Physics BS, Engineering Physics Emphasis

Physicists strive to understand the fundamental nature of the forces and particles, and the resultant states of matter, that make up the physical world. Our Engineering Physics degree provides a grounding in this approach with an added emphasis on practical applications. The Department of Physics and Astronomy at UMSL provides a broad-based education in the fundamental concepts of engineering physics, with the experimental and theoretical skills essential to practicing scientists. Undergraduate education in physics prepares students for both graduate study and a wide variety of professional careers in fields such applied physics and engineering.

General Education Requirements

Majors must complete the university and college general education requirements (http://bulletin.umsl.edu/generaleducationrequirements/). Any of the following courses may be used to satisfy the physical science requirement:

- ASTR 1001  Cosmic Evolution Introductory Astronomy  3
- ASTR 1011  Planets and Life in the Universe  3
- ASTR 1012  The Violent Universe and the New Astronomy  3
- ASTR 1050  Introduction to Astronomy I (MOTR ASTR 100)  3
- ASTR 1051  Introduction to Astronomy II  3
- ATM SCI 1001  Elementary Meteorology  3
- GEOL 1001  General Geology  3
- GEOL 1002  Historical Geology  3
- PHYSICS 1001  How Things Work (MOTR PHYS 100)  3
- PHYSICS 1011  Basic Physics I  3
- PHYSICS 1011L  Basic Physics I Laboratory  1
- PHYSICS 1012  Basic Physics II  3
- PHYSICS 1012L  Basic Physics II Laboratory  1
- PHYSICS 2111  Physics: Mechanics and Heat  4
- PHYSICS 2112  Physics: Electricity, Magnetism, and Optics  4

Declaring the Physics Major

Students seeking to major in physics are first designated as ‘pre-physicists majors’ until they have completed both PHYSICS 2111 and PHYSICS 2112 or equivalent courses. Upon successful completion of PHYSICS 2111 and PHYSICS 2112 with grades of C- or better, students will be allowed to declare physics as their major. Each of these courses must be completed successfully within two attempts.

Degree Requirements

All physics majors in all programs must complete the physics core curriculum with the exception that majors pursuing the Physics Education option are not required to take PHYSICS 1099 and CMP SCI 1250. In addition to the core courses, each individual program has its own specific requirements. Required Physics, Mathematics, Chemistry, Biology, and Computer Science courses for a major or minor in physics may not be taken on a satisfactory/unsatisfactory grading basis.

Core Curriculum

The following physics courses are required:

- PHYSICS 1099  Windows on Physics  23
- PHYSICS 2111  Physics: Mechanics and Heat  
- PHYSICS 2111L  Mechanics and Heat Laboratory  
- PHYSICS 2112  Physics: Electricity, Magnetism, and Optics  
- PHYSICS 2112L  Electricity, Magnetism, and Optics Laboratory  
- PHYSICS 3200  Mathematical Methods of Theoretical Physics  
- PHYSICS 3221  Mechanics  
- PHYSICS 3223  Electricity and Magnetism  
- PHYSICS 3231  Introduction to Modern Physics I  

Also required are:

- MATH 1800  Analytic Geometry and Calculus I  26
- MATH 1900  Analytic Geometry and Calculus II  
- MATH 2000  Analytic Geometry and Calculus III  
- MATH 2020  Introduction to Differential Equations  
- CHEM 1011  Introductory Chemistry I (MOTR CHEM 101L)  
- CMP SCI 1250  Introduction to Computing  

Total Hours  49

Note: Students are urged to begin the calculus sequence [MATH 1800, Analytic Geometry and Calculus I] as soon as possible to avoid delays in graduation.

Students with experience in digital computer programming may be excused from CMP SCI 1250.

Engineering Physics Option

Students interested in careers in the research and development field of industry should consider this option. This program exposes the student to a basic engineering curriculum, as well as to areas of physics with industrial applications, such as electronics, modern optics, and linear analysis. At least 49 hours, but no more than 51, are required. In addition to the core curriculum, the following courses are required:

Joint Engineering

- ENGR 2310  Statics  3
- ENGR 2320  Dynamics  3

Joint Electrical Engineering

- J E ENGR 2300  Introduction to Electrical Networks  3

Physics

- PHYSICS 4310  Modern Electronics  3
- PHYSICS 4311  Advanced Physics Laboratory I  3
- PHYSICS 4323  Modern Optics  3
- PHYSICS 4331  Intro to Quantum Mechanics  3
- PHYSICS 4341  Thermal and Statistical Physics  3

Mathematics

- MATH 1320  Introduction to Probability and Statistics  3
MATH 2450  Elementary Linear Algebra  3
Select one elective in mathematics at or above the 3000 level, or  3
in a computer science at or above the 2000 level.

Total Hours  33

Program Purpose
The purpose of the B.S. in Physics (Engineering Physics Emphasis)  
program at the University of Missouri at St. Louis is to prepare students  
for a professional career in engineering, physics, or applied physics, or for  
grauate studies in engineering physics or a related field.

Learning Outcomes

• Students will be able to demonstrate an understanding of basic  
  physics concepts including classical mechanics, electricity and  
  magnetism, thermal and statistical physics, quantum mechanics,  
  and modern electronics
• Students will be able to design and perform basic physics  
  experiments, assess the significance of their results, and  
  interpret the observed outcome
• Students will be able to demonstrate an understanding of statics,  
  dynamics, and electrical networks
• Students will be skilled in problem-solving, critical thinking and  
  analytical reasoning as applied to scientific problems
• Students will be proficient in both written and oral communication  
  of the results of scientific work
• Students will have the skills necessary for conducting original  
  scientific research as part of a problem-solving team
• Students will have the skills necessary to identify possible errors  
  in scientific data, and to assess the significance of observed  
  results

Sample Four Year Plan

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