

Chapter 20 - Graduate Programs

College of Engineering and Science

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Mathematics and Statistics

E. Eugene Callens, Jr., Academic Director

Bernd Schröder, Program Chair

Mechanical Engineering

Jenna P. Carpenter, Academic Director

Bill Jordan, Program Chair

Physics

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Address

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

College of Engineering and Science

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Ruston, LA 71272

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and by visiting the College's web site at

<http://www.latech.edu/coes/>.

Graduate Degrees Offered

Master of Science (MS)

Mathematics and Statistics

Physics

Master of Science Computer Science (MSCS)

Master of Science Engineering (MSE)

Engineering (with concentrations in Biomedical, Chemical,

Civil, Electrical, Industrial, or Mechanical Engineering)

Master of Science Engineering & Technology Management (MSETM)

Master of Science Microsystems Engineering (Professional Track) (MSMSE)

Master of Science Molecular Science and Nanotechnology (MSMSNT)

Doctoral of Philosophy (PhD)

Biomedical Engineering

Computational Analysis and Modeling

Engineering

Requirements for Admission

Students seeking admission to a graduate program are required to have an earned bachelor's degree from an accredited college or university and must satisfy the admission requirements outlined under the "Graduate School" section of this Catalog. An official Graduate Record Examination (GRE) score is required for admission. This requirement may be waived for exceptionally qualified students. Academic programs within the College may have additional requirements, and these are published on the respective program web pages.

Financial Assistance

Financial assistance is available to qualified graduate students in the form of a limited number of graduate assistantships. Out-of-state tuition is usually waived for students who are awarded assistantships. A limited number of fellowships are available to students in the doctoral programs; these fellowships may also include a full tuition waiver.

For a student on a full-time (20 hours of work per week) assistantship, the minimum required load is 6 semester hours of graduate credit per quarter, and the maximum load allowed is 9 credit hours (these hours must be listed on the student's Plan of Study).

Theses and Dissertations

A required element of the Master of Science degree (thesis plan) to be described below is a thesis describing the student's research which is approved by the student's Advisory Committee, the Director of Graduate Studies, and the Dean of Graduate School. See the subsection on "The Thesis" in Chapter 15 of this Catalog for more details.

A required element of the doctoral programs to be described below is a dissertation describing the student's research, approved by the student's Advisory Committee, the Director of Graduate Studies, and the Dean of Graduate School. See the subsection on "Research and Dissertation" in Chapter 15 of this Catalog for more details.

Submission of Thesis/Dissertation Proposals

Proposals describing the work to be done for a thesis (MS) or dissertation (Ph.D.) are required. Thesis proposals (MS) are due during the student's second quarter of enrollment in the given degree program and dissertation proposals (PhD) are due during the student's fourth quarter of enrollment.

Change of Thesis or Dissertation Advisor

After a thesis/dissertation proposal has been submitted, the student may appeal for a change of advisor only under extreme circumstances. A written request for a change of advisor, including a description of the circumstances leading to the request and an explanation of why the student believes this is the only course of action remaining to be explored, must be

submitted to the Director of Graduate Studies. The final decision on the matter rests with the Dean of Graduate School. If the appointment of a new advisor is appropriate, a new thesis/dissertation topic may also have to be adopted.

Presentation of Thesis/Dissertation Research

An oral presentation of each student's research for thesis or dissertation is required, which will be open to all faculty and students. This requirement may be waived only in cases where disclosure of classified or proprietary information is unavoidable.

The Master of Science Degree Programs

General Requirements

Thesis Plan. The student will be required to complete a minimum of 30 semester credit hours (SCH) for graduate credit, of which a maximum of 6 hours will be earned in Research and Thesis. A minimum of 21 hours out of the 30 must be earned in courses open only to graduate students.

Non-Thesis Plan. A minimum of 36 SCH of graduate course work will be required, of which a maximum of 3 hours will be earned in Practicum. In the Practicum track, a minimum of 18 hours out of the 36 must be earned in courses open only to graduate students. The practicum shall involve an advanced topic approved by the student's Advisory Committee. In the coursework-only track, a minimum of 21 hours out of 36 must be earned in courses open only to graduate students.

Professional track degrees. These require a minimum of 33 graduate hours of courses, as described under the specific degree programs that offer this option.

These minimum requirements apply to all Master of Science degrees offered by the College of Engineering & Science. Specific degree programs may have additional requirements, as stated below.

