

# *Guide to Undergraduate Studies in Physics at Florida State University*

**2009-2010 Academic Year**

**Department Web Site: <http://www.physics.fsu.edu>**

**Undergraduate Program Web Site:  
<http://www.physics.fsu.edu/undergrads/index.html>**

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## **Why you should major in Physics at FSU**

The FSU Physics Department has consistently been rated as one of the best in the southeastern United States. With internationally prominent faculty in astrophysics, atomic physics, biophysics, condensed matter physics, high energy physics and nuclear physics, and undergraduate research opportunities in all these fields, the FSU Physics Department is a great place to learn and achieve.

Undergraduates participate in all the activities of the Physics Department. The FSU chapter of the Society of Physics Students provides an opportunity for physics majors to build a community outside the classroom.

A bachelor's degree in physics opens a wide range of career opportunities. One is to pursue graduate study in physics, astronomy or a related field, and many FSU B.S. graduates succeed in strong graduate programs and continue on to outstanding scientific careers. However, the American Institute of Physics reports that there are many excellent career opportunities for students without any degree past a B.S. in physics. Three-fourths of these physics B.S. graduates work in science-related jobs, including software, engineering, high school teachers, and managers in technical fields. The largest group—about one-fourth—are employed in software jobs.

## **How to prepare to major in physics at FSU**

The best experience for an undergraduate physics major at FSU includes a full slate of elective courses that examine current physics research at the cutting edge and a substantial undergraduate research experience where the student becomes an integral and important member of a world-leading research group. Students who arrive for their first semester of college prepared to begin with the "standard" program of Calculus I (MAC 2311), General Physics A (PHY 2048C) and Discovering Physics (PHY 1090) have the best chance of taking advantage of these opportunities and of making themselves most attractive to strong graduate programs and employers after graduation.

As mentioned above, the "standard" program of studies for a physics major at FSU begins with Calculus I (MAC 2311), General Physics A (PHY 2048C) and Discovering Physics (PHY 1090) during the first semester. To prepare for this, a student entering FSU for her or his first semester in college should make sure that credit for MAC 1140 (Precalculus Algebra) and MAC 1114 (Analytic Trigonometry) has been earned prior to registration for the first semester at FSU. Credit for MAC 1147 (Precalculus Algebra and Trigonometry) can substitute for MAC 1140 and MAC 1114.

International Baccalaureate (IB) students may earn credit for MAC 1147 by achieving a score of 4 or better on the IB Mathematics examination. A student earning a score of 6 or 7 on this examination also receives credit for Calculus I (MAC 2311) and begins the FSU Physics program with an advantage in the area of mathematics. A score of 5 or better on the IB Mathematics-Methods examination earns credit for MAC 1140. Such a student would still be required to complete MAC 1114 prior to registration for Calculus I at FSU.

Students can also earn credit for precalculus algebra and trigonometry through the College Level Examination Program (CLEP). A student earning a score of 50 or better on the CLEP Precalculus examination receives credit for MAC 1147 and is prepared for registration in Calculus I at FSU.

Students entering with advanced placement credit for Calculus I (by earning a score of 3 or better on the Calculus AB or Calculus BC examinations) also begin the FSU Physics program with an advantage in the area of mathematics.

A first-time college student who arrives at FSU needing to take MAC 1140 and MAC 1114 prior to registration for MAC 2311 can "catch up" by taking both MAC 1140 and MAC 1114 in the first (fall) semester, taking MAC 2311 and PHY 2048C in the spring semester, and then MAC 2312 (Calculus II) and PHY 2049C (General Physics B) during the summer.

### **Advising for Physics Majors**

Advising for Physics Majors is provided by Professor Susan Blessing and Professor Paul Cottle. Contact them via e-mail to find out their office hours or to set up an appointment outside of their office hours.

Professor Susan Blessing, [blessing@hep.fsu.edu](mailto:blessing@hep.fsu.edu)

Professor Paul Cottle, [cottle@phy.fsu.edu](mailto:cottle@phy.fsu.edu)

### **Physics Major Lounge**

A lounge and computer lab for physics majors is provided in the Keen Building, Room 304. Announcements of opportunities for physics majors are often posted there.

