafting Technology is coordinated with Tech's BS degree in Civil Engineering. Grambling's BS degree in Electronics Technology is coordinated with Tech's BS degree in Electrical Engineering.

Students who wish to enroll in either of these dual programs may do so by declaring their intentions when applying for admission. Transfer students are allowed to enter these programs at any registration at either of the universities.

To qualify for a BS degree at Grambling and a BS degree at Tech, a student must complete all courses required by the Department of Industrial Education at Grambling and the courses required by the appropriate engineering department at Tech. Courses that are common to both degree programs and that are offered at both universities may be taken at either university.

Minors Offered

Students may earn minors in one of the following areas:
- Chemistry
- Computer Science
- Mathematics
- Physics

A student must earn a grade of C or better in each course applied toward meeting the requirement of a minor. This requirement will be applicable to new undergraduate students (freshmen and transfers) whose initial enrollment is Fall Quarter 2003 or quarters thereafter.

Admissions

Students who meet the University admissions criteria will be admitted to the College of Engineering and Science.

Transfer Students

Candidates for admission to the College of Engineering and Science who have studied at another institution of higher education must submit an official record of that study to Louisiana Tech University. This record will be evaluated by the program in which the candidate wishes to major. The evaluation will determine which curricular requirements of the intended program of study at Louisiana Tech have been satisfied by the student's prior study. Students must have an overall grade point average of at least 2.0 out of 4.0 in all courses for which transfer credit is allowed.

Scholastic Requirements

Students in the College of Engineering and Science are subject to the scholastic standards of the University regarding probation, suspension, and readmission. Program chairs may require workload restrictions intended to restore the quality of the student's work to the standards required by the College of Engineering and Science.

Students in the College of Engineering and Science must earn a grade of "C" or better in any math course; any statistics course; ENGR 120, 121, 122; CHEM 100, 101, 103; and PHYS 201 prior to taking courses for which these are prerequisites.

Students on scholastic probation and those returning from a period of suspension are limited to a maximum of 9 semester hours per quarter.

Cumulative Mathematics Grade Point Average (GPA) Policy

The mathematics for engineering and science classes (MATH 240-245) are fundamental for every engineering program. Success in these classes tends to predict success in later engineering classes. For this reason, each engineering program has identified at least one upper level class for which a cumulative MATH 240 series GPA of 2.0 is a prerequisite.

Some requisite classes only require the GPA to include grades through MATH 242, while some include grades through MATH 245. Regardless, the cumulative GPA includes all attempts, including hours that were transferred to Louisiana Tech as credit for any of the MATH 240 series classes. Grades in earlier mathematics classes (e.g., MATH 101, 112) are not included in this GPA.

If a student does not meet the cumulative mathematics GPA requirement for a certain class, he/she must retake one or more of the MATH 240 series classes until his/her cumulative mathematics GPA reaches a 2.0. The classes retaken cannot be ones in which the student made an A or B in a previous quarter, ensuring that students obtain review where they need it most. To retake an earlier mathematics class and discuss a plan for improvement, students must contact Alicia Boudreaux (alciab@latech.edu), the Student Success Specialist for the College of Engineering and Science.

The purpose of this policy is to further improve the preparation of students who enter upper level engineering classes, which will improve their performance in these advanced classes. Not only will this policy influence the quality of current students, but it will also produce better graduates who are prepared to enter the workforce as qualified engineers.

Electives

All electives must be approved by the appropriate program chair.

Credit by Examination

Students of exceptional scholastic achievement are allowed to take subject credit examinations in some of the courses required for a degree. A student in the College of Engineering and Science may earn up to a maximum of 30 semester hours by credit examination. The College of Engineering and Science will not accept any credits earned by passing the CLEP General Examination.

Correspondence Courses

Students in the College of Engineering and Science are permitted to include no more than six semester credit hours of correspondence courses for credit toward graduation in any curriculum. Prior to pursuing the correspondence work, the student must obtain written approval of the Associate Dean for Undergraduate Studies of the College of Engineering and Science. Approval will be granted only for courses in humanities or social sciences. (All English courses are excluded.)

Graduation Requirements

All requirements listed in the General Information section of this Catalog apply. In addition, a student majoring in a program in the College of Engineering and Science must have at least a 2.0 grade point average in courses bearing the specific rubric of the major program (e.g., computer science, civil engineering). In order to
graduate from a baccalaureate program in the College of Engineering and Science, a student must complete 27 of the last 36 hours in the curriculum while enrolled in the College of Engineering and Science.

**Ethical Standards**

Students in the College of Engineering and Science are preparing to enter a profession which demands high ethical standards of its members. Honesty and high ethical standards are demanded of these students and all others taking courses conducted in the College of Engineering and Science. It is the student's right and responsibility to discourage and report academic misconduct. The failure to do so is a breach of ethical standards.

Academic misconduct is a serious breach of ethics in academic activities, such as examinations, reports, and homework. It may occur in any of the following forms:

1. Giving or receiving unauthorized aid;
2. Stealing or plagiarizing the substance, work, or ideas of others;
3. Lying, using evasive statements, or concealing the truth behind technicalities.

Student-written computer programs and data are not to be shared with other students without the specific authorization of the responsible faculty. Students are responsible for protecting their disks from unauthorized access.

The determination of academic misconduct will be made in accordance with the University's "Academic Misconduct" section of this Catalog.

Repeated occurrences of academic misconduct are specifically contrary to the standards of personal integrity required by the professions connected with the programs in the College of Engineering and Science. Therefore, a stronger penalty may be awarded for repeated commissions of academic misconduct, including dismissal from the College of Engineering and Science.

**Undergraduate Research Opportunities**

Academically qualified undergraduate students have an opportunity to gain experience on campus by working part-time as a member of a research team including faculty and graduate students. Compensation is competitive with most local employment and entails the major advantage of providing on-campus stimulating work experience to enrich the student's total educational experience.

The qualifications required for participating include the following:

1. Students must be enrolled in a degree program in the College of Engineering and Science, and must be in good academic standing.
2. Students must have an overall grade point average of 3.0 or better.

Students are selected by the faculty responsible for the various research projects offering the employment. Applicants will be considered for suitable employment on research projects throughout the college regardless of the department in which they are enrolled.

**The Cooperative Education Program**

The College of Engineering and Science is cooperating with certain industrial firms in a plan of alternate periods of work and university study for students in engineering and science. The Cooperative Education Program provides one of the best methods for integrating technical theory and practical industrial experience.

