

- 423. Kant**
Spring. 5(4-0) Three credits in philosophy at 300 level or higher or 9 credits in philosophy or approval of department.
Kant's metaphysical and epistemological system as expressed in the *Critique of Pure Reason*.
- 424. Contemporary Continental Philosophy**
Spring. 4(3-0) Three credits of philosophy at the 300 level or higher or approval of department.
Typical areas of study are phenomenology, structuralism, contemporary interpretation of Marx, hermeneutic (Gadamer), critique of instrumental reason (Horkheimer, Adorno, Habermas) ontologies of the person.
- 427. Hegel**
Winter. 4(3-0) Three credits in philosophy at the 300 level or higher or 9 credits in philosophy or approval of department.
Hegel's *Phenomenology of Spirit*, *Science of Logic*, or *Philosophy of Right*. Textual analysis and critical study of epistemological, metaphysical or ethico-political aspects of Hegelian philosophy.
- 428. Special Topics in Existentialism**
Winter, Spring. 4(3-0) 323 or approval of department.
An examination of existentialist thought in terms of a single author or topic.
- 431. Modern Ethical Theories**
Fall. 4(3-0) 3 credits in philosophy at the 300 level or higher or approval of department.
Study of some of the important writers and problems in moral philosophy since the seventeenth century.
- 432. Contemporary Ethical Theories**
Winter. 4(3-0) 431 or 9 credits in philosophy or approval of department.
Study of some of the leading contemporary views of the nature of moral language and consciousness.
- 440. Epistemology, Part I**
Fall of even-numbered years. 4(3-0) Three credits in philosophy at 300 level or higher or 9 credits in philosophy or approval of department.
Study of evidence, grounds of assent, conviction, belief, and certainty.
- 441. Epistemology, Part II**
Winter of odd-numbered years. 4(3-0) 440 or approval of department.
Continuation of 440.
- 445. Metaphysics, Part I**
Fall of odd-numbered years. 4(3-0) Three credits in philosophy at 300 level or higher or 9 credits in philosophy or approval of department.
Fundamental concepts and categories in metaphysics: substance, process, cause, universal, particular, space, time, endurance, eternity, change, and value.
- 446. Metaphysics, Part II**
Winter of even-numbered years. 4(3-0) 445 or approval of department.
Continuation of 445.
- 447. Philosophy of Mind**
Winter. 4(3-0) Three credits in philosophy at 300 level or higher or 9 credits in philosophy or approval of department.
Examines classical and contemporary treatments of such concepts as "mind", "self", "intentionality", "mental act", and associated problems (the body-mind relation, "thinking" machines, the connection of thought with action, etc.).
- 450. History of Esthetic Theory**
Spring. 4(3-0) Three credits in philosophy at 300 level or higher or 9 credits in philosophy or 9 credits in art, music or literature or approval of department.
Poetics of Aristotle, and the tradition which it has generated in critical reflection on theory of poetry, the drama, and fine arts.
- 460. Moral and Political Issues**
Fall, Winter, Spring. 4(3-0) Three credits in philosophy at 300 level or higher or 9 credits in philosophy, or approval of department.
Philosophical aspects of such issues as freedom of speech and action, civil disobedience, violence, war, justice and equality, human rights and punishment.
- 471. Philosophy of Mathematics**
Spring. 4(3-0) 337 and 338 or approval of department.
An analysis of the nature of mathematical truth. The theses of logicism, formalism, intuitionism, and conventionalism are critically examined.
- 480. Philosophy of Science, Part I**
Winter. 4(3-0) 337 or approval of department.
Topics such as: the logical structure of scientific theories, empirical meaningfulness and testability, deductive and probabilistic explanation, prediction.
- 481. Philosophy of Science, Part II**
Spring. 4(3-0) 337 or approval of department.
Topics such as: discovery vs. validation of theories, probability, induction and confirmation theory.
- 483. Philosophy of Physical Science**
Fall, Spring. 4(4-0) Nine credits in physical science or approval of department. Interdepartmental with and administered by Lyman Briggs College.
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 College.
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 behavior sciences, including such topics as: concept formation and theory construction, explanation and insight, subjectivity and value judgments, emergence and teleology, historicism, reductionism, measurement, and statistical inference.
- 494. Special Topics**
Fall, Winter, Spring, Summer. 2 to 6 credits. May re-enroll for credit. Approval of department.
Intensive study of some particular problem or author in philosophy.
- 825. Seminar in the History of Philosophy**
Fall, Winter, Spring. 4 credits. Approval of department.
- 830. Seminar in Ethics**
Winter, Spring, Summer. 4 credits. May re-enroll for credit. Approval of department.
- 837. Seminar in Logic**
Fall, Winter, Spring. 4(3-0) May re-enroll for credit. Approval of department.
- 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.

