Kansas State University 2004-2005

http://www.phys.ksu.edu

PHYSICS

GENERAL

KSU's Department of Physics offers programs of study leading to three different degrees in physics:

- BS in Physics: This degree program is for students who plan to pursue an advanced degree in physics.
- BS in General Physics: This degree program provides broad foundation in fundamental principles for students who wish to pursue careers in technical areas or continue professional or graduate studies in areas outside of physics.
- BA in Physics: This degree program combines a foundation in physics with a broad general education for students who wish to pursue careers in technical areas or continue professional or graduate studies in areas of outside of physics.

In cooperation with the College of Education the Department guides students who wish to obtain an undergraduate degree in physics and become a school physics teacher. We also work with the College of Business Administration to prepare students who have an interest in management careers in the technical industry. Many students pursue simultaneously two undergraduate degrees--one in physics and a second in engineering, mathematics, computer science or other related fields.

ELECTIVES

The physics degree allows you to have time for a wide range of electives. In addition to elective courses in physics, you will fulfill the course distribution requirements of the College of Arts & Science and the University General Education Program. Thus, you will receive a broad-based education which will help you adopt to the careers in your future.

PHYSICS CLUB

Undergraduate physics majors and others interested in physics are encouraged to join the Physics Club. This organization provides an important channel of communication between the department and undergraduate students. The Physics Club selects one student to serve on the department's curriculum committee.

The Department maintains the John Giese Undergraduate Center for exclusive use by our majors. This room (CW40) provides a place for study, social events, and meetings of the Physics Club.

UNDERGRADUATE RESEARCH

All undergraduate physics majors are encouraged to take advantage of the research opportunities in the Department. Students may begin working with a faculty member as early as their first semester and continue throughout their career at KSU. Active Research programs are: Atomic-Molecular-Optical Physics, Condensed Matter, Cosmology, High Energy Physics, and Physics Education. Each of these programs welcomes undergraduate students to become participants in research. The Department's external funding for research is almost $7,000,000 per year. Thus, students who become involved in research are paid for their efforts.

Kansas State University

2004-2005

Required Classes	BS in Physics	BS in General Physics	BA in Physics
PHYS 122 Physics Today I (1)	*	*	*
PHYS 123 Physics Today II (1)	*	*	*
PHYS 223 Physics I, Mechanics and Thermodynamics (5)	*	*	*
PHYS 224 Physics II, Electromagnetism and Sound (5)	*	*	*
PHYS 325 Physics III, Relativity and Quantum Physics (4)	*	*	*
PHYS 506 Physics Laboratory (3)	*	*	*
PHYS 522 Mechanics (4)	*	*	*
PHYS 532 Electromagnetic Fields I (4)	*	*	*
PHYS 633 Electromagnetic Fields II (3)	*		
PHYS 662 Introduction to Quantum Mechanics (4)	*	*	*
PHYS 636 Physical Measurements & Instrumentation (5)	*		
PHYS 664 Thermodynamics & Statistical Physics (3)	*	*	
PHYS 6xx Advanced Physics Electives (see list below)	2 courses	1 course	1 course
PHYS 709 Applied Quantum Mechanics (3)	*		

Advanced Physics Course Number	Electives Course title	Credit	BS in Physics	BS in General Physics	BA in Physics
PHYS 620	Teaching University Physics	3	*	*	*
PHYS 633	Electromagnetic Fields II	3		*	*
PHYS 636	Physical Measurement & Instrumentation	5		*	*
PHYS 639	Computation in Physics	3	*	*	*
PHYS 642	Nuclear Physics	3	*	*	*
PHYS 651	Introduction to Optics	3	*	*	*
PHYS 652	Applied Optics & Optical Measurement	3	*	*	*
PHYS 655	Physics of Solids	3	*	*	*
PHYS 664	Thermodynamics & Statistical Physics	3			*
PHYS 691	Introduction to Astrophysics **§**	3	*	*	*
PHYS 692	Introduction to Cosmology **§**	3	*	*	*
PHYS 694	Particle Physics	3	*	*	*

§For the BS in Physics only one of these courses can be applied to the advanced physics electives.