Although the College of Engineering and Science cannot guarantee work or stipulate compensation, an effort will be made to place the students in jobs having the most favorable education and financial possibilities. The Cooperative Education Program will allow the student to have approximately one year of practical experience by the time of graduation. If the student accepts permanent employment with the cooperating company, the necessity for taking special company orientation and training courses after graduation is usually eliminated. The Cooperative Education Program does not obligate the student to accept employment with the cooperating company, nor does it obligate the company to offer permanent employment to the graduate.

Each student participating in the Cooperative Education Program is required to register at Louisiana Tech during each work period.

Students from any academic program within the College of Engineering and Science will be considered for participation in the Cooperative Education Program provided they have successfully completed 45 semester credit hours of University work with a grade point average of at least 2.8. Requirements for graduation and the degree earned are the same as those for regular students. Individuals interested in further details should contact the Director of the Cooperative Education Program, College of Engineering and Science, Louisiana Tech University, Ruston, LA 71272.

**Student Organizations**

The following national organizations have student chapters on campus:

- American Chemical Society
- American Institute of Chemical Engineers
- American Society of Civil Engineers
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers
- American Society of Mechanical Engineers
- Association for Computing Machinery
- Associated General Contractors of America
- Association of Business, Engineering, and Science Entrepreneurs
- Association of Electrical Engineering Technologists
- Biomedical Engineering Society
- Institute of Electrical and Electronics Engineers
- Instrument Society of America
- Institute of Industrial Engineers
- Institute of Transportation Engineers
- National Society of Black Engineers
- North American Society for Trenchless Technology
- Society of Automotive Engineers
- Society of Physics Students
- Society of Women Engineers

**Student Honor Societies**

The following honor societies are available to those students who excel academically and are elected to membership:

- All Engineering--Tau Beta Pi
- All Technology--Tau Alpha Pi
- Biomedical Engineering--Alpha Eta Mu Beta
- Chemical Engineering--Omega Chi Epsilon
- Chemistry-Phi Lambda Upsilon
- Civil Engineering--Chi Epsilon
- Computer Science--Upsilon Pi Epsilon
- Electrical Engineering--Eta Kappa Nu
- Industrial Engineering--Alpha Pi Mu
- Mathematics--Pi Mu Epsilon
- Mechanical Engineering--Pi Tau Sigma
- Physics--Sigma Pi Sigma

**Engineering and Science Scholarships**

The following scholarships are administered by the College of Engineering and Science and its individual programs. All scholarships are dependent on availability of funding and subject to cancellation or modification by the sponsor.

- American Petroleum Institute Scholarship
Employment opportunities for biomedical engineers exist in understanding the basic mechanisms that regulate the human body. Through appropriate application and development of technology, biomedical engineers combine the practical aspects of engineering with biology and medicine to produce an engineer capable of solving special kinds of problems. Biomedical engineers are alert and sensitive to the challenges of designing and using products for living systems and of studying these systems. The program provides medical and biological instruction in typical premedical courses (e.g., general biology, anatomy, physiology, organic chemistry) and engineering instruction in fundamental engineering courses. The biological training is integrated with the engineering training by means of a series of coordinated biomedical engineering courses taught at the sophomore, junior, and senior academic levels. In order to provide depth and focus in technical abilities, students select one of the following concentrations: chemical engineering, electrical engineering, mechanical engineering, computer information, or premedicine.

Internships are available in both clinical and industrial environments. Interns experience breadth of interactions, procedures, and technology, and they complete significant engineering projects.

Biomedical engineers are working in many rewarding areas: for example, design and construction of artificial internal organs; design and application of the electronics and instrumentation associated with hospital operating rooms, intensive care units, and automated clinical laboratories; development and instrumentation of biomedical computer systems; the functional rehabilitation of disabled persons through appropriate application and development of technology; clinical engineering; aerospace medicine and life science; basic research using engineering analysis principles aimed at understanding the basic mechanisms that regulate the human body. Employment opportunities for biomedical engineers exist in

**Bachelor Degree Programs**

### Biomedical Engineering

Biomedical engineering is formally defined as the application of engineering skills, principles, and tools to problems in biology and medicine. The undergraduate program at Louisiana Tech University combines the practical aspects of engineering with biology and medicine to produce an engineer capable of solving special kinds of problems. Biomedical engineers are alert and sensitive to the challenges of designing and using products for living systems and of studying these systems. The program provides medical and biological instruction in typical premedical courses (e.g., general biology, anatomy, physiology, organic chemistry) and engineering instruction in fundamental engineering courses. The biological training is integrated with the engineering training by means of a series of coordinated biomedical engineering courses taught at the sophomore, junior, and senior academic levels. In order to provide depth and focus in technical abilities, students select one of the following concentrations: chemical engineering, electrical engineering, mechanical engineering, computer information, or premedicine.

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hospitals, rehabilitation engineering centers, national research foundations, governmental research institutions and agencies (e.g., NASA and FDA), chemical companies, pharmaceutical companies, hospital products companies, medical instrumentation and computer companies, orthopedic implant companies, and aerospace life science companies. Also, entrepreneurial activity in the health-related industries is prospering. Innovative medical and health care products can be manufactured and marketed by resourceful biomedical engineers. In industry, Louisiana Tech biomedical engineering graduates are responsible for manufacturing, quality control, research and development, management, and marketing.

One special feature of the Biomedical Engineering Program is that, upon or before graduation, students may complete the basic requirements necessary for admission to medical school. The program provides a strong quantitative background for one who wishes to pursue a future medical career. Another feature of the program is that, upon completion of the Biomedical Engineering degree program in any of the specialties, the student will be adequately prepared to continue his/her education at the graduate level by pursuing a Master of Science and/or the Doctor of Philosophy degree in Biomedical Engineering. Continued professional education in business, law, and the basic medical sciences is also possible.

**Biomedical Engineering Program Educational Objectives**

- **BIENP01 (Career Preparation):** Graduates of the program will find employment as biomedical engineers or be admitted for continued study in engineering, science, business, medicine, or other professional programs.
- **BIENP02 (Skills):** Graduates will apply the skills obtained from the program to biomedical or other multidisciplinary fields.
- **BIENP03 (Professionalism):** Graduates of the program will communicate effectively, undertake professional responsibilities, and function effectively as members and leaders of multidisciplinary teams.
- **BIENP04 (Life-Long Learning):** Graduates of the program will continue to develop their knowledge and skills throughout their careers.