### **Undergraduate Degree Programs and Majors in the Physics Department**

The Physics Department offers two undergraduate majors: one the "regular" physics major that can prepare a student for graduate school or a high-tech career after graduation; and the other a major in "Physics and Astrophysics" that prepares students for graduate study in astrophysics or astronomy.

The "major code" listed for the regular physics major is 118110.

The Physics and Astrophysics major code is 118111.

## **Degree requirements and recommendations**

### *Major in Physics*

In addition to the general university requirements, the graduation requirements for the regular physics major include the following (all of which must be completed with grades of C- or better):

- Complete all of: PHY 1090 (Discovering Physics), PHY 2048C (General Physics A), PHY 2049C (General Physics B), PHY 3091 (Communication in Physics), PHY 3101 (Modern Physics), PHY 3221 (Intermediate Mechanics), PHY 3802L (Intermediate Lab A); PHY 4323 (Intermediate Electricity and Magnetism), PHY 4513 (Thermal and Statistical Physics), PHY 4604 (Quantum Theory of Matter A), PHY 4822L (Advanced Laboratory), PHZ 3113 (Mathematical Methods), MAC 2311 (Calculus I), MAC 2312 (Calculus II), and MAC 2313 (Calculus III)
- Complete four of: PHY 3424 (Optics), PHY 4241 (Advanced Dynamics), PHY 4605 (Quantum Theory of Matter B), PHZ 3400 (Condensed Matter Physics), PHZ 4390 (Particle and Nuclear Physics), PHZ 4601 (General Relativity), and AST 4211 (Introduction to Astrophysics)
- Complete either PHZ 4151C (Computational Physics Lab) or CGS 3406 (Object Oriented Programming in C++)
- Complete either MAP 2302 (Ordinary Differential Equations) or MAP 3305 (Engineering Math I)
- Complete either CHM 1045C (General Chemistry A) or CHM 1050C (Honors General Chemistry A)

Students are strongly advised to take the course “Physics Problem-Solving” during their third term (In Fall 2009, the course number will be PHY 4936, Section 9). The course is intended to prepare students for the demands of the critical Term 4 courses, Intermediate Mechanics (PHY 3221) and Mathematical Methods (PHZ 3113).

Students who are planning to conduct graduate work in physics are strongly advised to include advanced dynamics (PHY 4241) and quantum theory of matter B (PHY 4605) in their programs.

An Honors Thesis or Senior Thesis (minimum of six credit hours) may be substituted for the Advanced Lab (PHY 4822Lr).

### *Major in Physics and Astrophysics*

The Physics and Astrophysics major requires (once again, with grades of C- or better):

- Complete all of: PHY 1090 (Discovering Physics), PHY 2048C (General Physics A), PHY 2049C (General Physics B), PHY 3091 (Communication in Physics), PHY 3101 (Modern Physics), PHY 3221 (Intermediate Mechanics)

PHY 4323 (Intermediate Electricity and Magnetism), PHY 4513 (Thermal and Statistical Physics), PHY 4604 (Quantum Theory of Matter A), PHZ 3113 (Mathematical Methods), MAC 2311 (Calculus I), MAC 2312 (Calculus II), and MAC 2313 (Calculus III), AST 4211 (Introduction to Astrophysics)

- Complete either PHZ 4151C (Computational Physics Lab) or CGS 3406 (Object Oriented Programming in C++)
- Complete either MAP 2302 (Ordinary Differential Equations) or MAP 3305 (Engineering Math I)
- Complete either CHM 1045C (General Chemistry A) or CHM 1050C (Honors General Chemistry A)
- Complete either AST 3022L (Astronomy Laboratory) or PHY 3802L (Intermediate Laboratory A)
- Complete either AST 4419 (Extragalactic Astronomy) or AST 4722 (Observational Techniques)
- Complete three of: PHZ 4315 (Nuclear Astrophysics), PHZ 4390 (Particle and Nuclear Physics), PHZ 4601 (General Relativity), AST 4217 (Physics of Stars), AST 4414 (Cosmology and Structure Formation)

Students are strongly advised to take the course “Physics Problem-Solving” during their third term (In Fall 2009, the course number will be PHY 4936, Section 9). The course is intended to prepare students for the demands of the critical Term 4 courses, Intermediate Mechanics (PHY 3221) and Mathematical Methods (PHZ 3113).

