

# Chapter 13 - College of Engineering and Science

## Administration

### Dean

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James D. Nelson

Associate Dean, Graduate Studies

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Paul Hale

Biomedical Engineering

Paul Hale, Academic Director

Steven Jones, Program Chair

Chemical Engineering

Jenna Carpenter, Academic Director

Jim Palmer, Program Chair

Chemistry

Lee Sawyer, Academic Director

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Civil Engineering

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Mike O'Neal, Program Chair

Construction Engineering Technology

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Electrical Engineering

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Electrical Engineering Technology

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James Eads, Program Chair

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Eugene Callens, Jr., Academic Director

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Mechanical Engineering

Jenna Carpenter, Academic Director

Mel Corley, Program Chair

Physics

Lee Sawyer, Academic Director

Lee Sawyer, Program Chair

## 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>

## Vision

We will be the college of choice in this region for students in engineering and science.

## 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.

## 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.

## Undergraduate Degrees Offered

**Bachelor of Science** degrees are offered in biomedical engineering, chemical engineering, chemistry, civil engineering, computer science, construction engineering technology, electrical engineering, electrical engineering technology, industrial engineering, mathematics, mechanical engineering, nanosystems engineering, and physics.

## 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.

### 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 Bulletin 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 graduate 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, Refrigeration, 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
- 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.

- Butros Aukar Memorial Scholarship (Mechanical or Industrial Engineering)
- Associated General Contractors of America Scholarships (Construction Engineering Technology)
- David Michael Baker-Puffer Sweiven, Inc. Memorial Scholarships (Chemical Engineering)
- Ben T. Bogard Scholarship
- Frank Bogard Scholarship
- Robert V. Byrd Scholarship
- Ronald E. Cannon Endowed Scholarship
- Chemical Engineering Scholarships
- Chevron Scholarship (Mechanical Engineering)
- Civil Engineering Scholarships
- Loyd Ray Click Memorial Scholarship
- Edward C. Darling Endowed Memorial Scholarship (Civil Engineering)
- Desk and Derrick Club Scholarship (Geosciences)
- Dow Chemical Outstanding Junior Chemical Engineering Award (Chemical Engineering)
- Charlie Earl Scholarship (Mechanical Engineering)
- Eastman Minority Scholarships
- Eastman Scholars Award (Chemical Engineering)
- Engineering Alumni Scholarships
- Oliver Woodrow Fisher Memorial Scholarships (Construction Engineering Technology, Electrical or Mechanical Engineering)
- Ben F. Freasier Memorial Scholarship (Chemistry)
- Buford Echols Gatewood Scholarship (Mechanical Engineering)
- Thomas Harper Goodgame Scholarship
- J. R. Harrelson Memorial Engineering Scholarship
- Mendal Heller Memorial Scholarship (Mechanical Engineering)
- Mark David Hill Scholarship (Mechanical Engineering)
- David E. Hogan Endowed Scholarship
- John R. Horton Scholarship (Mechanical Engineering)
- Kaiser Aluminum Company Minority Scholarships (Chemical or Mechanical Engineering)

- Thomas E. Landrum Memorial Scholarship (Biomedical Engineering)
- Lazenby and Associates Scholarship (Civil Engineering)
- McDermott Incorporated Scholarships (Civil Engineering)
- Robert E. McFadden Endowed Scholarship
- R. A. McFarland Memorial Scholarship (Civil Engineering)
- Mechanical Engineering / Industrial Engineering Scholarship
- Mercedes Benz Scholarship (Mechanical Engineering)
- Pipes Foundation Scholarship
- H. E. Ruff Physics Scholarship
- Donald Ruffin Endowed Scholarship
- Maryanne Scogin Memorial Scholarship (Chemical or Mechanical Engineering)
- Roy T. Sessums Memorial Scholarships (Civil, Electrical, or Mechanical Engineering)
- Dr. and Mrs. P. K. Smith, Sr. Endowed Scholarship Fund (Mathematics)
- Harrell R. and Lenore S. Smith Scholarship
- Henry E. and Margaret A. Stamm Scholarship
- Harry Talbot Scholarship
- Jack Thigpen Scholarships (Mechanical Engineering)
- Cengiz Topakoglu Outstanding Biomedical Engineering Student Scholarship
- Bruce Tucker Memorial Scholarship (Construction Engineering Technology)
- Charles G. Tullis Scholarship
- Roy Wayne Vining-Dow Chemical Company Memorial Scholarship (Chemical Engineering)
- Calvin Watts Scholarship (Civil Engineering)
- Whetstone Scholarships (Mechanical Engineering)
- C. C. Whittelsey Scholarship
- Thomas J. and Elizabeth B. Wilson Scholarship
- Samuel McCain Young Memorial Scholarship (Civil Engineering)