Advanced Placement physics in high school or Engineering Physics 1 and 2 can substitute for Physics 1 and 2. Calculus 1, 2, and 3 and Elementary Differential Equations are required for all physics majors. High school courses may exempt students from one or more semesters of calculus. Chemistry 1 and 2 (CHM210 and 230) are highly recommended for all physics majors.

All undergraduate physics majors are strongly encouraged to participate in research with a faculty member. The following courses are available so that students may obtain appropriate academic credit for that research.

PHYS 400	Independent Study in Physics	1-3
PHYS 497	Senior Research in Physics	1-3
PHYS 498	Honors Tutorial in Physics	1-3
PHYS 499	Senior Honors Thesis	2

Undergraduate Physics Courses		Hours	When Available	Prerequisite
PHYS 122	Physics Today I	1	Every Fall	
PHYS 123	Physics Today II	1	Every Spring	
PHYS 213	Engineering Physics I	5	Every Fall/Spring	MATH 220 or Concurrent Enrollment
PHYS 214	Engineering Physics II	5	Every Spring/Fall	PHYS 213; MATH 221 or Concurrent
PHYS 223	Physics I	5	Every Fall	MATH 220 or Concurrent Enrollment
PHYS 224	Physics II	5	Every Spring	PHYS 223; MATH 221 or Concurrent Enrollment
PHYS 325	Physics III	4	Every Fall	PHYS 224 or 214; MATH 222 or Conc. Enroll
PHYS 399	Physics Honors Seminar	1-3	On Demand	Instructor's Permission
PHYS 400	Independent Study	1-3	On Demand	Instructor's Permission
PHYS 460	Undergraduate Topics in Physics	1-6	On Demand	Instructor's Permission
PHYS 506	Physics Laboratory	3	Every Spring	PHYS 325/Basic/Pascal/Fortran/C or C++
PHYS 515	Physics for Science Teachers	1-4	On Demand	Instructor's Permission
PHYS 522	Mechanics	4	Every Spring	PHYS 224
PHYS 532	Electromagnetic Fields I	4	Every Fall	PHYS 224; MATH 240
PHYS 620	Teaching University Physics	3	Fall of even years	
PHYS 623	Oscillations, Waves & Relativity	3	On Demand	PHYS 472, 522 and 532
PHYS 633	Electromagnetic Fields II	3	Every Spring	PHYS 532
PHYS 636	Physical Measurements & Instrumentation	5	Every Spring	PHYS 214 or 224
PHYS 639	Computations in Physics	3	On demand	PHYS 472 and 5xx/Basic/Pascal/Fortran/C
PHYS 642	Nuclear Physics	3	On demand	
PHYS 651	Introduction to Optics	3	Spring of even years	PHYS 214
PHYS 652	Appl. Optics and Optical Meas	3	Fall of even years	PHYS 651
PHYS 655	Physics of Solids	3	Fall of odd years	
PHYS 662	Intro. to Quantum Mechanics	4	Every Spring	PHYS 325, 522
PHYS 664	Thermodynamics & Statistical Physics	3	Every Fall	PHYS 522; MATH 240
PHYS 691	Introduction to Astrophysics	3	Spring of odd years	PHYS 325, 522, 532
PHYS 692	Intro. to Cosmology	3	Every Spring	PHYS 522
PHYS 694	Particle Physics	3	Spring of even years	PHYS 325
PHYS 707	Topics in Physics	Var	On Demand	Instructor's Permission
PHYS 709	Applied Quantum Mechanics	3	Every Fall	PHYS 662

TYPICAL PROGRAMS

Bachelor of Science in Physics

This degree provides professional preparation who students plan to pursue an advanced degree in physics.

