

850. Ionized Gases

Spring. 3(3-0) E E 835 or PHY 448. Interdepartmental with the departments of Astronomy and Astrophysics and Electrical Engineering and administered by Electrical Engineering.

Elastic collision processes; Boltzmann equation; moment equations; basic plasma phenomena; motion of a charged particle in electrical and magnetic field; individual and collective charged particle behavior.

857. Theoretical Mechanics I

Winter. 3(3-0)

Two-body central force problems, rigid body motion, small oscillations, Hamilton's principle, Lagrangian and Hamiltonian formalism for particles and fields, canonical transformations, relativity.

858. Theoretical Mechanics II

Spring. 3(3-0) Approval of department.

Hamiltonian formalism for particles and fields, variational methods, canonical transformations, small oscillators, classical fields, relativity.

860. General Relativity and Cosmology I

Fall of even-numbered years. 3(3-0) 858 or approval of department. Interdepartmental with the Department of Astronomy and Astrophysics.

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) AST 860. Interdepartmental with the Department of Astronomy and Astrophysics.

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

867. Quantum Mechanics IV

Fall. 3(3-0) 839.

Transformation theory and invariance principles; the rotation group and theory of angular momentum; Wigner-Eckart theorem and applications.

868. Relativistic Quantum Mechanics

Winter. 3(3-0) 867.

Relativistic equations of motion; Dirac equation, free particle solutions and Lorentz transformation properties; interaction with electromagnetic fields; quantization of scalar, electromagnetic and Dirac fields.

869. Quantized Fields

Spring. 3(3-0) 868.

Heisenberg representation, S-matrix reduction formulae, Feynman rules, quantum electrodynamics; topics from many-body theory.

877. Equilibrium Statistical Mechanics

Fall. 3(3-0) Approval of department.

Ensembles, partition functions, thermodynamic potentials with applications to simple thermodynamics; topics from many-body theory.

878. Nonequilibrium Statistical Mechanics

Winter. 3(3-0) 877.

Time-dependent Liouville equation, Bloch equation, and master equation, with application to relaxation processes and atomic, molecular, and nuclear systems.

879. Quantum Statistical Mechanics

Spring. 3(3-0) 878.

Green's function techniques with application to transport theory, superconductivity, magnetism.

899. Research

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

927. Elementary Particle Physics

Fall. 3(3-0) 869.

Properties of elementary particles; invariance principles and conservation laws; strong, electromagnetic, and weak interactions; pion physics.

928. Elementary Particle Physics

Winter. 3(3-0) 927.

Baryon and meson resonances, unitary symmetry, dispersion relations.

929. Elementary Particle Physics

Spring. 3(3-0) 928.

Selected current topics, partial wave amplitudes and Regge poles; current algebra and weak interactions.

937. Molecular Structure and Spectra I

Fall of odd-numbered years. 3(3-0) 837 or concurrently.

Structure and spectra of diatomic molecules.

938. Molecular Structure and Spectra II

Winter of even-numbered years. 3(3-0) 937.

Structure and spectra of polyatomic molecules.

939. Molecular Structure and Spectra III

Spring of even-numbered years. 3(3-0) 938.

Advanced topics in vibration-rotation theory of polyatomic molecules.

947. Solid State Physics I

Fall. 3(3-0) 839 and 840.

Crystal symmetry, crystal binding, lattice vibrations and specific heat, one-electron theory; Hartree-Fock equation, Brillouin zones.

948. Solid State Physics II

Winter. 3(3-0) 947.

Effective mass approximation. Exchange and correlation corrections. Theory of conductivity and related effect, metals and semiconductors.

949. Solid State Physics III

Spring. 3(3-0) 948.

Ionic crystals. Imperfections in crystals, plastic deformations, color centers. Optical properties. Rectification, transistors, selected topics.

957. Nuclear Physics I

Fall. 3(3-0) 867.

Nucleon-nucleon scattering, nuclear sizes and shapes, multipole moments; shell model; collective states.

958. Nuclear Physics II

Winter. 3(3-0) 957.

Experimental methods and instrumentation; nuclear reactions; inelastic scattering and particle transfer.

959. Nuclear Physics III

Spring. 3(3-0) 958.

Many-body methods in nuclear physics; Bethe-Goldstone equation; effective interaction; nuclear models.

984. Advanced Readings in Physics or Astronomy

Fall, Winter, Spring, Summer. Variable credit. Interdepartmental with the Department of Astronomy and Astrophysics.

987. Advanced Topics in Physics

Fall, Winter, Spring. 3(3-0) or 4(4-0)

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. Waves and Radiations in Plasmas

Fall of even-numbered years. 3(3-0)

850. Interdepartmental with the Department of Astronomy and Astrophysics and Electrical Engineering. Administered by Electrical Engineering.