The curriculum in Biomedical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

### Biomedical Engineering Curriculum (BS)

#### Freshman Year

<table>
<thead>
<tr>
<th>Natural Sciences (GER)</th>
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<tr>
<td>Chemistry 100, 101, 102, 103, 104</td>
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<tr>
<td>Biological Sciences 130, 131</td>
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<td>Physics 201</td>
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<tr>
<td><strong>Total Semester Hours</strong></td>
<td><strong>36</strong></td>
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#### Sophomore Year

| Biological Sciences 225, 227 | 6 |
| Biomedical Engineering 202, 203 | 2 |
| Engineering 220, 221, 222 | 9 |
| Mathematics 243, 244, 245 | 9 |
| Physics 202 | 3 |
| Mechanics of Materials 201 | 2 |
| Mechanical Engineering 215 | 1 |
| **Total Semester Hours** | **32** |

#### Junior Year

| Arts (GER) | 3 |
| Humanities (GER) | 6 |
| English 201 or 202, and 303 | 6 |
| Speech 377 | 3 |

### Biomedical Engineering 225, 230, 301, 325, 401, 425

- **Directed Electives**: 6

### Senior Year

| Social Sciences (GER) | 9 |
| Humanities (GER) | 3 |
| Biomedical Engineering 400, 402, 403, 404, 430, 435 | 12 |
| **Directed Electives**: 6 |
| **Total Semester Hours**: 134

**Pre-Medical**: Chemistry 250, 251, 252, 253, 254; Physics 261, 262: One 2 hr. 300- or 400-level elective in engineering or biology.

**Chemical Engineering**: Chemical Engineering 202, 332, 402, and one 3 hr. Chemical Engineering*** course at 300- or 400-level.

**Computer Information System Requirement (pg. 14)**

**Electrical Engineering**: Electrical Engineering 232, 242, 311, 335, one 2 hr. Electrical Engineering*** course at the 300- or 400-level.

**Mechanical Engineering**: Mechanics and Materials 212, 312, and seven additional semester hours of Mechanical Engineering*** courses at 300- or 400-level.

*Students who wish to apply to medical school should be aware that they will need additional Biological Sciences coursework to meet medical school entrance requirements. Some required courses depend on the medical school to which the student is applying.

**An approved Biomedical Engineering course appropriate to this track may be substituted with consent of the student’s advisor.**

### Chemical Engineering

The primary task of chemical engineers is the design of industrial processes that chemically transform various natural resources into more useful and valuable products. These products range from paper and gasoline to medicines and computer microchips. The chemical engineering is constantly concerned with improving these processes to best conserve resources (including capital) while preserving and protecting the environment along with the health and well being of the public.

The education of the chemical engineer covers advanced chemistry, physics, biology, mathematics, general engineering, computer applications, material balances, energy balances, chemical equilibria, thermodynamics, kinetics and reactor design, unit operations and transport processes, and process control, with laboratories emphasizing these areas along with oral and written communication skills.

Graduates in chemical engineering are particularly versatile. Industrial work may involve the production, operations, customer service, sales, or research departments of industries producing semiconductors, microchips, metals, paper, petroleum, petrochemicals, plastics, forest products, pharmaceuticals, or foods or the technical service or process improvement sections of such industries. In addition, chemical engineers are increasingly in demand in emerging fields such as nanosystems engineering and nanotechnology. Meaningful careers are also available with
governmental agencies or private foundations associated with space, energy, and the environment. Graduate education in medical school, dental school, business school, law school, and chemical engineering are viable alternatives. At the undergraduate level, the purpose of the program is to provide a strong basic education such that the graduate will be prepared for all these options.

**Chemical Engineering Program Educational Objectives**
- Graduates will engage in successful careers in industry (primarily chemical, petrochemical, and pulp/paper) and/or graduate or other professional schools (law, medical, pharmacy).
- Graduates will demonstrate the technical chemical engineering skills required for the workforce including knowledge of chemical engineering techniques and the ability to utilize science, mathematics, and engineering principles to analyze and solve problems.
- Graduates will exhibit the professional skills necessary to be effective and succeed in the modern workforce including the ability to function in teams, the ability to communicate effectively, and high standards of ethics and professionalism.
- Graduates will be active in professional development and acquiring new skills to remain relevant in today’s fast changing environment.

The program is accredited by the Engineering Accreditation Commission of the Accreditation board for Engineering and Technology. Graduates of this program are encouraged to become registered professional engineers.

**Chemical Engineering Curriculum (BS)**

**Freshman Year**

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<th>Course</th>
<th>Semester Hours</th>
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<td>Chemistry 100, 101, 102, 103, 104</td>
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<td>Biological Sciences 130</td>
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<td>Mathematics 240, 241</td>
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<td>Engineering 120, 121, 122</td>
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**Sophomore Year**

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<th>Course</th>
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<td>Engineering 220, 222</td>
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**Junior Year**

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<td>Chemical Engineering 304, 313, 332, 413</td>
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<td>Chemistry 311, 313</td>
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<td>Biological Sciences 260 or Chemistry 351, 352</td>
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<tr>
<td>Engineering 221</td>
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<td>Directed Technical Elective*</td>
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**Senior Year**

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<td>Speech 377 or English 463</td>
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**Total Semester Hours**

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<td>134</td>
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**Chemistry Curriculum (BS)**

**Freshman Year**

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**Sophomore Year**

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**Junior Year**

<table>
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<tr>
<th>Course</th>
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<td>English 201 or 202, and 303</td>
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<td>Mathematics 244, 245</td>
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<td>Technical Electives*</td>
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**Senior Year**

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<tbody>
<tr>
<td>Chemistry 466, 481</td>
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<td>Chemistry 409 or 424** (any two)</td>
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<td>Chemistry 498**</td>
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<td>Chemistry 490**</td>
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<td>History</td>
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<td>Speech 110 or 377</td>
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<td>Electives*</td>
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**Total Semester Hours**

<table>
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<td>121</td>
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**Notes:**
- International Education Requirement (IER): International Education Requirement (pg. 15)
- Total Semester Hours (GER): General Education Requirement (pg. 14)
- Technical electives must be selected in consultation with a faculty advisor. MATH 308 is recommended.
**In addition to the ACS core curriculum (Chemistry 466 and 481 are part of the core), the ACS certified BS requires six hours of 400-level courses that require Physical Chemistry (Chemistry 311, 312) as a prerequisite. If Chemistry 498 is used as a 400-level class for ACS certification, a written report that meets ACS standards for undergraduate research is required.**

***Each senior student must conduct an undergraduate research Capstone Project which demonstrates integration and synthesis of chemistry skills. The duration of the Capstone Project must be two or more quarters.***

****Each senior student must submit a Career Portfolio that documents major aspects of chemistry training and experience.****

******Electives must be selected in consultation with a faculty advisor.****

**Requirements for a Minor in Chemistry**
A minor in chemistry consists of Chemistry 250, 251, 252, 253, and 254 and eleven additional hours of chemistry, of which eight must be 300 - or 400-level.

