

**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.