

## *Department of Physics & Engineering Physics*

### **Bachelor of Science in Education (for High School Teachers)**

## **PHYSICS EDUCATION**

The teaching of physics offers a unique career opportunity. Enthusiastic, innovative and well-prepared teachers are needed not only to prepare high school students for careers in science but also to provide all students with an appreciation of science and how it has benefited society. This is especially true in physics, the most fundamental of the physical sciences. Physics describes and explains not only what goes on in our immediate surroundings but also in the minute world of atoms and elementary particles and the vast world of stars and galaxies. Physics teachers can help provide the knowledge that students need to understand and appreciate the world in which they live, and to show the many scientific ideas upon which modern technology is built.

The Bachelor of Science in Education degree with a major in Physics Education is divided into two options:

The **B.S. in Physics Education – Physics option** is a 57-60 hour major focusing specifically on the area of physics and satisfying the Missouri certification for high school teaching of physics only. However, once the Missouri Physics teaching certification is obtained, endorsements in other areas (e.g. biology or chemistry) may be added by passing the appropriate subject area Praxis II exam.

The **B.S. in Physics Education - Unified Science option** is a 72 hour major certifying the student to teach any of the major science areas at the high school level in the state of Missouri. This degree is particularly attractive to rural high schools that need a single instructor to teach several different sciences, however, this course of study may take 5 years to complete.

#### **FACULTY ADVISOR:**

Dr. Margaret Hill

#### **CAREER OPPORTUNITIES:**

Physics Teacher, General Science Teacher, Chemistry Teacher, Biology Teacher, Earth Science Teacher, Educational Administrator, Science Supply Salesman, Textbook Sales Representative and Laboratory Technician.

#### **EMPLOYMENT OUTLOOK:**

There is currently a shortage of qualified physics teachers at the secondary level for which there is no immediate solution. Thus, graduates will have no difficulty in obtaining teaching positions. A national awareness of this problem has led to the speculation that salaries will increase substantially in the future to attract needed qualified teachers.

#### **HIGH SCHOOL PREPARATION FOR MAJOR:**

Students should have completed four years of mathematics, which includes trigonometry and an introduction to calculus. Four years of science, including physics and chemistry, is highly recommended. A strong background in English and a speech course are desirable since a teaching position requires effective written and verbal communication.

**Major: Physics Education**  
**Option: Physics**

**Degree: Bachelor of Science in Education**

**MINIMUM DEGREE REQUIREMENTS**

**I. University Studies** (up to 21 hours can be met within sections II and III in the following curriculum) **48 hours (27 actual)**

The following University Studies courses are required for teacher certification:

EN140	Rhetoric & Critical Thinking	(3)	US105	American History I	(3)
PY222	Development of the Adolescent	(3)		<b>or</b> US107 American History II	
PS103	U.S. Political Systems	(3)	SC105	Fundamentals of Oral Communication	(3)

**II. Required Courses for the Major** **57-60 hrs.**

A.	History/Philosophy of Science and Technology	UI422 <b>or</b> UI364*	Scientific Reasoning Experimental Knowledge <b>Total History/Philosophy:</b>	(3)* <b>3 hours</b>
B.	Biology	BS108* <b>or</b> BS218* <b>or</b> BO200 <b>or</b> ZO200	Biology for Living Biological Science: A Process Approach Plant Biology Animal Biology <b>Total Biology:</b>	(3)* <b>3 hours</b>
C.	Chemistry	CH181/001/081* CH185/ 005/085* CH186	Basic Principles of Chemistry <b>or</b> General Chemistry I <b>and</b> General Chemistry II <b>Total Chemistry:</b>	(5)* (5)* (3) <b>5 - 8 hours</b>
D.	Mathematics	MA140 MA145 MA240 MA245	Analytic Geometry and Calculus I Analytic Geometry and Calculus II Analytic Geometry and Calculus III Vector Calculus <b>Total Mathematics:</b>	(5)* (4) (3) (2) <b>14 hours</b>
E.	Physics	PH230/030 PH231/031 EP100 PH341 UI330 PH360 PH370 PH371	General Physics I General Physics II Physics & Engineering Concepts Optics Experimental Methods I (PH345) Modern Physics Mechanics Electromagnetics <b>Total Physics:</b>	(5) (5) (1) (3) (3)* (3) (3) (3) <b>26 hours</b>
F.	Geoscience	UI318 <b>or</b> GO110 <b>or</b> GO220 <b>or</b> GO320	Earth Science: A Process Approach* Physical Geology Meteorology Oceanography <b>Total Geoscience:</b>	(3)* <b>3 hours</b>
H.	Environmental Science	BS105 <b>or</b> BI332 <b>or</b> GO305 <b>or</b> UI372* <b>or</b> UI360*	Environmental Biology General Ecology Environmental Geoscience Earthquakes & Society Recycling & Waste Management <b>Total Environmental Science:</b>	(3)* <b>3 hours</b>