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Civil Engineering

Civil engineers are in the forefront providing constructive counsel on matters vital to mankind and the environment. Civil engineers are primarily responsible for planning, designing, and constructing all the world's constructed facilities. Most people can only talk about solving traffic congestion, environmental pollution, droughts, and floods. Civil engineers help to eliminate or greatly reduce the destructive effects of these events.

Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, the curriculum in civil engineering is designed to produce graduates who have the background necessary for the practice of civil engineering and the capacity for further development of mind and character to assume the highest responsibilities of citizenship and of professional engineering.

The up-to-date curriculum provides the fundamentals of engineering and teaches the application of those fundamentals in engineering analysis and design. It also helps the student acquire the ability to communicate, to develop a personal value system, and to have a sense of social responsibility and concern for the needs and welfare of mankind and the environment. Well-equipped laboratories for environmental engineering, hydraulics, materials testing, soil mechanics, structural testing, surveying, and transportation enhance the classroom lectures.

The student will gain some competence in all of the following areas with emphasis on at least one: structural design, environmental engineering, hydraulics, hydrology, surveying, transportation, soil mechanics, highways, and materials.

**Civil Engineering Program Educational Objectives**

- To produce graduates who have developed the skills required to design civil engineering systems and facilities, including the graduates’ abilities to formulate problems, to think creatively, to synthesize information, and to work collaboratively in teams. The civil engineering program at Louisiana Tech University will concentrate undergraduate instruction in areas of water resources/environmental, structures, transportation, and geotechnical engineering.
- To produce graduates who are trained thoroughly in methods of analysis, including the mathematical and computational skills appropriate for civil engineers to use when solving problems.
- To produce graduates who are prepared for life-long learning and successful careers as civil engineers.
- To produce graduates who are taught to use current experimental and data analysis techniques for civil engineering applications.
- To produce graduates who developed oral and written communication skills that allow students to present information effectively.
- To produce graduates who possess a proper understanding of their professional and ethical responsibilities.

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Civil Engineering Curriculum (BS)

**Freshman Year**

<table>
<thead>
<tr>
<th>Natural Sciences (GER)</th>
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</thead>
<tbody>
<tr>
<td>Chemistry 100*, 101*</td>
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<tr>
<td>Physics 201*</td>
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<td>Humanities (GER)</td>
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<td>History</td>
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<td>Mathematics (GER)</td>
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<tr>
<td>Mathematics 240*, 241*</td>
<td>6</td>
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<tr>
<td>Mathematics 243*</td>
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<tr>
<td>Engineering 120*, 121*, 122*</td>
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**Sophomore Year**

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<tr>
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<tr>
<td>English 303, 463</td>
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<td>Civil Engineering 202, 254</td>
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<td>Engineering 220*, 221, 222</td>
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<td>Mechanics and Materials 201, 212*</td>
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<td>Chemistry 102*</td>
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**Junior Year**

<table>
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</thead>
<tbody>
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<td>Biological Sciences</td>
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<td>Social Sciences (GER)</td>
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<tr>
<td>Civil Engineering 310, 324, 332, 333, 340, 342, 343, 392</td>
<td>22</td>
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<tr>
<td>Mechanics and Materials 312, 313*</td>
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**Senior Year**

<table>
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<th>Humanities (GER)</th>
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</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Social Sciences (GER)</td>
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<tr>
<td>Civil Engineering 314, 325, 411, 464 or 466, 439, 492, 493, 494</td>
<td>17</td>
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<tr>
<td>Directed Electives**</td>
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</table>

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Total Semester Hours ......................................................... 134

*Grade of "C" or higher required.

**Directed Electives chosen by student in consultation with faculty advisor and approved by the Civil Engineering Program Chair.

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Construction Engineering Technology

The program prepares the graduate for the responsibilities of managing and supervising all of the activities related to converting the plans and specifications prepared by engineers and architects into finished facilities. With increasing demand for economical service and continuous quality improvement, the construction industry continues to improve its technology as well as its management efficiency.

The program provides technical and managerial education in that field of construction most closely aligned with engineering, with a particular emphasis on highway, heavy, and underground construction. It is in many ways similar to civil engineering but has the following major differences:

- Emphasis is on practical application of engineering science rather than upon the comprehensive understanding of the scientific theories.
- Considerable time is devoted to management and business administration courses.
- Less time is devoted to mathematics and the sciences.

Graduates of this program are qualified to fill many professional positions in governmental agencies, industrial concerns,
manufacturing companies of construction supplies and equipment, and in construction firms. These jobs may involve contract supervision, intermediate managerial responsibilities, inspection or sales, as well as the supervised design of construction projects. The undergraduate business and management training prepares graduates to move up the executive ladder to success.

On occasion courses in construction are shared with the Construction programs at Grambling State University and the University of Louisiana at Monroe.

The Construction Engineering Technology Program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 347-7700.

**Construction Engineering Technology Program Educational Objectives**

- To produce graduates who are prepared to apply engineered construction principles in the construction process, with a focus on the knowledge and skills needed for the heavy-highway, underground utility, and building structural frame construction segments of the industry.
- To produce graduates who are prepared for successful careers in the construction field by providing them with the appropriate technical background, strong communication skills, a sense of professional, ethical, and societal responsibilities, and tools for life-long learning.

**Construction Engineering Technology Curriculum (BS)**

**Freshman Year**

- Natural Sciences (GER) .......................... 3
- Biological Sciences 101.............................. 3
- Physics 209, 261 .................................. 4
- English (GER) ...................................... 6
- Mathematics (GER) ............................... 6
- Mathematics 101, 112 ............................... 6
- Business Law 255 .................................. 3
- Civil Engineering 254 .............................. 3
- Civil Technology 100 ............................... 3

**Total Semester Hours ................................ 28**

**Sophomore Year**

- Humanities (GER) ................................. 3
- English 303 ........................................ 3
- Natural Sciences (GER) ......................... 3
- Physics 210, 262 .................................. 4
- Social Sciences (GER) ......................... 3
- Economics 215 .................................. 3
- Social Sciences courses ......................... 6
- Computer Literacy (GER) ................. 3
- Mathematics 220 .................................. 3
- Computer Science Program Educational Objectives

- **Computer Science**

Computer Science is primarily concerned with the study of algorithms and the data structures on which they operate. Topics of interest include problem analysis: algorithm design, implementation, and testing; the definition of programming languages and the construction of environments for creating software; the study of computing hardware; the human/computer interface; and the development of formal techniques for characterizing algorithm efficiency.

