

**PHTH580*****Professional Ethics***

Basic ethical theory and methods and their place in the study of human behavior. Medical professional context and challenges of ethical behavior are examined including the relationships between peers, superiors, subordinates, and patients. Contemporary medical ethical issues are discussed and illustrated with actual cases and related to Christian biblical presuppositions.

(2)

**PHTH648*****Workshop***

(1-4)

# PHYSICS

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Haughey Hall, Room 212  
(616) 471-3430  
physics-info@andrews.edu  
<http://www.andrews.edu/PHYS/>

**Faculty**

Robert E. Kingman, *Chair*  
Gary W. Burdick  
Mickey D. Kutzner  
Margarita C. K. Mattingly  
S. Clark Rowland

Physics describes the world in terms of matter and energy and relates the many facets of its phenomena in terms of fundamental law. Its scope includes systems that range in size from sub-nuclear to the entire cosmos. A major .t l of o y0f

sciences to meet certification requirements. Such persons should consult with the biophysics advisor and the School of Education early in their programs.

### Minor in Physics—20

Chosen in consultation with the department including PHYS241, 242, and 271, 272.

*PHYS110, 115, 131, 132, 405 are not applicable to a major or minor in Physics.*

**PHYS241, 242** (4, 4)

#### *Physics for Scientists and Engineers*

An introduction to mechanics, relativity, heat, electricity, magnetism, wave motion, physical and geometrical optics, and modern physics emphasizing the mathematical formulation and the physical significance of the fundamental principles. Weekly: 4 lectures and 1 recitation. Prerequisites: MATH141, 142. Corequisites: PHYS271, 272.

**PHYS271, 272** \$ (1, 1)

#### *Physics for Scientists Laboratory*

Weekly: one 3-hour lab. Corequisites: PHYS241, 242.

**PHYS280** (1-3)

#### *Topics in \_\_\_\_\_*

Introductory-level topics in astrophysics, high-energy physics, or

## Graduate Program

The Physics Department collaborates in the MS: Interdisciplinary Studies (Mathematics and Physical Sciences). See the Interdisciplinary Studies section, p. 124.

## Courses

(Credits)

See inside front cover for symbol code.

**PHYS110** \$ (3)

#### *Astronomy*

Explores the cosmic environment. Topics include the solar system, stars and their development star clusters, the interstellar medium, galaxies, and the large-scale features of the universe. Meets the natural science elective course requirement. Weekly: 2 lectures, 1 recitation, and a 2-hour lab. Prerequisite: MATH 165 or its equivalent.

**PHYS110** V (3)

#### *Astronomy*

Distance education—see content above.

**PHYS115** Alt \$ (3)

#### *Concepts of Physics*

A conceptual approach to physics for the non-science student. Explores matter, energy, motion, waves, electricity, and magnetism and quantum physics. Meets the natural science elective course requirement. Weekly: 2 lectures, 1 recitation, and a 2-hour lab. Prerequisite: MATH 165 or equivalent.

**PHYS130** \$ (4)

#### *Applied Physics for Health Professions*

Mechanics, waves, electricity, magnetism, acoustics and optics as applied to health professions such as Physical Therapy, but not acceptable for admission to dental, medical or veterinary schools. Weekly: 3 lectures, 1 recitation, and one 3-hr lab. Prerequisite: MATH 165.

**PHYS141, 142** \$ (4, 4)

#### *General Physics*

Algebra based introduction to mechanics, relativity, heat, electricity, magnetism, wave motion, physical and geometrical optics, and modern physics. Weekly: 3 lectures, 1 recitation, 1 laboratory briefing lecture, and one 3-hour lab. Prerequisite: Any of the following: MATH141, 165, 168, 182 or MPE 4.0.

**PHYS416** Alt (2.5)**Biophysics**

Modeling and describing physical phenomena of living systems. Topics deal with transport and diffusion across membranes and electrical processes in muscle and nerve tissue.

**PHYS420** (2-3)**Advanced Topics in \_\_\_\_\_**

Astrophysics, atomic physics, biophysics, nuclear physics, relativity or other areas of current interest. Prerequisite: PHYS242 or 411. Repeatable to 6 credits.

**PHYS430** ♦ Alt (2.5)**Thermodynamics**

Systematic introduction to thermodynamics, kinetic theory, and statistical mechanics (classical and quantum). Prerequisites: PHYS242 (recommended) or PHYS142; MATH142.

**PHYS431, 432** ♦ Alt (3, 3)**Electricity and Magnetism**

A treatment of electromagnetic phenomena in terms of potentials and vector fields. PHYS431 develops Maxwell's equations with descriptions of electrostatics and magnetostatics as solutions to Laplace's and Poisson's equations. PHYS432 addresses electromagnetic radiation in media, reflection and refraction, and the fields of wave guides and antennae. Prerequisite or concurrently enrolled in PHYS411.

**PHYS445** ♦ Alt (2.5)**Particle Physics**

A study of particle properties, forces, structure, decay and reaction mechanism in the context of the Standard Model. Prerequisite: PHYS481.

**PHYS460** ♦ Alt (2.5)**Solid State Physics**

A study of crystallography, x-ray diffraction, properties of crystalline and amorphous solids, band theory of solids, and lattice dynamics. Prerequisite: PHYS411.

**PHYS475** (2.5)**Physics Review**

A review and synthesis of physics concepts and analytical and experimental techniques in preparation for entry into a graduate program. Topics include classical, statistical and quantum mechanics, waves and classical fields. Prerequisite: PHYS411.

**PHYS477** ♦ \$ (1)**Advanced Physics Laboratory II**

Acquaints students with important phenomena, equipment, and technique of modern experimental physics. Repeatable to 2 credits.

**PHYS481, 482** ♦ Alt (3, 3)**Quantum Mechanics**

The mechanics of small-scale physical phenomena as developed by Heisenberg, Schroedinger, and Dirac. Treatment of square well, step, and harmonic oscillator potentials; uncertainty relations; and symmetries to include angular momenta. Prerequisite or concurrently enrolled in PHYS411.

**PHYS495** (1-3)**Independent Study/Research**

Individually directed study or research in selected fields of physics. Repeatable to 6 credits. A minimum of 4 hours work per

week is required for each credit earned. A written paper required. Approval of the instructor required.

**PHYS530** (2-3)**Topics in Teaching Physics**

Each time the course is offered, one of the following areas is discussed:

- Principles of physics and effective approaches for teaching them.
- The physics lab, its purposes, administrative and safety procedures, essential equipment, seminal experiments, data analysis, lab journal, and reports.

Repeatable to 6 credits.

**PHYS540** (2-3)**Topics in Physics**

Study of one of the traditional areas of graduate physics such as electromagnetic theory, analytical mechanics, solid state physics, astrophysics, mathematical physics, and theoretical physics. Students must complete assigned readings and problems. Satisfactory performance on a written or oral comprehensive exam required. Repeatable to 9 credits.

**PHYS648** (1-3)**Workshop****PHYS690** (1-3)**Independent Study/Research**

Independent problems of research in selected fields of physics. Open to qualified students who show ability and initiative. Repeatable to 6 credits. A minimum of 4 hours work per week expected for each credit earned. Prerequisite: Consent of department chair.