FIRST YEAR

PHYS 122	**Physics Today I**	**1**	**PHYS 123**	**Physics Today II**	**1**
PHYS 223	**Physics I**	**5**	**PHYS 224**	**Physics II**	**5**
MATH 220	**Calculus I**	**4**	**MATH 221**	**Calculus 2**	**4**
ENGL 100	Expository Writing I	3	ENGL 200	Expository Writing II	3
SPCH 105	Public Speaking I	2		Elective	3
	TOTAL	15		TOTAL	16

SECOND YEAR

PHYS 325	**Physics III**	**4**	**PHYS 506**	**Physics Lab**	**3**
MATH 222	**Calculus III**	**4**	**PHYS 522**	**Mechanics**	**4**
	Electives	6	**MATH 240**	**Differential Equations**	**4**
				Elective	3
	TOTAL	14		TOTAL	14

THIRD YEAR

PHYS 532	**Electromagnetic Fields I**	**4**	**PHYS 633**	**Electromagnetic Fields II**	**3**
PHYS 664	**Thermodynamics & Statistics Physics**	**3**	**PHYS 662**	**Introduction to Quantum Mechanics**	**4**
	Electives	9		Electives	9
	TOTAL	16		TOTAL	16

FOURTH YEAR

PHYS 709	**Applied Quantum Mechanics**	**3**	**PHYS 6xx**	**Advanced Physics Elective**	**3**
PHYS 6xx	**Advanced Physics Elective**	**3**	**PHYS 636**	**Physical Measurements & Instrumentation**	**5**
	Electives	10		Electives	9
	TOTAL	16		TOTAL	17

All bachelors degrees require 124 credits of which 45 must be in upper division courses.

College of Arts & Sciences Requirements (taken as part of the electives):

LIFE SCIENCE	4
HUMANITIES & FINE ARTS	11
SOCIAL SCIENCES	12

1. Chemistry I (CHM 210) and II (CHM230) are highly recommended for all physics majors.
2. In addition to specific course requirements all physics majors must have knowledge of computational tools and computer programming as stated in the prerequisites for PHYS 325 and PHYS 506.

Bachelor of Science in General Physics

This degree program provides broad foundation in fundamental principles for students who wish to pursue careers in technical areas or continue studies in areas outside of physics.

FIRST YEAR

PHYS 122	**Physics Today I**	**1**	**PHYS 123**	**Physics Today II**	**1**
PHYS 223	**Physics I**	**5**	**PHYS 224**	**Physics II**	**5**
MATH 220	**Calculus I**	**4**	**MATH 221**	**Calculus 2**	**4**
ENGL 100	Expository Writing I	3	ENGL 200	Expository Writing II	3
SPCH 105	Public Speaking I	2		Elective	3
	TOTAL	15		TOTAL	16

SECOND YEAR

PHYS 325	**Physics III**	**4**	**PHYS 506**	**Physics Lab**	**3**
MATH 222	**Calculus III**	**4**	**PHYS 522**	**Mechanics**	**4**
	Electives	7	**MATH 240**	**Differential Equations**	**4**
				Electives	15
	TOTAL	15		TOTAL	16

THIRD YEAR

PHYS 532	**Electromagnetic Fields I**	**4**	**PHYS 662**	**Introduction to Quantum Mechanics**	**4**
	Electives	12		Electives	12
	TOTAL	16		TOTAL	16

FOURTH YEAR

PHYS 664	**Thermodynamics & Statistical Physics**	**3**	**PHYS 6xx**	**Advanced Physics Elective**	**3**
	Electives	12		Electives	12
	TOTAL	15		TOTAL	15

All bachelors degrees require 124 credits of which 45 must be in upper division courses.