*“C- rule” and “Five UDF rule”*

No physics, chemistry or math course with a grade below C- may be used to satisfy requirements for any of the degree programs in the Physics Department. Furthermore, a student who has received more than five unsatisfactory grades (U, F, D-, D, D+) in courses required for any of the Physics Department’s majors taken at Florida State University or elsewhere, whether or not repeated, will not be permitted to graduate from any of the department’s degree programs.

### **Honors in the Major**

The Department of Physics and the University Honors Office offer the Honors in the Major program to encourage talented juniors and seniors to undertake independent research as part of the undergraduate experience. Consult the Physics Department’s faculty advisors regarding requirements.

### **Standard Schedules for Physics Undergraduate Majors**

The schedules listed here for each of the undergraduate majors in the Physics Department are intended for well-prepared students entering the department’s degree programs.

Students who are not sufficiently prepared to begin with Calculus I (MAC 2311) and General Physics A (PHY 2048C) during their first fall semester at FSU should plan to

attend the summer session after their first academic year to complete Calculus II (MAC 2312) and General Physics B (PHY 2049C) prior to the fall semester of their second year. Students who do not do this will have a registration stop imposed on them during the fall semester of their second year through the university's "mapping" initiative. The registration stop can then only be lifted by the Physics Department's Director of Undergraduate Studies.

*Standard Schedule Index:* Standard Physics Major, Page 7; Standard Physics Major for A.A. transfer, Page 8; Physics and Astrophysics Major, Page 9.

**Regular Physics Major (118110)**

<b>FALL Semester</b>		<b>SPRING Semester</b>	
<b>Semester 1</b>		<b>Semester 2</b>	
ENGLISH I	3	ENGLISH II	3
PHY 1090 Discovering Physics	1	MAC 2312 Calculus II	4
MAC 2311 Calculus I	4	PHY 2049C General Physics B	5
PHY 2048C General Physics A	5	LIBERAL STUDIES/LANGUAGE	3-4
LIBERAL STUDIES/LANGUAGE	3-4		
	<hr/> 16-17		<hr/> 15-16
<b>Semester 3</b>		<b>Semester 4</b>	
PHY 3101 Intermediate Modern Physics	3	MAC 2313 Calculus III	5
MAP 2302 Ordinary Differential Eqns OR		PHY 3221 Intermediate Mechanics	3
MAP 3305 Engineering Mathematics I	3	PHZ 3113 Mathematical Physics	3
CHM 1045C General Chemistry I OR		LIBERAL STUDIES/LANGUAGE	3-4
CHM 1050C Honors General Chemistry I	4		
PHY 4936 Physics Problem Solving	3		
	<hr/> 13		<hr/> 14-15
<b>Semester 5</b>		<b>Semester 6</b>	
PHY 3424 Optics	3	PHY 4822L Advanced Lab	2
PHY 3802L Intermediate Lab A	1	PHY 4605 Quantum Theory of Matter B	3
PHY 4604 Quantum Theory of Matter A	3	PHZ 4151C Computational Physics Lab	3
PHY 3091 Communications in Physics	2	LIBERAL STUDIES/LANGUAGE	3-4
LIBERAL STUDIES/LANGUAGE	3-4	LIBERAL STUDIES	3
	<hr/> 12-13		<hr/> 14-15
<b>Semester 7</b>		<b>Semester 8</b>	
PHY 4323 Intermediate E & M	3	PHY 4513 Thermal and Statistical Physics	3
AST 4211 Introduction to Astrophysics	3	PHZ 3400 Condensed Matter	3
PHZ 4390 Particle and Nuclear Physics	3	PHY 4241 Advanced Dynamics	3
PHYSICS ELECTIVE	3	PHYSICS ELECTIVE	3
	<hr/> 12		<hr/> 12

**Regular Physics Major (118110) – Junior College Transfer**

It is assumed that the student has completed Calculus I (MAC 2311), Calculus II (MAC 2312), Calculus III (MAC 2313), Ordinary Differential Equations (MAP 2302), and General Chemistry A with laboratory (CHM 1045C) prior to the first fall semester at FSU.

