

521B. Pharmacodynamics
Spring. 4(4-0) PHM 520B or PHM 520A.
Pharmacology of the central and peripheral nervous systems. Cardiovascular, renal and gastrointestinal drugs. Endocrine and autocooid pharmacology.

810. Synaptic Transmission
Winter of odd-numbered years. 4(4-0)
Approval of department.
Chemical and electrical aspects of nervous impulse transmission at synaptic and neuroeffector junctions and influences of drugs upon these processes. Intrinsic neuronal circuitry; reticular formation; thalamus; neocortex; cerebellum.

811. Advanced Renal and Autocoid Pharmacology
Spring of even-numbered years. 4(4-0)
PHM 521A or PHM 521B and approval of department.
Advanced concepts and current topics in renal and autocoid pharmacology.

812. Advanced Principles of Pharmacology
Fall. 2(2-0) PHM 521A or PHM 521B, approval of department.
Pharmacodynamics, drug-receptor interactions, computer modeling, drug metabolism.

813. Cardiac Pharmacology
Winter of even-numbered years. 4(4-0)
PHM 520A, PHM 521A or PHM 520B, PHM 521B; PSL 801, PSL 802, PSL 803; and approval of department.
Effects of drugs on normal physiological and biochemical processes in cardiac cells are studied. Emphasis is placed on mechanisms of drug action.

814. Advanced Principles of Toxicology
Spring of even-numbered years. 4(4-0)
PHM 812.
Current biochemical and physiological mechanisms of toxicity on major organ systems. Mechanisms of mutagenicity, carcinogenicity and teratology.

870. Problems
Fall, Winter, Spring, Summer. 2 to 4 credits. May reenroll for a maximum of 12 credits. Approval of department.
Limited amounts of individual work on selected research problems for first year graduate students in the Department of Pharmacology and Toxicology.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
Individual work on research problems for the master's degree in pharmacology.

910. Seminar
Fall, Winter, Spring. 1(1-0) May reenroll for a maximum of 3 credits. Approval of department.
Discussion of recent topics on pharmacology by departmental or outside speakers, or reporting of research efforts by graduate students of the Department of Pharmacology and Toxicology.

980. Problems
Fall, Winter, Spring, Summer. 2 to 5 credits. May reenroll for a maximum of 20 credits. Approval of department.
Limited work on selected research problems.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
Individual work on research problems for the doctoral degree in pharmacology.

PHILOSOPHY PHL

College of Arts and Letters

Each of the courses PHL 101, PHI 102, PHL 103 is an independent gateway to a major area of philosophy. Together they provide a comprehensive introduction to philosophical inquiry.
The courses may be taken independently and in any order.

101. Introduction to Philosophy: Ethics and Value (A)
Fall, Winter, Spring, Summer. 3(3-0)
Students may not receive credit for both PHL 101 and PHL 330.

An inquiry into the nature of the right and the good, addressed to such fundamental problems as the objectivity of moral judgments, the criteria of right and wrong, and the grounds of moral responsibility.

102. Introduction to Philosophy: Knowledge and Reality (A)
Fall, Winter, Spring, Summer. 3(3-0)

An examination of such basic philosophical problems as free will and determinism, the existence of God, the relation of mind and body, and the scope and limits of human knowledge.

103. Introduction to Philosophy: Logic
Fall, Winter, Spring, Summer. 3(3-0)

An examination of deductive and inductive reasoning and of such topics as rational argumentation, fallacies, definition, meaning, truth, and evidence. Designed to improve students' capacities to read and think critically.

120. Classics of Philosophical Literature (A)
Fall, Winter, Spring. 4(4-0)

An introduction to contrasting classics of literary and philosophical importance. Primary texts from such philosophers as Plato, Lucretius, Descartes, Hume, Nietzsche, James, Russell and Sartre will be read and discussed.

200H. Honors Work
Fall, Winter, Spring. 1 to 16 credits. Approval of department.

Taken together, PHL 211, PHI 212 and PHL 213 provide a comprehensive introduction to the history of western philosophy. It is recommended that these courses be taken in sequence. However, if only one course is taken it may be any one of these, since each course is self-contained and may be taken independently of the others.

211. Ancient Philosophy (A)
Fall, Winter, Spring. 3(3-0)

An introduction to the history of philosophy: the Greek and Roman periods, with emphasis on Plato and Aristotle.

212. Medieval and Early Modern Philosophy (A)
Winter, Spring. 3(3-0) PHL 211 recommended.

An introduction to the history of philosophy: the Middle Ages to the rise of modern science, with emphasis on Aquinas, Descartes, Spinoza and Leibniz.

213. Modern Philosophy (A)
Fall, Spring. 3(3-0) PHL 212 recommended.

An introduction to the history of philosophy: the Enlightenment to the nineteenth century, with emphasis on Hume and Kant and such other philosophers as Locke, Berkeley, Hegel, Kierkegaard and Neitzsche.

