

841. Seminar in Epistemology
 Fall, Winter, Spring. 4 credits. May re-enroll for credit. Approval of department.

845. Seminar in Metaphysics
 Fall, Winter, Spring. 4 credits. May re-enroll for credit. Approval of department.

850. Seminar in Aesthetics
 Fall. 4(3-0) Approval of department.
 The nature of aesthetic values, grounds of criticism, function of the arts, etc.

860. Seminar in Social Philosophy
 Spring. 4(3-0) Approval of department.
 Philosophy of law and of the state.

870. Seminar in the Philosophy of Language
 Fall. 4(3-0) Approval of department.
 Concrete bases of language and nature of meaning.

880. Seminar in the Philosophy of Science
 Fall, Winter. 4 credits. Approval of department.

890. Graduate Reading Course
 Fall, Winter, Spring, Summer. 1 to 10 credits. May re-enroll for credit. Approval of department.
 Supervised reading course for advanced graduate students for more thorough investigation of special fields.

899. Research
 Fall, Winter, Spring, Summer. Variable credit. Approval of department.

999. Research
 Fall, Winter, Spring, Summer. Variable credit. Approval of department.

PHYSICAL SCIENCE PHS

College of Natural Science

203. Foundations of Physical Sciences
 Fall, Winter, Spring, Summer. 4(3-3)
 Primarily for elementary school teachers.
 Integrated descriptive course in the elements of physical science including the interrelations among chemistry, geology, meteorology, astronomy, and physics.

401. Mathematics for Teachers
 Fall. 4(4-0) Teaching experience and approval of department.
 Provides mathematical background for science teachers. It will emphasize the basic concepts of mathematics, including number systems. Topics will be selected from algebra, analytic geometry and trigonometry to illustrate the principles of number, operation, relation, proof and other basic mathematical ideas.

402. Mathematics for Teachers
 Fall, Winter. 4(4-0) 401 or approval of department.
 Continuation of 401.

403. Mathematics for Teachers
 Winter, Spring. 4(4-0) 402 or approval of department.
 Continuation of 402.

404. Physical Science for Teachers
 Fall, Winter, Spring. 4(3-3) Bachelor's degree.
 An integrated course in the physical sciences on the nature of the matter and energy gained by interrelating the facts, principles and laws about light, electricity, magnetism and sound as well as the structure and properties of substances, rates of reaction, equilibria. The concepts of measurement will be stressed. The course is for general science teachers and is not applicable for chemistry or physics majors.

405. Physical Science for Teachers
 Fall, Winter, Spring. 4(3-3) 404.
 Continuation of 404.

406. Physical Science for Teachers
 Fall, Winter, Spring. 4(3-3) 405.
 Continuation of 405.

407. Earth Science for Teachers
 Fall. 3(3-0) or 4(3-3)
 Fundamentals of climatology and its relationship to weathering in rocks; agents of erosion, transportation, and deposition; study of the common minerals; the three classes of rocks, and igneous, sedimentary and metamorphic processes; geomorphic features including glaciers, volcanoes, oceans, lakes, deserts, caves and others. Laboratory includes identification of minerals, rocks; study of topographic maps; and field trips to points of geologic interest.

408. Earth Science for Teachers
 Winter. 3(3-0) or 4(3-3) 407.
 Continuation of physical geology and introduction to historical geology, containing discussions of earth structures, mountain building, economic geology; geologic time, basic astronomy, theories of earth origin; the earliest geologic eras, first evidences of life.

409. Earth Science for Teachers
 Spring. 3(3-0) or 4(3-3)
 Historical development of the various geologic periods through time with reference to the evolutionary development of the physical landscape, ancient geography, past climate, diastrophic events, and marine and land animals and plants. Laboratory includes the identification of important animal and plant fossils, fossil environments, geologic maps; field trips to collecting localities.

410. Seminar on Recent Advances in Physical Science
 Fall, Winter, Spring, Summer. 3(3-0)
 May re-enroll for a maximum of 6 credits if different topic is taken. Approval of department.
 A series of lectures by senior faculty of topics on the history, development, the most recent advances and the possible future and limits of the Physical Sciences.

411. Seminar on Man, His Universe
 Fall, Winter, Spring, Summer. 3(3-0)
 Approval of department.
 A creative review by senior faculty from Astronomy, Biochemistry, Biophysics, Geology, Physics and Philosophy on the impact of recent space probes in developing modern concepts of the universe.

412. Seminar on Man, His Earth
 Fall, Winter, Spring, Summer. 3(3-0)
 Approval of department.
 A summary by senior faculty from Astronomy, Anthropology, Botany, Geology, Meteorology, and Zoology of new ideas, methods, and theories employed by current researchers to unravel the mysteries of the origin of the earth, its interior, the forces developing the scenic surface features, and the evolution of life in its historical setting.

PHYSICS

PHY

College of Natural Science

Introductory courses are divided into three groups:

- (1) 237, 238, 239 (theory) and 257, 258, 259 (laboratory) open to students who are taking at the same time, or who have taken, first year mathematics through college algebra and trigonometry.
- (2) 287, 288, 289 (theory) and 297, 298, 299 (laboratory) for students of engineering, physical sciences, mathematics, and others. Those electing this sequence should have completed courses in mathematics through two terms of analytic geometry and calculus.
- (3) 291, 292, 293, 294, 392, 393, 394, 395 for physics majors and others who have a special interest in physics. Students electing this sequence should have completed or should be taking the second term of analytic geometry and calculus.

A student may change from one group of introductory courses to another but may not receive credit for the equivalent of more than one complete three-term introductory sequence.

Credit may not be earned for more than one of the courses PHY 294, 357, 364 or 491.

PHY 357 and 360 cannot be used to meet the requirements for a major in physics.

All 400 level physics courses require PHY 289 or 293 as prerequisites.

237. Introductory Physics
 Fall, Winter. 3(4-0) MTH 102 or 109 or 111 or concurrently.
 Mechanics and heat.

238. Introductory Physics
 Winter, Spring. 3(4-0) 237.
 Heat, electricity and magnetism.

239. Introductory Physics
 Fall, Spring. 3(4-0) 238.
 Wave motion, sound, light, and modern developments.

257. Introductory Physics Laboratory
 Fall, Winter. 1(0-2) 237 or concurrently.
 Mechanics and heat.

258. Introductory Physics Laboratory
 Winter, Spring. 1(0-2) 238 or concurrently.
 Heat, electricity and magnetism.

259. Introductory Physics Laboratory
 Fall, Spring. 1(0-2) 239 or concurrently.
 Wave motion, sound, light and modern developments.

287. Principles of Physics
 Fall, Winter. 4(5-0) MTH 113.
 Mechanics.

288. Principles of Physics
 Winter, Spring. 4(5-0) 287; MTH 214 or approval of department.
 Heat and thermodynamics, electricity and magnetism.

289. Principles of Physics
 Fall, Spring, Summer. 4(5-0) 288; MTH 214 or approval of department.
 Wave motion, sound, light, and modern developments.