The computer science curriculum at Louisiana Tech is designed to provide students with a general education in mathematics, science, and the humanities; an in-depth study of computing, including the practical and theoretical aspects of both hardware and software; and an opportunity for graduate study or a challenging position in industry. Because of the rapid pace of change in the field, the program places primary emphasis on fundamental computing concepts.

The Computer Science program is accredited by the Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 437-7700.

**Computer Science Program Educational Objectives**

- **Depth: Our graduates demonstrate fundamental knowledge of Computer Science, making valuable technical contributions to the design, development, and production of computing systems and related areas.**
- **Breadth: Our graduates have knowledge not only of the critical areas of Computer Science but also of related disciplines and they have the broad education in arts and sciences necessary for productive careers and successful postgraduate education.**
- **Professionalism: Our graduates utilize and exhibit strong communication and interpersonal skills, as well as professional and ethical principles, and function effectively as members and leaders of multi-disciplinary teams.**
- **Lifelong Learning: Our graduates engage in professional development in order to remain current in the field and to understand ongoing issues in Computer Science.**

**Computer Science Curriculum (BS)**

**Freshman Year**

- Natural Sciences (GER) .......................... 4
- Biological Sciences 130, 131 ...................... 4
- English (GER) ...................................... 6
- Humanities (GER) .................................. 3
- History ............................................ 3
- Mathematics (GER) ............................... 6
- Mathematics 240, 241 ............................... 6
- Computer Science 100, 120, 122 .............. 9

**Total Semester Hours ................................ 31**

**Sophomore Year**

- Arts (GER) ........................................ 3
- Social Sciences (GER) ............................ 3
- Economics 215 .................................. 3
- Additional Social Science courses .................. 6

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Natural Sciences (GER)
Physics 201, 202, 261, 262 ........................................... 8
Mathematics 311 ................................................................ 3
Computer Science 220, 251, 265, 269 ............................... 9

Junior Year

Humanities (GER)
English 305 .................................................................. 3
English (Literature) ................................................................ 3
Computer Science 310, 325, 330, 345, 364 ......................... 15
Directed Elective*
Mathematics/Science ............................................................. 3
Computer Science.................................................................... 3
Minor** ............................................................................ 6

Senior Year

Humanities (GER)
English 363 .................................................................. 3
Computer Science 403, 404 ................................................ 6
Statistics 405 or Industrial Engineering 400 ....................... 3
Directed Electives*
Computer Science ................................................................ 6
Minor** ............................................................................ 12

Total Semester Hours .......................................................... 126

(GER): General Education Requirement (pg. 14)
(IER): International Education Requirement (pg. 15)
*Directed Electives chosen by student in consultation with faculty advisor and approved by the Computer Science Program Chair.
**All computer science majors are required to complete a minor in another discipline. The Computer Science Program Chair must approve the minor subject. After the requirements for a minor have been met, the balance of the minor/support area courses should be chosen from science, mathematics, engineering, computer science, or approved business courses. Subject to the approval of the Computer Science Program Chair, students who complete a second bachelor’s degree may use that degree to satisfy the minor requirement.

Requirements for a Minor in Computer Science

Students in other departments who wish to minor in computer science are required to take 21 semester hours of computer science courses consisting of Computer Science 100, 120, 122, 220, 325, and six additional hours at the 300-level or above.

Electrical Engineering

Electrical Engineering is that profession which deals with the application of the fundamental laws of electrical phenomena to the service of mankind. Broadly, electrical engineers are involved in one or more of the following areas: electromagnetics; the design of electronic and solid-state devices; the control, conversion, and distribution of energy; computing and data processing; and communications, including transmission and retrieval.

Electrical Engineering Program Educational Objectives

• Depth: Our graduates will have a fundamental knowledge needed for the practice of, or advanced study in, electrical engineering in such application areas as electric power, communications, controls, and microelectronics.
• Breadth: Our graduates will have a broad education necessary for productive careers or the pursuit of graduate education, including a knowledge of important current issues in electrical engineering.
• Professionalism: Our graduates will have strong communications skills, will understand and undertake professional responsibilities, and will function effectively as members and leaders of multidisciplinary teams.
• Lifelong Learning: Our graduates will believe that their undergraduate electrical engineering education was a wise investment and will continue to develop their knowledge and skills after graduation.

The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC-ABET). Graduation from an EAC-ABET accredited program is one of the requirements for qualifying as a Registered Professional Engineer in Louisiana as well as most other states. If, in addition to meeting the minimum requirements established for an EAC-ABET accredited curriculum, a graduate has maintained a relatively good scholastic record, the graduate may qualify for further study in the advanced degree program.

Electrical Engineering Curriculum (BS)

Freshman Year

English (GER) ................................................................. 6
Mathematics (GER) ........................................................... 6
Mathematics 240, 241 ......................................................... 6
Mathematics 242 ............................................................... 3

Sophomore Year

Humanities (GER)
History ............................................................................ 3
Natural Sciences (GER) ...................................................... 3
Physics 202 .................................................................... 3
Engineering 220, 221 ......................................................... 6
Mathematics 243, 244, 245 ................................................ 6
Electrical Engineering 223, 232, 311 .............................. 7

Junior Year

Humanities (GER)
English 201 or 202 .............................................................. 3
Engineering 222 ............................................................... 3
Industrial Engineering 300 ................................................. 2
Electrical Engineering 224, 229, 242, 292, 321, 334, 335, 336, 339, 381, 411 ......................................................... 28

Senior Year

Arts (GER) ........................................................................ 3
Humanities (GER)
English 303, 463 ............................................................... 6
Social Sciences (GER) ...................................................... 3
Electrical Engineering 406, 407, 408, 422 ....................... 6
Directed Electives* ............................................................ 6
Electrical Engineering Senior Option** ............................ 8

Total Semester Hours .......................................................... 134

(GER): General Education Requirement
(IER): International Education Requirement (pg. 15)
*Directed Electives chosen by the student in consultation with faculty advisor and approved by the Electrical Engineering Program Chair.
**Electrical Engineering Seniors are required to complete two groups of courses (total 8 hrs.) selected from the following three groups:
Electrical Engineering 461(3) and 469(1)
Electrical Engineering 471(3) and 479(1)
Electrical Engineering 481(3) and 489(1)
Electrical Engineering Technology

The increasing complexity of industrial processes, a continuing expansion of research activities and the need for greater cost-effective productivity has created a need for a new group of specialists known as engineering technologists. These technologists work with professional engineers and scientists to design, install, operate and maintain complex technical systems. Technologists may also assume independent responsibilities for the coordination of the people, materials and equipment required to create these systems. To meet his/her responsibilities, the technologist must possess a variety of skills and have both practical and theoretical knowledge.

