

984. Advanced Readings in Physics or Astronomy
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 6 credits.

987. Advanced Topics in Physics
Fall, Winter, Spring. 3(3-0) or 4(4-0)
May reenroll for a maximum of 12 credits.

In any one term this course will be devoted to a single topic, such as advanced quantum theory, quantum electrodynamics, specialized topics in solid state physics, statistical mechanics, relativity theory and cosmology.

989. Electrodynamics of Plasmas II
Winter of odd-numbered years. 3(3-0)
E E 850. Interdepartmental with Astronomy and Astrophysics, and Electrical Engineering. Administered by Electrical Engineering.

One fluid plasma model, magnetohydrodynamics, Maxwell's stress tensor, low frequency waves, transport phenomena, Landau damping, collision and rate coefficients. Diffusions in a magnetic field; investigation of dc, rf and microwave discharges.

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

Astronomy and Astrophysics AST

119. General Astronomy (N)
Fall, Winter, Spring, Summer. 4(4-0)
Intended primarily for nonscience majors. Not open to engineering or physical science majors. Students may not receive credit in more than one of the following: AST 119, AST 217, AST 229, N S 135, N S 155, N S 1834.

A qualitative presentation of the current view of the universe including birth and death of stars, cosmology, comparisons of planets, and life in the universe.

217. General Astronomy (N)
Fall, Winter, Spring. 4(4-0) MTH 109 or MTH 111. High school physics recommended. Students without the necessary science or math background are directed to AST 119. Intended primarily for physical science majors. Students may not receive credit in more than one of the following: AST 119, AST 217, AST 229, N S 135, N S 155, N S 1834.

A semiquantitative presentation of current views of the universe including birth and death of stars, cosmology, comparisons of planets, and life in the universe, and their interpretation through physical laws.

229. General Astronomy
Fall. 4(4-0) PHY 287 or PHY 291H or concurrently; MTH 113. Intended for physical science majors and recommended for astrophysics majors. Students may not receive credit in more than one of the following: AST 119, AST 217, AST 229, N S 135, N S 155, N S 1834.

Fundamental observations in astronomy and their interpretation through physical laws. Quantitative discussions of orbital motion, time, telescopes, solar system, stars, galaxies, and cosmology.

230. General Astronomy
Winter. 3(3-0) AST 229.

Fundamental observations in astronomy and their interpretation through physical laws. Continuation of AST 229.

327. Practical Astronomy
Spring. 3(3-0) AST 230.

Celestial coordinate systems. Time conversion and sidereal time. Atmospheric refraction, parallax, proper motion, aberration, and precession. Star catalogs and ephemerides. Finding charts and setting of equatorial telescopes.

399. Astrophysics Journal Seminar
Winter. 1(1-0) One year of calculus based introductory physics, Juniors.

Independent readings from selected articles in the current literature. Preparation of written reports and presentation of oral reports. Critiques of presentations by peers.

406. Astrophysics Senior Thesis
Fall, Winter, Spring. 1 to 5 credits.
May reenroll for a maximum of 6 credits. Senior Astrophysics or Physics majors.

Independent experimental or theoretical research under faculty supervision. Preparation of senior thesis.

442. Radiation Astrophysics
Winter of even-numbered years. 3(3-0)
PHY 395.

Emission, absorption and transfer of radiation in an astrophysical context. Stellar atmospheres, line formation, plasma diagnostics. Synchrotron radiation.

443. Astrophysical Fluid Dynamics
Spring of even-numbered years. 3(3-0)
PHY 396.

Dynamics of fluids in an astrophysical context. Fundamental equations. Applications to stellar structure, interstellar medium, and compact objects.

462. Galactic Astronomy
Winter of odd-numbered years. 3(3-0)
PHY 427.

Structure, content, dynamics, and evolution of the Milky Way galaxy and its nearest neighbor galaxies. Star clusters. Stellar populations.

463. Extragalactic Astronomy
Spring of odd-numbered years. 3(3-0)
AST 462.

Ordinary and active galaxies. Galaxy clusters. Quasars. Cosmology.