Plasma oscillation; interaction, electromagnetic fields with plasmas, wave propagation in magnetoionic media; plasma sheath; radiation of electric source in incompressible and compressive plasmas; electroacoustic waves; magnetohydrodynamics; research topics in plasmas.

999. Research

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

PHYSIOLOGY

PSL

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

240. Introductory Physiology

Fall, Spring, Summer. 4(3-2) Sophomores or approval of department.

Survey of the physiology of circulatory system, excretion, nervous system and special senses, digestion, metabolism and endocrinology.

241. Introductory Physiology

Winter, Summer. 4(3-2) 240.

Continuation of 240. Physiology of muscle function and neuro-muscular relationships; exercise; respiration; changes in organ systems in relation to muscular exercise.

323. Physiology, Anatomy, and Hygiene of the Eye

Fall. Summer of even-numbered years. 3(2-2) 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.

331. Human Physiology

Winter. 4(3-2) ANT 316; CEM 132, or approval of department.

332. Human Physiology

Spring. 4(3-2) 331.

401. Comparative Physiology I

Fall. 4(3-4) 240 or BS 212 and CEM 132. Interdepartmental with 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) 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.

416. Physiology of the Cell

Fall. 3(3-0) BCH 401 or 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.

417. Physiology of the Cell

Summer. 4(3-3) 4(6-6) 5 weeks. This is equivalent to 3 hours of lecture and 3 hours of laboratory on a ten-week basis. Approval of department.

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.

440. Avian Physiology

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

A survey of the systemic physiology of birds emphasizing digestion, metabolism, the endocrines, and reproduction.

444. Milk Secretion

Winter. 4(3-2) Interdepartmental and administered jointly with the Dairy Science Department.

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.

445. Endocrinology and Reproduction of Farm Animals

Fall. 4(5-0) 240. Interdepartmental and administered jointly with the Department of Dairy Science.

Endocrine and reproductive systems are presented with emphasis upon characteristics which can be altered for economic benefit and upon causes, prevention, and treatment of endocrine abnormalities.

IDC. Biological Membranes

For course description, see Interdisciplinary Courses.

480. Special Problems

Fall, Winter, Spring, Summer. 1 to 5 credits. Approval of department.

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

(500.) Fall, Winter. 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

Summer. 3(3-0) or 4(3-1) Admission to the professional program in a college of medicine.

Classical concepts and problems in physiology which form a base for clinical physiology training in subsequent terms.

500C. Introductory Physiology for Medicine

Fall. 3(3-0) or 4(3-1) Admission to the professional program in a college of medicine.

Continuation of 500B.

801. Advanced Physiology

(501.) Winter. 4(3-2) 332 or 402 or approval of department; courses in anatomy, histology, biochemistry and calculus recommended.

Principles of physiological control systems. Physiology of the nervous system including, neuromuscular, reflex, sensory and autonomic nervous function. Physiology of respiration; acid-base, regulation of body fluids.

802. Advanced Physiology

(502.) Spring. 4(3-2) 332 or 402 or approval of department; courses in anatomy, histology, biochemistry and calculus recommended.

Physiology of kidney and micturition, blood and cardiovascular system.

803. Advanced Physiology

Fall. 4(3-2) 332 or 402 or approval of department; courses in anatomy, histology, biochemistry and calculus recommended.

Physiology of the digestive system, regulation of metabolism; endocrinology and reproduction.

808. Neuroendocrinology

Winter. 3(3-0) Approval of department.

Anatomical, biochemical and physiological aspects of neuroendocrinology. Control systems and interaction among endocrine glands will be emphasized.

819. Kidney Physiology and Electrolyte Metabolism

Summer. 3(3-0) 802, approval of department.

Critical study of the literature on classical and contemporary principles of renal physiology and related aspects of body fluid and electrolyte metabolism.

835. Neurophysiology

Winter of odd-numbered years. 4(2-4) Approval of department.

Functions and properties of the peripheral and central nervous systems.

836. Physical Principles of Biological Systems

Winter. 3(3-0)

Application of laws and methods of physics to measurement and description of physiological phenomena.

837. Radiobiology

Fall. 3(3-0) Approval of department.

Application of radioactive tracer techniques to study of biological functions. Determination of turnover rates and tissue constituents by isotope dilution. Control of radiation hazards.

859. Analysis of Hormone Action

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

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.

865. Advanced Neurobiology

Winter. 3(3-0) BPY 825. Interdepartmental with the departments of Biophysics, Biomechanics, Psychology and Zoology and administered by the Department of Biomechanics.