## 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 premedical.

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 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

- To prepare graduates for employment as biomedical engineers, for graduate study in engineering or science or business, and for medical school. Career opportunities will include, but will not be limited to, clinical engineering, aerospace biomedical engineering, clinical practice as a physician, or any sector of the medical device industry. Our graduates will receive specific technical training in one of the following four areas: chemical engineering, electrical engineering, mechanical engineering, or pre-medical studies.
- To prepare graduates with skills that will enable them to be immediately productive in their chosen career. These tools include a knowledge of contemporary topics in medical technology, design experience, and professional experience appropriate to their post-graduation goal.
- To produce graduates who communicate effectively, who understand and undertake professional responsibilities, and who function effectively as members and leaders of multi-disciplinary teams.
- To produce graduates who believe that their undergraduate biomedical engineering education was a wise investment and who desire to 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

Natural Sciences (GER)	
Chemistry 100, 101, 102, 103, 104.....	8
English (GER).....	6
Mathematics (GER)	
Mathematics 240, 241, 242.....	9
Engineering 120, 121, 122.....	6
Physics 201.....	3
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	32

### Sophomore Year

Natural Sciences (GER)	
Biological Sciences 225, 227.....	6
Biomedical Engineering 202, 203, 230.....	4
Engineering 220, 221, 222.....	9
Mathematics 243, 244, 245.....	9
Physics 202.....	3
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	31

### Junior Year

Arts (GER).....	3
Humanities (GER)	
English 201 or 202, and 303.....	6
Speech 377.....	3
Biomedical Engineering 225, 301, 325, 401, 425.....	15
Biological Science 321.....	1
Directed Electives*.....	6
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	34

### Senior Year

Social Sciences (GER).....	9
Humanities (GER)	
History.....	3
Biomedical Engineering 400, 402, 403, 404, 430, 435.....	12
Directed Electives.....	7
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	31

Total Semester Hours.....128

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

(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.

The Biomedical Engineering Program requires a "C" or better in any course in the College of Engineering and Science prior to taking courses for which these are prerequisites.

\*Directed Electives chosen by students in consultation with faculty advisor from one of the following concentrations:

**Pre-Medical\*\*:** Chemistry 250, 251, 252, 253, 254; Physics 261, 262: One 3 hr. 300- or 400-level elective in one of the engineering programs.

**Chemical Engineering:** Chemical Engineering 213, 313, 353, 413, and one 3 hr. Chemical Engineering\*\*\* course at 300- or 400-level.

**Computer Information:** BIEN 310, CSC 120, 220; 3 hours taken from CSC, CIS, or HIM at 300- or 400-level, with approval of advisor, 1 hr. lab elective with approval of advisor.

**Electrical Engineering:** Electrical Engineering 232, 242, 311, 335, one 3 hr. Electrical Engineering\*\*\* course at the 300- or 400-level.

**Mechanical Engineering:** Mechanics and Materials 201, 211, 312, Mechanical Engineering 215, and two additional 3 hr. Mechanical Engineering \*\*\* courses at 300- or 400-level.

\*\*Students who wish to apply to medical school should be aware that they will need an additional course in Biological Sciences to meet medical school entrance requirements.

\*\*\*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 engineer is constantly concerned with improving these processes to best conserve resources (including capital) while preserving and protecting the environment.

The education of the chemical engineer covers advanced chemistry, physics, 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.