490. Special Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 10 credits. Approval of department.

Individual study or project under the direction of a faculty member. An oral report on the work may be required in department seminar.

820. Advanced Topics in Astrophysics
Winter. 3(3-0) May reenroll for a maximum of 15 credits. Approval of department.

Possible topics include dynamics of stars in galaxies, astrophysical fluid dynamics, quasar theory, stellar atmospheres, stellar interiors, stellar spectroscopy, and stellar photometry.

850. Electrodynamics of Plasmas I
Fall. 3(3-0) E E 835 or PHY 448; E E 874. Interdepartmental with Electrical Engineering and Physics. Administered by Electrical Engineering.

Boltzmann equation; moment equations; two-fluid theory of plasma, waves in cold, warm and anisotropic infinite plasma; waves in bounded plasma structures, energy flow in anisotropic plasmas.

989. Electrodynamics of Plasmas II
Winter of odd-numbered years. 3(3-0)
E E 850. Interdepartmental with Electrical Engineering, and Physics. Administered by Electrical Engineering.

One fluid plasma model, magnetohydrodynamics, Maxwell's stress tensor, low frequency waves, transport phenomena, Landau damping, collision and rate coefficients. Diffusions in a magnetic field; investigation of dc, rf and microwave discharges.

PHYSIOLOGY PSL

**College of Human Medicine
College of Natural Science
College of Osteopathic Medicine
College of Veterinary Medicine**

210. General Biology
Fall, Spring. 4(4-2) Not open to students with credit in LBS 141. Interdepartmental with the Biological Science Program and the departments of Biochemistry, and Microbiology and Public Health. Administered by Biological Science Program.

Principles of biological organization: scientific method, biochemistry, cell biology, and evolution.

240. Introductory Physiology
Fall, Spring. 4(4-0) Sophomores or approval of department.

Physiology of the cell, nerve and reflex activity, skeletal muscle, brain, and cardiovascular system emphasizing environmental influences such as disease and exercise.

241. Introductory Physiology
Winter. Summer of even-numbered years. 4(4-0) PSL 240 or approval of department.

Continuation of PLS 240. Physiology of respiration, digestion, metabolism, kidney, endocrinology, and reproduction.

323. Physiology, Anatomy, and Hygiene of the Eye
Fall. Summer of even-numbered years. 3(2-2) PSL 240; Elementary Education or Special Education major, or approval of department.

Basic course in anatomy, physiology, and hygiene of the visual system; includes discussion of normal visual functioning and abnormal visual functioning, with methods of correction and education implications.

401. Comparative Physiology I
Fall. 4(3-4) PSL 240 or B S 212; CEM 131 or CEM 141. Interdepartmental with the Department of Zoology.

A comparison of osmoregulation, digestion, respiration, and other physiological processes in a wide range of organisms.

402. Neurophysiology
Winter. 4(4-0) PSL 401 or BCH 401. Interdepartmental with and administered by the Department of Zoology.

A comparison of sensory, motor, and other integrative mechanisms in animals.

Descriptions — Physiology of Courses

410. Computational Problem Solving in Physiology

Fall, Spring, Summer. 3(3-0) PSL 240 or PSL 431 or PSL 811, approval of instructor. Utilization of existing computer software and designing custom programs for statistical functions to solve complex sets of equations in physiology.

416. Physiology of the Cell

Fall, Summer of odd-numbered years. 3(3-0) BCH 401 or BCH 451.

Physiologic mechanisms common to all living cells with emphasis on those of the vertebrates. The functions of the cell membrane and cytoplasm are studied as the basis for the physiologic behavior of vertebrate organs and systems.

421. Hormones and Development

Winter. 4(4-0) ZOL 317. Interdepartmental with and administered by the Department of Zoology.

Hormonal regulation of sex differentiation, puberty, growth, and functional development of selected organs and tissues. The role of hormones in the development of tumors and hormonal decline in aging.

431. Human Physiology

Winter. 4(4-0) One year of biological science or ANT 316; CEM 131 or CEM 141.

Physiology of the digestive, endocrine, nervous, and reproductive systems.

432. Human Physiology

Spring. 4(4-0) PSL 431 or approval of department.