The Electrical Engineering Technology curriculum includes circuit analysis, electronics, computers, electrical power, communications, instrumentation and control systems. The program combines course work and coordinated laboratory work to create graduates who are capable of performing a variety of technical tasks. Both areas emphasize the latest in solid-state devices, integrated circuits and microprocessor technology. The technology graduate also receives training in technical writing, public speaking and general industrial practices. This combination of elements produces graduates qualified for a wide variety of commercial and industrial employment opportunities in the fields of electrical and electronics technology.

The program is accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012. Telephone: (410) 347-7700.

Electrical Engineering Technology Program Educational Objectives

After graduating, Electrical Engineering Technology majors will:

• Leverage their technical skills to acquire professional positions in electrical, electronic, and related fields.
• Apply appropriate mathematical, computational, computer, and critical reasoning skills to analyze and solve problems.
• Utilize oral and written communication skills to present information effectively.
• Demonstrate a commitment to life-long learning and continuous professional improvement.
• Practice in a professional, ethical, and socially responsible manner.

Electrical Engineering Technology Curriculum (BS)

**Freshman Year**

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<tr>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Arts (GER)</td>
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<tr>
<td>Computer Literacy (GER)</td>
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<td>English (GER)</td>
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<td>6</td>
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<tr>
<td>English 101, 102</td>
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<td>Humanities (GER)</td>
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<tr>
<td>History</td>
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<td>Mathematics (GER)</td>
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<tr>
<td>Electrical Engineering Technology 100, 170, 171, 180, 181</td>
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**Sophomore Year**

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<td>Biological Sciences 101</td>
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<td>Mathematics 220, 223</td>
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<tr>
<td>Electrical Engineering Technology 260, 261, 268, 270, 271, 272, 273, 280</td>
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**Junior Year**

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<tr>
<td>English (Literature) 201 or 202</td>
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<tr>
<td>Social Sciences (GER)</td>
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<td>Chemistry 100, 101, 103</td>
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<tr>
<td>Engineering Mechanics 206</td>
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Electrical Engineering Technology 360, 361, 370, 371, 374, 375, 378, 380

**Senior Year**

<table>
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<th>Course Code</th>
<th>Course Title</th>
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<td>Speech 377</td>
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<tr>
<td>Electrical Engineering Technology 422, 423,460, 461, 470, 471, 472, 475, 476</td>
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<td>Free Elective</td>
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<td>Technical Elective*</td>
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</table>

**Total Semester Hours** 124

**Industrial Engineering**

Industrial engineering involves decision-making related to the best use of people, material, equipment and energy to achieve the goals of an organization. The organization may be a manufacturing facility, hospital, bank, amusement park, airline, government office, or any other group organized to make a product or perform a service. Industrial engineers make significant contributions to their employers by saving money while making the workplace better for fellow workers.

If there is one phrase that summarizes the activities of industrial engineers, it is “the search for a better way.” For example, a better way to make workplaces more comfortable and safer by improving workstations and work procedures, a better way to perform assembly operations using robots and machine vision systems, a better way to reduce inventory cost using just-in-time technology, a better way to assure product quality by statistical process control techniques, a better way to improve the efficiency of the entire organization by implementing Lean-Six Sigma technologies, and so on.

Manufacturing firms and service industries hire a significant number of industrial engineers. Today, more and more businesses hire industrial engineers in areas like computer information systems, business operations, finance, and sales and marketing. Corporations as diverse as Coca Cola, UPS, Disney, IBM, Entergy, Lockheed Martin, Northrop Grumman, Intel, Microsoft, Motorola, and Boeing all use people with industrial engineering backgrounds to help manage their business. Many industrial engineers enter the workforce as engineers but eventually move up to the upper level of management.

The industrial engineering curriculum has been developed to prepare students for meaningful careers in this challenging and important branch of engineering. The success of the program is evidenced by the high demand for its graduates in all sectors of the economy and the many professional accomplishments of the faculty.

**Industrial Engineering Program Educational Objectives**

• Our graduates will demonstrate the ability to use appropriate techniques and modern engineering tools for successful industrial engineering careers that support the local, regional and national economy.
• Our graduates will demonstrate the ability to design, develop, implement, improve and integrate systems with machines, people, materials, information, and energy for productivity, quality and work environment improvements.
• Our graduates will have effective written and oral communication skills.

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Our graduates will be able to work collaboratively in and lead teams and to understand their professional and ethical responsibilities.

Our graduates will participate in life-long learning and/or continue into graduate programs.

The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC-ABET). Graduates of this program are qualified to pursue registration as a Professional Engineer in Louisiana as well as most other states.

**Industrial Engineering Curriculum (BS)**

**Freshman Year**
- Natural Sciences (GER)
  - Chemistry 100*, 101*, 103* .................................................. 5
- Mathematics (GER)
  - Mathematics 240*, 241* .................................................. 6
  - Mathematics 242* .................................................. 3
  - Engineering 120*, 121*, 122* .................................................. 6
  - Physics 201* .................................................. 3
  - Industrial Engineering 101 .................................................. 3
  - Total Semester Hours .................................................. 32

**Sophomore Year**
- Social Sciences (GER) .................................................. 3
- Natural Sciences (GER)
  - Biological Sciences 101 .................................................. 3
  - Physics 202, or Chemistry 102 and 104 .................................................. 3
  - Engineering 220, 221, 222 .................................................. 9
  - Industrial Engineering 300, 301 .................................................. 4
  - Mechanical Engineering 215 .................................................. 1
  - Mechanical and Materials 201 .................................................. 2
  - Mathematics 243*, 244*, 245 .................................................. 9
  - Total Semester Hours .................................................. 34

**Junior Year**
- Humanities (GER)
  - English 303, 306 .................................................. 6
  - Industrial Engineering 400, 401, 402, 404, 405, 407, 409, 413, 414 .................................................. 27
  - Mechanical Engineering 321 .................................................. 2
  - Total Semester Hours .................................................. 35

**Senior Year**
- Arts (GER) .................................................. 3
- Social Sciences (GER) .................................................. 6
- Humanities (GER)
  - English 201 or 202 .................................................. 3
  - History .................................................. 3
  - Industrial Engineering 408, 410, 415, 421, 422, 423, 424 .................................................. 12
  - Directed Electives** .................................................. 6
  - Total Semester Hours .................................................. 33

**Total Semester Hours** .................................................. 134

(GER): General Education Requirement (pg. 14)
(IER): International Education Requirement (pg. 15)

*Grade of "C" or higher required.

**Directed electives chosen by student in consultation with faculty advisor and approved by the Industrial Engineering Program Chair.

