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(0-5) May re-enroll for a maximum of 6 credits. 980, 880.
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-infective, poisoning therapy, and other basic related topics.

430. Drug Abuse
Fall. 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.

450. Special Problems
Fall, Winter, Spring, Summer. 1 to 3 credits. May re-enroll for a maximum of 9 credits. Approval of department.

520A. Principles of Pharmacology
Fall. 4(4-0) PSL 500B, 500C. Primarily for students of Veterinary Medicine.
Drug absorption, distribution, bioconversion, antagonism; receptor-theory and pharmacogenetics; adverse drug reactions, chemical toxicity. Chemotherapy (anti-infective, anti-helminthic, anti-neoplastic agents). Pharmacology of the autonomic nervous system.

520B. Pharmacodynamics
Winter. 4(4-0) PSL 500A, or 501, 802, 803. Primarily for students of Human and Osteopathic Medicine.
Pharmacology principles, including absorption, distribution, bioconversion, antagonism, receptor theory and pharmacogenetics; literature data analysis; adverse drug reactions. Chemotherapy including anti-neoplastic, anti-viral and anti-infective agents; endocrine and emergency therapies.

521A. Pharmacodynamics
Spring. 5(4-2) 520A. Primarily for students of Veterinary Medicine.
Pharmacology of drugs that affect the heart, kidney, central nervous system and non-vascular smooth muscle. Endocrine and autonomic pharmacology.

521B. Pharmacodynamics
Spring. 4(4-0) 520B. Primarily for students of Human and Osteopathic Medicine.
Pharmacology of the nervous system (central, peripheral and autonomic); cardiovascular, renal, gastrointestinal drugs.

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 neurotransmitter junctions and the influences of drugs upon these processes.

811. Advanced Renal and Autocoid Pharmacology
Spring of even-numbered years. 4(4-0) 521A or B and approval of department.
Advanced renal, endocrine and autonomic pharmacology.

812. Advanced Principles of Pharmacology and Toxicology
Spring of odd-numbered years. 5(5-0) 521A or 521B.
Kinetics of drug absorption, elimination and metabolism; drug receptor interactions, toxicology of metals, pesticides, industrial and inhalation toxicology; developmental toxicology; teratogenesis, mutagenesis, and carcinogenesis.

813. Cardiac Pharmacology
Winter of even-numbered years. 4(4-0) 520A, 521A or 520B, 521B; PSL 601, 602, 603, or approval of instructor.
Effects of drugs on normal physiological and biochemical processes in cardiac cells are studied. Emphasis is placed on mechanisms of drug action.

870. Problems
Fall, Winter, Spring, Summer. 2 to 5 credits. May re-enroll for a maximum of 15 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.

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 350.

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.

211. Introduction to the History of Philosophy, Part I
Fall, Winter. 3(3-0) The Greek and Roman period with emphasis on Plato and Aristotle.

212. Introduction to the History of Philosophy, Part II
Winter. 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(2-0) to 6(0-0) 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 transcendentlism, 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 Tai, Lao Tai, Taoism, Yin-Yang dualism, Buddhism, responses to Western influences, the new China.

A-150
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. The theory-building: axioms, definitions, theorems.

340. Moral Problems in Medicine and the Life Sciences
Winter, Spring. 3(3-0)

341. Philosophical Aspects of Feminism
Fall, Winter, Spring. 3(3-0)
Conceptual issues in feminist theory. Such concepts as oppression, sexism and chauvinism, feminist separation, rape, respect and self-respect, and the relevance of the feminist perspective to political authority and individual liberty. Consideration of such theories as natural law, social contract, utilitarianism and historicism.

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 these issues immediately affect their own lives.

343. Ethical Issues in the Social Sciences
Winter. 3(2-0)
Philosophical treatment of ethical issues arising from the social sciences' 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 Aesthetic Theory
Winter. 3(3-0) Three credits in philosophy or 6 credits in art, music, or literature.
Critical examination of contemporary theory in aesthetics and the philosophy of art, in which the primary categories of reflection upon the arts have been created. Readings from such authors as Tolstoy, Santayana, Croce, Bullock, Freud, Parker, Frall, Greene.

355. Philosophy of Religion
Winter, Spring. 3(3-0) Three credits in philosophy or six 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 Logic
Fall, Winter, Spring. 3(3-0) Three credits in philosophy or six credits in mathematics or approval of department.
Philosophical examination of such logical concepts as truth, knowledge, existence, rules and equivalence, falsity of natural law, positivism and realism.

361. Philosophy of Technology
Fall, Winter, Spring. 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 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 applications 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.
Contending 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
Spring. 3(3-0) Juniors.
Philosophical appraisal of 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.
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, Moore, 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, Byler, 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 of philosophy at the 300 level or higher in department.
Typical areas of study are phenomenology, structuralism, contemporary interpretation of Marx, hermeneutics, 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 ethical-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). Three 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). 451 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; intensional logic.

439. Introduction to Metatheory
Spring, 4(3-0). 337 or approval of department.
Metatheory for quantificational logic and first order theories including consistency and completeness, 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-soul relation, "thinking" machines, the connection of thought with action, etc.).

449. History of Esthetic Theory
Spring, 4(3-0). Three credits in philosophy at 300 level or higher or 9 credits in philosophy 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.

450. 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.

451. 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 constructivism are critically examined.

452. 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.

453. 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.

455. 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.

456. 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, emergence, vitalism, value neutrality.

457. Philosophy of Social Sciences
Spring, 4(3-0). Three credits in philosophy at 300 level or higher or 9 credits in philosophy 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.

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 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(3-0). May re-enroll for a maximum of 12 credits. Approval of department.

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

837. Seminar in Logic
Fall, 4(3-0). 4 credits. May re-enroll for credit. Approval of department.

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

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

850. Seminar in Aesthetics
Fall, Winter, Spring, 4(3-0). May re-enroll 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 re-enroll 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 re-enroll for a maximum of 12 credits. Approval of department.
Concrete bases of language and nature of meaning.
PHYSICAL SCIENCE

College of Natural Science

The content of course 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.

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.

405. Topics in Physical Science
Fall, Winter, Spring, Summer. 1 to 3 credits. May re-enroll 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 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 historical 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 re-enroll 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. Planetary and Classroom Instruction
Fall, Winter, Spring, Summer. 4(3-2) AST 119 or 217 or 229. Practical operation, techniques, and methods of instruction for astronomy and other sciences in the planetarium theater and the classroom.

431. Problems in Planetary Education
Fall, Winter, Spring, Summer. 1 to 3 credits. May re-enroll 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.

PHYSICS

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 into 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 interested in the life and earth sciences. The mathematics prerequisite is credit for or concurrent enrollment in calculus III with vectors (MTH 214).

291, 292, 293, 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, 295, 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 combine with 281, 287B; 282, 288B, 289B to Spring, 288, 289 to give a five credit introductory series.

291B, 292B, 293B (Honors Physics) 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.

281, 282, 287, 288, 289 may be taken as 281, 287A; 282, 288A; 283, 299A.

291B, 292B, 293B may be taken as 281, 287A; 282, 288A; 283, 299A; 293A; or as 287, 291A; 288, 292A; 289, 293A; 294.

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, 301, 357, 436, 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 299 or 293.

201. The Science of Sound I
Fall, Winter, Spring. 3(3-0) or 4(4-0). Interdepartmental with the Department of Mechanical Engineering.


202. The Science of Sound II
Spring. 3(3-0) or 4(4-0). Interdepartmental with and administered by the Department of Mechanical Engineering.


203. Science of Light and Color for Nonscientists
Spring. 4(4-0)

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