Physiology of the autonomic nervous, cardiovascular, renal, and respiratory systems.

433. Human Physiology Laboratory

Spring. 1(0-3) PSL 431, PSL 432 or concurrently or approval of department.

Human and vertebrate animal experiments demonstrate fundamental physiological processes. Responses to sensory inputs are systematically studied; numerical data are tabulated and analyzed.

435. Mammary Physiology

Fall. 4(3-2) PSL 241, BCH 200 or BCH 401. Interdepartmental with and administered by the Department of Animal Science.

Anatomy of mammary gland. Hormonal and nervous control of mammary growth, initiation and maintenance of lactation. Biochemistry of milk secretion. Physiology of milking; physiological, pathological and management factors affecting lactation.

455. Principles of Animal Reproduction

Winter. 4(5-0) PSL 241, BCH 200 or BCH 401. Interdepartmental with and administered by the Department of Animal Science.

Processes of reproduction and endocrinology with special emphasis on anatomy of reproductive systems, folliculogenesis, gametogenesis, reproductive cycle, fertilization, sex determination, gestation and artificial regulation of these reproductive events for economic benefit.

465. Avian Physiology

Spring. 4(3-3) Approval of department. Interdepartmental with and administered by the Department of Animal Science.

Systemic physiology of birds emphasizing respiration, circulation, temperature regulation, the endocrines, and reproduction.

470. Biological Membranes

(IDC 470.) Spring. 3(3-0) BCH 401. Interdepartmental with the departments of Biochemistry, and Microbiology and Public Health. The chemistry, physics and mathematics of the permeability, energy transductions and surface functions of differentiated cell membranes and membranous organelles are compared. A brief discussion of theoretical and experimental models is included.

480. Special Problems

Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 8 credits. Approval of department.

481. Honors Research Paper

Fall, Winter, Spring, Summer. 2 credits. PSL 480 and approval of department.

Oral and written presentation of undergraduate research project initiated and carried forward under PSL 480.

483. Environmental Physiology

Winter. 4(3-2) B S 212. Interdepartmental with and administered by the Department of Zoology.

Aspects of physiology that bear particularly on the interrelationships between animals and their environments.

497. Principles of Endocrinology

Winter. 4(4-0) One year organic chemistry; ZOL 317. Interdepartmental with and administered by the Department of Zoology.

Hormonal principles, illustrated by experimental observations, in vertebrates and invertebrates. Emphasis on cellular endocrinology. Group discussion, background in organic chemistry and cell biology strongly recommended. Term paper required.

Approved through Fall 1989.

500A. Introductory Physiology for Medicine

Spring. 5(5-0) Admission to the professional program in a college of medicine.

Concepts and problems in physiology to be followed by supplemental physiology instruction during subsequent phases of medical training.

500B. Introductory Physiology for Medicine

Fall. 4(4-0) Admission to the professional program in a college of medicine.

Principles of systemic physiology germane to the practice of medicine with introduction to clinical physiopathology.

500C. Introductory Physiology for Medicine

Winter. 5(5-0) Admission to the professional program in a college of medicine.

Continuation of PSL 500B.

500D. Introductory Physiology for Medicine

Winter. 5(5-0) Admission to a college of medicine or approval of department.

Concepts and problems in physiology germane to the practice of medicine.

500E. Introductory Physiology for Medicine

Spring. 5(5-0) Admission to a college of medicine or approval of department.

Continuation of PSL 500D.

804A. Neuroscience Laboratory I

Winter. 4(2-4) ZOL 827 and approval of instructor. Interdepartmental with the departments of Psychology and Zoology. Administered by the Department of Psychology. Development of skills in the methods, techniques and instrumentation necessary for research in a variety of areas concerned with neuroscience.

804B. Neuroscience Laboratory II

Spring. 4(2-4) PSY 804A. Interdepartmental with the departments of Psychology and Zoology. Administered by the Department of Psychology.

Continuation of PSL 804A.

811. Advanced Cell Physiology

(PSL 801.) Fall. 6(6-0) PSL 431, PSL 432 or PSL 401, PSL 402; BCH 453 or concurrently; or approval of department; calculus recommended. Interdepartmental with the Department of Zoology.