In order to meet current career interests and opportunities, elective courses are offered in nuclear applications and safety, industrial waste treatment, specialized computer techniques (including artificial intelligence), polymer engineering, pulp and paper processes, biochemical engineering, and fire and process safety.

The graduate in chemical engineering is 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. 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

- To prepare students for success and lifelong learning in their chemical engineering careers.
- To train students to develop skills in creative thinking, teamwork, problem solving, and chemical engineering design.
- To teach methods of problem analysis and solution techniques including math and computational skills appropriate to the chemical engineering profession.
- To train students in experimental methods and data analysis appropriate for chemical engineering applications.
- To engage students in the training and practice of technical oral and written communication.
- To permeate our educational program with an emphasis on the professional and ethical practice of chemical engineering both by example and explicit instruction.

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

Natural Sciences (GER)	
Chemistry 100, 101, 102, 103, 104.....	8
English (GER).....	6
Mathematics (GER)	
Mathematics 240, 241, 242.....	9
Engineering 120, 121, 122.....	6
Social Sciences (GER).....	3
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	32

### Sophomore Year

Engineering 220, 222.....	6
Chemical Engineering 202, 213, 254.....	8
Chemistry 250, 251, 252, 253.....	7
Mathematics 243, 244, 245.....	9

Physics 201 .....	3
	33
<b>Junior Year</b>	
<b>Humanities (GER)</b>	
English 201 or 202, and 303 .....	6
History .....	3
Social Sciences (GER) .....	3
Chemical Engineering 304, 313, 332, 353, 413 .....	13
Chemistry 311, 313 .....	4
Engineering 221 .....	3
	32
<b>Senior Year</b>	
<b>Arts (GER)</b> .....	
Natural Sciences (GER)	3
Biological Sciences 101 .....	3
Social Sciences (GER) .....	3
Chemical Engineering 402, 407, 430, 432, 434, 451.....	13
Directed Elective* .....	6
Humanities (GER) Speech 377 or English 463 .....	3
	31

Total Semester Hours .....128

(GER): General Education Requirement (pg. 14)  
(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.

The Chemical Engineering Program normally requires a “C” or better in any course in the College of Engineering and Science prior to taking courses for which these are prerequisites.

\*Directed Electives chosen by student in consultation with faculty advisor from courses offered in the College of Engineering and Sciences or the College of Applied and Natural Sciences. All electives must be approved by the Chemical Engineering Program Chair.

## Chemistry

The chemistry curriculum offers a broad background in chemistry and results in a degree which is approved by the American Chemical Society. *Students who complete the curriculum without substitutions are eligible for Certification to the ACS. A grade of C or better is required for all Chemistry courses.* Students entering this program generally plan to pursue a career as an industrial chemist or to attend graduate school with a specialty in one of the major areas of chemistry (analytical, inorganic, organic, or physical).

Students who are interested in **pre-medicine, pre-dentistry, or biochemistry** may make the following substitutions:

Physics 209, 210 for Physics 201, 202; Humanities elective for English 303; Biological Sciences 131, 132, 133, either 260 or 290, and 310 for Math 244, 245, and six semester hours of technical elective; Biological Science 315 or 422 for Chemistry 481; Chemistry 352, 353, 354, and one semester hour of science elective for Chemistry 409 or 420 or 424 (any two).

### Chemistry Curriculum (BS)

<b>Freshman Year</b>	
Chemistry 100, 101, 102, 103, 104 .....	8
English (GER) .....	6
<b>Mathematics (GER)</b>	
Mathematics 240, 241, 242 .....	9
Social Science (GER) .....	6
<b>Natural Sciences (GER)</b>	
Biological Sciences 130 .....	3
	32
<b>Sophomore Year</b>	
Chemistry 205 .....	4
Chemistry 250, 251, 252, 253, 254 .....	8
Chemistry 281 .....	3

