AIMS OF THE PROGRAM

Studying physics can be a valuable part of a broad education. Students who combine mastery of the basic principles and methods of physics with the outlook and adaptability provided by a liberal Christian education will find themselves well-prepared for a variety of careers. Recent physics graduates have gone into top graduate and professional schools and have successfully entered careers in industry.

The objectives of the physics program are to prepare students for a professional career or graduate study, provide the training required by other programs and professional schools, and support the general education program of the University by providing courses of instruction for non-science students.

PROGRAMS

B.S. Mathematical Physics - 52 hours (30 u.d.)
B.S. Physical Science - Secondary Certification - 46 hours (32 u.d.)
Physics Minor - 18 hours (6 u.d.)

Mathematical Physics, B.S.

MATH 181 Calculus I ......................................................... 4
MATH 282 Calculus II ....................................................... 4
MATH 283 Calculus III ...................................................... 4
MATH 321 Differential Equations ........................................ 3
MATH 361 Introduction to Linear Algebra ............................. 3
MATH 381 Complex Variables ............................................. 3
MATH 411 Numerical Analysis ........................................... 3
MATH 431 Modern Algebra or
MATH 471 Advanced Calculus ........................................... 3
MATH 455 Probability Theory ........................................... 3
PHYS 121 General Physics I ............................................. 4
PHYS 122 General Physics II .......................................... 4
PHYS 221 General Physics with Calculus I ......................... 1
PHYS 222 General Physics with Calculus II ....................... 1
PHYS 311 Modern Physics ............................................... 3
PHYS 322 Classical Mechanics ........................................ 3
PHYS 351 Electromagnetic Fields .................................... 3
PHYS 411 Quantum Mechanics ........................................ 3
CHEM 112 General Chemistry I ....................................... 4
CHEM 112 General Chemistry II ..................................... 4
CHEM 231 Organic Chemistry I ....................................... 4
CHEM 232 Organic Chemistry II ..................................... 4
CHEM 341 Physical Chemistry I ....................................... 4
CHEM 341 Physical Chemistry II ..................................... 4
TOTAL (30 upper division) 52

Required cognates: MATH 201 or CHEM 201; CHEM 111, 112; and CSIS 110; or equivalent.
The B.S. in Mathematical Physics is a composite major, therefore no minor is required.

Physics Minor

PHYS 121 General Physics I ............................................. 4
PHYS 122 General Physics II ............................................. 4
PHYS 221 General Physics with Calculus I .......................... 1
PHYS 222 General Physics with Calculus II ........................ 1
PHYS 311 Modern Physics ............................................... 3
PHYS Electives .............................................................. 6
TOTAL (6 upper division) 19

TEACHING CERTIFICATION PROGRAM

The following Physical Science major is for teaching certification only. Requirements for certification are listed in the Education section of this bulletin.

You must make formal application for admittance to the Teacher Education Program. Applications are available at the Education Department office.

Physical Science with Physics Emphasis, B.S.
Secondary Teaching Area

PHYS 112 Introductory Astronomy ...................................... 4
PHYS 121 General Physics I ............................................. 4
PHYS 121 General Physics II .......................................... 4
PHYS 221 General Physics with Calculus I ......................... 1
PHYS 222 General Physics with Calculus II ....................... 1
PHYS 311 Modern Physics ............................................... 3
PHYS 322 Classical Mechanics ........................................ 3
PHYS 351 Electromagnetic Fields .................................... 3
PHYS 411 Quantum Mechanics ........................................ 3
CHEM 111 General Chemistry I ....................................... 4
CHEM 112 General Chemistry II ..................................... 4
CHEM 231 Organic Chemistry I ....................................... 4
CHEM 232 Organic Chemistry II ..................................... 4
CHEM 341 Physical Chemistry I ....................................... 4
CHEM 341 Physical Chemistry II ..................................... 4
TOTAL (16 upper division) 46

Required cognates: MATH 201 or CHEM 201; MATH 181, 282, 283, and CSIS 110.
COURSES

PHYS 101 Introductory Physics 4 hours
A laboratory science course for the student with no previous background in physics. A conceptual, rather than mathematical, approach is emphasized. Topics include mechanics, heat, sound, electromagnetism, light, and modern physics. 3 Lec 3 Lab. (Fall)

