

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.

960. Techniques in Nuclear and Particle Physics
Fall. 3(3-0) Approval of department.
Properties of accelerators and particle beams, passage of radiation through matter, particle detection, pulse electronics, statistics, on-line computation.

961. Accelerator Physics
Winter. 3(3-0) 849, 859.
Cyclotrons, betatrons, synchrotrons, and linear accelerators. Theory of magnetic focussing: constant gradient, alternating gradient, edge focussing. Acceleration processes, longitudinal motion. Non-linear resonances, stability limits. Beam injection, extraction, and transport.

984. Advanced Readings in Physics
Fall, Winter, Spring, Summer. Variable credit.

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.

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

PHYSIOLOGY

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
(412.) Fall. 4(3-4) 240 or B S 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) CEM 242 or 353.

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.

PSL

440. Avian Physiology
Spring of odd-numbered years. 4(3-3)
Approval of department. Interdepartmental and administered jointly with the Poultry Science Department.

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(3-2) 240. Interdepartmental and administered jointly with the Dairy Science Department.

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.

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

497. Principles of Endocrinology
Winter. 4(4-0) Organic chemistry; ZOL 317. Interdepartmental with and administered by the Zoology Department.

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. 3(3-0) or 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.

501. Advanced Mammalian Physiology
Winter. 5(5-0) Approval of department.

Basic aspects of cellular physiology: membrane permeability, ionic equilibria, bioelectric phenomena, fluid and electrolyte environment of cells. Neuro-muscular physiology; reflexes, central and autonomic nervous systems; sensory physiology. Endocrine gland system; digestion and metabolism.

502. Advanced Mammalian Physiology
Spring. 6(5-4) 501.

Continuation of 501; reproduction; blood and cardiovascular system; respiration and kidney.

808. Advanced Endocrinology
Winter. 3(3-0) Approval of department.

Current developments on anatomy, physiology, chemistry, and regulation of the major endocrine glands; nervous and hormonal control of reproduction and lactation.

812. Advanced Comparative Physiology
Fall. 4(3-4) B S 212 or approval of department.

A study of organ function in a wide range of groups of animals with emphasis on evolutionary relationships and physiological basis of ecology.

815. Sensory Physiology
Winter of even-numbered years. 3(2-2) Not open to students with credit in 323. Approval of department.

Physiology of sense organs for students in physiology, psychology and others.

819. Kidney Physiology and Electrolyte Metabolism
Spring. 3(3-0) 502.

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
(430.) 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.

870. Research Problems and Techniques in Pathologic Physiology
Summer. 3(3-0) 501, 502.

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.

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

910. Seminar
Fall, Winter, Spring. 1(1-0) May re-enroll for a maximum of 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
Winter. 4(3-2) 502, approval of department.

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

919. Cardiovascular System
Fall. 4(3-3) 502.

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.

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
(300.) Fall, Winter, Spring, Summer. 4(3-0) Not open to majors.

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
(260.) 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.

290. Methods of Political Research
Fall, Winter. 4(3-0) 200.

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
(401.) 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
(424.) 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
(425.) 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.

331. American Political Parties and Elections
Fall. 4(3-0)

Origins, structure, and functions of political parties. Dynamics of the two-party system. Role of third parties. Nominating process, political campaigns, and the analysis of election results.