**Requirements for a Major in Mathematics**

Each student majoring in mathematics is assigned an advisor from the Mathematics and Statistics program. The student is requested to meet with his/her advisor at least once during each quarter, at which time courses for the following quarter are decided upon.

Each mathematics major must complete the mathematics curriculum which follows with a grade of 'C' or higher in all mathematics and statistics courses, and must complete a minor. The minor subject must be chosen with the approval of the student's advisor. The minor requirements are listed under the department concerned.

Students who wish to obtain a more intensive degree program with a concentration in statistics-mathematics-engineering are not required to declare a minor if they earn 21 additional semester hours credit in mathematics, statistics, or engineering courses which are approved by the student’s advisor. Note: No course may count toward the required mathematics and statistics courses in the mathematics curriculum and also the statistics-mathematics-engineering concentration.

**Mathematics Curriculum (BS)**

**Freshman Year**
- Natural Sciences (GER)
  - Chemistry 100*, 101*, 102, 103*, 104 .................................................. 8
- Biology 130, 131 .................................................. 4
- English (GER) .................................................. 6
- Mathematics (GER)
  - Mathematics 240*, 241* .................................................. 6
  - Mathematics 242* .................................................. 3
  - Humanities (GER)
    - History 101, 102, 201, or 202 .................................................. 6
    - Total Semester Hours .................................................. 33

**Sophomore Year**
- Computer Literacy (GER)
  - Computer Science 120 .................................................. 3
- Social Sciences (GER) .................................................. 6
- Mathematics 243*, 244*, 245* .................................................. 9
  - Physics 201*, 202, 261*, 262 .................................................. 8
  - Humanities (GER)
    - English 201 or 202 .................................................. 3
  - Electives for Minor/Concentration* .................................................. 3
  - Total Semester Hours .................................................. 32

**Junior Year**
- Arts (GER) .................................................. 3
  - Foreign Language*** .................................................. 6
  - Mathematics 307*, 308* .................................................. 6
  - Mathematics or Statistics Elective** .................................................. 6
  - Electives for Minor/Concentration* .................................................. 9
  - Total Semester Hours .................................................. 30

**Senior Year**
- Humanities (GER)
  - English 303 .................................................. 3
  - Speech 110 .................................................. 3
  - Mathematics 319*, 482* .................................................. 6
  - Mathematics or Statistics Elective** .................................................. 6
  - Electives for Minor/Concentration* .................................................. 6
  - Science Elective .................................................. 3
  - Social Sciences (GER) .................................................. 3
  - Total Semester Hours .................................................. 30

(GER): General Education Requirement (pg. 14)
(IER): International Education Requirement (pg. 15)

*Grade of C or higher required.

**Mathematics electives above 300, Statistics electives above 200 (other than STAT 402). Grade of C or higher required.

***Can be replaced by 6 semester hours of courses which are approved by the student’s advisor and are at or above the 300 level in English, mathematics, or the student’s minor/concentration.

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**Mathematics and Statistics**

Mathematics and statistics courses are designed as follows: (1) to provide mathematics courses in the core curriculum; (2) to serve the requirements of students pursuing a curriculum in business, education, engineering, etc.; and (3) to provide students majoring in mathematics a thorough preparation for graduate mathematics or employment in industry or education. This program leads to the degree of Bachelor of Science.
Mechanical Engineering

Mechanical Engineering is the profession that deals with the design, development, testing, manufacturing, and maintenance of machines, systems, devices, and components for the betterment of society. Mechanical engineers are involved with such areas as aerospace engineering, automatic control systems, automotive engineering, chemicals, oil and gas, computer-aided design, manufacturing, energy conversion, engineering materials, environmental engineering, machine design, manufacturing processes, medicine, robotics, stress analysis, and thermal systems.

Mechanical engineers may deal with hardware as small as a microchip or as large as an aircraft carrier. They may work from the bottom of the ocean up to the weightless environment of interplanetary space. Of all the engineering disciplines, mechanical engineering is the most diversified and offers the largest selection of career paths. If you can see it or touch it, a mechanical engineer probably helped to create it.

The mechanical engineering curriculum at Louisiana Tech is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Mechanical Engineering Program Educational Objectives

• Our graduates will actively participate in lifelong learning activities that enhance their technical and professional skills.

• Our graduates will apply science technology, engineering, and mathematics principles to solve problems.

• Our graduates will demonstrate the ability to formulate problems, think creatively, synthesize information, and work individually and collaboratively in the design of effective problem solutions.

• Our graduates will demonstrate skill in the use of appropriate testing and evaluation techniques.

• Our graduates will demonstrate effective written and oral communication.

• Our graduates will demonstrate professional and ethical conduct.

The curriculum includes courses featuring a wide variety of both technical and non-technical topics. Instruction is delivered in a variety of modes designed to assure that upon graduation, each student has the ability to become a successful mechanical engineer.

Mechanical Engineering Curriculum (BS)

Freshman Year

Natural Sciences (GER)
Chemistry 100*, 101*, 103* ......................................................... 5
Physics 201* ............................................................................ 3
Biological Sciences 101................................................................. 3

English (GER) ........................................................................... 6

Mathematics (GER)
Mathematics 240*, 241* ............................................................ 6
Mathematics 242* ..................................................................... 3

Engineering 120*, 121*, 122* ..................................................... 3

Sophomore Year

Arts (GER) ................................................................................ 3

Natural Sciences (GER)
Physics 202* ............................................................................. 3

Social Sciences (GER) ................................................................. 3

Humanities (GER) ..................................................................... 3

Junior Year

Humanities (GER)
English 303, 304..................................................................... 3

Senior Year

Humanities (GER)

Notes:
1. Grade of "C" or higher required.
2. Directed Electives chosen by student in consultation with faculty advisor and approved by the Mechanical Engineering Program Chair.

Nanosystems Engineering

Nanotechnology may be defined as (1) research or technology development at the atomic, molecular or macromolecular levels, in the length scale of approximately 1-100 nanometers; (2) creating and using structures that have novel properties or functions because of their small size; or (3) controlling or manipulating matter on the atomic scale. Like biotechnology and information technology, it is a growth industry with the potential to greatly change the world in which we live. Nanosystems engineering can be considered the branch of engineering that deals with the development of materials, devices, or systems that have features smaller than 100 nanometers (1 nanometer is a billionth of a meter), especially with the manipulation of individual molecules. The purpose of the undergraduate program at Louisiana Tech University is to prepare graduates with the knowledge and skills in integrating basic nanoscale science with engineering fundamentals to design and develop useful technology. The program combines the fundamentals of the basic sciences (chemistry, physics, and biology), engineering principles, and the practical aspects of current technological tools of nanoscience to produce engineers capable of solving special kinds of problems. In order to provide depth and focus in possible applications of nanotechnology, students select an engineering concentration area as part of their curriculum from one of the following: biomedical engineering, chemical engineering, electrical engineering, mechanical engineering, or microsystems engineering.

