

## Department of Microbiology

**Edward A. Birge**  
*Chair*  
(LSE 210) 602/965-1457

### PROFESSORS

BURKE, MOSSMAN, SCHMIDT

### ASSOCIATE PROFESSORS

BIRGE, HOFFMAN, JACOBS

### ASSISTANT PROFESSORS

BLOOM, MISRA, STOUT

### CLINICAL FACULTY

DOWNS, LEFEVRE, MASS, ROBERTS

### PROFESSORS EMERITI

JOHNSON, LEATHERS,  
NORTHEY, REEVES

## MICROBIOLOGY—B.S.

The B.S. in Microbiology consists of a minimum of 41 semester hours in microbiology and approved related fields. Students majoring in Microbiology are required to take the following courses:

BIO 181	General Biology <i>SI/S2</i> .....	4
BIO 182	General Biology <i>S2</i> .....	4
BIO 340	General Genetics .....	4

Choose between the two combinations  
of courses below.....8

CHM 231	Elementary Organic Chemistry <i>SI/S2</i> <sup>1</sup> (3)	8
CHM 235	Elementary Organic Chemistry Laboratory <i>SI/S2</i> <sup>1</sup> (1)	
CHM 361	Principles of Biochemistry (3)	8
CHM 367	Elementary Biochemistry Laboratory (1)	
— or —		
CHM 331, 332	General Organic Chemistry (6)	8
CHM 335, 336	General Organic Chemistry Laboratory (2)	
MIC 206	Microbiology Laboratory <i>S2</i> <sup>2</sup> .....	1
MIC 220	Biology of Microorganisms ...	3
MIC 302	Advanced Bacteriology Laboratory <i>L2</i> <sup>3</sup> .....	2
MIC 360	Bacterial Physiology .....	3

MIC 401	Research Paper <i>L2</i> <sup>3</sup> .....	1
MIC 470	Bacterial Diversity and Systematics.....	3

<sup>1</sup> Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

<sup>2</sup> Both MIC 205 and 206 must be taken to secure S2 credit.

<sup>3</sup> Both MIC 302 and 401 must be taken to secure L2 credit.

A minimum of eight semester hours of upper-division electives in microbiology or approved related fields must be taken and must include one laboratory course. In addition, students are required to fulfill the university numeracy requirements with MAT 210 (or 270 or 290) as their N1 course and BIO 420 (or any CSE course that meets the N3 requirement). The required supplemental courses are as follows:

CHM 113	General Chemistry <i>SI/S2</i> .....	4
CHM 115	General Chemistry with Qualitative Analysis <i>SI/S2</i> ....	5
PHY 111, 112	General Physics <i>SI/S2</i> * .....	6
PHY 113, 114	General Physics Laboratory <i>SI/S2</i> *.....	2

\*Both PHY 111 and 113 or PHY 112 and 114 must be taken to secure S1 or S2 credit.

## CLINICAL LABORATORY SCIENCES—B.S.

The goal of the Clinical Laboratory Sciences degree program is to prepare individuals to practice in the field of clinical laboratory sciences, which includes the major disciplines of clinical chemistry, hematology, immunohematology, and microbiology. Employment opportunities exist in hospital, private, physician, and research laboratories and in government, sales, management, and education. After obtaining a B.S. degree in Clinical Laboratory Sciences, the graduate is eligible for national certification by examination.

A student majoring in Clinical Laboratory Sciences is required to take 40 hours of clinical laboratory sciences courses. Also required are the following courses:

CHM 113	General Chemistry <i>SI/S2</i> .....	4
CHM 231	Elementary Organic Chemistry <i>SI/S2</i> <sup>1</sup> .....	3
CHM 361	Principles of Biochemistry ....	3
MIC 205	Microbiology <i>S2</i> <sup>2</sup> .....	3
	or MIC 220 Biology of Microorganisms (3)	

MIC 206	Microbiology Laboratory <i>S2</i> <sup>2</sup> .....	1
ZOL 360	Basic Physiology .....	4

<sup>1</sup> Both CHM 231 and 235 must be taken to secure S1 or S2 credit.

<sup>2</sup> Both MIC 205 and 206 must be taken to secure S2 credit.

Equivalent courses may be substituted upon approval of an advisor. Students must consult with the clinical laboratory sciences advisor to select general electives courses. Completion of the degree is dependent upon acceptance of the student into the accredited professional study program, which consists of 40 hours of clinical laboratory sciences courses. The university does not guarantee all students to be accepted into the professional study program due to space limitations at the clinical affiliates and restrictions of program accreditation. For more information on acceptance procedures and program standards, contact the department for a program brochure. For proper course planning, students must meet with a clinical laboratory sciences advisor.

