

PHYSICS

Haughey Hall, Room 211
(269) 471-3430
physics@andrews.edu
http://physics.andrews.edu

Faculty

Margarita C. K. Mattingly,
Gary W. Burdick
Mickey D. Kutzner

Robert E. Kingman
Bruce E. Lee
S. Clark Rowland

Academic Programs	Credits
BS: Physics	40
BS: Biophysics	40
Physics as a Second Major	30
Minor in Physics	20

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 the sub-nuclear to the entire cosmos.

A major in physics supports and enhances professional careers in engineering, the life sciences, the physical sciences, and similar areas.

A major in biophysics prepares the graduate for advanced studies in medical and bioengineering fields. Both physics programs prepare the graduate for a career in secondary teaching.

A **Physics as a Second Major** is an add-on major that complements other majors without incurring additional general education requirements. It strengthens and expands marketability and interdisciplinary opportunities.

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

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; and CPTR125 (FORTRAN) or CPTR151.

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—27

CHEM131, 132, 231, 232, 241, 242; MATH141, 142, 286.

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

Students electing to take a BS: Biophysics should consult with the chair of the Physics Department. Biophysics majors who are interested in secondary teaching need to select electives to meet certification requirements and should consult with the School of Education early in their programs.

Senior Thesis. Physics and Biophysics majors may elect to perform original research in a topic of mutual interest with a Physics Department faculty member and present this original work in the form of a senior thesis. Students are expected to log a minimum of 180 hours, and may receive up to 3 credits in PHYS495 or HONS497. Research scholarships are available.

BS: Physics as a Second Major—30

Major Requirements: PHYS241, 242, 271, 272, 277, 377, 411 (or ENGR285 and PHYS412), 430, 431 or ENGR435, 481, 495 plus an additional 3.5–6 upper division elective credits numbered 300 and above in consultation with advisor.

Cognate Courses: MATH141, 142, 240, 286

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, 411, and electives chosen in consultation with the department chair.

PHYS110, 115, 405 are not applicable to a major or minor in Physics or a major in Biophysics.

Graduate Program

The Physics Department collaborates in the MS: Mathematics and Physical Science program. See the Interdisciplinary Studies section, p. 141.

Courses

(Credits)

See inside front cover for symbol code.

PHYS110

\$ (3)

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: MATH145 or 166 or MPE P3.

mechanism in the context of the Standard Model. Prerequisite: PHYS481.

PHYS460 ◆ Alt (2.5)

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)

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)

Important phenomena, equipment, and techniques in modern experimental physics. Repeatable to 2 credits.

PHYS481, 482 ◆ Alt (3, 3)

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)

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 (1-3)

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)

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)

PHYS690 (1-3)

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.

RELIGION AND BIBLICAL LANGUAGES

Griggs Hall, Room 214
(269) 471-3177
Fax: (269) 471-6258
religion@andrews.edu
<http://www.andrews.edu/RELG>

Faculty

Keith E. Mattingly,
Lael O. Caesar
Glenn E. Russell
Ranko Stefanovic
Woodrow W. Whidden II
Susan P. Zork

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

Academic Programs	Credits
BA: Theology	
Pastoral Ministry	68
Secondary Education	54
Youth Ministry	74
BA: Religion	31
BA Distance Degree: Religion	35
AA: Personal Ministries	32
AA Distance Degree: Personal Ministries	32
Minor in Religion	20
Minor in Biblical Languages	22
Minor in Missions	20

Programs

BA: Theology

Choose from one of the following:

Pastoral Ministry Emphasis—68

RELB110, 115, 210, 214, 335, 406, 476; RELH316, 317; HIST404; RELP200 (Twice), 240, 331, 332, 333, 334, 441, 442; RELT100, 226, 250, 308, 340, 400; BIBL211, 212, 311, 312, 321, 322, 427.

Required Cognates (9 credits): HIST404; RELH316, 317.
Minimum grades of C- must be earned in HIST404 and in all RELB, RELH, RELP, and RELT courses that apply to major requirements.

Youth Ministry Emphasis—76

RELB110, 115, 210, 214, 335, 406, 476; RELP200 (Twice), 240, 331, 332, 333, 334, 335, 441, 442; RELT100, 226, 250, 308, 340; BIBL211, 212, 311, 312, 321, 322.

Choose three from ANTH200, BHSC220, FMST454, 456, PSYC204, 251, 252, 319, 454, SOCI120, 345, 415, 430