

**Descriptions — Physics and Astronomy  
of  
Courses**

**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.

**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.

**800. Research Methods**  
Fall, Winter, Spring, Summer. 2(0-6) May reenroll for a maximum of 6 credits. Beginning graduate students. Interdepartmental with and administered by Physics.

Problems and techniques of current research by taking part in the design and setup of experiments, data taking and reduction; study and practice of theoretical methods. Areas of study: solid state and molecular structure, nuclear, elementary particles, astronomy, astrophysics.

**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.

**860. General Relativity and Cosmology I**  
Fall of even-numbered years. 3(3-0) PHY 858 or approval of department. Interdepartmental with and administered by Physics.

Conceptual foundations of general relativity theory; elements of tensor calculus; Riemann-Christoffel curvature tensor; the field equations; experimental tests; special solutions; the extension to cosmology.

**861. General Relativity and Cosmology II**  
Winter of odd-numbered years. 3(3-0) PHY 860. Interdepartmental with and administered by Physics.

Relativistic cosmology; the model universes; steady-state theory; observational evidence and possibilities for decision among models; current problems.

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

**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**

**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. Comparative Physiology II**  
Winter. 4(4-0) PSL 401 or approval of department. Interdepartmental with and administered by the Department of Zoology.

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

**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.

**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. 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.

**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.

**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**

(PSY 885.) Winter of odd-numbered years. 5(3-4) ANT 815, ANT 865 recommended. 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**

(ZOL 886.) Spring of odd-numbered years. 5(3-4) 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**

(BPY 890.) 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.

## Descriptions — Physiology

### of Courses

**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; capitol 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.

**331. American Political Parties**  
*Fall, Winter, Spring. 3(3-0)*  
Origins, structure, and functions of political parties. Dynamics of the two-party system. Role of third parties.

**332. Interest Groups and Political Movements**  
*Fall, Winter. 3(3-0)*  
Group theory and politics. Growth of organizations and associations to represent the interests of business, labor, agricultural, professional, veterans, and other groups. Internal politics of private associations and their impact on public policy.

**333. Political Opinion and Voting Behavior**  
*Fall, Winter, Spring. 3(3-0)*  
Development of political attitudes, ideology, and partisanship and their relation to voting behavior; political participation; comparisons of mass and elite attitudes and behavior; representation of public opinion in the political system.

**334. Campaigns and Elections**  
*Fall, Winter, Spring. 3(3-0)*  
Methods of campaigning. Nominating process and recruitment of candidates. Formation of electoral coalitions and analysis of election results. Examination of trends and changes in electoral support.

**335. Comparative Parties and Pressure Groups**  
*Spring. 3(3-0)*  
Dynamics of political party and pressure group behavior in selected political systems. Comparative analysis of organization, ideologies, membership, leadership, tactics, power and influence of parties.