

461. Ethical Issues in Nursing
Winter. 2(2-0) PHL 340 or approval of instructor.

Application of ethical analysis, principles, and reasoning to such topics as parentalism, truthfulness, coercion, confidentiality, and autonomy in the nursing context.

471. Philosophy of Mathematics
Spring. 4(3-0) PHL 337 or LBS 372 or MTH 471 or approval of department.

An analysis of the nature of mathematical truth. The theses of logicism, formalism, intuitionism, and conventionalism are critically examined.

480. The Nature of Scientific Theory and Explanation
Winter. 4(3-0) PHL 337 or approval of department.

Topics such as: the logical structure of scientific theories, empirical meaningfulness and testability, deductive and probabilistic explanation, prediction.

481. Foundations of Scientific Inference
Spring. 4(3-0) PHL 337 or approval of department.

Topics such as: discovery vs. validation of theories, probability, induction and confirmation theory.

483. Philosophy of Physical Science
Fall. 4(4-0) Nine credits in physical science or approval of department. Interdepartmental with and administered by Lyman Briggs School.

Philosophical problems of the physical sciences. The topics will be taken from such areas as: quantum mechanics, space-time, classical mechanics, relativity.

484. Philosophy of Biological Sciences
Winter, Spring. 4(4-0) Nine credits in science or approval of department. Interdepartmental with and administered by Lyman Briggs School.

Methodological notions and problems of the biological sciences such as: observation and measurement, classification, teleological and functional explanation, teleological systems, emergentism, vitalism, value neutrality.

485. Philosophy of the Social Sciences
Spring. 4(3-0) Three credits in philosophy at 300 level or higher or 9 credits in philosophy or 9 credits, other than basics, in social science or approval of department.

Selected problems in the methodology of the behavioral sciences, including such topics as: concept formation and theory construction, explanation and insight, subjectivity and value judgements, emergence and teleology, historicism, reductionism, measurement, and statistical inference.

490. Individual Reading
Fall, Winter, Spring, Summer. 1 to 4 credits. Approval of department.
Supervised reading on a particular author or topic.

494. Special Topics
Fall, Winter, Spring, Summer. 2(2-0) to 6(6-0) Approval of department.
Intensive study of some particular problem or author in philosophy.

495. Proseminar
Winter, Spring. 1 credit. May reenroll for a maximum of 4 credits. Juniors. Fifteen credits in philosophy or approval of instructor.
Each section will examine a particular topic or author. Emphasis on discussion of student papers.

805. Business Ethics
Spring. 4(4-0) Graduate student in the College of Business or approval of instructor. Interdepartmental with the Department of Business Law and Office Administration.

Ethical dimensions of such topics as corporate responsibility, preferential hiring, profit and taxation, deception and bribery, self-regulation versus government regulation, 'whistleblowing', and advertising. Readings from philosophical and business sources.

825. Seminar in the History of Philosophy
Fall, Winter, Spring. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.

830. Seminar in Ethics
Winter, Spring, Summer. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.

837. Seminar in Logic
Fall. 4(3-0) May reenroll for credit. Approval of department.

841. Seminar in Epistemology
Fall, Winter, Spring. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.

845. Seminar in Metaphysics
Fall, Winter, Spring. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.

850. Seminar in Aesthetics
Fall. 4(3-0) May reenroll for a maximum of 12 credits. 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) May reenroll for a maximum of 12 credits. Approval of department.
Philosophy of law and of the state.

870. Seminar in the Philosophy of Language
Fall. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.
Concrete bases of language and nature of meaning.

880. Seminar in Philosophy of Science
Fall, Winter, Spring. 4(3-0) May reenroll for a maximum of 12 credits. Approval of department.

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

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

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

PHYSICAL SCIENCE PHS

College of Natural Science

The content of courses 400, 405, 410 and 412, as well as the problems course, 890, may vary from term to term. Brochures giving detailed information about individual courses are available in the Science and Mathematics Teaching Center and the Office of the Assistant Dean for Lifelong Education. These courses are primarily designed for in-service teachers and interested adults and are offered in off-campus locations.

