859. 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 odd-numbered years. 3(3-0) 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. 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) 838.
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 formalism, 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 thermodynamic topics; 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.

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

927. Elementary Particle Physics
Fall. 3(3-0) 865.
Properties of elementary particles; invariance principles and conservation laws; strong, electromagnetic, and weak interactions; pion physics.

928. Elementary Particle Physics
Winter. 3(3-0) 857.
Baryon and meson resonances, unitary symmetry, dispersion relations.

929. Elementary Particle Physics
Spring. 3(3-0) 825.
Selected current topics, partial wave amplitudes and Regge poles; current algebra and weak interactions.

936. Molecular Structure and Spectra I
Fall of odd-numbered years. 3(3-0) 837 or concurrently.
Structure and spectra of diatomic molecules.

937. Molecular Structure and Spectra II
Spring. 3(3-0) 837.
Structure and spectra of polyatomic molecules.

938. Molecular Structure and Spectra III
Spring of even-numbered years. 3(3-0) 838.
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; inclusive 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
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 3(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

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(3-2) 340; 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
Winter. 4(3-4) 345 or B 316 and CEM 132. Interdepartmental with Department of Zoology.
A comparison of ommatidial, 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.

418. 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
Spring. 4(3-2) 4(3-0) 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.

438B. Introductory Physiology for Medicine
Winter. 3(3-0) or 4(3-1) Admission to the professional program is a college of medicine.
Classical concepts and problems in physiology which form a base for clinical physiology training in subsequent terms.

450B. Introductory Physiology for Medicine
Summer. 3(3-0) or 4(3-1) Admission to the professional program is a college of medicine.
Classical concepts and problems in physiology which form a base for clinical physiology training in subsequent terms.

450C. Introductory Physiology for Medicine
Fall. 3(3-0) or 4(3-1) Admission to the professional program is a college of medicine.
Continuation of 450B.

801. Advanced Physiology
Winter. 4(3-2) 322 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
Spring. 4(3-2) 322 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) 322 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 or 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) 205 and 836 recommended. Interdepartmental with the Zoology, Biophysics and Psychology Departments and administered by the Psychology Department.
Description of mechanisms of human disease states. Stimulation of research where especially needed. Development of animal models to study these disease states. Lectures demonstrate illustrate methods of producing disease models.

875. Advanced Physiology Laboratory
Spring. 4(2-5) 901, 902, 903 and approval of department.
Experiments in animal and human physiology; data collection, analysis and interpretation.

885. Vertebrate Neural Systems I
Fall of even-numbered years. 3(3-4) Approval of department.
PSY 855 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 odd-numbered years. 3(3-4) Approval of department.
PSY 855 recommended. 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.

890. Research
Fall, Winter, Spring. Variable credit. Approval of department.

910. Seminar
Fall, Winter, Spring. 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.
945. Physiology of Mammalian Reproduction
Winter. 4(3-0): DRY or ESL 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 placenta
tion 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. 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 Ims
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)
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. Policies 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 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 policies 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 the 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.

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 compared 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)
Examine attempts of blacks to gain political access and identity in America 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 policy­making, in the United States and in compara­tive perspective.