College of Arts & Sciences Requirements (taken as part of the electives):

LIFE SCIENCE	4
HUMANITIES & FINE ARTS	11
SOCIAL SCIENCES	12

1. Chemistry I (CHM 210) and II (CHM230) are highly recommended for all physics majors.
2. In addition to specific course requirements all physics majors must have knowledge of computational tools and computer programming as stated in the prerequisites for PHYS 325 and PHYS 506.

Bachelor of Arts in Physics

This degree program combines a foundation in physics with a broad general education for students who wish to pursue careers in technical areas or continue studies in areas of outside of physics.

FIRST YEAR

PHYS 122	**Physics Today I**	**1**	**PHYS 123**	**Physics Today II**	**1**
PHYS 223	**Physics I**	**5**	**PHYS 224**	**Physics II**	**5**
MATH 220	**Calculus I**	**4**	**MATH 221**	**Calculus 2**	**4**
ENGL 100	Expository Writing I	3	ENGL 200	Expository Writing II	3
SPCH 105	Public Speaking I	2		Modern Language	5
	TOTAL	15		TOTAL	18

SECOND YEAR

PHYS 325	**Physics III**	**4**	**PHYS 506**	**Physics Lab**	**3**
MATH 222	**Calculus III**	**4**	**PHYS 522**	**Mechanics**	**4**
	Modern Language	5	**MATH 240**	**Differential Equations**	**4**
	Electives	3		Modern Language	5
	TOTAL	16		TOTAL	16

THIRD YEAR

PHYS 532	**Electromagnetic Fields I**	**4**	**PHYS 662**	**Introduction to Quantum Mechanics**	**4**
	Electives	12		Electives	10
	TOTAL	16		TOTAL	14

FOURTH YEAR

PHYS 6xx	**Advanced Physics Elective**	**3**	Electives	14
	Electives	12		
	TOTAL	15	TOTAL	14

All bachelors degrees require 124 credits of which 45 must be in upper division courses.

College of Arts & Sciences Requirements (taken as part of the electives):

LIFE SCIENCE	4
HUMANITIES & FINE ARTS	11
SOCIAL SCIENCES	12

1. Chemistry I (CHM 210) and II (CHM230) are highly recommended for all physics majors.
2. In addition to specific course requirements all physics majors must have knowledge of computational tools and computer programming as stated in the prerequisites for PHYS 325 and PHYS 506.

Bachelor of Science in General Physics with a Minor in Business

This degree program provides broad foundation in fundamental principles for students who wish to pursue careers in the technical industry and be prepared for management positions.

FIRST YEAR

PHYS 122	**Physics Today I**	**1**	**PHYS 123**	**Physics Today II**	**1**
PHYS 223	**Physics I**	**5**	**PHYS 224**	**Physics II**	**5**
MATH 220	**Calculus I**	**4**	**MATH 221**	**Calculus 2**	**4**
ENGL 100	Expository Writing I	3	ENGL 200	Expository Writing II	3
SPCH 105	Public Speaking I	2	ECON 110	Macroeconomics	3
	TOTAL	15		TOTAL	16

SECOND YEAR

PHYS 325	**Physics III**	**4**	**PHYS 506**	**Physics Lab**	**3**
MATH 222	**Calculus III**	**4**	**PHYS 522**	**Mechanics**	**4**
ECON 120	Microeconomics	3	**MATH 240**	**Differential Equations**	**4**
ACCTG 231	Accounting for Business Oper.	3	ACCTG 241	Accounting for Investing & Finance	3
				Electives	3
	TOTAL	14		TOTAL	17

THIRD YEAR

PHYS 532	**Electromagnetic Fields I**	**4**	**PHYS 662**	**Introduction to Quantum Mechanics**	**4**
MANGT 420	Management Concepts	3	MKTG 400	Intro. To Marketing	3
	Electives	9		Electives	9
	TOTAL	16		TOTAL	16

FOURTH YEAR

PHYS 664	**Thermodynamics & Statistical Physics**	**3**	**PHYS 6xx**	**Advanced Physics Elective**	**3**
FINAN 350	Principles of Finance	3		Electives	12
	Electives	9			
	TOTAL	15		TOTAL	15

All bachelors degrees require 124 credits of which 45 must be in upper division courses.

