

Department of Physics & Engineering Physics

Bachelor of Science PHYSICS

Physics is the fundamental science that reduces our knowledge of the world about us to a more orderly and satisfying form. It is also successfully applied to solving problems of practical importance to mankind. Modern technology depends heavily upon physics, and technological progress follows advances in physics and the other basic sciences. The interest of physicists extends from the vast world of stars and galaxies to the minute world of atoms and elementary particles. Physicists did the pioneering work in the discovery and development of electrical and nuclear power, communication systems, solid state devices and integrated circuits, computers, jet propulsion, and interplanetary space navigation. They continue to search for more discoveries that will benefit society.

Physics students at Southeast Missouri State University are encouraged to supplement their normal classroom experience by participating in undergraduate research, independent studies, and seminars. These activities provide the opportunity for greater student-teacher interaction and the involvement in scholarly endeavors that augment the student's professional growth. Students are also strongly encouraged to join the local chapter of the Society of Physics Students and participate in their regular meetings and field trips.

Many physics graduates choose to continue their studies in graduate school and earn an advanced degree, either a Master of Science or Doctor of Philosophy. With these degrees, they are qualified to teach and become involved with research at the college or university level, or to choose advanced positions in industry. Other graduates prefer to seek employment immediately upon receiving their degree. Opportunities are available in private industries and with state and federal government agencies in such areas as basic research, design, development, management and sales. With a choice of proper electives in the degree program, opportunities are available in such areas as biophysics, geophysics, health physics, atmospheric science and environmental science.

FACULTY ADVISORS:

Dr. Michael L. Cobb

Dr. Jai N. Dahiya

CAREER OPPORTUNITIES:

Research Physicist; Biophysicist, Geophysicist; Astrophysicist; Environmental Scientist; Atmospheric Scientist; Meteorologist; Product Designer; Plant Manager; Quality Controller; Manufacturer's Representative; Engineer; Consultant; Teacher; Specialists in areas such as Electrical and Nuclear Power, Atomic Energy, Aerodynamics, Acoustics, Solid State, Microelectronics, Optical Design, Illumination, and Materials Science.

EMPLOYMENT OUTLOOK:

Job opportunities should be available, especially for students who maintain a high grade point average. Obtaining an advanced degree will improve job qualifications.

HIGH SCHOOL PREPARATION FOR MAJOR:

A student should complete four years of mathematics that includes trigonometry and an introduction to calculus. Four years of science, which includes both chemistry and physics is highly recommended. A strong background in English is essential.

PHYSICS
(B.S. Degree)

Physics Courses		55 hours
PH230/030	General Physics I	5
PH231/031	General Physics II	5
PH341	Optics	3
PH345	Experimental Methods I (UI330)	3
PH360	Modern Physics	3
PH370	Mechanics	3
PH371	Electromagnetics	3
PH473	Quantum Mechanics	3
PH477	Physics Seminar	1
PH478	Undergraduate Research	1
PH479	Undergraduate Research	2
PH570	Mathematical Physics	3
EP100	Physics and Engineering Concepts	1
EP340	Electronic Circuits	4
EP361	Thermal Analysis	3
EP462	Materials Science	3
	Technical Electives ¹	9
Mathematics Courses²		20 Hours
MA140	Analytic Geometry and Calculus I	5
MA145	Analytic Geometry and Calculus II	4
MA240	Analytic Geometry and Calculus III	3
MA245	Vector Calculus	2
MA350	Differential Equations I	3
	Math Elective (300 -500 level)	3
Other Courses		50 Hours
CH185/005/085	General Chemistry I	5
CS177	Programming for Scientists & Engineers	3
	University Studies courses ³	42

Minimum Degree Requirements **125 Hours**

¹ Chosen from an approved list of courses in consultation with student's academic advisor.

² Completion of this sequence of mathematics courses satisfies the requirements for a minor in Mathematics. Students must declare the minor to receive it.

³ Completion of MA140, CH185, and UI330 satisfies 9 credit hours of the 51 credit hour University Studies requirement.