PHYS 112 Introductory Astronomy 4 hours
An introductory study of the solar system; stellar structure and evolution; star clusters, galaxies, quasars, the large scale structure of the universe, and cosmology. A conceptual, rather than mathematical, approach is emphasized, though some arithmetic calculations are required. 3 Lec 3 Lab. (Spring)

PHYS 121 General Physics I 4 hours
Prerequisite: MATH 121
An introduction to motion in one dimension, vectors in 2 and 3 dimensions, the laws of motion, work and energy, momentum and collisions, uniform curricular motion, gravity, rotational equilibria and dynamics involving torque and angular momentum, solids and fluids, thermal physics and heat, thermodynamical laws, vibrations, waves, and sound. Math level is algebra and trigonometry. 3 Lec 3 Lab. (Fall)

PHYS 122 General Physics II 4 hours
Prerequisite: PHYS 121
Continuation of PHYS 121. Topics include: electric force and electric field, electric potential, capacitance, resistance and resistivity, direct and alternating currents, Kirchhoff Laws, Ohm's Law, magnetism and Ampere's Law, Faraday's Law, electromagnetic waves, reflection and refraction of light, mirrors and lenses, relativity, quantum physics, atomic and nuclear physics, particles. 3 Lec 3 Lab. (Fall)

PHYS 221 General Physics with Calculus I 1 hour
Prerequisite: MATH 181
Corequisite: PHYS 121
A one hour addition to the topics of PHYS 121 where the calculus is thoroughly used. A student taking PHYS 121 and PHYS 221 will have the equivalent of a 4-hour university course in calculus-based general physics (topics as in PHYS 121). (Offered periodically, fall)

PHYS 222 General Physics with Calculus II 1 hour
Prerequisite: MATH 181
Corequisite: PHYS 122
A one hour addition to the topics of PHYS 122 where the calculus is thoroughly used. A student taking PHYS 122 and PHYS 222 will have the equivalent of a 4-hour university course in calculus-based general physics (topics as in PHYS 122). (Offered periodically, Spring)

PHYS 291 Selected Topics 1 hour
Prerequisite: Approval of department chair
Study in areas of interest beyond those listed in the bulletin. May include lectures, lab or readings under the direction of a staff member. Content and methods of study to be arranged prior to registration. May be repeated for a total of 2 credits.

PHYS 305 Digital Electronics 4 hours
Prerequisite: Permission of instructor
An introduction to the theory and application of digital logic circuits. Combinatorial and sequential logic design principles and practices. Microcomputer interfacing: I/O programming, system bus structures and I/O interfaces. 3 Lec 3 Lab. (Fall)

PHYS 311 Modern Physics 3 hours
Prerequisite: PHYS 122, PHYS 222
Corequisite: MATH 282
Special relativity and quantum theory applied to atoms, molecules, solids, nuclei and elementary particles. (Offered periodically)

PHYS 322 Classical Mechanics 3 hours
Prerequisite: PHYS 122, 222
Corequisite: MATH 282
The Newtonian dynamics of particles and rigid bodies; central forces, harmonic motion, many particle systems, and an introduction to the formalisms of Lagrange and Hamilton. (Offered periodically)

PHYS 351 Electromagnetic Fields 3 hours
Prerequisite: MATH 283
Electric and magnetic fields in the presence of matter, scalar, and vector potentials, multipole expansions, Poisson's and LaPlace's equations, and an introduction to Maxwell's equations. (Offered periodically)

PHYS 411 Quantum Mechanics 3 hours
Prerequisite: PHYS 311; MATH 283
The Schrödinger equation, operators, angular momentum, perturbation theory, scattering theory, and many particle systems. Techniques from the theory of partial differential equations and linear algebra will be introduced as needed. This course meets the upper division writing component for senior year English. (Offered periodically)

PHYS 491 Selected Topics 1-3 hours
Prerequisite: Approval of department chair
Study in areas of interest beyond these listed in the bulletin. May include lectures, lab or readings under the direction of staff member. Content and methods of study to be arranged prior to registration. May be repeated for a total of 6 credits.