College of Arts & Sciences Requirements (taken as part of the electives):

LIFE SCIENCE	4
HUMANITIES & FINE ARTS	11
SOCIAL SCIENCES	12

ECON 110 and 120 can be applied to the social sciences requirement. By adding STAT 350, STAT 351, FINAN 520 and MKTG 690 as part of the electives, a student can complete a Masters in Business Administration in three additional semesters (see next page).

1. Chemistry I (CHM 210) and II (CHM230) are highly recommended for all physics majors.
2. In addition to specific course requirements all physics majors must have knowledge of computational tools and computer programming as stated in the prerequisites for PHYS 325 and PHYS 506.

Bachelor of Science in General Physics with a Masters in Business Administration (MBA)

This degree program provides broad foundation in fundamental principles of physics and management for students who wish to pursue careers in a technical industry or business.

		FIRST YEAR			
PHYS 122	**Physics Today I**	**1**	**PHYS 123**	**Physics Today II**	**1**
PHYS 223	**Physics I**	**5**	**PHYS 224**	**Physics II**	**5**
MATH 220	**Calculus I**	**4**	**MATH 221**	**Calculus 2**	**4**
ENGL 100	Expository Writing I	3	ENGL 200	Expository Writing II	3
SPCH 105	Public Speaking I	2	ECON 110	Macroeconomics	3
	TOTAL	15		TOTAL	16
		SECOND YEAR			
PHYS 325	**Physics III**	**4**	**PHYS 506**	**Physics Lab**	**3**
MATH 222	**Calculus III**	**4**	**PHYS 522**	**Mechanics**	**4**
ECON 120	Microeconomics	3	**MATH 240**	**Differential Equations**	**4**
ACCTG 231	Accounting for Business Oper.	3	ACCTG 241	Accounting for Investing & Finance	3
				Electives	3
	TOTAL	14		TOTAL	17
		THIRD YEAR			
PHYS 532	**Electromagnetic Fields I**	**4**	**PHYS 662**	**Introduction to Quantum Mechanics**	**4**
MANGT 420	Management Concepts	3	MKTG 400	Intro. To Marketing	3
STAT 350	Statistics for Business	3	STAT 351	Statistics for Business II	3
	Electives	6		Electives	6
	TOTAL	16		TOTAL	16
		FOURTH YEAR			
PHYS 664	**Thermodynamics & Statistical Physics**	**3**	**PHYS 6xx**	**Advanced Physics Elective**	**3**
FINAN 340	Principles of Finance	3	FINAN 520	Equity Security Markets	3
	Electives	9	MKGT 690	Marketing Management	3
				Electives	6
	TOTAL	15		TOTAL	15
		FIFTH YEAR (MBA)			
MANGT 820	Behavioral Mangt. Theory	3	ECON 815	Economic Analysis for Business	3
MANGT 830	Applied Mangl. Computing	3	MANGT 810	Operations Mangt. & Analysis	3
ACCTG 860	MAB Problem Solving	3	GENBA 880	Business Strategy	3
FINAN 860	Managerial Finance II	3	GENBA 890	Business Practicum	4
	TOTAL	12		TOTAL	13
		SIXTH YEAR (MBA)			
MANGT 860	Management of Legal, Ethical & Public Policy Issues	3			
	International Elective	3			
	Electives	6			
	TOTAL	12			

II. B.S. in General Physics with Secondary Physics Teaching License

This course of study is preparation for a career in secondary teaching with a B.S. in General Physics. Elective and general education courses must be selected from the College of Education list which qualifies students for the teacher certification in secondary teaching. Students in the program are required to have an advisor in Science Education as well as an advisor in the Department of Physics. Students apply for admission to the teacher education program after 50 hrs. have been completed. To be accepted your grade point average must be at least 2.75, and you must pass an admission test. Several options are available. The course of study below results in certification to teach physics, chemistry and general science. A B.S. in Secondary Education with a concentration in physics can be completed in 4 years.