Mathematics 243 .....	3
<b>Natural Sciences (GER)</b>	
Physics 201, 202, 261, 262 .....	8
Arts (GER) .....	3
	29
<b>Junior Year</b>	
Chemistry 311, 312, 313, 314 .....	8
Chemistry 351 .....	3
Chemistry 390 .....	1
<b>Humanities (GER)</b>	
English 201 or 202 and 303 .....	6
Mathematics 244, 245 .....	6
Technical Elective* .....	6
	30

<b>Senior Year</b>	
Chemistry 466, 481 .....	7
Chemistry 409 or 420 or 424** (any two) .....	6
Chemistry 498*** .....	3
Chemistry 490**** .....	1
<b>Humanities (GER)</b>	
History .....	3
Speech 110 or 377 .....	3
Social Sciences (GER) .....	3
Electives .....	4
	30

Total Semester Hours..... 121

(GER): General Education Requirement (pg. 14)  
(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.

\*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.

### 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.

## 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 develop the skills required to design civil engineering systems including the students' 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 train students thoroughly in methods of analysis, including the mathematical and computational skills appropriate for civil engineers to use when solving problems.
- To prepare students for life-long learning and successful careers as civil engineers.
- To teach students to use current experimental and data analysis techniques for civil engineering applications.
- To develop oral and written communication skills that allow students to present information effectively.
- To instill in our students an understanding of their professional and ethical responsibilities.

**Civil Engineering Curriculum (BS)**

Freshman Year	
Natural Sciences (GER)	
Chemistry 100*, 101* .....	4
Physics 201* .....	3
English (GER)	
English 101, 102 .....	6
Humanities (GER)	
History .....	3
Mathematics (GER)	
Mathematics 240*, 241*, 242* .....	9
Engineering 120*, 121*, 122* .....	6
	31
Sophomore Year	
Humanities (GER)	
English 303, 463 .....	6
Civil Engineering 202, 254 .....	4
Engineering 220*, 221, 222 .....	9
Mathematics 243*, 244*, 245 .....	9
Mechanics and Materials 201, 211* .....	4
Chemistry 102 .....	2
	34
Junior Year	
Arts (GER) .....	3
Natural Sciences (GER)	
Biological Sciences Elective .....	3
Social Sciences (GER) .....	3
Civil Engineering 310, 324, 332, 333, 340, 342, 343, 392 .....	20
Mechanics and Materials 312, 313* .....	5
	34
Senior Year	
Humanities (GER)	
English 201 or 202 .....	3
Social Sciences (GER) .....	6
Civil Engineering 314, 325, 411 or Structural Analysis	
Design Elective, 439, 492, 493, 494 .....	14

Directed Electives\*\* ..... 6

29

Total Semester Hours..... 128

(GER): General Education Requirement (pg. 14)  
 (IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.

\*Grade of "C" or higher required.  
 \*\*Directed Electives chosen by student in consultation with faculty advisor and approved by the Civil Engineering Program Chair.

**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.

**The Construction Engineering Technology Program at Louisiana Tech University will**

- Prepare graduates 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.
- Prepare graduates 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)	
Biological Sciences 101 .....	3
Physics 209, 261 .....	4

English (GER)	
English 101, 102 .....	6
Mathematics (GER)	
Mathematics 101, 112 .....	6
Business Law 255.....	3
Civil Engineering 254 .....	3
Civil Technology 100.....	3
	<hr/>
	28
Sophomore Year	
Humanities (GER)	
English 303.....	3
Natural Sciences (GER)	
Physics 210, 262 .....	4
Social Sciences (GER)	
Economics 215.....	3
Social Sciences courses.....	6
Micro Computer Applications Electives (GER).....	3
Mathematics 220 .....	3
Mechanics and Materials 206.....	3
Statistics 200.....	3
Accounting 201 .....	3
Civil Technology 255.....	2
Electrical Engineering Technology 274.....	1
	<hr/>
	34
Junior Year	
Humanities (GER)	
Speech .....	3
Management 310 plus an additional management course .....	6
Chemistry 120 .....	3
Civil Engineering 357, 438, 439 .....	7
Civil Technology 372, 373, 471, 473.....	12
Industrial Engineering 300.....	2
	<hr/>
	33
Senior Year	
Arts (GER).....	3
Humanities (GER)	
English 201 or 202 .....	3
History.....	3
Civil Engineering 436, 437 .....	6
Civil Technology 210, 424, 475, 492.....	9
Directed Electives* .....	6
	<hr/>
	30
Total Semester Hours.....	125

(GER): General Education Requirement (pg. 14)  
(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.  
\*Directed Electives chosen by student in consultation with faculty advisor and approved by the Construction Engineering Technology Program Chair.