Concepts in advanced cellular physiology, including bioenergetics, transport, regulation of metabolic reactions, and specialized cell functions including nerve, muscle, secretory, epithelial and lymphocyte.

812. Advanced Systems Physiology I

Winter. 6(6-0) PSL 811 or approval of the course coordinator.

Basic and advanced physiologic concepts of the cardiovascular, renal, central nervous systems.

813. Advanced Systems Physiology II

Spring. 6(6-0) PSL 812 or approval of the course coordinator.

Basic and advanced physiologic concepts of the endocrine, gastrointestinal and respiratory systems.

825. Cell Structure and Function

Spring. 4(4-0) BCH 451 or BCH 401 or approval of instructor. Interdepartmental with the departments of Biochemistry, and Microbiology and Public Health. Administered by the Department of Biochemistry.

Molecular basis of structure and function of cells. Fundamental properties of cells: reproduction, dynamic organization, integration, programmed and interactive information transfer considered through original investigations in all five kingdoms.

827. Neurobiology

Fall. 4(4-0) Approval of department. Interdepartmental with the departments of Pharmacology and Toxicology and Zoology. Administered by the Department of Zoology.

Neural structure and function at cellular and intercellular levels. Membrane and synaptic potentials, receptor transduction, and intracellular transport with an introduction to comparative and evolutionary aspects.

839. Systems Neuroscience

Winter of odd-numbered years. 5(4-2) Approval of department. Interdepartmental with the departments of Anatomy, and Pharmacology and Toxicology. Administered by the Department of Anatomy.

Physiology, anatomy and pharmacology of sensory, somatomotor and autonomic neural systems.

841. Advanced Endocrine Physiology and Pharmacology

Fall of odd-numbered years. 5(5-0) PSL 500E or approval of course coordinator. Interdepartmental with the Department of Pharmacology and Toxicology.

Basic and advanced physiologic and pharmacologic concepts of general endocrinology including reproductive endocrinology.

859. Analysis of Hormone Action

Spring, 4(4-0) ZOL 317, or approval of department. Interdepartmental with and administered by the Department of Zoology.

Discussion of recent work on the molecular and developmental aspects of hormone action in vertebrates and invertebrates. Selected topics to vary from year to year.

875. Advanced Physiology Laboratory

Summer, 4(2-5) PSL 811, PSL 812, PSL 813; approval of department.

Experiments in animal and human physiology; data collection, analysis and interpretation.

885. Vertebrate Neural Systems I

Winter of odd-numbered years, 3(2-2) ANT 839 or approval of department. Interdepartmental with the departments of Anatomy, Psychology, and Zoology. Administered by the Department of Anatomy.

Structure and function of major component systems of vertebrate brains, their evolution, ontogeny and comparative analysis in mammals, birds, reptiles, amphibians and fish. Interrelation of behavioral, anatomical and physiological studies.

886. Vertebrate Neural Systems II

Spring of odd-numbered years, 3(2-2) ANT 885. Interdepartmental with the departments of Anatomy, Psychology, and Zoology. Administered by the Department of Anatomy.

Continuation of ANT 885. Major component systems of vertebrate brains, their evolution, ontogeny, and comparative analysis in mammals, birds, reptiles, amphibians and fish. Interrelation of behavioral, anatomical, and physiological studies.

890. Readings in Biophysics

Fall, Winter, Spring, Summer, 3 to 6 credits. Approval of department.

Reading course in special topics adapted to the individual preparation and needs of the student.

899. Master's Thesis Research

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

901. Investigating the Lung

Fall of even-numbered years, 3(3-0) Approval of department. Interdepartmental with the departments of Large Animal Clinical Sciences, and Pathology. Administered by the Department of Large Animal Clinical Sciences.

Classic and current concepts of respiratory structure and function in health and disease and mechanisms of lung injury.

919. Cardiovascular System

Fall, 4(3-3) May reenroll for a maximum of 12 credits if different topics are taken. Approval of the course coordinator.