Major: Physics**Degree: Bachelor of Science**

<u>First Semester</u>		<u>Hrs</u>	<u>Second Semester</u>		<u>Hrs</u>
EP100	Physics & Engineering Concepts	1	MA145	Analytic Geometry & Calculus II	4
CS177	Programming for Sci. & Engrs.	3	EN140	Rhetoric & Critical Thinking	3
CH185	General Chemistry I Lecture	5	PH230	General Physics I Lecture	5
CH085	General Chemistry I Laboratory	+	PH030	General Physics I Laboratory	+
CH005	General Chemistry I Recitation	+	UI100	First Year Seminar	<u>3</u>
MA140	Analytic Geometry & Calculus I	5			15
EN100	English Composition	<u>3</u>			
		17			

<u>Third Semester</u>		<u>Hrs</u>	<u>Fourth Semester</u>		<u>Hrs</u>
MA240	Analytic Geometry & Calculus III	3	MA245	Vector Calculus	2
PH231	General Physics II Lecture	5	MA350	Differential Equations I	3
PH031	General Physics II Laboratory	+	MAXXX	Math Elective (300-500 level)	3
	University Studies core course	3		University Studies core course	3
	University Studies core course	3		University Studies core course	3
	University Studies core course	<u>3</u>		University Studies core course	<u>3</u>
		17			17

<u>Fifth Semester</u>		<u>Hrs</u>	<u>Sixth Semester</u>		<u>Hrs</u>
PH360	Modern Physics	3	PH341	Optics**	3
PH371	Electromagnetics*	3	PH570	Mathematical Physics**	3
UI330	Experimental Methods I	3	EP340	Electronic Circuits	4
	University Studies core course	3	UI3XX	US Interdisciplinary Course	3
	Technical or Math Elective	<u>3</u>		Technical or Math Elective	<u>3</u>
		15			16

<u>Seventh Semester</u>		<u>Hrs</u>	<u>Eighth Semester</u>		<u>Hrs</u>
EP361	Thermal Analysis*	3	EP462	Materials Science**	3
PH370	Mechanics*	3	PH473	Quantum Mechanics**	3
PH477	Physics Seminar	1	PH479	Undergraduate Research***	2
PH478	Undergraduate Research***	1	UI4XX	US Seminar Course	3
	University Studies core course	3		Technical or Math Elective	<u>3</u>
	Technical or Math Elective	<u>3</u>			14
		14			

* These courses are offered once every two years. A student starting the sequence in an **even-numbered** year must switch these courses between the **Fifth** and **Seventh** Semesters.

These courses are offered once every two years. A student starting the sequence in an **odd-numbered year must switch these courses between the **Sixth** and **Eighth** Semester.

***Undergraduate Research may be taken in the junior or senior year.

Areas of Emphasis for the Physics Major

Astronomy

PH109 Exploring the Universe (3)

UI416 Planetary Exploration (3)

Choose one of the following courses:

GO110 Physical Geology (3)

EP372 Signals and Systems (3)

GO340 Remote Sensing (3)

Biology

BI151 Biological Reasoning (3) (University Studies Living Systems Course)

BI152 Introduction to Biological Reasoning (1)

BI153 Introduction to Organismal Biology (4)

BI154 Genetics and Cell Biology (4)

Note: Completion of 9 additional hours of BI, BO, or ZO prefix courses constitutes a Minor in Biology

Chemistry

CH186 General Chemistry II (3)

CH187 Qualitative Analysis (2)

CH271 Quantitative Analysis (4)

Note: Completion of the courses listed below in addition to those listed above constitutes a Minor in Chemistry

CH341 Organic Chemistry I (4)

CH342 Organic Chemistry Lab I (1)

Computer Science

CS155 Computer Science I (4)

CS265 Computer Science II (4)

Note: Completion of 7 additional hours of CS courses constitutes a Minor in Computer Science, including 6 hours at the 300-500 level. Suggested courses are listed below in preferred order.

CS315 C & Unix Environment (3)

CS300 Computer Science III (4)

EP461 Computer Applications (3)

The following courses require one or both of the previous two CS courses as prerequisites.

CS331 Applications Programming (3)

CS445 Software Engineering I (3)

CS480 Data Communications (3)

Engineering Physics

Any EP course

UI450 Capstone Experience

Environmental Science

BS105 Environmental Biology (3) (University Studies Living Systems Course)

GO110 Physical Geology (3)

UI387 Environmental Law & Public Policy (3)

UI429 Environmental Ethics (3)

Note: Completion of 9 additional hours selected from courses described in the Bulletin constitutes a minor in Environmental Studies.

Geoscience

GO110 Physical Geology (3)

UI373 Earth and Life Through Time (3)

Note: Completion of 6 additional hours selected from GO courses 200-500 level and 3 additional hours selected from GO courses 400-500 constitutes a Minor in Geoscience.

Mathematics

Any MA course above MA334

Note: Careful selection of Mathematics courses along with completion of the courses listed below will satisfy the requirements for a major in Applied Mathematics.

MA138 Discrete Mathematics I (3)

MA223 Elementary Probability and Statistics (3)

MA250 Foundations in Mathematics (3)

MA448 Mathematics Seminar (1)

Remote Sensing

GO340 Remote Sensing

GO445 Geographic Information Systems