## 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) 347-7700.

### Computer Science Curriculum (BS)

Freshman Year	
Natural Sciences (GER)	
Biological Sciences 130, 131 .....	4
English (GER).....	6
Humanities (GER)	
History .....	3
Mathematics (GER)	
Mathematics 240, 241, 242 .....	9
Computer Sciences 100, 120, 122 .....	9
	<hr/>
	31
Sophomore Year	
Arts (GER).....	3
Social Sciences (GER)	
Economics 215.....	3
Additional Social Science course .....	3
Natural Sciences (GER)	
Physics 201, 202, 261, 262.....	8
Mathematics 311 .....	3
Computer Science 220, 230, 251, 265, 269.....	12
	<hr/>
	32
Junior Year	
Humanities (GER)	
English 303 .....	3
English (Literature).....	3
Speech 377.....	3
Computer Science 310, 325, 330, 345, 364.....	15
Directed Elective*	
Mathematics/Science .....	3
Minor/Support Area** .....	6
	<hr/>
	33
Senior Year	
Social Sciences (GER).....	3
Computer Science 404 .....	3
Statistics 405 or Industrial Engineering 400.....	3
Directed Electives*	
Computer Science .....	9
Minor/Support Area** .....	12
	<hr/>
	30

Total Semester Hours..... 126  
(GER): General Education Requirement (pg. 14)  
(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.  
\*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.** To produce graduates who have a fundamental knowledge needed for the practice, or advanced study in, electrical engineering. Our graduates will receive an emphasis in at least two of the following four application areas: electric power, communications, controls, and microelectronics.
- **Breadth.** To produce graduates who 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.** To produce graduates who have strong communications skills, who understand and undertake professional ethical responsibilities, and who function effectively as members and leaders of multi-disciplinary teams.
- **Lifelong Learning.** To produce graduates who believe that their undergraduate electrical engineering education was a wise investment and who 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)

<b>Freshman Year</b>	
English (GER) .....	6
Mathematics (GER)	
Mathematics 240, 241, 242 .....	9
Natural Sciences(GER)	
Biological Science 101.....	3
Physics 201.....	3
Chemistry 100, 101, 103.....	5
Engineering 120, 121, 122 .....	6
<hr/>	32
<b>Sophomore Year</b>	
Humanities (GER)	
History .....	3
Natural Sciences (GER)	
Physics 202.....	3
Social Sciences (GER) .....	3
Engineering 220, 221, 222 .....	9
Mathematics 243, 244, 245 .....	9
Electrical Engineering 232, 311.....	4
<hr/>	31
<b>Junior Year</b>	
Humanities (GER)	
English 201 or 202 .....	3
Social Sciences (GER) .....	3

Industrial Engineering 300 .....	2
Electrical Engineering 223, 242, 321, 334, 335, 381, 411 .....	21
Mechanical Engineering 292 .....	3
<hr/>	32
<b>Senior Year</b>	
Arts (GER) .....	3
Humanities (GER)	
English 303, 463 .....	6
Social Sciences (GER).....	3
Electrical Engineering 406, 407, 408, 422 .....	7
Directed Electives* .....	6
Electrical Engineering Senior Option** .....	8
<hr/>	33

Total Semester Hours..... 128  
 (GER): General Education Requirement  
 (IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.  
 \*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 and the expansion in research and production have created demand for a new group of specialists known as engineering technologists. These technologists work with professional engineers and scientists or assume independent responsibility in the production, installation, operation, and maintenance of complex technical apparatus. The engineering technologist organizes the personnel, materials and equipment to design, construct, operate, and manage technical projects. The engineering technologist coordinates people, materials, and machines and must possess a variety of skills and practical and theoretical knowledge.