Graduates with a nanosystems engineering degree will have many opportunities at the boundaries of traditional engineering due to the cross-disciplinary nature of their degree. We expect many of the graduates of this program may choose to pursue research-based careers by going on to graduate study or working at government laboratories and/or research centers. Graduates who wish to work in a commercial environment will find ever-expanding opportunities in the many new nanotechnology companies that are emerging.
National Science Foundation projects “the market for nanotechnology” to be over $1 trillion annually within the next 10-15 years and has estimated that two million workers will be needed to support nanotechnology industries by 2015. Whatever the environment, commercial or research, these employment opportunities will be very exciting and at the cutting edge of technology.

Nanosystems Engineering Program Educational Objectives
- Our graduates will possess a solid background in engineering fundamentals with an in-depth knowledge about nanotechnology and its applications to a variety of disciplines
- Our graduates will be employed in successful careers in the fields of engineering and/or science, or pursuing postgraduate study in related fields
- Our graduates will exhibit strong communication and interpersonal skills, as well as professional and ethical principles, and function effectively as members and leaders of multidisciplinary teams
- Our graduates will engage in life-long learning in order to remain technically current in their field and to know about contemporary issues in their field.

Nanosystems Engineering Curriculum (BS)
Freshman Year
Natural Sciences (GER)
Chemistry 100, 101, 102, 103, 104 ........................................ 8
Physics 201 .......................................................... 6
Mathematics (GER)
Mathematics 240, 241 .................................................. 6
Mathematics 242 .................................................. 3
Engineering 120, 121, 122 ........................................ 6

Sophomore Year
Humanities (GER)
English 201 or 202 .................................................. 3
History .......................................................... 3
Social Science (GER) .............................................. 3
Engineering 220, 221, 222 ........................................ 9
Mechanics and Materials 201 .................................... 2
Mathematics 243, 244, 245 .................................... 9
Nanosystems Engineering 201 .................................. 2
Physics 202 .................................................. 3

Junior Year
Natural Sciences (GER)
Biological Sciences 130, 131 ........................................ 4
Humanities (GER)
English 303 .......................................................... 3
Chemistry 250, 251, 253 ........................................ 5
Directed Electives* .............................................. 9
Electrical Engineering 334 .......................................... 3
Nanosystems Engineering 404, 406 ................................ 6
Nanosystems Engineering 301, 303, 490 .................. 5

Senior Year
Arts (GER) .......................................................... 3
Humanities (GER)
English 201 or 202 .............................................. 3
Social Sciences (GER) ............................................ 6
Directed Electives* .............................................. 9
Mechanical Engineering 382 ..................................... 2
Nanosystems Engineering 406, 407, 408, 410 ............ 6
Physics 412 .......................................................... 3

Total Semester Hours ............................................... 133

(GER): General Education Requirement (pg. 14)

Physics

This curriculum is designed to give a broad and fundamental knowledge of the principles of physics as well as an introduction to the techniques of physics research. Although the primary aim of the basic curriculum is to prepare the student for graduate work in physics, sufficient specialized courses are available to prepare the graduate for jobs in industry and in various government laboratories. A physics major is an excellent choice for the pre-medical student.

Requirements for a Major in Physics
Each student majoring in physics is required to follow the physics curriculum leading to the Bachelor of Science degree in physics.

For students interested in interdisciplinary fields involving physics, it is suggested that the physics curriculum be followed with all electives taken in the other field of interest. Some interdisciplinary fields are listed with the appropriate elective field in parentheses: astrophysics (astronomy), geophysics (geology), materials science (chemistry and engineering), biophysics (microbiology), mathematical physics (mathematics), solid state (chemistry and engineering).

Physics Curriculum (BS)
Freshman Year
Natural Sciences (GER)
Biological Sciences ............................................. 3
Chemistry 100, 101, 102 ........................................ 6
Integrated Science Labs
Chemistry 103, 104 .............................................. 2
English (GER) .................................................. 6
Humanities (GER) .............................................. 3
Mathematics (GER)
Mathematics 240, 241 ........................................ 6
Mathematics 242 .............................................. 3
Physics 102, 103 .............................................. 6

Sophomore Year
Arts (GER) .......................................................... 3
Humanities (GER) .............................................. 3
Social Sciences (GER) .......................................... 3
Chemistry 243, 244, 245 ..................................... 9
Physics 201, 202, 261, 262, 307, 320 ................. 12
Directed Electives* ........................................... 3

Junior Year
Humanities (GER) .............................................. 6
Social Sciences (GER) .......................................... 6

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Physics 416, 417, 418, 419, 424 ........................................... 11
Directed Electives* .......................................................... 9

Senior Year
Physics 304, 406, 407, 408, 409, 422, 423, 435 ......................... 20
Directed Electives* .......................................................... 9

Total Semester Hours ................................................................ 125

(GER): General Education Requirement (pg. 14)
(IER): International Education Requirement (pg. 15)
*Directed electives can be chosen from advanced Physics, Mathematics, Engineering, Computer Science, or Chemistry courses and must include at least one computer programming course such as Computer Science 120.

Requirements for a Minor in Physics
Students from other departments who elect a minor in physics should complete Physics 201, 202, 261, 262 and 14 semester hours of advanced courses 300-400 level.

Double Degree in Electrical Engineering and Physics
If your primary degree and major is Electrical Engineering, the following changes to the Physics curriculum will allow you to obtain a second degree with a major in Physics:
- Substitute ENGR 122 for PHYS 102 and 103 (i.e. project-based freshman design course);
- Add PHYS 261 and 262 sophomore labs not required in the ELEN curriculum;
- Substitute ENGR 222 for PHYS 307;
- Substitute ELEN 311 and 411, for PHYS 406 and 408;
- Substitute ELEN 223 for PHYS 407 and 409;
- Substitute ELEN courses for PHYS directed electives, as long as the electives include one computational course;
- Student can concurrently enroll in PHYS 435 with Senior Design. Senior design project can count toward PHYS 435 research requirement if turned in to completely satisfy course requirements of PHYS 435.

Total additional requirements are 25 semester credit hours (PHYS 304, 422, 423, 416, 417, 418, 419, 424, plus sophomore labs, plus 435 which can be concurrent with senior design) to add a Bachelor of Science degree with a major in Physics.