**III. Professional Education** (includes 3 hrs. of Univ. Studies—SE275)\* **37 hours**

**IV. Other** EN100 English Composition (or other composition course) **3 hours**

**Minimum Degree Requirements** **124-127 hours**

\*denotes University Studies courses

**Major: Physics Education**  
**Option: Physics**

**Degree: Bachelor of Science in Education**

**SUGGESTED PLAN**

<b><u>First Semester</u></b>		<b><u>Hrs</u></b>	<b><u>Second Semester</u></b>		<b><u>Hrs</u></b>
EP100	Physics & Engineering Concepts	1	MA145	Analytic Geometry & Calculus II	4
MA140	Analytic Geometry & Calculus I	5	PH230	General Physics I Lecture	5
CH181/001/081	Basic Principles of Chemistry (lecture, recitation, laboratory) <b>OR</b>		PH030	General Physics I Laboratory	+
CH185/005/085	General Chemistry I <sup>§</sup> (lecture, recitation, laboratory)	5	CH186	General Chemistry II <sup>§</sup>	3
UI100	First Year Seminar	3	PY222	Development of the Adolescent	3
EN100	English Composition	<u>3</u>	SE222	Secondary Block I Field Exp.	<u>0</u>
		17			15
<b><u>Third Semester</u></b>		<b><u>Hrs</u></b>	<b><u>Fourth Semester</u></b>		<b><u>Hrs</u></b>
MA240	Analytic Geometry & Calculus III	3	MA245	Vector Calculus	2
PH231	General Physics II Lecture	5	PH341	Optics**	3
PH031	General Physics II Laboratory	+	EF200	School and Society	2
BS218	Biological Sci.: A Process Approach	3	SE270	Secondary Block II Field Exp.	2
EN140	Rhetoric & Critical Thinking	3	SE271	Theories of Learning & Mgmt	2
SC105	Fund. of Oral Communication	<u>3</u>	SE272	Teaching Reading in Sec. School	2
		17	SE273	Fund. of High School Education	<u>3</u>
					16
<b><u>Fifth Semester</u></b>		<b><u>Hrs</u></b>	<b><u>Sixth Semester</u></b>		<b><u>Hrs</u></b>
PH360	Modern Physics	3	PS103	U.S. Political Systems	3
PH371	Electromagnetics*	3		Environmental Science elective	3
UI330	Experimental Methods I (PH345)	3	UI422	Scientific Reasoning	3
US105	American History I	3	SE300	Technology to Enhance Learning§	2
SE275	Diversity in America's Schools§	<u>3</u>	SE320	Techniques of Teaching Science***	3
		15	SE370	Secondary Block III Field Exp.***	<u>2</u>
					16
<b><u>Seventh Semester</u></b>		<b><u>Hrs</u></b>	<b><u>Eighth Semester</u></b>		<b><u>Hrs</u></b>
PH370	Mechanics*	3	EX390	Psych. & Educ. Of Except. Child§	3
UI318	Earth Sci.: A Process Approach	3	EF400	Seminar for Student Teachers	1
	Literary Expression	3	SE463	Student Teaching Experience I	6
	Artistic Expression	3	SE464	Student Teaching Experience II	<u>6</u>
	Economic Systems	<u>3</u>			16
		15			
				TOTAL HOURS	127

<sup>§</sup> CH186 is required in a subsequent semester if the CH185/005/085 option is chosen.

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

\*\*This course is offered once every two years in the spring semester and may have to be taken in the **Sixth or Eighth Semester**.

\*\*\*offered spring only—meets M-F, 8-11 am

§ These courses can be taken out of sequence

Admission to Teacher Education Program: students must complete PY222 and SE222, pass the CBASE exam (score 235 or better if ACT was 22 or above, or 265 on all parts if ACT is less than 22), and fill out an application for admission to the teacher ed. program. No further education courses may be registered for until admission is complete. No Block II or higher course may be registered for without admission to teacher education program.

**Major: Physics Education**  
**Option: Unified Science**

**Degree: Bachelor of Science in Education**

**MINIMUM DEGREE REQUIREMENTS**

**I. University Studies** (up to 21 hours can be met within sections II and III in the following curriculum) **48 hours (27 actual)**

The following University Studies courses are required for teacher certification:

EN140	Rhetoric & Critical Thinking	(3)	US105	American History I	(3)
PY222	Development of the Adolescent	(3)		<b>or</b> US107 American History II	
PS103	U.S. Political Systems	(3)	SC105	Fundamentals of Oral Communication	(3)