## MINOR IN MICROBIOLOGY

The minor in Microbiology consists of a minimum of 24 semester hours. Required courses are as follows:

BIO 181	General Biology <i>SI/S2</i> .....	4
BIO 182	General Biology <i>S2</i> .....	4
BIO 340	General Genetics .....	4
MIC 206	Microbiology Laboratory <i>S2</i> <sup>1</sup> .....	1
MIC 220	Biology of Microorganisms ...	3
MIC 302	Advanced Bacteriology Laboratory <i>L2</i> <sup>2</sup> .....	2
MIC 360	Bacterial Physiology .....	3

<sup>1</sup> Both MIC 205 and 206 must be taken to secure S2 credit.

<sup>2</sup> Both MIC 302 and 401 must be taken to secure L2 credit.

The remaining upper-division microbiology courses are chosen in consultation with an advisor. Students majoring in Biology may not minor in Microbiology.

## GRADUATE PROGRAMS

The Department of Microbiology offers programs leading to the degrees of Master of Natural Science, Master of Science, and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

The department participates in the interdisciplinary program for the Master of Science and Doctor of Philosophy degrees in Molecular and Cellular Biology. See page 172 for courses. For more information, phone 602/965–3595.

## MICROBIOLOGY

**MIC 205 Microbiology.** (3) F, S, SS  
Basic course for persons without credit in BIO 181, emphasizing general principles; role of microorganisms in health, ecology, and applied fields. May not be used for Microbiology major credit unless a diagnostic test is passed. Prerequisites: BIO 100 (or BOT 108) and CHM 101 or instructor approval. *General Studies: S2 (if credit also earned in MIC 206).*

**206 Microbiology Laboratory.** (1) F, S, SS  
Principles and laboratory techniques used in identifying and handling microorganisms. 3 hours lab. Pre- or corequisite: MIC 205 or 220. *General Studies: S2 (if credit also earned in MIC 205).*

**220 Biology of Microorganisms.** (3) F, S  
Basic course for persons with credit in BIO 181. Detailed study of microbial cells, their structure, genetics, physiology, and taxonomy. Corequisites: BIO 182; CHM 115.

**302 Advanced Bacteriology Laboratory.** (2) F, S  
Advanced laboratory techniques in bacterial growth, physiology, genetics, microscopy, and basic virology. Required of Microbiology majors. 4 hours lab. Prerequisites: completion of L1 requirement and either A or B. (A) MIC 206 and 220 or (B) MIC 205 and 206 and instructor approval. *General Studies: L2 (if credit also earned in MIC 401).*

**360 Bacterial Physiology.** (3) F  
Mechanisms and control of cell metabolism, structures, and functions. Prerequisite: MIC 220. Pre- or corequisite: CHM 361 or instructor approval.

**381 Pathogenic Microbes.** (3) S  
Host-microbial interactions in infectious disease, with emphasis on pathogenesis, host defenses, and molecular mechanisms of microbial virulence. Prerequisite: MIC 360 or 6 hours of microbiology with instructor approval.

**401 Research Paper.** (1) F, S, SS  
A paper of 15 or more pages based on library or laboratory research in collaboration with a faculty member. Required of all Microbiology majors. Prerequisites: MIC 302; completion of L1 requirement. *General Studies: L2 (if credit also earned in MIC 302).*

**420 Introductory Immunology.** (3) F  
Fundamental concepts in research and medicine. Cellular immunity, antibody and antigen, immunogenetics, immunoregulation, hypersensitivity, clinical immunology, and nervous-immune system interactions. Prerequisites: CHM 231 (or 331) and MIC 205 (or 220) or instructor approval.

**421 Experimental Immunology.** (2) S  
An introduction to the basic techniques, methods, and assays used in immunology. 6 hours lab. Prerequisites: CHM 231 and 331 and MIC 302 or instructor approval.

**425 Advanced Immunology.** (3) S '98  
A survey of recent advances in immunology, including lymphocyte membranes, lymphokines/biochemistry, molecular genetics, theoretical immunology, immunoregulation, neuroimmunology, and immunologic diseases. Prerequisite: MIC 420 or instructor approval.

**441 Bacterial Genetics.** (3) S  
Survey of genetic exchange and regulatory processes in bacteria and their viruses. Bacteria and viruses as tools in genetic engineering. Prerequisites: BIO 340 and MIC 205 (or 220) or instructor approval.

**442 Bacterial Genetics Laboratory.** (1) F  
Techniques of mutagenesis, mapping, and strain construction. 4 hours lab. Prerequisites: MIC 206, 302. Pre- or corequisite: MIC 441.

