869. Quantized Fields
Spring. 3(3-0) PHY 868.
Heisenberg representation, S-matrix reduction formulae, Feynman rules, quantum electrodynamics, topics from many-body theory.

877. Statistical Mechanics I
Fall. 3(3-0) Approval of department.
Necessity of statistical considerations, ensembles, probability distributions and density matrices, Liouville's equation, equilibrium distributions, microscopic basis of thermodynamics; applications to thermodynamics of spin systems.

878. Statistical Mechanics II
Winter. 3(3-0) PHY 877.
Applications to thermodynamic properties of ideal classical and quantum gases, and to imperfect gases and interacting spin systems. Nonequilibrium distributions and transport theory, the Boltzmann equation, Onsager's linear response theory, Onsager's relations.

879. Statistical Mechanics III
Spring. 3(3-0) PHY 878.
Special topics chosen at discretion of instructor. Topics may include phase transitions, critical phenomena and renormalization group techniques; Green's function and diagrammatic techniques for interacting systems.

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

927. Elementary Particle Physics
Fall of even-numbered years. 3(3-0) PHY 869.
Properties of elementary particles; invariance principles and conservation laws; strong, electromagnetic, and weak interactions; pion physics.

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

937. Molecular Structure and Spectra II
Winter of odd-numbered years. 3(3-0) PHY 937.
Structure and spectra of polyatomic molecules.

939. Molecular Structure and Spectra III
Spring of odd-numbered years. 3(3-0) PHY 938.
Advanced topics in vibration-rotation theory of polyatomic molecules.

947. Solid State Physics I
Fall of odd-numbered years. 3(3-0) PHY 839 and PHY 840.
Crystal symmetry, crystal binding, lattice vibrations and specific heat, one-electron theory, Hartree-Fock equation, Brillouin zones.

948. Solid State Physics II
Winter of even-numbered years. 3(3-0) PHY 947.
Effective mass approximation. Exchange and correlation corrections. Theory of conductivity and related effects, metals and semiconductors.

949. Solid State Physics III
Spring of even-numbered years. 3(3-0) PHY 948.
Ionic crystals. Imperfections in crystals, plastic deformations, color centers. Optical properties. Refraction, transistors, selected topics.

957. Nuclear Physics I
Fall of odd-numbered years. 3(3-0) PHY 867.
Nucleon-nucleon scattering, nuclear sizes and shapes, multipole moments; shell model; collective states.

958. Nuclear Physics II
Winter of even-numbered years. 3(3-0) PHY 957.
Experimental methods and instrumentation; nuclear reactions; inelastic scattering and particle transfer.

959. Nuclear Physics III
Spring of even-numbered years. 3(3-0) PHY 958.
Many-body methods in nuclear physics, Bethe-Goldstone equation, effective interaction; nuclear models.

984. Advanced Readings in Physics or Astronomy
Fall, Winter, Spring. 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.

999. Waves and Radiations in Plasmas
Winter of even-numbered years. 3(3-0) E E 950. 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 magnetonic media, plasma sheath; radiation of electric source in compressive and compressive plasmas; electroacoustic waves; magnetohydrodynamics; research topics in plasmas.

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. 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. 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 and CEM 135. 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.

416. Physiology of the Cell
Fall. 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.

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.

431. Human Physiology
(331.) Winter. 4(4-0) ANT 316 or one year of biological science, CEM 132 or approval of department.

432. Human Physiology
(332.) Spring. 4(4-0) PSL 431.
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 endocrine systems, and reproduction.

444. Mammary Physiology
Winter. 4(3-2). PSL 240, BCH 300. Interdepartmental and administered jointly with the Department of Dairy Science.

445. Endocrinology and Reproductive Physiology
Fall. 4(5-0). PSL 240. Interdepartmental and administered jointly with the Department of Dairy Science.
Processes of reproduction and endocrinology, with special emphasis on anatomy of reproductive systems, follicle development, gamete formation, reproduction cycle, fertilization, sex determination, gestation and artificial regulation of these reproductive events for economic benefit.

IDC. Biological Membranes
For course description, see Interdisciplinary Courses.

450. Special Problems
Fall, Winter, Spring, Summer. 1 to 3 credits. Approval of department.

497. Principles of Endocrinology
Winter. 4(4-0). One year organic chemistry; ZOL 317. Interdepartmental with the Department of Zoology.

500A. Introductory Physiology for Medicine
(500.) Fall, Winter. 5(3-0). 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 the 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 PSL 500B.

801. Advanced Physiology
(501.) Winter. 4(3-2). PSL 432 or PSL 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). PSL 432 or PSL 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). PSL 432 or PSL 402 or approval of department; courses in anatomy, histology, biochemistry and calculus recommended.

804A. Neuroscience Laboratory I
Winter. 3(3-4). Approval of instructor. Interdepartmental with the departments of Biophysics, Psychology and Zoology and 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. 5(2-4). PSL 804A. Interdepartmental with the departments of Biophysics, Psychology and Zoology and administered by the Department of Psychology.
Continuation of PLS 804A.

805. 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. 4(3-0). PSL 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.

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.

865. Advanced Neurobiology
Spring. 3(3-0). BPY 827. 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 of odd-numbered years. 3(3-0)
PSL 801, PSL 802, PSL 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). PSL 801, PSL 802, PSL 803 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. ANT 815 and BPY 827 recommended. Interdepartmental with the departments of Zoology, Biophysics and Psychology and administered by the Department of Psychology.
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)
PSL 885. Interdepartmental with the departments of Psychology, Biophysics and Zoology and administered by the Department of Zoology.
Continuation or PSL 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.

889. 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
Winter of odd-numbered years. 4(3-2)
PSL 801, approval of department.
Development of ideas leading to our present state of knowledge in respiration.
Descriptions – Physiology

of Courses

919. Cardiovascular System
Fall. 4(3-3) May reenroll for a maximum of 12 credits if different topics are taken. PSL 892.
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.

945. Physiology of Mammalian Reproduction
Winter. 4(5-0) DRY 445 or PSL 445 or approval of department 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 concepts, uterus and corpus luteum. Parentunion.

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. 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.

251. Human Values and Politics I: On Liberty
Fall. 4(4-0)
How conflicts over basic human values of liberty, equality, justice, and individualism at the root of major issues of American public policy such as capital punishment, abortion, censorship, women's rights, school prayer. Centors on questions of citizenship, liberty, and life and death. Approved through Summer term 1979.

252. Human Values and Politics II: Equality and Justice
Winter. 4(4-0)
Continuation of PLS 251. Focuses on policies dealing with crime and punishment, equality of opportunity, role of courts in assuring rights of women, blacks, and the poor. Approved through Fall term 1979.

253. Human Values and Politics III: Individual and Community
Spring. 4(4-0)
Continuation of PLS 252. Focuses especially on conflicts between individual and community in such issues as tolerance of political and ethnic minorities, the right of privacy, free speech, censorship, abortion. Approved through Winter term 1990.

IDC. Continuing Revolution in China: Problems and Approaches
Fall, Winter, Spring, Summer. 4(3-0)
For course description, see Interdisciplinary Courses.

290. Methods of Political Research
Fall, Winter, Spring. 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) PLS 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. 4(3-0)
Urban political process in America. Politics of policymaking 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; interorganizational 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 policymaking 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 Policymaking
Fall, Spring. 4(3-0)
Consideration of political behavior of judges (especially Justices of Supreme Court) and their policymaking. 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.

330. Government and the Mass Media
Spring. 4(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. 4(3-0)
Origins, structure, and functions of political parties. Dynamics of the two-party system. Role of third parties.