Electrical engineering technology includes the areas of computers, electrical power, communications, instrumentation, and control systems. The program combines course work and coordinated laboratory work so that graduates will be capable of performing a variety of technical tasks demanded of them. The course and laboratory work emphasize the latest in solid-state and integrated circuit and microprocessor technology. The graduate will also have received training in technical writing, public speaking, documentation, and general industrial practices which result in rapid advancement in a typical industrial organization. Thus, the program produces graduates qualified for a wide variety of commercial and industrial employment in the rapidly developing electrical-electronics technology field.

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

- To develop the technical skills needed for professional positions in electrical, electronic and related industries
- To educate the students in methods of analysis, including mathematical and computational methods, needed to solve problems as electrical engineering technologists
- To prepare students for lifelong learning and successful professional careers

- To develop oral and written communication skills that allow graduates to present information effectively
- To instill an understanding of professional, ethical and societal responsibilities

### Electrical Engineering Technology Curriculum (BS)

Freshman Year	
Arts (GER).....	3
Computer Literacy (GER)	
Computer Science 100 .....	3
English (GER) .....	6
Humanities (GER)	
History .....	3
Mathematics (GER)	
Mathematics 101, 112.....	6
Electrical Engineering Technology 100, 170, 171, 180, 181 .....	9
	<hr/>
	30
Sophomore Year	
Natural Sciences (GER)	
Physics 209, 210, 261, 262 .....	8
Mathematics 220, 223 .....	6
Electrical Engineering Technology 260, 261, 270, 271, 272, 273, 280, 284, 285 .....	19
	<hr/>
	33
Junior Year	
Humanities (GER)	
English (Literature) .....	3
English 303.....	3
Social Sciences (GER) .....	3
Chemistry 100, 101, 103 .....	5
Engineering Mechanics 206 .....	3
Electrical Engineering Technology 360, 361, 370, 371, 390 .....	11
Engineering Elective .....	3
	<hr/>
	31
Senior Year	
Natural Sciences (GER)	
Biological Sciences .....	3
Humanities (GER)	
Speech 377 .....	3
Social Sciences (GER) .....	6
Electrical Engineering Technology 460, 461, 465, 470, 471, 472 .....	11
Directed Electives*	
Electrical Engineering Technology .....	4
Additional Course.....	3
	<hr/>
	30
Total Semester Hours .....	124

(GER): General Education Requirements (pg. 28)  
 (IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.

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

## 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 a computerized enterprise resource planning system, 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, Nike, The Gap, Intel, Microsoft, Motorola, 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

- To produce graduates that can use the techniques, skills, and modern engineering tools for successful industrial engineering careers that support local/regional/national economy
- To produce graduates who can design and integrate systems with machines, people, materials, and information for productivity, quality and work environment improvements
- To produce graduates with effective written and oral communication skills
- To produce graduates who can work collaboratively in teams and understand their professional and ethical responsibilities
- To produce graduates capable to continue into graduate program and/or life-long learning

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
English (GER) .....	6
Mathematics (GER)	
Mathematics 240*, 241*, 242* .....	9
Engineering 120*, 121*, 122* .....	6
Physics 201* .....	3
Industrial Engineering 101.....	3
	<hr/>
	32
Sophomore Year	
Natural Sciences (GER)	
Biological Sciences 101.....	3
Physics 202 or Chem 102 and 104 .....	3
Engineering 220, 221, 222 .....	9
Industrial Engineering 300, 301 .....	4
Mechanical Engineering 215, 351 .....	3
Mechanics and Materials 201 .....	2
Mathematics 243*, 244*, 245.....	9
	<hr/>
	33

Junior Year	
Humanities (GER)	
English 303, 463 .....	6
History .....	3
Industrial Engineering 400, 401, 402, 404, 405, 407, 409 .....	21
Mechanical Engineering 321 .....	2
	32
Senior Year	
Arts (GER) .....	3
Social Sciences (GER) .....	9
Humanities (GER)	
English 201 or 202 .....	3
Industrial Engineering 408, 413, 411, 412 .....	10
Directed Electives** .....	6
	31
Total Semester Hours .....	128
(GER): General Education Requirement (pg. 14)	
(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.	
*Grade of "C" or higher required.	
**Directed electives chosen by student in consultation with faculty advisor and approved by the Industrial Engineering Program Chair.	