**470 Bacterial Diversity and Systematics.** (3) F  
Enrichment culture, biology, and classification of the nonpathogenic bacteria. 1 hour lecture, 6 hours lab. Prerequisite: MIC 302.

**485 General Virology.** (3) F  
Fundamental nature of viruses, their replication, pathogenesis, and ecology. Prerequisites: BIO 340 and CHM 331 or instructor approval.

**486 General Virology Laboratory.** (2) N  
An introduction to the growth, assay, and detection of viruses. 6 hours lab. Prerequisite: MIC 302. Pre- or corequisite: MIC 485.

**527 Neuroimmunology.** (3) S '97  
Studying mind's influence on immunity and the immune system's influence on the mind, neuroimmunologic diseases, and the neuroimmunological circuitry involved. Seminar. Prerequisite: MIC 420 or instructor approval.

**530 Bacterial Differentiation.** (3) N  
Molecular biology of sporulation and germination in bacteria. Emphasis on the control of cellular differentiation. Prerequisite: BIO 543 or MIC 441 or instructor approval.

**545 Recombinant DNA Methodology.** (3) N  
Principles of genetic engineering using in vitro DNA recombination; characteristics of plasmid and phage vectors; recombinant selection and physical characterization. Prerequisites: BIO 543; MIC 441; instructor approval.

**546 Recombinant DNA Laboratory.** (2) N  
Basic techniques in isolation of chromosomal, plasmid, and bacteriophage DNA; transformation; gene-splicing methods. Corequisite: MIC 545.

**581 Molecular Mechanism of Pathogenesis.** (3) F  
Pathogenic mechanisms and host responses in bacterial diseases. Prerequisites: MIC 381 and 420 or instructor approval.

**585 Molecular Virology.** (3) S '98  
Selected topics concerning molecular aspects of eukaryotic virus replication and pathogenesis. Prerequisite: instructor approval.

**591 Seminar.** (1–3) F, S  
Topics may be selected from the following:  
(a) Bacterial Ecology  
(b) Current Research in Microbiology  
(c) Enzymology  
(d) Genetic Engineering  
(e) Genetics  
(f) Immunology  
(g) Molecular Virology  
(h) Neuroimmunology  
(i) Pathogenic Bacteriology

## CLINICAL LABORATORY SCIENCES/ MEDICAL TECHNOLOGY

**CLS 100 Introduction to Clinical Laboratory Sciences.** (1) F  
Introduction to the field of clinical laboratory sciences. Required for Clinical Laboratory Sciences majors.

*Enrollment for the following CLS classes is restricted to students admitted to the Clinical Laboratory Sciences Professional Study Program.*

**310 Principles of Clinical Chemistry I.** (6) S  
Theory and application of principles of clinical chemistry, with emphasis on laboratory techniques, pathophysiology, methods of analysis, and assessment of procedure. 3 hours lecture, 9 hours lab.

**320 Principles of Clinical Microbiology I.** (6) S  
Emphasizes disease mechanisms, isolation, and identification of medically significant fungi and bacteria. Includes principles of laboratory safety and quality control. 3 hours lecture, 9 hours lab.

**330 Principles of Clinical Hematology I/ Body Fluids.** (3) F  
Theory and application of principles in hematology, with emphasis on techniques to evaluate blood dyscrasias and analyze body fluids. 2 hours lecture, 3 hours lab.

**410 Principles of Clinical Chemistry II.** (2) SS  
Continuation of 310, with emphasis on principles of automation, laboratory computers, and method evaluation. 1 hour lecture, 3 hours lab.

**411 Advanced Applications of Clinical Chemistry.** (4) F  
Clinical application of theory/techniques from Principles of Clinical Chemistry I and II. Emphasis on operation of common laboratory instrumentation, clinical correlation, and radioimmunoassay. Minimum 180 hours practicum.

**420 Principles of Microbiology II.** (2) SS  
Disease mechanisms and identification of medically significant parasites. Mycobacteria, Actinomycetes, Chlamydia, Rickettsia, Mycoplasma, and viruses. 1 hour lecture, 3 hours lab.

**421 Advanced Applications of Clinical Microbiology.** (4) S  
Practical laboratory application of the principles of specimen collection, processing, detection, identification, and antimicrobial testing of medically significant bacteria, fungi, and parasites. Minimum 180 hours practicum.

**430 Principles of Clinical Hematology II/Hemostasis.** (3) F

Theory and applications of principles in hematology with emphasis on etiology, pathophysiology, clinical manifestations, and treatment of blood dyscrasias/hemostatic defects. 2 hours lecture, 3 hours lab.