<b>FALL Semester</b>		<b>SPRING Semester</b>	
<b>Semester 1</b>		<b>Semester 2</b>	
PHY 3101 Intermediate Modern Physics	3	PHZ 3113 Mathematical Physics	3
PHY 3424 Optics	3	PHY 3221 Intermediate Mechanics	3
PHY 3802L Intermediate Lab A	1	PHY 4822L Advanced Lab	2
PHY 3091 Communications in Physics	2	PHZ 4151C Computational Physics Lab	3
PHY 1090 Discovering Physics	1		
MODERN LANGUAGE or ELECTIVES	3-4	MODERN LANGUAGE or ELECTIVES	4
	13-14		15
<b>Semester 3</b>		<b>Semester 4</b>	
PHY 4323 Intermediate E & M	3	PHY 4513 Thermal and Statistical Physics	3
PHY 4604 Quantum Theory of Matter A	3	PHZ 3400 Condensed Matter	3
PHZ 4390 Particle and Nuclear Physics	3	PHY 4605 Quantum Theory of Matter B	3
AST 4211 Introduction to Astrophysics	3	PHY 4241 Advanced Dynamics	3
MODERN LANGUAGE or ELECTIVES	3-4	ELECTIVES	2-3
	15-16		14-15

**Physics and Astrophysics Major (118111)**

<b>FALL Semester</b>		<b>SPRING Semester</b>	
<b>Semester 1</b>		<b>Semester 2</b>	
ENGLISH I	3	ENGLISH II	3
PHY 1090 Discovering Physics	1	MAC 2312 Calculus II	4
MAC 2311 Calculus I	4	PHY 2049C General Physics B	5
PHY 2048C General Physics A	5	LIBERAL STUDIES/LANGUAGE	3-4
LIBERAL STUDIES/LANGUAGE	3-4		
	16-17		15-16
<b>Semester 3</b>		<b>Semester 4</b>	
PHY 3101 Intermediate Modern Physics	3	PHZ 3113 Mathematical Physics	3
MAP 2302 Ordinary Differential Eqns OR		PHY 3221 Intermediate Mechanics	3
MAP 3305 Engineering Mathematics I	3	AST 4419 Extragalactic Astronomy	3
AST 4211 Introduction to Astrophysics	3	CHM 1045C General Chemistry A OR	4
MAC 2313 Calculus III	5	CHM 1050C Honors Chemistry A	
PHY 4936 Physics Problem Solving	3		
	17		13
<b>Semester 5</b>		<b>Semester 6</b>	
PHY 4604 Quantum Theory of Matter A	3	PHY 4605 Quantum Theory of Matter B	3
AST 3721L Astrophysics Lab	1	PHZ 4151C Computational Physics Lab	3
PHY 3091 Communication in Physics	2	AST 4217 Physics of Stars	3
PHY 4601 General Relativity	3	AST 4722 Observational Techniques	3
PHZ 4390 Particle and Nuclear Physics	3	LIBERAL STUDIES/LANGUAGE	3-4
LIBERAL STUDIES/LANGUAGE	3-4		
	15-16		15-16
<b>Semester 7</b>		<b>Semester 8</b>	
PHY 4323 Intermediate E & M	3	PHY 4513 Thermal and Statistical Physics	3
AST 4218 Astrophysics Seminar	1	AST 4218 Astrophysics Seminar	1
AST 4414 Cosmology	3	PHZ 4316 Nuclear Astrophysics	3
LIBERAL STUDIES	3	PHYSICS/ASTR ELECTIVE	3
LIBERAL STUDIES/LANGUAGE	3-4	LIBERAL STUDIES/LANGUAGE	3-4
	13-14		13-14