Classical and current literature on physiology of heart, circulation, and microcirculation. Each fall a different one of these three topics will be discussed. Laboratory work illustrates methodology and special procedures.

950. Topics in Physiology

Fall, Winter, Spring, Summer, 1 to 3 credits. May reenroll for a maximum of 9 credits. Approval of department.

Classical and modern concepts in selected areas of physiology.

980. Problems

Fall, Winter, Spring, Summer, 1 to 3 credits. May reenroll for a maximum of 9 credits. Approval of department.

Limited amounts of individual work on selected research problems.

999. Doctoral Dissertation Research

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

POLITICAL SCIENCE PLS

College of Social Science

100. American National Government

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

Major aspects of national government with emphasis on the policy-making process.

140. Comparative Politics

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

Comparison of political systems in western and non-western nations.

160. International Relations

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

Contemporary world affairs surveyed. The struggle for power, the nation-state system; factors creating harmony and hostility among nations. War and peace in our time.

170. The Isms

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

Introduction to basic contemporary political ideologies; theoretical foundations of democracy, socialism, communism, political elitism, and nationalism. Special attention to ideology underlying contemporary political problems.

200. Introduction to Political Science

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

Acquaints the student with the theories, methods and concepts of political science. Emphasis is on ideology and interests in the political process.

228. Politics of the Western Hemisphere (MTC)

Fall, Winter, Spring, 3(3-0) May reenroll for a maximum of 12 credits if different subtitles are taken. Interdepartmental with and administered by James Madison College.

Developing areas of the western hemisphere: historical development of the societies; contemporary political and economic status; international relationships with other area countries, the United States, the wider world community.

251. Human Values and Politics: On Liberty (S)

Fall, 4(4-0)

Liberty as a basic value underlying public issues of life or death: right to live; rights of women and children; slavery; justification of war and terrorism; capital punishment; biological planning.

253. Human Values and Politics: Authority and the Individual (S)

Spring, 4(4-0)

Individualism and authority as basic values underlying public issues; free speech; rights of minorities; right of privacy; community norms and individual preferences.

IDC. Introduction to Contemporary China

For course description, see Interdisciplinary Courses.

290. Methods of Political Research

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

Design and execution of research in political behavior and institutions. Major emphasis on logic underlying various types of political research, on identification of appropriate data sources and field methods.

291. Methods of Political Research

Fall, Winter, Spring, 4(4-0) PLS 290.

Analysis of political data, with major emphasis on quantitative techniques.

301. American State Government

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

Major aspects of policy-making process at the state government level. Comparison of state political systems.

302. American Urban Government

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

Urban political process in America. Politics of policymaking for urban functions; politics of intergovernmental relations.

310. Public Bureaucracy in the Policy Process

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

Introduces student to following major areas of public administration: development of administration in the U.S.; theories of administrative organization; principles and methods of administrative management; executive leadership; interpersonal and intergroup relationships; levels of decision making, ethics and responsibility.

313. Public Policy Analysis

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

Problems and methods in perception of public problems, determination of goals, generation and evaluation of alternatives, policy choice. Planning and program budgeting, political and analytical methods of policymaking compared.

320. The American Judicial Process

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

Analysis of the structure and functions of judicial systems. Organization, administration, and politics of judicial bureaucracies. Roles of judges, juries, counsel, litigants, and interest groups in adjudication processes.

321. American Constitutional Law

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

U.S. Supreme Court decision making and its effect on issues of current importance, including civil liberties, national economic policy and interrelationships among governmental units.

324. The American Legislative Process

Fall, Winter, 3(3-0)

Nature of legislative process in the United States; organization and procedure of legislative bodies; direct legislation; relationship of legislative branch to other branches of government.

325. The American Executive Process

Spring, 3(3-0)

Role of the president, state governors, and municipal executives in the American system of government. Analysis and discussion of constitutional status and powers, selection, administrative responsibilities, legislative and political leadership, accountability and responsibility of chief executives.

330. Government and the Mass Media

Spring, 3(3-0) Juniors.

How press, radio, television and journals shape public opinion and government policy; examines questions of influence and linkage, regulation vs. free comment, and the media as an interest group.