**431 Advanced Applications of Clinical Hematology.** (4) S

Practical laboratory application of methods/techniques used to evaluate and diagnose blood dyscrasias/hemostatic defects. Applied techniques in body fluid analysis. Minimum 180 hours practicum.

**440 Principles of Clinical Immunology/Immunohematology.** (4) F

Theoretical and practical application of clinical immunology and immunohematology. Emphasizes serological techniques that aid disease diagnosis and blood donor selection. 3 hours lecture, 3 hours lab.

**441 Advanced Applications of Clinical Immunology/Immunohematology.** (3) S

Practical laboratory application of the principles of serological methods used in diagnosing disease and selecting blood components for transfusion therapy. Minimum 135 hours practicum.

**450 Principles of Clinical Laboratory Administration.** (2) F, S

Principles of management, with emphasis on the clinical laboratory. Basic management process, personnel supervision, identification, and allocation of resources. *General Studies: L2 (if credit also earned in CLS 460).*

**460 Principles of Clinical Laboratory Education.** (1) S

Principles of learning, with application to the development of instructional objectives, strategies, and evaluation for teaching-learning situations in the laboratory. *General Studies: L2 (if credit also earned in CLS 450).*

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## Department of Military Science

### Army ROTC

**Stephen J. Heynen, Lt. Col.**  
*Chair*  
**(MAIN 240) 602/965-3318**

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**PROFESSORS**

DALGLEISH, HEYDEN

**ASSISTANT PROFESSORS**BUCHANAN, CLARK,  
FLUEKIGER, SMITH**INSTRUCTORS**GARRISON, LANE, OLNEY,  
RINGENOLDUS, WHITAKER**PURPOSE**

The Department of Military Science curriculum consists of the basic course (MIS 101, 102, 201, and 202) and the advanced course (MIS 301, 302, 401, and 402). The goal of this professional

education curriculum is to prepare students with leadership potential to be commissioned as U.S. Army officers. Objectives include developing the following characteristics in the students: leadership and managerial skills; the ability to think creatively; the ability to speak and write effectively; appreciation of the requirements for national security; and an understanding of the nature and functions of the U.S. Army. Upon successful completion of the advanced course and graduation, qualified students receive commissions in the Active Army (on a competitive basis), U.S. Army Reserve, or Army National Guard.

In addition to the military science curriculum, core courses in the field of national defense studies are both an integral and parallel source of the department's program. Integrally, they provide MIS courses at all levels with topical intensity and highlight such professionally related areas as military technology; weapons procurement; national intelligence, secrecy, and counterintelligence; civil-military relations; security coalitions and regional defense communities; national, regional, and global levels of strategy; generalship skill-in-action; deterrence dynamics and structure; military doctrine; service-branch livelihood, appropriations rivalry, and interservice cooperation; personnel recruitment, morale, training, advancement, and bureaucratic organization; military reform; threat and threat perception; military-historical experience and analogy; media and biographical insights; the rationale and matrices of security analysis and research; and independently selectable topics.

The department also fields an independent but parallel set of 400-level courses in the areas of geostrategic, politico-strategic, and national defense policy and analysis—available to students irrespective of Reserve Officers' Training Corps (ROTC) status, departmental major, or college affiliation—for assigned credit toward General Studies, social science, and global awareness requirements for graduation. Special emphasis is laid upon a single-semester course in Soviet foreign and national defense policy and analysis, and a variable accredited course available for appropriately qualified students in independent study and research in national defense policy and analysis. (See catalog qualifications for 499 Independent Study, page 44.)

**GENERAL QUALIFICATIONS**

**Basic Course.** Any student who is enrolled in ASU (or approved by the professor of military science) can enter into military science basic classes. It is strongly recommended that the student be in good physical shape because some of the curriculum requires physical exertion.

**Advanced Course.** Any student who is enrolled in ASU (or approved by the professor of military science) may enroll in military science advanced classes. However, to be competitive and obtain a commission in the U.S. Army, students must meet the following requirements:

1. be a citizen of the United States (noncitizens may enroll but must obtain citizenship before commissioning);
2. be of sound physical condition and pass the U.S. Army physical fitness test;
3. meet the required professional military educational requirements; and
4. be at least 17 years of age for entrance into the advanced course and be able to complete all commissioning requirements before age 30.

Only those students in the basic and advanced courses who meet the required standards according to military regulations are eligible to receive financial assistance through the U.S. Army. Faculty of the Department of Military Science are available during normal office hours to answer questions or provide counseling.