400. Physical Science for Teachers

Fall, Winter, Spring, Summer. 3 or 4 credits. May re-enroll 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 the classroom experiences of participants.

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.

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.

890. Problems in Physical Science

Fall, Winter, Spring, Summer. 1 to 12 credits. May re-enroll for a maximum of 15 credits. Bachelors degree in a physical science.

culus I (MTH 112).

Self-paced, under combined management with 291A, 291B, 292A, 292B, and the self-paced sections of 281A, 282A, 283A, 287, 288, 289.

Students in 281, 282, 283 may take either 257, 258, 259 or 297, 298, 299 laboratory course sequences.

- 3) 281A, 282A, 283A, 287, 288, 289 (theory) for students of the physical sciences, mathematics, engineering and others taking Calculus III (MTH 214). May be taken as 287 or as 281 plus 281A, 288, or as 282 plus 282A, as 289 or 283 plus 283A.

The self-paced sections are under combined management with 281, 282, 283, and 291A, 291B, 292A, 292B, 293A, 293B.

Students in 287A, 287B, 288A, 288B, 289A, 289B may take either 297, 298, 299 or 392, 393, 394 laboratory course sequences.

- 4) 291A, 291B, 292A, 292B, 293A, 293B (theory) for physics majors and others with a special interest in physics. Students should be taking Calculus III (MTH 214). Self-paced, under combined management with 281, 282, 283, and self-paced sections of 281A, 282A, 283A, 287, 288, 289.

291, 292, 293, 294 (theory) for physics majors and others with a special interest in physics. Students should be taking Calculus III (MTH 214). Lecture-recitation format only.

Students in 292, 293, 294, 291A, 291B, 292A, 292B, 293A, 293B may take either 392, 393, 394, or 297, 298, 299 laboratory course sequences.

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 PHY 294, 357 or 364.

PHY 201, 256, 301, 357 and 430 cannot be used to meet the requirements for a major in physics.

All 400 level physics courses (except 430) require PHY 289 or 293B or equivalent and MTH 215 as prerequisites.

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

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

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) 201. Interdepartmental with and administered by the Mechanical Engineering Department.

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

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.

256. Energy Consumption and Environmental Quality

Spring. 3(3-0) Sophomores. Interdepartmental with and administered by Lyman Briggs College.

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) 237 or 281, or concurrently.

Mechanics and heat.

258. Introductory Physics Laboratory

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

Heat, electricity and magnetism.

259. Introductory Physics Laboratory

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

Wave motion, sound, light and modern developments.

281. Basic Physics I

Fall. 3 credits—Self-paced only. MTH 112.

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

281A. Physics IA

Fall. 1 credit—Self-paced only. MTH 113; PHY 281 or concurrently.

Extensions of 281, plus; frames of reference, special relativity, rocket equation, forced oscillations, resonances, fluid motion, numerical (computer) solutions, moments of inertia, gyroscopic motion.

282. Basic Physics II

Winter. 3 credits—Self-paced only. 281, or 281A, or 287, or 291A, or 291B, or 291.

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

282A. Physics IIA

Winter. 1 credit—Self-paced only. 281 or 281A, or 287, or 291, or 291B; MTH 214 or approval of department.

Extensions of 282, plus: entropy, transport phenomena, general relativity, electrons, atoms, molecules, solids, Maxwell's equations, electromagnetic fields, energy, alternating currents, and other electricity and magnetism applications, numerical (computer) solutions.

283. Basic Physics III

Spring. 3 credits—Self-paced only. 282, or 282A, or 288, or 292, or 292A or 292B.

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

283A. Physics IIIA

Spring. 1 credit—Self-paced only. 282, or 282A, or 288, or 292A, or 292B; MTH 214 or approval of department.

Extensions of the 283 material, plus topics in: spectral origins and analysis, optics, standing wave phenomena, diffraction, quantum mechanics, numerical (computer) solutions, nuclei.

287. Principles of Physics

Fall, Winter. 4(5-0) MTH 113.

Mechanics.

PHYSICS**PHY****College of Natural Science**

Introductory physics courses are divided into four groups:

- 1) 237, 238, 239 (theory) and 257, 258, 259 (laboratory). These are for students who are taking at the same time, or who have taken, first year mathematics through college algebra and trigonometry.
- 2) 281, 282, 283 (theory) for students of the natural sciences who have taken Cal-