The exercise of these options and the choice of courses will be proposed as a Plan of Study by the student and his/her Advisory Committee subject to review and approval (in order) by the major program chair, the Director of Graduate Studies, the Dean of the College of Engineering and Science, and the Dean of the Graduate School. The transfer of graduate credit from another graduate institution, graduate credit by examination, graduate credit as a graduating senior, or credit earned other than as a regularly enrolled graduate student in the College of Engineering and Science at Louisiana Tech must meet all University standards and is also subject to approval as part of the Plan of Study. Courses taken for graduate credit while the student is registered in the non-degree unclassified category will not be applied to a degree program without approval by the student's Advisory Committee and the Director of Graduate Studies.

A minimum Grade Point Average (GPA) of 3.00 is required in order to maintain "good academic standing" while in graduate school. Additional information is given in Chapter 15 of the Graduate School section of this Catalog.

Individual Requirements

Individual programs may, upon approval by the Dean of the College of Engineering and Science, impose additional requirements, such as written comprehensive exams.

Master of Science in Computer Science (MSCS)

The computer science program offers in-depth study and research in systems, theory, algorithms, and applied aspects of computer science. Completion of the master's degree will prepare a student for employment in government and industry and for doctoral programs in computer science.

Students entering the master's program in computer science will be expected to have a background equivalent to the bachelor's program in computer science at Louisiana Tech. Any core computer science courses in the BS program at Tech will be considered deficiency courses for master's students if they have not taken equivalent courses in their bachelor's programs. A student may challenge a deficiency course by successfully completing a comprehensive examination and, as appropriate, programming projects.

In computer science, a *thesis student* must complete 30 semester hours, including 3 core courses, 2 two-course sequences, a 500-level elective, and 6 semester hours of thesis. *Non-thesis students* must complete 36 semester hours, including 3 core courses, 3 two-course sequences, two 500-level electives, and 3 semester hours of practicum.

Master of Science in Engineering (MSE)

For students desiring to pursue a concentration in biomedical, chemical, civil, electrical, industrial, or mechanical engineering, a baccalaureate degree with a major in the same engineering discipline from an Accreditation Board for Engineering and Technology (ABET) accredited program is the best preparation. Students who do not possess this background are not discouraged from applying, but, in general, must expect some non-graduate credit background work in order to pursue their graduate program effectively and successfully. As the master's degree is generally accepted as a higher level of intellectual accomplishment than the baccalaureate degree, the student must expect his/her program to be structured accordingly. The student will be required to remove any deficiencies in mathematics, science, engineering, and communication. In particular, students with a baccalaureate in mathematics or the physical sciences should expect remedial courses stressing engineering analysis, synthesis, and design.

Master of Science in Engineering and Technology Management (MSETM)

The engineering management program is a practice-oriented professional track master's degree and focuses on managing technology and engineering functions. The program includes 33 SCH of coursework.

Master of Science - Mathematics and Statistics (MS)

The Mathematics and Statistics Program offers in-depth studies in algebra, analysis, differential equations, probability and statistics, applied mathematics, and computational mathematics.

In addition to the University requirements for admission, the applicant must have a bachelor's degree with the equivalent of an undergraduate major in mathematics of not less than 30 semester hours. By the end of the first quarter of enrollment, the student is to choose one area of interest. An Advisory Committee that reflects the student's major area of interest will then be appointed.

Each candidate for the MS degree will be required to have credit in the following Louisiana Tech University courses or their equivalent at another college or university: Math 405, 414, 480, and Statistics 405.

In addition, each candidate for the MS degree must satisfy the conditions in one of the following two plans:

Plan A: Thirty semester hours of graduate credit must be earned. A minimum of 24 semester hours, 6 of which are to be for an acceptable thesis, must be earned in the Mathematics and Statistics Program. The remaining 6 semester hours of graduate courses may be chosen from a related field if approved by the Advisory Committee.

Plan B: Thirty-six semester hours of graduate credit must be earned. A minimum of 27 semester hours, 3 of which are to be for a practicum, must be in the Mathematics and Statistics Program. Up to 9 graduate hours may be chosen from a related field if approved by the Advisory Committee. The Practicum will be a study in some area of mathematics or statistics not normally covered in a regularly scheduled course, or it will be a solution to a problem that requires mathematics or statistics at the graduate level.