294. 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.

311. Indian Philosophy
Fall, Winter. 3(3-0)

Metaphysical, ethical and social theories developed within major Indian philosophical systems; e.g., philosophical Buddhism, Vedantist transcendentalism, Samkya dualism, and the Realist schools.

312. Chinese Philosophy
Spring. 3(3-0)

Major cosmological and ethical doctrines of such Chinese authors and movements as Confucius, Mo Tzu, Lao Tzu, Taoism, Yin-Yang dualism, Buddhism, responses to Western influences, the new China.

315. American Philosophy
Spring, Summer. 3(3-0) Three credits in philosophy or approval of department.

Examination of such thinkers as Royce, Pierce, James, Dewey, Whitehead and Santayana, illustrating classic American contributions to philosophy.

323. Existentialism
Fall, Winter, Spring. 3(3-0) Three credits in philosophy or approval of department.

Such authors as Husserl, Jaspers, Kierkegaard, Marcel, Nietzsche, Sartre and such topics as hope, anxiety, bad faith, subjectivity, freedom, social being, and phenomenological method.

330. Elements of Ethics
Fall, Winter, Spring, Summer. 3(3-0) Juniors. Students may not receive credit for both PHL 101 and PHL 330.

An inquiry into the nature of the right and the good, addressed to such fundamental problems as the objectivity of moral judgments, the criterion of right and wrong, and the grounds of moral responsibility.

337. Logic I
Fall, Winter, Spring. 4(4-0)

Modern symbolic methods in deductive reasoning. The logic of connectives and quantifiers.

338. Logic II
Fall, Winter, Spring. 4(4-0) PHL 337 or approval of department.

The logic of identity, functions, and descriptions. Theory-building: axioms, definitions, theorems.

Descriptions – PHILOSOPHY

of

Courses

340. *Moral Problems in Medicine and the Life Sciences*

Fall, Winter, Spring, 4(4-0) Juniors.

Philosophical aspects of euthanasia, allocation of scarce medical resources, experimentation and informed consent, truth-telling and the doctor-patient relationship, genetic counseling, genetic engineering, behavior control, and health care delivery.

341. *Philosophical Aspects of Feminism*

Fall, Winter, Spring, 4(4-0)

Conceptual issues in feminist theory. Such concepts as oppression, sexism and chauvinism, feminist separatism, rape, respect and self-respect, personhood, power and control and feminism will be analyzed and explored.

342. *Philosophy of the Counter Culture*

Fall, Spring, 3(3-0)

Students will examine counter cultural critiques of contemporary culture and values; and develop, articulate, defend their own views on such issues, especially as those issues immediately affect their own lives.

343. *Ethical Issues in the Social Sciences*

Winter, 3(3-0)

Philosophical treatment of ethical issues arising from the social scientists' conflicting obligations to their subjects, science, profession, career, personal values and society.

350. *Philosophy of Art*

Fall, Winter, Spring, 3(3-0) Three credits in philosophy or 6 credits in art, music, or literature.

Inquiry into the principles of artistic activity made with a view to determining the conditions under which art is produced, the nature of its product, and the sources of its value.

351. *Contemporary Esthetic Theory*

Winter, 3(3-0) Three credits in philosophy or 6 credits in art, music, or literature.

Critical examination of contemporary theory in esthetics and the philosophy of art, in which the primary categories of reflection upon the arts have gained their currency. Readings from such authors as Tolstoy, Santayana, Croce, Bullough, Freud, Parker, Prall, Greene.

355. *Philosophy of Religion*

Winter, Spring, 3(3-0) Three credits in philosophy or 6 credits in religious studies or approval of department.

Alternative philosophical approaches to religion as a personal and/or social phenomenon. Contemporary problems of meaning, evidence and obligation in relation to religious beliefs and practices.

360. *Philosophy of Law*

Fall, Winter, Spring, 3(3-0) Three credits in philosophy or 6 credits in political science or approval of department.

Philosophic examination of such legal concepts as punishment, responsibility, rights and duties, judicial decisions and justice, and such legal theories as natural law, positivism and realism.

361. *Philosophy of Technology*

Fall, Winter, 4(4-0) Sophomores or approval of college. Interdepartmental with and administered by Lyman Briggs College.

Is our technology desirable? Are its social forms desirable? What alternatives are there? Students will develop and defend their own appraisals of technology.

365. *Social and Political Philosophy*

Winter, Spring, 3(3-0) Three credits in philosophy or 6 credits in political science, or approval of department.

Philosophical justifications for political authority and individual liberty. Consideration of such theories as natural law, social contract, utilitarianism and historicism.

366. *The Philosophy of Karl Marx*

Spring, 4(4-0) Three credits in philosophy or approval of department.