Basic organization, structure and function of neural networks comprising sensory, motor, and autonomic systems including examples from invertebrates and vertebrates.

870. Research Problems and Techniques in Pathologic Physiology

Spring. 3(3-0) 801, 802, 803.

Description of mechanisms of human disease states. Stimulation of research where especially needed. Development of animal models to study these disease states. Lecture demonstrations illustrate methods of producing disease models.

875. Advanced Physiology Laboratory

Spring. 4(2-5) 801, 802, 803 and approval of department.

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

885. Vertebrate Neural Systems I

Fall of odd-numbered years. 5(3-4) Approval of department; ANT 815 and BPY 825 recommended. Interdepartmental with the Zoology, Biophysics and Psychology Departments and administered by the Psychology Department.

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

Winter of even-numbered years. 5(3-4) PSY 885. Interdepartmental with the Psychology, Biophysics and Zoology Departments and administered by the Zoology Department.

Continuation of 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.

899. Research

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

910. Seminar

Fall, Winter, Spring. 1(1-0) May enroll for a maximum of 2 credits for the Master's program and a maximum of 4 additional credits for either the Ph.D. or the diploma program.

915. Respiratory Physiology

Fall. 4(3-2) 801, approval of department.

Development of ideas leading to our present state of knowledge in respiration.

919. Cardiovascular System

Fall. 4(3-3) 802.

Outstanding literature on physiology of heart, blood vessels and lymphatics, hemodynamics, cardiac output and circulation in special regions. Appropriate methodology discussed. Laboratory work illustrates principles of special procedures.

**Descriptions — Physiology
of
Courses**

945. Physiology of Mammalian Reproduction

Winter. 4(5-0) DRY or PSL 445 or approval of department. Interdepartmental with and administered by the Department of Dairy Science.

Chemistry and biosynthesis of reproductive hormones. Gonadal, hypothalamic and pituitary development of reproductive potential. Ovulation, fertilization, implantation and placentation will be studied. Relationships of conceptus, uterus and corpus luteum. Parturition.

950. Topics in Physiology

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

Limited amounts of individual work on selected research problems.

999. 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. 4(3-0)
Major aspects of national government with emphasis on the policy-making process.

140. Comparative Politics

Fall, Winter, Spring. 4(3-0)
Comparison of political systems in western and non-western nations.

160. International Relations

Fall, Winter, Spring, Summer. 4(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. 4(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. 4(3-0)
Acquaints the student with the theories, methods and concepts of political science. Emphasis is on ideology and interests in the political process.

IDC. Introduction to Latin America III

For course description, see Interdisciplinary Courses.

IDC. The Politics of Ecology

For course description, see Interdisciplinary Courses.

IDC. Continuing Revolution in China: Problems and Approaches

For course description, see Interdisciplinary Courses.

290. Methods of Political Research

Fall, Winter. 4(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

Winter, Spring. 4(3-0) 290.
Analysis of political data, with major emphasis on quantitative techniques.

301. American State Government

Fall, Winter, Spring, Summer. 4(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. 4(3-0)
Urban political process in America. Politics of policy-making for urban functions; politics of intergovernmental relations.

303. Michigan Government

Spring. 4(3-0)
How Michigan government is organized and conducted and how policies are made; sources of executive-legislative conflict; politics of taxation; role of the state in local affairs; balance of political forces in the state.

310. Public Bureaucracy in the Policy Process

Fall, Spring. 4(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

Winter. 4(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 policy making compared.

320. The American Judicial Process

Fall, Winter, Spring, Summer. 4(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. Judicial Policy Making

Fall, Spring. 4(3-0)
Consideration of political behavior of judges (especially Justices of Supreme Court) and their policy making. Focus on policy questions currently important, including civil liberties, national economic policy and interrelationships among governmental units.

324. The American Legislative Process

Winter. 4(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. 4(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.

329. Socialist Politics in the U.S.

Spring. 4(3-0)
The politics of Marxist and non-Marxist socialism from the post-Civil War to the present. Political parties, social movements, ideas, and individuals.

331. American Political Parties

Fall, Winter, Spring. 4(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

Winter. 4(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. 4(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, Spring. 4(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. 4(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.

336. Black Political Movements

Fall. 4(3-0)
Examines attempts of blacks to gain political access and identity in America from post civil war through black nationalism. Treated as a case study of the politics of social movements.

337. Ethnicity, Race and Politics

Winter. 4(3-0) Juniors.
Ethnicity and race as factors in the political process and as issues of public policy.

338. Politics and Inequality

Winter, Spring. 4(3-0)
Nature of democratic politics, distribution of power and the role of political elites, and impact of politics on social inequality and policy-making, in the United States and in comparative perspective.