## 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.

### 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 240*, 241*, 242* .....	9
Humanities (GER)	
History 101, 102, 201, or 202 .....	6
	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
	32

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

Senior Year	
Humanities (GER)	
English 303 .....	3
Speech 110 .....	3
Mathematics 318*, 340* .....	6
Mathematics or Statistics Elective** .....	6
Electives for Minor/Concentration* .....	6
Science Elective .....	3
Social Sciences (GER) .....	3
	30

Total Semester Hours .....	125
(GER): General Education Requirement (pg. 14)	
(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.	
*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.	

### Requirements for a Minor in Mathematics

Students in other departments who wish to minor in mathematics are required to take Math 242, 243, 244, 245 and an additional 9 semester hours earned in statistics courses or mathematics courses numerically above Math 300 and Statistics 200 (other than STAT 402). No more than 6 semester hours may be in statistics. Note: The student must have met all prerequisite requirements before enrolling in any mathematics or statistics course.

## 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 400, 451, 465, 480, 481, 482, 486..... 10  
 Directed Electives\*\* ..... 6

**Mechanical Engineering Program Educational Objectives**

- To prepare students for lifelong learning and successful mechanical engineering careers
- To train students thoroughly in methods of analysis, including the mathematical and computational skills appropriate for mechanical engineers to use when solving problems
- To develop the skills pertinent to the engineering design process, including the students' abilities to formulate problems, to think creatively, to synthesize information, and to work collaboratively in teams
- To teach students to use current experimental and data analysis techniques for mechanical engineering applications
- To develop oral and written communication skills that allow students to present information effectively
- To instill in our students an understanding of their professional and ethical responsibilities

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\*, 242\* .....9  
 Engineering 120\*, 121\*, 122\* .....6  
 32

Sophomore Year  
 Natural Sciences (GER)  
 Chemistry or Physics .....3  
 Social Sciences (GER) .....3  
 Humanities (GER)  
 English 303 .....3  
 Engineering 220\*, 221\*, 222\* .....9  
 Mechanical Engineering 215, 292 .....4  
 Mechanics and Materials 201\*, 312\* .....4  
 Mathematics 243\*, 244\*, 245\* .....9  
 35

Junior Year  
 Humanities (GER)  
 English 463 .....3  
 Industrial Engineering 300 .....2  
 Mechanical Engineering 321, 334, 351  
 353, 361, 363, 371, 382 .....20  
 Mechanics and Materials 211\*, 313\* .....5  
 30

Senior Year  
 Humanities (GER)  
 History .....3  
 Arts (GER) .....3  
 Social Sciences (GER) .....6  
 Humanities (GER)  
 English 201 or 202 .....3

Total Semester Hours..... 128

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

\*Grade of "C" or higher required.

\*\*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 development 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. The 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**

- **Career Preparation:** To prepare graduates for employment as engineers, for graduate study in engineering or science or business. Our graduates will understand the application of engineering principles to nanosystems, and will receive specific technical training in one of the following five areas: *biomedical engineering, chemical engineering, electrical engineering, mechanical engineering, or microsystems engineering.*
- **Skills:** To prepare graduates with skills that will enable them to be immediately productive in their chosen career. These tools include knowledge of contemporary topics in

nanotechnology, understanding of modern engineering tools, design experience, and professional experience appropriate to their post-graduation goal.

- **Professionalism:** To produce graduates who communicate effectively, who understand and undertake professional responsibilities, and who function effectively as members and leaders of multi-disciplinary teams.
- **Life-Long Learning:** To produce graduates who believe that their undergraduate engineering education was a wise investment and who desire to continue to develop their knowledge and skills throughout their careers.

