

the taxonomies of learning, learning styles, multiple intelligence, and educational technology.

PTH749 (1)***Advanced Concepts in Women's Health Laboratory***

Advanced practice and application of clinical skills required in the physical therapy assessment and intervention of women's health. Corequisite: PTH739.

PTH750 (2)***Professional Communication & Consulting***

An introduction to the integration of the physical therapist as consultant. Discussion will include applying physical therapy consultation services to individuals, business, schools, government agencies and/or other organizations.

PTH760 (2)***Applications in Clinical Research***

Information presented on how to develop and present a publishable quality case study. It also includes the actual practice of doing an outcomes study in the clinical environment.

PTH765 (1-2)***Ethical & Legal Issues in Healthcare***

Contemporary ethical issues are explored, including the relationships among peers, superiors, subordinates, institutions, clients, and patients. Illustrations include actual cases related to Christian biblical principles.

PTH768 (1)***Professional Compendium***

Summarization of previous or added learning experiences relative to contemporary issues in physical therapy. An overview of the new graduate's role and responsibility to his/her patients and their families, employer, and community in the expanding physical therapy profession.

PTH788 (0)***Research Project Continuation***

Non-package, reduced tuition rate applies.

PTH798 (1-10)***Capstone Experience***

Serves as an essential outcome component to augment the professional development and new learning that occurs in didactic course work of the postprofessional doctoral degree and demonstrates the ability of the DPT/DScPT to make significant contributions to the profession and/or serve as a change agent in the field of physical therapy.

PTH799 (1-3)***Research Project (topic)***

Provides students with guidelines and supervision for data collection, analysis, capstone project preparation and oral presentation.

PTH880 (1)***PT Seminar***

Preparation of a personal portfolio, assessment of the clinical experiences and preparation for professional licensure.

PTH881, 882, 883, 884 (4, 4, 5, 5)***Clinical Affiliation I, II, III, IV***

Advanced full-time clinical experience (8-10 weeks each) in a variety of professional practice settings. One of the affiliations must be in outpatient orthopedics, inpatient, and a neurology setting. Thirty-six to forty hours per week. May be repeated.

PHYSICS

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

Faculty

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

Emeriti

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 *second major in physics* 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.

UNDERGR

*, 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.

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.

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 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 Department of Physics collaborates in the MS: Mathematics and Science with the Departments of Mathematics, Biology, and Chemistry. See the program description under Mathematics and Science, p. 151.

COURSES

See inside front cover for symbol code.

PHYS110 \$ CS (4)

Astronomy

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 physical science general education requirement and may substitute for Scientific Inquiry. Weekly: 3 lectures, 1 recitation, and a 2-hour lab. Prerequisite: MATH145 or 166 or MPE P3.

PHYS110 V \$ (3)

Astronomy

AU/HSI course—see content above.

PHYS115 \$ CS (4)

Concepts of Physics

A conceptual approach to physics—forces, matter, and energy with 21st century applications. Meets the physical science general education requirement and may substitute for Scientific Inquiry. Weekly: 3 lectures, 1 recitation, and a 2-hour lab. Prerequisite: MATH145 or 166 or MPE P3.

PHYS141, 142 \$ (4, 4)

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.

PHYS241, 242; PHYS241H, 242H (4, 4)

Physics for Scientists and Engineers

Annual physics course for scientists and engineers.

able as PHYS241H, 242H. Weekly: 4 lectures and 1 recitation. Prerequisite for PHYS241: MATH141. Corequisite to guide the preparation and presentation of one short talk. Grades are based on attendance and the quality of the presentation and its content. Required of all physics and biophysics majors each year, except those in which PHYS377 or PHYS477 is taken. Repeatable.

Spring

PHYS280 (0.5–3)

Topics in _____

Introductory-level topics in astrophysics or other areas of current interest. Repeatable to 4 credits. Minimum of 4 hours work per week is required for each credit earned. Approval of the instructor is required.

PHYS295 (1–2)

Independent Study / Research

Reading and lab projects (e.g., holography and astrophotography). Repeatable to 4 credits. A minimum of 4 hours work per week is required for each credit earned. Approval of the instructor is required.

PHYS350 Alt (2.5)

Optics

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

PHYS377 \$ (1)

Advanced Physics Laboratory I

Development of advanced physical TT1 13C -20.253 -henTfna.velopment

PHYS400**(1-2)*****Demonstrations in Physics***

Consideration of topics suitable for demonstration, a survey of the literature, prepared demonstrations, suppliers of materials and equipment. A critical evaluation of demonstrations—their design, preparation, and execution—with student participation. Prerequisite: Approval of the department.