203. Foundations of Physical Sciences
Fall, Winter, Spring, Summer. 4(3-0) 12 credits of Natural Science.

An introduction to physical science for non-science majors. Emphasis on basic concepts relating to human interaction with the physical environment. Topics selected from physics, chemistry, and the earth and space sciences.

400. Physical Science for Teachers
Fall, Winter, Spring, Summer. 3 or 4 credits. May reenroll for a maximum of 12 credits. Teacher certification with science major or minor.

For in-service teachers stressing process, inquiry, meaning and field experience. Topics will be generated from classroom experiences of participants.

405. Topics in Physical Science
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 6 credits if different topic is taken. Approval of department.

Presentation of single topics from the physical sciences by senior faculty and guest lecturers. Topics are selected to facilitate development of strong physical science programs in schools.

410. Seminar on Recent Advances in Physical Science
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll 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.

412. Recent Advances in Earth Science
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 6 credits if different topic is taken. Approval of department.

A series of lectures by senior faculty on the history, development, most recent advances and possible future trends in the earth sciences.

430. Planetarium and Classroom Instruction
Summer. 4(3-2) AST 119 or AST 217 or AST 229.

Practical operation, techniques, and methods of instruction for astronomy and other sciences in the planetarium theater and the classroom.

Descriptions – Physical Science

of

Courses

431. Problems in Planetarium Education

Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 6 credits. Approval of department.

Individual study, training, or project under the direction of a faculty member. Often the training will be in the area of actual delivery of planetarium presentations.

890. Problems in Physical Science

Fall, Winter, Spring, Summer. 1 to 12 credits. May reenroll for a maximum of 15 credits. Bachelor's degree in a physical science.

PHYSICS

PHY

College of Natural Science

Introductory physics courses are offered in both the lecture-recitation and the Competency-Based-Instructional (CBI) format. In the latter format the students are carefully guided through each course via written materials with ample consulting time available. Both content and pace of course are flexible to suit student's needs and interests, final grades being based on total amount of material for which student's mastery is certified. The introductory courses may be grouped by the application of two criteria: The interests of the students the courses are designed to serve and the method of instruction employed.

Lecture-Recitation Format

237, 238, 239, three credits each, designed primarily for students with interests in the life and earth sciences. The mathematics prerequisite is credit for or concurrent enrollment in college algebra and trigonometry (MTH 109 or 111).

287, 288, 289, four credits each, designed primarily for students with interest in the physical sciences, mathematics and engineering. The mathematics prerequisite is credit for or concurrent enrollment in calculus III with vectors (MTH 214).

291H, 292H, 293H, four credits each, designed primarily for Physics majors and others with a special interest in Physics. The mathematics prerequisite is credit for or concurrent enrollment in calculus III with vectors (MTH 214), the Honors section recommended.

Competency Based Instructional Format

237B, an alternate way to earn credit in 237. 281, 282, 283, three credits each, designed for students with interest in the natural sciences, including the life and earth sciences. The mathematics prerequisite is calculus I with analytic geometry (MTH 112).

287A, 288A, 289A, one credit each, to follow 281, 282, 283 to give a four credit per term introductory series. However, 287A may not be taken concurrently with 281, 288A may not be taken concurrently with 282, and 289A may not be taken concurrently with 283.

287B, 288B, 289B, in which the four credit introductory series is covered in one term for each course.

291A, 292A, 293A, one credit each to follow 281, 287A; 282, 288A; 283, 289A or 287, 288, 289 or 287B, 288B, 289B to give a five credit introductory series.

291B, 292B, 293B in which the five credit introductory series is covered in one term for each course.

The courses taught via the two formats may be grouped to give a wide variety of introductory physics courses. The following equivalencies exist:

237, 238, 239 may be taken as 237B, 238, 239.

287, 288, 289 may be taken as 281, 287A; 282, 288A; 283, 289A; or 287B, 288B, 289B.

291B, 292B, 293B may be taken as 281, 287A, 291A; 282, 288A, 292A; 283, 289A, 293A; or as 287, 291A; 288, 292A; 289, 293A; or as 287B, 291A; 288B, 292A; 289B, 293A.

A student may change from one group of introductory courses to another, but may not earn credit for more than one complete sequence.

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

201, 202, 203, 301, 357, 430, and 431 cannot be used to meet the requirements for a major in Physics.

