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 the sub-nuclear to the entire cosmos.

The BS: Physics program supports and enhances professional careers in all the physical sciences, engineering, and the life sciences. Its emphasis on problem-solving also provides a foundation for careers in medicine, business, law, and government. The BS: Biophysics program prepares the graduate for direct entry into the workforce or advanced studies in medical and bioengineering fields as well as biophysics.

The BS: Physics Education program prepares the graduate for a career in secondary teaching.

Physics as a Second Major is an add-on degree program that complements any baccalaureate degree without incurring additional general education requirements. It strengthens and expands marketability and interdisciplinary opportunities.

A Minor in Physics complements any baccalaureate degree and is the minimum requirement for secondary teaching certification in physics. All physics majors and minors desiring certification should consult with the School of Education throughout their program.

Undergraduate Programs

BS: Physics (40)

**Major Requirements:** PHYS241, 242, 271, 272, 277, 377, 411, 430, 431, 477, 481, 495 plus an additional 12 credits numbered 300 and above.

Cognate Courses: MATH141, 142, 215, 240, 286; CHEM131, 132, 371, 372; and PHYS495.

Physics majors desiring secondary-teaching certification should also consult with the School of Education.

**Recommended Electives:** ELCT141, 142, TCED250

BS: Biophysics (40)

Offered by the biology and physics departments

BIOL165, 166, 371, 372 or BCHM421*; PHYS241, 242, 271, 272, 277, 377, 411, 416, 430 or CHEM431 and 441, PHYS431, 495

*A student may earn a minor in chemistry by selecting BCHM421 or CHEM431 and 441.

**Cognate Courses:** CHEM131, 132, 231, 232, 241, 242; MATH141, 142, 286.

**Recommended Electives:** BCHM422, 430; CHEM432, 442; ELCT141, 142; MATH215, 240.

Senior Thesis. All Physics and Biophysics majors do some original research in collaboration with an established physicist on-campus or at another university, industrial, or national laboratory. If students enroll for 3 credits of PHYS495 or HONS497, they may prepare a Senior Thesis. Undergraduate Research Assistant (URA) scholarships are available through the Office of Scholarly Research when students collaborate with Andrews Physics faculty.

BS: Physics Education (30)

**Major Requirements:** PHYS241, 242, 271, 272, 277, 377, 411, 430, 431, 481, 495 plus an additional 6 credits numbered 300 and above in consultation with advisor.

**Cognate Courses:** MATH141, 142, 240

This major is available only to those who are obtaining secondary teacher certification.

BS: Physics as a Second Major (30)

**Major Requirements:** PHYS241, 242, 271, 272, 277, 377, 411, 430, 431, 481, 495 plus an additional 3.5–6 credits numbered 300 and above in consultation with advisor.

**Cognate Courses:** MATH141, 142, 240

This major is available only as a second major, to those taking a major in another field.

Minor in Physics (20)

**PHYS241, 242, 271, 272, 277, 411,** and electives chosen in consultation with the department chair. Students in a teacher certification program are required to take PHYS430.

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 and Science.

Courses (Credits)

See inside front cover for symbol code.

**PHYS110** $ CS (4)

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. Fall, Spring

**PHYS110**  
*Informatics*-  
AU/GU course—see content above.

**PHYS115**  
*Mythbusting*  
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.

**PHYS225**  
*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 Science requirement. Does not apply to a major or minor. Weekly: 3 lectures and a 2-hour lab. Prerequisite: MATH167 or MATH168 or MPE P4.

**PHYS241, 242; PHYS241H, 242H**  
*General Physics*  
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.

**PHYS271, 272; PHYS271H, 272H**  
*Physics for Scientists Laboratory*  

**PHYS277**  
*Physics Colloquium*  
Current topics and issues of interest to the physics community. Required each semester of all students with a physics major or minor. Weekly: 1 lecture or activity. Repeatable.

**PHYS280**  
*Talents in_______*  
Introductory-level topics in astrophysics, other current physics area or associated scientific programming. Repeatable to 4 credits. Minimum of 4 hours per week is required for each credit earned. Prerequisite: Approval of the instructor.

