

**826. Laboratory Animal Pathology**  
Spring. 4(3-3) Graduate status and approval of department. Interdepartmental with and administered by Laboratory Animal Resources.

Macro and microscopic studies on the diseases of laboratory animals with special emphasis on naturally-occurring diseases which might interfere with the interpretation of experimental results.

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

**910. Biology of Disease**  
Fall. 3(2-3) Approval of department. Primarily for students in the biological sciences.

Basic morphologic changes in disease with emphasis on the related physiologic pathology. Laboratory includes relevant problems in post-mortem diagnosis.

**980. Histopathologic Diagnosis**  
Fall, Winter, Spring, Summer. 3(0-9) May re-enroll for a maximum of 6 credits. 803, 820.

Trimming, histopathologic examination, description, diagnosis and reporting of specimens from biopsy and necropsy.

**990. Advanced Correlative Pathology**  
Fall, Winter, Spring, Summer. 5(0-15) May re-enroll for a maximum of 15 credits. Approval of department.

Experience in morphologic and clinical pathology and correlation of these with the clinical aspects of disease.

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

## PHARMACOLOGY PHM

College of Human Medicine  
College of Osteopathic Medicine  
College of Veterinary Medicine

**350. Introductory Human Pharmacology**  
Spring. 3(3-0) PSL 332 or concurrently; or approval of department.

Survey of pharmacology including general principles, central nervous system drugs, autonomic nervous system drugs, cardiovascular and renal drugs, endocrine drugs, anti-infectives, poisoning therapy, and other basic related topics.

**430. Drug Abuse**  
Fall, Spring. 4(4-0) Juniors or approval of department. Biology and chemistry recommended.

Actions, mechanism of action, toxicity and uses of drugs of abuse. Sociological and psychological aspects of drug abuse and the legal aspects of the sale and distribution of drugs are considered.

**480. Special Problems**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 5 credits. Approval of department.

**520A. Principles of Pharmacology**  
(520.) Fall. 4(4-0) PSL 500B, 500C. Primarily for students of Veterinary Medicine. Pharmacology principles, including absorption, distribution, biotransformation, drug antagonism, receptor theory and pharmacogenetics; literature data analysis; adverse drug reactions. Chemotherapy including anti-neoplastic, anti-viral and anti-microbial agents; endocrine and emergency therapies.

**520B. Principles of Pharmacology**  
Winter. 4(4-0) PSL 500A, or 801, 802, 803. Primarily for students of Human and Osteopathic Medicine.

Pharmacology principles, including absorption, distribution, biotransformation, drug antagonism, receptor theory and pharmacogenetics; literature data analysis; adverse drug reactions. Chemotherapy including anti-neoplastic, anti-viral and anti-microbial agents; endocrine and emergency therapies.

**520C. Principles of Pharmacology—Independent Study**  
Summer. 4(1-9) Approval of department. Primarily for students of Human and Osteopathic Medicine.

Independent study of pharmacology principles, including absorption, distribution, biotransformation, drug antagonism, receptor theory and pharmacogenetics; literature data analysis; adverse drug reactions. Chemotherapy including anti-neoplastic, anti-viral and anti-microbial agents; endocrine and emergency therapies.

**521A. Pharmacodynamics**  
(521.) Winter 5(4-4) 520A. Primarily for students of Veterinary Medicine.

Pharmacology of the nervous systems (central, peripheral and autonomic); cardiovascular, renal, gastrointestinal drugs.

**521B. Pharmacodynamics**  
Spring. 4(4-0) 520B. Primarily for students of Human and Osteopathic Medicine.

Pharmacology of the nervous systems (central, peripheral and autonomic); cardiovascular, renal, gastrointestinal drugs.

**521C. Pharmacodynamics—Independent Study**  
Summer. 5(1-11) 520B or 520C. Primarily for students of Human and Osteopathic Medicine.

Independent study of pharmacology of the nervous systems (central, peripheral and autonomic); cardiovascular, renal, gastrointestinal drugs.

**522. Toxicology**  
Spring. 3(3-0) 521A or 521B or 521C.

Toxicology of economic and household poisons, noxious gases and vapors, minerals solvents, pesticides and pollutants.

**810. Synaptic Transmission**  
Winter of odd-numbered years. 4(4-0) Approval of department.

Chemical and electrical aspects of the transmission of nervous impulses at synaptic and neuroeffector junctions and the influences of drugs upon these processes.

