119. General Astronomy (N)
Fall, Winter, Spring, Summer. 4(4-0)
Intended primarily for non-science 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.
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.

120. Topics in Astronomy
Winter, Spring. 4(4-0) AST 119.
Detailed qualitative discussion of currently interesting topics in astronomy. May include such topics as quasars, pulsars, black holes, planetary exploration, cosmology, concepts of reality.

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 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.
A semiquantitative presentation of current views of the universe including birth and death of stars, cosmology, comparisons of planets, and life in the universe; their interpretation through physical laws.

229. General Astronomy
Fall. 4(4-0) PHY 287 or PHY 281H 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.
Fundamental observations in astronomy and their interpretation through physical laws. Quantitative discussions of orbital motion, time, telescopes, solar system, stars, galaxies, and cosmology.

237. Introductory Observatory Laboratory
Fall: 1(0-3) AST 217 or AST 229 or concurrently. Photographic and spectroscopic telescopic observations. Darkroom processing.

327. Practical Astronomy
Winter. 3(3-0) AST 217 or AST 229, MTH 113.

378. Contemporary Astronomy
Winter. 3(3-0) AST 217 or AST 229.
A continuation of General Astronomy with particular emphasis on modern developments. May include such topics as planetary exploration, interstellar matter, star formation, evolution through final stages, supernovae, pulsars, neutron stars, black holes, galaxies, and cosmology.

437. Observatory Practice
Spring. 3(4-1) AST 327 and approval of department. Stellar photography. Photographic photometry. Photographs for photometic extinction. Multicolor photometric system. Astronomical spectroscopy and radial velocity determinations.

451. Solar System Astrophysics
Fall. 3(3-0) PHY 427 or concurrently or approval of department. Application of physical principles to the study of the planets, satellites, asteroids, comets, and interplanetary dust and gas. Mechanics of solar system objects.

452. Stellar and Interstellar Astrophysics
Winter. 3(3-0) PHY 364 or PHY 294 and PHY 395 or approval of department.
Emission, absorption and transfer of radiation in stars and the interstellar medium. Application of physical principles to the study of the interstellar medium and stellar interiors. Evolution of stars.

453. Galactic and Extragalactic Astrophysics
Spring. 3(3-0) PHY 364 or PHY 294 and PHY 395 or approval of department.
The large scale structure of stellar systems, clusters and galaxies. Stellar kinematics, spiral structures, interstellar and intergalactic medium, evolution of galaxies. Theoretical models will be compared with observation.

490. Special Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. May enroll 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) PHY 820.
May enroll for a maximum of 6 credits. Intersessional with and administered by Physics.

894. Advanced Readings in Physics or Astronomy
Fall, Winter, Spring, Summer. 1 to 3 credits. May enroll for a maximum of 6 credits. Intersessional with and administered by Physics.

981. 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. Diffusion in a magnetic field; investigation of dc, rf and microwave discharges.

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 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 8 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.

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.

418. Introductory Biophysics: Membranes and Electrical Systems (BYP 403) Spring. 3(3-0) One year organic chemistry or biochemistry, PHY 235, PHY 259, MTH 113 or approval of department.
Sallent features of biophysics, principles and methods, radiation biophysics, membrane biophysics, bioelectric phenomena, neurobiology and psychophysics.

431. Human Physiology
Winter. 4(4-0) One year of biological science or ANT 218; 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.

435. Mammary Physiology (444) Fall. 4(3-2) 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 system, folliculogenesis, gametogenesis, reproductive cycle, fertilization, sex determination, gestation and artificial regulation of these reproductive events for economic benefit.

465. Avian Physiology (460) 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 endocrine, and reproduction.

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

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. 4(4-0) Admission to a college of medicine or approval of department.
Concepts and principles in physiology germane to the practice of medicine.

500E. Introductory Physiology for Medicine
Spring. 4(4-0) Admission to a college of medicine or approval of department.
Continuation of PSL 500D.

503. Introduction to Medical Biology
Fall. 5(5-0) Admission to the College of Human Medicine. Interdepartmental with the departments of Biochemistry, Microbiology and Public Health, and Pharmacology and Toxicology. Administered by the Department of Microbiology and Public Health.
Principles of medical biology for medical students.

801. Advanced Cell Physiology
Fall. 5(6-0) PSL 431, PSL 432 or PSL 401, PSL 402; BCH 451, BCH 452, BCH 453 or concurrently; or approval of department; calculus recommended.
Concepts in advanced cellular physiology, including bioenergetics, transport, regulation of metabolic reactions, and specialized cell functions including nerve, muscle, secretory, epithelial and lymphoid.
Descriptions — Physiology of Courses

539. Systems Neuroscience
Fall, Winter. 3(4-2) PSL 801 or approval of department. Interdepartmental with the departments of Anatomy, and Pharmacology and Toxicology. Physiology, anatomy and pharmacology of sensory, somatomotor and autonomic neural systems.

559. 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
(BIM 865.) Spring, 4(4-0) ZOL 897. Interdepartmental with the departments of Anatomy, Psychology, and Zoology. Administered by the Department of Anatomy. Basic organization, structure and function of neural networks comprising sensory, motor and autonomic systems including examples from invertebrates and vertebrates. Attendance at neuroscience seminar is required.

875. Advanced Physiology Laboratory
Summer of odd-numbered years, 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
(FSY 885.) Winter of even-numbered years. 5(4-4) ANT 885. Interdepartmental with the departments of Anatomy, Psychology, and Zoology. Administered by the Department of Zoology. 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.

895. Vertebrate Neural Systems II
(ZOL 885.) Spring of even-numbered years, 5(4-4) ANT 885. Interdepartmental with the departments of Anatomy, Psychology, and Zoology. Administered by the Department of Anatomy. Continuation of PSL 885. Major component systems of vertebrate brains, their evolution, ontogeny and comparative analysis in mammals, birds, reptiles, amphibia and fish. Interrelation of behavioral, anatomical and physiological studies.

900. Readings in Biophysics
(BFI 890.) Fall, Winter, Spring, Summer. 3 credits. ANT 895 recommended. Interdepartmental with the departments of Anatomy, Psychology, and Zoology. Administered by the Department of Anatomy. Reading course in special topics adapted to the individual preparation and needs of the student.

980. 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.

990. 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. Variable credit. Approval of department.

POLITICAL SCIENCE

PSL

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 structure 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.

251. Human Values and Politics: On Liberty
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; capital punishment; biological planning.

252. Human Values and Politics: Equality and Justice
Winter. 4(4-0) Equality and justice as basic values underlying major public issues in society such as crime and punishment, education, family and employment. Effect of public policy on equal opportunity.

253. Human Values and Politics: Authority and the Individual
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. 3(3-0) Urban political process in America. Politics of policymaking for urban functions; politics of intergovernmental relations.

303. Michigan Government
Spring. 3(3-0) How the 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, Winter, Spring. 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.

312. Public Policy Analysis
Fall, Winter, Spring. 3(3-0) Problems and methods of 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 policies of judicial bureaucracies. Roles of judges, jurors, counsel, litigants, and interest groups in adjudication processes.

321. Judicial Policymaking
Fall, Winter, Spring. 3(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 interdepartmental policies among governmental units.

324. The American Legislative Process
Fall, Winter. 3(3-0) Nature of legislative process in the United States; organization and procedures of legislative bodies; direct legislation; relationship of legislative branch to other branches of government.