**II. Required Courses for the Major** **72 hrs**

A.	History/Philosophy of Science and Technology	UI422 <b>or</b> UI364	Scientific Reasoning Experimental Knowledge	(3)*
			<b>Total History/Philosophy:</b>	<b>3 hours</b>
B.	Biology	BS108  BO200 ZO200	Biology for Living <b>or</b> BS218 Biological Sci.: A Proc. Appr.* Plant Biology Animal Biology	(3)*  (3) (3)
			<b>Total Biology:</b>	<b>9 hours</b>
C.	Chemistry	CH185/ 005/085 CH186	General Chemistry I General Chemistry II	(5)* (3)
			<b>Total Chemistry:</b>	<b>8 hours</b>
D.	Mathematics	MA140	Analytic Geometry and Calculus I	(5)*
			<b>Total Required Mathematics:</b>	<b>5 hours</b>
E.	Physics	PH230/030 PH231/031	General Physics I General Physics II	(5) (5)
			<b>Total Physics:</b>	<b>10 hours</b>
F.	Physics Endorsement (Major)	EP100 PH341 UI330 PH360 PH370 PH371 MA145 MA240 MA245	Physics & Engineering Concepts Optics Experimental Methods I (PH345) Modern Physics Mechanics Electromagnetics Analytic Geometry and Calculus II Analytic Geometry and Calculus III Vector Calculus	(1) (3) (3)* (3) (3) (3) (4) (3) (2)
			<b>Total Physics Endorsement:</b>	<b>25 hours</b>
G.	Geoscience	GO110 GO220 GO320	Physical Geology Meteorology Oceanography	(3) (3) (3)
			<b>Total Geoscience:</b>	<b>9 hours</b>
H.	Environmental Science	BS105 <b>or</b> BI332 <b>or</b> GO305 <b>or</b> UI372* <b>or</b> UI360*	Environmental Biology General Ecology Environmental Geoscience Earthquakes and Society Recycling and Waste Management	(3)*    
			<b>Total Environmental Science:</b>	<b>3 hours</b>

**III. Professional Education** (includes 3 hrs. of Univ. Studies—SE275)\* **37 hours**

**IV. Other** EN100 English Composition **3**

**Minimum Degree Requirements** **139 hours**

\*denotes University Studies courses

**Major: Physics Education**  
**Option: Unified Science**

**Degree: Bachelor of Science in Education**

**SUGGESTED PLAN**

<b><u>First Semester</u></b>		<b><u>Hrs</u></b>	<b><u>Second Semester</u></b>		<b><u>Hrs</u></b>
EP100	Physics & Engineering Concepts	1	MA145	Analytic Geometry & Calculus II	4
MA140	Analytic Geometry & Calculus I	5	PH230	General Physics I Lecture	5
CH185	General Chemistry I Lecture	5	PH030	General Physics I Laboratory	+
CH085	General Chemistry I Laboratory	+	CH186	General Chemistry II	3
CH005	General Chemistry I Recitation	+	PY222	Development of the Adolescent	3
UI100	First Year Seminar	3	SE222	Secondary Block I Field Exp.	<u>0</u>
EN100	English Composition	<u>3</u>			15
		17			
<b><u>Third Semester</u></b>		<b><u>Hrs</u></b>	<b><u>Fourth Semester</u></b>		<b><u>Hrs</u></b>
MA240	Analytic Geometry & Calculus III	3	MA245	Vector Calculus	2
PH231	General Physics II Lecture	5	PH341	Optics**	3
PH031	General Physics II Laboratory	+	EF200	School and Society	2
BS108	Biology for Living	3	SE270	Secondary Block II Field Exp.	2
EN140	Rhetoric & Critical Thinking	3	SE271	Theories of Learning & Mgmt	2
SC105	Fund. of Oral Communication	<u>3</u>	SE272	Teaching Reading in Sec. School	2
		17	SE273	Fund. of High School Education	<u>3</u>
					16
<b><u>Fifth Semester</u></b>		<b><u>Hrs</u></b>	<b><u>Sixth Semester</u></b>		<b><u>Hrs</u></b>
PH360	Modern Physics	3	UI360	Recycling and Waste Mgmt.	3
PH371	Electromagnetics*	3	GO220	Meteorology	3
UI330	Experimental Methods I (PH345)	3	EX390	Psych. & Educ. of Except. Child§	3
BO200	Plant Biology	3	SE300	Technology to Enhance Learning§	2
SE275	Diversity in America's Schools§	<u>3</u>	SE320	Techniques of Teaching Science***	3
		15	SE370	Secondary Block III Field Exp.***	<u>2</u>
					16
<b><u>Seventh Semester</u></b>		<b><u>Hrs</u></b>	<b><u>Eighth Semester</u></b>		<b><u>Hrs</u></b>
PH370	Mechanics*	3	UI422	Scientific Reasoning	3
	Artistic Expression	3	PS103	U.S. Political Systems	3
	Literary Expression	3	US105	American History I	3
GO110	Physical Geology	3	ZO200	Animal Biology	3
GO320	Oceanography	<u>3</u>		Economic Systems	<u>3</u>
		15			15
<b><u>Ninth Semester</u></b>		<b><u>Hrs</u></b>			
EF400	Seminar for Student Teachers	1			
SE463	Student Teaching Experience I	6			
SE464	Student Teaching Experience II	<u>6</u>			
		13			
			TOTAL HOURS	139	

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

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