**811. Organ System Pharmacology**  
Fall of odd-numbered years. 4(3-3) 521A or 521B or 521C and approval of department.

Current concepts and recent advances in the areas of cardiovascular, renal and syncytial smooth muscle pharmacology.

**812. Advanced Principles of Pharmacology and Toxicology**  
Spring of odd-numbered years. 4(4-0) 522 and approval of department.

Kinetics of drug absorption, elimination and metabolism; drug-receptor interaction. Principles of drug toxicity in evaluation and treatment; includes problems of modern toxicology, i.e., teratogenesis, mutagenesis, carcinogenesis.

**870. Problems**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 5 credits. Approval of the department. Limited amounts of individual work on selected research problems.

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

**910. Seminar**  
Fall, Winter, Spring. 1(1-0) May re-enroll for a maximum of 3 credits.

**980. Problems**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 5 credits. Approval of department. Limited amounts of individual work on selected research problems.

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

## PHILOSOPHY PHL

### College of Arts and Letters

Each of the courses 101, 102, 103 is an independent gateway to an area of philosophy. Together they provide a comprehensive introduction to philosophical inquiry through contact with philosophical issues.

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

Moral responsibility, praise and blame, good and evil, justice, law and morality, individual liberty and collective authority and contemporary moral issues are typical problems.

**102. Introduction to Philosophy: Epistemology and Metaphysics**  
Fall, Winter, Spring, Summer. 3(3-0)

Skepticism and certainty, existence, matter and mind, God, space and time, knowledge and belief, perception, personal identity, causality, and free-will are typical problems.

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

Deductive and inductive reasoning and such topics as rational argumentation, fallacies, definition, meaning, truth and evidence.

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

**Descriptions — Philosophy  
of  
Courses**

**211. Introduction to the History of  
Philosophy, Part I**

Fall, Winter, Spring. 3(3-0)

The Greek and Roman period with emphasis on Plato and Aristotle.

**212. Introduction to the History of  
Philosophy, Part II**

Winter, Spring. 3(3-0)

The Middle Ages and early modern periods, with emphasis on Aquinas, Descartes, Spinoza and Leibniz.

**213. Introduction to the History of  
Philosophy, Part III**

Fall, Spring. 3(3-0)

The eighteenth and nineteenth centuries with emphasis on British empiricism, Kant, and post-Kantian philosophy.

**294. Special Topics**

Fall, Winter, Spring, Summer. 2 to 6 credits. 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.

An examination of a major existentialist author (or authors), so designed as to place existentialist views in significant relation to the tradition of European thought.

**330. Elements of Ethics**

Fall, Winter, Spring, Summer. 3(3-0)

Juniors. Students may not receive credit for both 101 and 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) 337 or approval of department.

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

**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 six 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 six credits in political science or approval of department.

Philosophical 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.

**365. Social and Political Philosophy**

Winter, Spring. 3(3-0) Three credits in philosophy or six 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. 3(3-0) 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, Part I**

Fall, Winter. 3(3-0) Three credits in philosophy or 6 credits beyond basics in natural science or social science or mathematics or approval of department.

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

**381. The Nature of Science, Part II**

Winter, Spring. 3(3-0)

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**

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) 411 or approval of department.

Continuation of 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) 337 and 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) 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**  
Spring. 4(3-0) Three credits in 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.
- 437. Nonstandard Logics**  
Winter. 4(4-0) 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 Metalogic**  
Spring. 4(4-0) 337 or approval of department.  
Metalogic 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) 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.
- 495. Proseminar**  
Winter, Spring. 1 credit. May re-enroll 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 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. 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.

**Descriptions — Philosophy  
of  
Courses**

**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.

**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.

**PHYSICAL SYSTEMS IN  
AGRICULTURE AND NATURAL  
RESOURCES**

See Agricultural Engineering

**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 Calculus 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.

**230. The Role of the Natural Sciences in Future Environments**

Fall. 4(4-0) Approval of department. Interdepartmental with the departments of Entomology, Geology and Zoology and the College of Natural Science and administered by the College of Natural Science.

Physical and biological science concepts relevant to understanding of environmental issues. Options for action in areas of population size, energy and life support system. Illustrated by case studies.

**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.

**IDC. Energy Consumption and Environmental Quality**

For course description, see Interdisciplinary Courses.

**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, Winter, Spring. 3 credits—Self-paced only. MTH 112.

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