Structural and critical analysis of Karl Marx's philosophical thought. Theory of objectification and alienation; its application to the religious, philosophical, political, social, and economic spheres; reform of the Hegelian dialectic.

370. *Philosophy of Language*

Fall, 3(3-0) Three credits in philosophy or approval of department.

An elucidation of elementary topics in semantics and philosophy of language, including such topics as meaning, denotation and truth.

380. *The Nature of Science*

Fall, Winter, 3(3-0) One course in the biological, physical or mathematical sciences.

Conflicting views about science. Such topics as: scientific methodology, the objectivity of science, the presuppositions, goals and limits of science.

381. *Science, Values, and Decision Making*

Winter, Spring, 3(3-0) One course in the biological, physical or mathematical sciences.

Issues concerning science and man. Such topics as: the value neutrality of science, science and ideology, science and decision making, the scientific predictability of human actions.

390. *Philosophy in Literature (A)*

Spring, 3(3-0) Juniors.

Philosophical problems found in such writers as Aeschylus, Goethe, Dostoevsky, Tolstoy, Mann, Hesse, Camus.

400H. *Honors Work*

Fall, Winter, Spring, Variable credit. Approval of department.

Individually selected program of supervised group or individual study dealing with some phase of philosophy.

410. *Plato*

Fall, 5(4-0) Three credits in philosophy at 300 level or 9 credits in philosophy or approval of department.

The most important Socratic dialogues, including the "Republic" and the dialogues of the early Academy.

411. *Aristotle, Part I*

Winter, 4(3-0) Three credits in philosophy at the 300 level or higher or 9 credits in philosophy or approval of department.

Introduction to the philosophy of Aristotle. Readings from the texts of Aristotle and lectures on his philosophy with emphasis on his logical, epistemological and metaphysical inquiries.

412. *Aristotle, Part II*

Spring, 4(3-0) PHL 411, or approval of department.

Continuation of PHL 411, with emphasis on Aristotle's method in relation to his ethics, politics and rhetoric.

413. *Continental Rationalism*

Fall, 5(4-0) Three credits in philosophy at 300 level or 9 credits in philosophy or approval of department.

The rationalists of the seventeenth century, with emphasis on Descartes, Spinoza and Leibniz.

414. *Medieval Philosophy*

Winter, 4(3-0) Three credits in philosophy at 300 level or higher, or 9 credits in philosophy, or approval of department.

Significant philosophers and philosophical problems of the Medieval period.

416. *British Empiricism*

Winter, 5(4-0) Three credits in philosophy at 300 level or higher or 9 credits in philosophy or approval of department.

The development of the philosophical school of British Empiricism, with emphasis on the writings of Locke, Berkeley, and Hume.

419. *Nineteenth Century Philosophy*

Fall, 4(3-0) Three credits in philosophy at 300 level or higher or approval of department.

Significant philosophical developments in 19th century thought, with emphasis on post-Kantian idealism.

420. *Analytic Philosophy, 1900-1945*

Fall, 4(3-0) Three credits in philosophy at the 300 level or higher or 9 credits in philosophy or approval of department.

Issues in the works of such philosophers as Frege, Russell, Morre, Wittgenstein and Carnap. Will provide a background for recent analytic philosophy.

421. *Formal Linguistic Analysis*

Winter, 4(3-0) PHL 337 or PHL 420 or approval of department.

Issues in the works of such philosophers as Carnap, Quine, Goodman and Bergman.

422. *Non-Formal Linguistic Analysis*

Spring, 4(3-0) PHL 420.

Issues in the works of such philosophers as Wittgenstein, Ryle, Austin and Strawson.

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*

Winter, 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**
Spring. 4(3-0) PHL 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) PHL 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.
- 437. Nonstandard Logics**
Winter. 4(4-0) PHL 337 or approval of department.
Such topics as the logic of possibility, of existence, of knowledge and belief, of obligation, of tense; many-valued logics; intuitionist logic.
- 439. Introduction to Metatheory**
Spring. 4(4-0) PHL 337 or approval of department.
Metatheory for quantificational logic and first order theories—including consistency and completeness theorems, independence of axioms. Introduction to model theory and proof theory.
- 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)
PHL 440 or approval of department.
Continuation of PHL 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)
PHL 445 or approval of department.
Continuation of PHL 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.
- 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 LBC 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 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 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.
- 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. 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.

Descriptions – PHILOSOPHY

of

Courses

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(3-3)
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.

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.

PHYSICAL SYSTEMS IN AGRICULTURE AND NATURAL RESOURCES

See Agricultural Engineering.

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.

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.

100, 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.

100. The Universe as Home for Man
Spring, 4(4-0)

The place of man in the physical universe. Cosmology, complexities on the human scale, paradoxes of sub-atomic physics, universal conditions for life, future for man, space colonization.

Approved through Winter 1981.

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, 3(3-0) 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.