### Nanosystems Engineering Curriculum (BS)

Freshman Year

Natural Sciences (GER)

Chemistry 100, 101, 102, 103, 104.....	8
Physics 201.....	3

English (GER)

English 100 or 101, 102.....	6
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Mathematics (GER)

Mathematics 240, 241, 242.....	9
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Engineering 120, 121, 122.....	6
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32

Sophomore Year

Humanities (GER)

English 303.....	3
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Chemistry 250, 251, 253.....	5
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Engineering 220, 221, 222.....	9
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Mechanics and Materials 201.....	2
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Mathematics 243, 244, 245.....	9
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Nanosystems Engineering 201.....	2
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Physics 202.....	3
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33

Junior Year

Natural Sciences (GER)

Biological Sciences 130.....	3
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Humanities (GER)

English 463.....	3
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Social Science (GER).....	6
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Directed Electives*.....	6
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Electrical Engineering 334.....	3
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Mechanical Engineering 382.....	2
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Microsystems Engineering 404, 406.....	6
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Nanosystems Engineering 301.....	1
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Physics 412.....	3
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33

Senior Year

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

English 201 or 202.....	3
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History.....	3
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Social Sciences (GER).....	3
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Directed Electives*.....	12
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Nanosystems Engineering 401, 402, 403.....	5
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29

Total Semester Hours.....	127
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(GER): General Education Requirement (pg. 14)

(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.

The Nanosystems Engineering Program requires a "C" or better in any course in the College of Engineering and Science prior to taking courses for which these are prerequisites.

\*Directed Electives are chosen by students in consultation with faculty advisor from one of the following concentrations:

**Biomedical Engineering:** Biomedical Engineering 230, 225, 325, 403 and 6 hours of 300- or 400-level electives\*\* in engineering or science.

**Chemical Engineering:** Chemical Engineering 202, 304, 332, 402, and 6 hours of 300- or 400-level electives\*\* in engineering or science.

**Electrical Engineering:** Electrical Engineering 223, 321, 335, 471, and 6 hours of 300- or 400-level electives\*\* in engineering or science.

**Mechanical Engineering:** Mechanical Engineering 292, 351; Mechanics and Materials 211, 312, 313 and 6 hours of 300- or 400-level electives\*\* in engineering or science.

**Microsystems Engineering:** Microsystems Engineering 401, 402, 403, 407, and 6 hours of 300- or 400-level electives\*\* in engineering or science.

\*\*All electives must be approved by faculty advisor or Nanosystems Engineering Program Chair.

## 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 130.....	3
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English (GER).....	6
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Humanities (GER).....	3
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Natural Sciences (GER)

Chemistry 100, 101, 102.....	6
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Integrated Science Labs

Biological Sciences 131, Chemistry 103, 104.....	3
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Mathematics (GER)

Mathematics 240, 241, 242.....	9
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Physics 102, 103.....	2
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32

Sophomore Year

Arts (GER).....	3
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Humanities (GER).....	3
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Social Sciences (GER).....	3
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Mathematics 243, 244, 245.....	9
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Physics 201, 202, 261, 262, 307.....	11
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Directed Electives*.....	3
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32

Junior Year

Humanities (GER).....	6
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Social Sciences (GER).....	6
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Mathematics Elective.....	3
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Physics 416, 417, 418, 419, 424.....	11
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Directed Electives*.....	6
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32

Senior Year	
Physics 304, 406, 407, 408, 409, 422, 423, 435 .....	20
Math Elective .....	3
Directed Electives* .....	6
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	29

Total Semester Hours.....125

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

(IER): International Education Requirement (pg. 15). Effective with the freshman class of 2005, each student must complete a minimum of one 3-hour course which has been identified as satisfying the international education requirement. Course choices are on pg. 15 of this Catalog.

\*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.

### **Laser/Optics Concentration**

A laser/optics concentration is designed to provide students with more specific studies in the area of lasers and optics. Technical electives in the third and fourth years of study are to be taken from courses such as physical optics, geometrical optics, lasers, modern optics, and Fourier optics. Laboratory courses emphasize hands-on learning through experimentation with modern optical equipment.