Prerequisites to nearly all the first courses in the 300-400 level course sequences are stated in terms of the Introductory Physics courses. The course selected for prerequisite is that which requires the least number of credits and the least mathematical background the department considers adequate. The corresponding term of any introductory sequence that requires a mathematical background equal to or greater than that of the stated prerequisite may be substituted for the stated prerequisite.

All 400 level physics courses (except 430 and 431) require 289 or 293H.

201. The Science of Sound I: Rock, Bach and Oscillators (N)

Winter. 3(3-0) or 4(4-0) Interdepartmental with the Department of Mechanical Engineering.

Man-sound relationship. Production, propagation, detection of sounds. Voice, hearing, scales, timbre, musical instruments. Room acoustics. Electronic reproduction and synthesis of music. Demonstrations emphasized.

202. The Science of Sound II

Spring. 3(3-0) or 4(4-0) PHY 201. Interdepartmental with and administered by the Department of Mechanical Engineering.

Nature, generation, and propagation of sound. Acoustical phenomenon and measurements. Storage and manipulation of sound in numerical form. Music programming.

203. Science of Light and Color for Nonscientists

Spring. 4(4-0)

Properties of light with applications to mirrors, lenses, eyes, cameras, lasers, holography. Light spectra, color TV, color vision, filters, pigments. Black and white and color photography.

227. Physics for Audiology and Speech Sciences

Fall, Spring. 4(4-0) MTH 108. Not open to students with credit in PHY 237. Interdepartmental with the Department of Audiology and Speech Sciences.

Introductory physics for Audiology and Speech Sciences majors: kinematics, Newton's Law, conservation of energy and momentum, waves and vibrations, sound propagation, resonance, speech production.

237. Introductory Physics

Fall, Winter, Spring. 3(4-0) MTH 109 or MTH 111 or concurrently. Not open to students with credit in PHY 227.

Mechanics, including Newton's Law, momentum, energy, and conservation laws.

237B. Introductory Physics I, CBI

Fall, Winter, Spring. 3 credits. MTH 109 or MTH 111 or concurrently.

Mechanics including Newton's Law, momentum, energy, and conservation laws.

238. Introductory Physics

Fall, Winter, Spring. 3(4-0) PHY 237.

Heat, electricity and magnetism.

238B. Introductory Physics II, CBI

Fall, Winter, Spring. 3 credits. PHY 237B or PHY 237.

Heat, electricity and magnetism.

239. Introductory Physics

Fall, Winter, Spring. 3(4-0) PHY 238.

Wave motion, sound, light, and modern developments.

239B. Introductory Physics III, CBI

Fall, Winter, Spring. 3 credits. PHY 238B or PHY 238.

Wave motion, sound, light and modern developments.

256. Energy Consumption and Environmental Quality (N)

Spring. 3(3-0) Interdepartmental with Lyman Briggs School.

The role of energy as a fundamental pollutant will be discussed along with the availability of fossil energy sources. Limitations on the safe utilization of both fossil and nuclear energy will also be considered.

257. Introductory Physics Laboratory

Fall, Winter, Summer. 1(0-2) PHY 237 or PHY 281 or concurrently.

Mechanics and heat.

258. Introductory Physics Laboratory

Winter, Spring, Summer. 1(0-2) PHY 238 or PHY 282 or concurrently.

Heat, electricity and magnetism.

259. Introductory Physics Laboratory

Fall, Spring, Summer. 1(0-2) PHY 239 or PHY 283 or concurrently.

Wave motion, sound, light and modern developments.

281. Basic Physics I, CBI

Fall, Winter, Spring. 3 credits. MTH 112.

Static equilibrium, Newton's laws, power, harmonic motion, rotational motion.

282. Basic Physics II, CBI

Fall, Winter, Spring. 3 credits. PHY 281.

Microscopic origin of heat flow and first law of thermodynamics, electric and magnetic forces and sources, direct currents.

283. Basic Physics III, CBI

Fall, Winter, Spring. 3 credits. PHY 282.

Physics of sound, light, and optical instruments, wave-particle duality, radioactivity, fission and fusion, elementary particles, fundamental forces of nature.