FIRST YEAR

Fall Semester			Spring Semester		
PHYS 122	Physics Today I	1	PHYS 123	Physics Today II	1
PHYS 223	Physics I	5	PHYS 224	Physics II	5
MATH 220	Calculus I	4	MATH 221	Calculus II	3
ENGL 100	Expository Writing I	3	ENGL 120	Expository Writing II	4
SPCH 105	Public Speaking	2		Elective	3
EDSEC 102	Teaching as a Career	1			
	TOTAL	16		TOTAL	16

SECOND YEAR

PHYS 325	Physics III	4	PHYS 506	Physics Lab	3
MATH 222	Calculus III	4	PHYS 522	Mechanics	3
BIOL 198	Prin. of Biology	4	MATH 240	Elem. Diff. Equation	4
CHEM 210	Chemistry 1	4	CHEM 230	Chemistry 2	4
			FSHS 110	Intro. to Human Development	3
	TOTAL	16		TOTAL	17

THIRD YEAR

PHYS 532	Electromagnetic Fields I	4	PHYS 662	Intro. To Quantum Mechanics	4
PHYS 191	Descriptive Astronomy	3	EDCIP 410	Foundations of Education	3
	Electives	9	EDETC 318	Instructional Media	2
				Electives	6
	TOTAL	16		TOTAL	15

FOURTH YEAR

PHYS 664	Thermodynamics & Statistical Physics	3	EDSEC 420	Content-Reading Methods	1
CHEM 350	Gen. Organic Chem	3	EDSEC 500	Content Area Methods	3
EDCEP 315	Ed. Psychology	3	EDSEC 477	Middle Level Reading	2
EDSP 323	Exceptional Students	2	GEOL 512	Earth Science	3
EDSEC 376	Core Teachings Skills	3	EDCIP 455	Teaching Multicultural	1
			EDCEP 525	Interpersonal Relations	1
			EDSEC 614	Lab Techniques	3
	TOTAL	14		TOTAL	14

FIFTH YEAR

EDSEC 586	Teaching Participation	12	PHYS 6xx	Advanced Physics Elective	3
			STAT 320	Elements of Statistics	3
				Electives	6
	TOTAL	12		TOTAL	12

Minor in Physics

Basic Courses:

PHYS 213 Engineering Physics 1
or PHYS 223 Physics 1 ..... 5 credits
PHYS 214 Engineering Physics 2
or PHYS 224 Physics 2 ..... 5 credits
PHYS 325 Physics 3 ..... 4 credits

Additional Requirement:

Any physics course at the 500 level or higher ..... 3-5 credits

Possible courses are listed below:

PHYS 506 Advanced Physics Laboratory (3)
PHYS 522 Mechanics (4)
PHYS 532 Electromagnetic Fields I (4)
PHYS 620 Teaching University Physics (3)
PHYS 623 Oscillations, Waves, and Relativity (3)
PHYS 633 Electromagnetic Fields II (3)
PHYS 636 Physical Measurements and Instrumentation (5)
PHYS 651 Introduction to Optics (3)
PHYS 655 Physics of Solids (3)
PHYS 662 Introduction to Quantum Mechanics (4)
PHYS 664 Thermodynamics and Statistics Physics (3)
PHYS 691 Introduction to Astrophysics (3)
PHYS 692 Introduction to Cosmology (3)
PHYS 694 Particle Physics (3)

More Information:

Course descriptions are available at:
KSU Physics Web site: http://www.phys.ksu.edu
KSU Catalog: http://courses.ksu.edu/catalog/undergraduate/as/phys.html

To make an appointment with an advisor or to add physics as a minor see Jane Peterson, CW 107 (Janie@phys.ksu.edu).

02/22/06