

PHYSICS

Haughey Hall, Room 211
269-471-3430
physics@andrews.edu
physics.andrews.edu

Faculty

Margarita C. K. Mattingly, Co-Chair
Gary W. Burdick
Mickey D. Kutzner
Tiffany Z. Summerscales
Stephen C. Thorman

Emeriti

Ronald L. Johnson, Distinguished Professor Emeritus
Robert E. Kingman
S. Clark Rowland

Academic Program	Credits
BS: Physics	40
BS: Biophysics	40
BS: Physics Education	30
Major in Physics Studies	30
Minor in Physics	20

Mission

Our mission is to increase the appreciation, understanding and application of physics in the integrated context of scientific rigor, personal ethics and spirituality, and Seventh-day Adventist faith and service.

Physics describes the world in terms of matter and energy and relates phenomena to fundamental law using mathematical representations. Its scope includes systems that range in size from

Graduate Program

The Department of Physics collaborates in the MS: Mathematics and Science program with the departments of Mathematics, Biology, and Chemistry. See the program description under Mathematics & Science.

Courses

(Credits)

See inside front cover for symbol code.

— \$ C ()

Astronom

Exploring the cosmic environment—the solar system, stars and their development, star clusters, the interstellar medium, galaxies, and large-scale features of the Universe. Meets the General Education Physical Science requirement. Does not apply to a major or minor. Weekly: 3 lectures, 1 recitation, and a 2-hour lab. Prerequisite: MATH145 or 166 or STAT285 or MPE P2. *F* *ci* *S* *h* *f*

— \$ (7)

Astronom

AU/GU course—see content above.

— \$ C ()

M thbusting

Examining what is commonly believed about the physical world and how to realign it with reality. A conceptual and relevant understanding of physics—forces, matter and energy with 21st century applications. Weekly: 3 lectures, 1 recitation, and a 2-hour lab. Prerequisite: MPE P2 or GE-level math course.

— \$ ()

General Ph sics

Algebra based introduction to mechanics, relativity, heat, electricity, magnetism, wave motion, physical and geometric optics, and modern physics. Weekly: 3 lectures, 1 recitation, and one 3-hour lab. Prerequisite: A minimum of MATH167 or MATH168 or MPE P4. PHYS142 must be preceded by PHYS141.

— \$ C ()

Sound and Waves

The production, transmission, synthesis, and perception of sound as understood through the physical principles, properties, and nature of waves. Includes a survey of applications—music, speech, locomotion, and imaging—and comparisons with light and other kinds of waves. Meets the General Education Physical

statistical mechanics (classical and quantum). Prerequisites: PHYS242 (recommended) or PHYS142; MATH192. $\mathcal{S}_{\mathcal{P}}^{\mathcal{I}}_{\mathcal{F}}$ (odd years)

7 7

4A (7 7)

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 corequisite: PHYS411. $\mathcal{F}_{\mathcal{A}}$ (even years), $\mathcal{S}_{\mathcal{P}}^{\mathcal{I}}_{\mathcal{F}}$ (odd years)

Particle Physics

A study of particle properties, forces, structure, decay and reaction mechanism in the context of the Standard Model. Prerequisite: PHYS481. $\mathcal{S}_{\mathcal{P}}^{\mathcal{I}}_{\mathcal{F}}$ (even years)

3 3

4A (3 3)

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.

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. $\mathcal{F}_{\mathcal{A}}$

3 3

4S (3 3)

Advanced Physics Laboratory II

Important phenomena, equipment, and techniques in modern experimental physics. Repeatable to 2 credits. $\mathcal{S}_{\mathcal{P}}^{\mathcal{I}}_{\mathcal{F}}$

Study Tour:

Travel to destinations relevant to individual programs of study. Classes will be selected from department(s) offerings. Fee may be required.

7 7

4A (7 7)

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 corequisite: PHYS411. $\mathcal{F}_{\mathcal{A}}$ (odd years), $\mathcal{S}_{\mathcal{P}}^{\mathcal{I}}_{\mathcal{F}}$ (even years)

3 3

4A (3 3)

Independent Study /Research

Individually directed study, problem-solving, or research in selected fields of physics. A minimum of 4 hours work per week is required for each credit earned and a written paper is required. Repeatable to 6 credits. Prerequisite: Approval of the instructor.

7 7

4A (7 7)

Topics in Teaching Physics

Discussions on 1) the principles of physics and effective approaches for teaching them, or 2) the physics lab, its purposes, administrative and safety procedures, essential equipment,

seminal experiments, data analysis, lab journal, and reports. Repeatable to 9 credits.

Topics in Physics

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

Workshop

An intensive program for middle school and secondary teachers and teachers-in-training who seek certification or endorsement in physics and who wish to update and expand their skills in the physics laboratory.

Independent Study /Research

Individually directed study, problem-solving, or research in selected fields of physics. Open to qualified students who show ability and initiative. A minimum of 4 hours work per week expected for each credit earned. Repeatable to 6 credits. Prerequisite: Consent of department chair.