Master of Science in Microsystems Engineering (MSMSE)

The Microsystems Engineering professional track MS degree offers students an opportunity to learn microsystems and nanosystems engineering principles and obtain hands-on laboratory experience in microfabrication and microelectronics with state-of-the-art equipment. The degree requires 33 SCH of coursework and entails no thesis or research-based practicum. It is possible to complete this degree within one calendar year.

Master of Science in Molecular Sciences and Nanotechnology (MSMSNT)

The College of Engineering and Science offers an interdisciplinary MS degree in Molecular Sciences and Nanotechnology (MSNT) in collaboration with the College of Applied and Natural Sciences. Please see Chapter 16 of this Catalog for more information.

Master of Science - Physics (MS)

The physics program offers instruction and opportunities for research in the areas of solid state physics, high energy physics, computational physics, and nuclear physics. The completion of the master's program will prepare the student for further work toward the doctorate degree as well as for employment in government and industry.

In addition to the admission requirements of the Graduate School, the applicant must have a bachelor's degree with the equivalent of an undergraduate major in physics.

The minimum residence requirement for the master's degree with a major in physics is 3 quarters.

Each candidate for the MS degree must satisfy the conditions in one of the following two plans:

Plan A: The candidate for the master's degree must complete a minimum of 24 semester hours of graduate credit in physics plus Math 502 and Math 544, or other courses acceptable to his/her thesis committee. Six of the required 30 hours must be earned by taking Physics 551, Research and Thesis, and by completing an acceptable master's thesis.

During the first quarter of residence, the student must take a preliminary oral examination over undergraduate physics. In addition, the student must pass an oral examination on his/her thesis.

Plan B: The candidate must earn 36 hours in this non-thesis plan as approved by his/her Advisory Committee. At least 27 hours must be in 500-level courses in the physics program and 9 hours in mathematics or other courses acceptable to the student's Advisory Committee. During

the first quarter of residence, the student must take a preliminary oral examination over undergraduate physics. In addition, the student must pass an oral examination over his/her graduate work.

The Doctoral Degree Programs

The Louisiana Tech University College of Engineering & Science offers four doctoral programs. A Doctor of Philosophy degree is offered in Biomedical Engineering. An interdisciplinary Doctor of Philosophy degree in Engineering is offered in which the research is aligned with two Centers of Excellence. The College is also the major participant in the Interdisciplinary Doctor of Philosophy degree in Computational Analysis and Modeling (CAM) and is a joint partner in the combined MD/PhD (Biomedical Engineering) Program with Louisiana State University Medical Center – Shreveport.

Admission to the Doctoral Programs

Prior to entering the Doctor of Philosophy program in Engineering, a student must have a degree in an acceptable engineering or related curriculum.

For students desiring to major in biomedical engineering, a baccalaureate degree with a major in an engineering discipline from an ABET-accredited institution is the best preparation. Students who do not possess this background are not discouraged from applying but, in general, must expect some amount of undergraduate remedial courses stressing engineering analysis and synthesis to prepare them for pursuit of their graduate program effectively and successfully.

Students entering the Doctor of Philosophy in Engineering program or the Doctor of Philosophy program in Biomedical Engineering will be required to remove any deficiencies in mathematics, science, engineering, and communication.

An official GRE score is required for admission. This requirement may be waived for exceptionally qualified students. Each doctoral program has its own specific admission criteria. These are published on the web pages describing these programs.

The Doctor of Philosophy Degree Program in Biomedical Engineering (PhD)

The program is designed such that students will

- Demonstrate command of advanced engineering principles and their applications in medicine and biology;
- Understand the research process and demonstrate capability to conduct independent research;
- Disseminate their research findings to the broader scientific community;
- Develop a sense of professional ethics, responsibility, and service.

The program is a balance of intensive and extensive formal course work as a foundation, a sequence of examinations, and the production of a dissertation.

The PhD requires a minimum of 66 hours total, including research and dissertation, out of which a minimum of 48 hours should be earned in graduate courses. The coursework will include a core sequence of 18 hours in biomedical engineering and statistics, 3 additional hours in mathematics or statistics, and 15 hours in engineering disciplines. The remaining courses can be taken from biology, chemistry, mathematics, physics, and computer science, and may also include 6 hours of advanced courses in any discipline. Individual interests, needs, and the demands of the engineering profession, both current and anticipated, will guide course selection, with flexibility as the

keynote. Choice of acceptable graduate-level courses, including choice and composition of major and minor areas, will be established by the Advisory Committee in concert with the doctoral student, subject to approval as part of the Plan of Study. In addition to coursework, a minimum of 15 hours must be earned in BIEN 651, Research and Dissertation.