**PHYS295**  
*Independent Study / Research*  
Individually directed reading and lab projects (e.g., holography and astrophotography). A minimum of 4 hours per week is required for each credit earned. Repeatable to 4 credits. Prerequisite: Approval of the instructor.

**PHYS350**  
*Optics*  
Geometrical and physical optics; interference and diffraction, polarization, Fourier optics, lasers, and holography. Prerequisites: PHYS242 (recommended) or 142; MATH142.

**PHYS377**  
*Advanced Physics Laboratory I*  
Development of advanced lab skills in the study of basic physical phenomena. Emphasis includes scientific instrumentation, laboratory procedure, data reduction, interpretation, and technical communication. Repeatable to 2 credits. Spring

**PHYS400**  
*Demonstrations in Physics*  
Identifying topics suitable for demonstration, surveying the literature, preparing demonstrations, finding suppliers of materials and equipment. A critical evaluation of demonstrations—their design, preparation, and execution—with student participation. Prerequisite: Approval of the department chair.

**PHYS411, 412**  
*Theoretical Mechanics*  
Statics, kinematics, and dynamics of systems of particles. Application of vector calculus to mechanics; Lagrangian and Hamiltonian formulations. Prerequisite: PHYS242 (recommended) or PHYS142; MATH142. Fall, Spring (odd years)

**PHYS416**  
*Biophysics*  
Modeling and describing physical phenomena of living systems, including transport and diffusion across membranes and electrical processes in muscle and nerve tissue. Prerequisite: PHYS242 (recommended) or PHYS142; MATH142. Spring (odd years)

**PHYS420**  
*Advanced Topics in_______*  
Astrophysics, atomic physics, nuclear physics, relativity or other current physics area. Prerequisite: PHYS242 or 411. Repeatable to 6 credits.

**PHYS430**  
*Thermodynamics and Statistical Mechanics*  
Systematic introduction to thermodynamics, kinetic theory, and statistical mechanics (classical and quantum). Prerequisites: PHYS242 (recommended) or PHYS142; MATH142. Spring (odd years)

**PHYS431, 432**  
*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. Fall (even years), Spring (odd years)

**PHYS445**  
*Particle Physics*  
A study of particle properties, forces, structure, decay and reaction mechanism in the context of the Standard Model. Prerequisite: PHYS481. Spring (even years)
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. Fall

PHYS477 ♦ S (1)  
Advanced Physics Laboratory II  
Important phenomena, equipment, and techniques in modern experimental physics. Repeatable to 2 credits. Spring

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 corequisite: PHYS411. Fall (odd years), Spring (even years)

PHYS495 (1–3)  
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.

PHYS530 (1–3)  
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.

PHYS540 (2–3)  
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.

PHYS648 (1–3)  
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.

PHYS690 (1–3)  
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.

RELIGION & BIBLICAL LANGUAGES  
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Susan P. Zork

Emeriti  
Elly H. Economou  
A. Josef Greig  
S. Douglas Waterhouse

Academic Programs Credits  
BA: Theology  
Pastoral Ministry  
Youth Ministry  
74  
32

BA: Religion  
Religion for Secondary Education  
BA: Religion (Distance Degree)  
33–35  
35

AA: Bible Work and Evangelistic Ministries  
AA: Personal Ministries (Distance Degree)  
36  
32

Minor in Religion  
Minor in Biblical Languages  
Minor in Missions  
20  
22  
20

Mission  
The Department of Religion & Biblical Languages seeks to engage majors and general education students through a biblically grounded, theologically astute and relevant process of spiritual formation; equipping and inspiring them to passionately serve the Seventh-day Adventist Church and the wider world beyond as dedicated laypersons and committed denominational employees in the expectation of the soon coming of Jesus Christ.

Students who are religion and theology majors must maintain a minimum overall 2.25 GPA (2.5 for BA: Religion for Secondary Education). They must be in good and regular standing in terms of student life citizenship. As future ministers of the church, they are expected to live in harmony with Seventh-day Adventist beliefs and practices. Failure in any of these areas may lead to a student being placed on probation or being dismissed from the program. Academic requirements and other program standards are stated in detail in the departmental handbook.