All students are required to enroll in the doctoral seminar course BIEN 610 each Fall quarter.

No foreign language is required for the PhD in Biomedical Engineering. English is the language of communication, and both oral and written skills are important.

The schedule of examinations consists of a qualifying examination after completion of core BIEN courses, an oral defense of the research proposal, and a defense of the dissertation. At least 60% of all those serving on the Advisory Committee must recommend that the student has satisfactorily passed any of the examinations. None of the examinations may be taken more than 3 times. Advisory Committees must have at least 3 biomedical engineering faculty members, including one who serves as the chairperson, regardless of the student's project topic and research supervisor.

The Doctor of Philosophy Degree Program in Computational Analysis and Modeling (PhD)

The College of Engineering and Science is the major participant in the interdisciplinary PhD in Computational Analysis and Modeling (CAM). See Chapter 16 of this Catalog for the full program description.

The Doctor of Philosophy Degree Program in Engineering (PhD)

The PhD in Engineering is an interdisciplinary degree with a strong research emphasis. The program prepares candidates for both academic and industry careers. Interdisciplinary graduate degrees have been advocated in recent reports by the National Academy of Engineering and the National Research Council, among others. This degree focuses on the technical strengths and research focal areas of the Institute for Micromanufacturing and the Trenchless Technology Center. *Students must choose research projects for their dissertation in thematic areas closely aligned with these Centers.*

Students in this program are expected to complete 66 graduate hours (including dissertation) beyond the baccalaureate degree. These hours will be approved as part of a comprehensive plan of study by the student's PhD Advisory Committee. Eighteen credit hours of core courses are required of all students in the program. These courses are intended to provide a strong fundamental set of research capabilities and to help individual students bridge the gap to other disciplines preparatory not only to dissertation work but also to their future career. The remaining courses are chosen in relation to the thematic areas, which currently are microelectronics, micromanufacturing, and materials and construction systems.

All students are required to enroll in the doctoral seminar course ENGR 610 each Fall quarter.

A student must register for a minimum of 18 credit hours in Research and Dissertation (ENGR 651). The topic will be selected in accordance with and approved by the student's Advisory Committee and the Director of Graduate Studies.

The schedule of exams consists of a comprehensive examination at or near the completion of formal coursework and a defense of the dissertation. The comprehensive examination consists of written and oral parts organized by the Ph.D. in Engineering Steering Committee. At least 60% of the faculty

serving on the Advisory Committee must recommend that the student has satisfactorily passed any of the examinations. None of the examinations may be taken more than three times.

The minimum residence requirement for the doctoral degree is 8 quarters beyond the bachelor's degree. The student is required to spend at least 3 quarters beyond the first year of graduate study in continuous residence. The transfer of course work from a recognized graduate school carries with it the transfer of residence credit, but a minimum of 24 semester hours of graduate credit beyond the first year of graduate study must be earned in residence at Louisiana Tech University. PhD students are required to complete the doctoral program in its entirety within 3 years after successful completion of the comprehensive examination.

The Combined MD/PhD Degree Program

The combined MD/PhD program is designed to promote the education of physician-scientists by allowing qualified students to progress concurrently through the School of Medicine at Louisiana State University-Shreveport to earn an MD and the Graduate School at Louisiana Tech University to earn a PhD in Biomedical Engineering, in a more efficient and productive manner than could be otherwise accomplished. The program is administrative in nature and does not alter the degree requirements, curricula, courses, or admission requirements at either school.

Application

Students who have not matriculated in either school shall make separate application to the School of Medicine at Louisiana State University-Shreveport and the Graduate School at Louisiana Tech University, and to the MD/PhD Program through the MD/PhD Program Supervisory Committee. Students must be accepted by each of the schools and by the MD/PhD Program Supervisory Committee.

Students will meet the admission and program requirements of each school and will maintain the level of good standing requirement by each school to continue in the program, including GPA > 3.0 in all coursework and no failing grades.

Special circumstances and exceptions may be considered by the MD/PhD Supervisory Committee. Exceptions may be implemented if approved by the MD/PhD Supervisory Committee and the Deans of the respective schools.