The following are various options open to students who wish to obtain a commission in the U.S. Army. Contact the Department of Military Science personnel for more information.

**Four-Year Program.** Students may enroll in Army ROTC during their freshman year. They take the basic course during the first two years, receiving a total of 12 semester hours of credit for four semesters of study. Upon satisfying the requirements stated above, they enter the advanced course, where they earn 12 additional semester hours for four semesters of study. Students are also required to attend a six-week advanced summer camp at Fort Lewis, Washington, between their junior and senior years. All commissioned

officers must meet certain Professional Military Education requirements by completing courses in English, math, and computer literacy. Selected majors such as nursing, engineering, and architecture, among others, may require an additional semester or two, or summer school, to complete all requirements for a degree and commission without excessive course overloads. Upon successful completion of the advanced course and requirements for a degree, students are commissioned as second lieutenants in the Regular Army, U.S. Army Reserve, or Army National Guard.

**Two-Year Program.** Students must have at least two academic years of college work remaining, either at the undergraduate or graduate level. The student must also have reached academic junior status. This program is open to all students with the exception of three- and four-year Army ROTC scholarship winners (see “Scholarship Programs”). Students seeking enrollment in the two-year program should make application during the spring semester of the calendar year in which they desire to enter the program. They must pass the Officer Selection Battery (OSB) and the Army physical aptitude examination. After successfully completing a paid six-week basic camp, students may enroll in the advanced course. (The camp is conducted during June and July at Fort Knox, Kentucky.) Students who have previous military experience or who are currently members of the National Guard or Reserves may be admitted directly into the two-year program, provided they are academic juniors. They then follow the same program and meet the same requirements as stated for advanced course students in the four-year program.

**Qualifications for Admittance to the Advanced Course.** The following qualifications are required for admittance to the advanced course:

1. successful completion of the basic course for the students in the four-year ROTC program; for the students in the two-year program, selection for and completion of the six-week basic summer camp or prior military service;
2. passing the Officer Selection Battery (OSB);
3. passing the Army physical examination;
4. achieving and maintaining the minimum cumulative GPA required for graduation in the student’s selected major, but no less than 2.0;
5. attainment of at least junior class standing; and
6. maintenance of full-time student status.

**Pay and Allowances.** Each advanced course student receives one-half the pay of a second lieutenant during attendance at the six-week advanced camp. Uniforms, housing, and meals are provided at camp without cost to the students, and they are reimbursed at the current mileage rate for travel to and from the camp. Students who attend basic camp receive the pay of an army recruit during attendance at basic camp as well as the current mileage rate for travel to and from the camp. All students in the advanced course, regardless of scholarship status, are paid about \$1,500.00 tax-free for each of these two years.

**Simultaneous Membership Program.** Under this program, ROTC students may simultaneously be members of the Army Reserves or the National Guard. The combination of advance course allowance and pay for Army Reserve or National Guard participation provides more than \$1,250.00 for each semester’s involvement.

**Military Construction Option.** The Department of Military Science and the Department of Construction of the College of Engineering and Applied Sciences have jointly developed the military construction option under the Construction major. It is composed of 70% technical studies and 30% electives in the areas of planning, management, and organization. It is distinctly military in orientation and is designed to prepare graduates to plan, manage, and direct large-scale construction projects, such as roads, dams, air fields, bridges, and other public works. ROTC cadets enrolled in this program receive credit to-

ward the degree for 18 semester hours of military science courses. Upon completion of the 132-hour program, cadets graduate with a Bachelor of Science degree in Construction.

**Scholarship Programs.** The Army ROTC offers scholarship programs for outstanding young men and women who are motivated toward a career as professional officers in the U.S. Army. These scholarships are awarded in varying amounts for tuition. In addition, the scholarship pays \$150.00 per month subsistence allowance and \$225.00 each semester for textbooks and supplies. A scholarship for four years is available to freshmen who enter the four-year program. Applications must be submitted in accordance with a schedule furnished by high school counselors. Selection is made on a nationwide basis. Scholarships are also available for three- and two-year periods, commencing with the sophomore and junior years of ROTC respectively. Applications are open to all students in good standing with the university; previous ROTC or military experience is not required for application for three- and two-year scholarships. Selection is made by a review board at the national level. Acceptance of any of the three scholarship programs requires a service commitment to serve in the Active Army for a period of up to four years after commissioning and graduation.

**Active Duty Requirements.** Graduates of Army ROTC may serve as officers in the Active Army, Army National Guard, or Army Reserves. Active duty commitments may vary from four years to as little as three months. Scholarship students have up to a four-year active duty commitment.

**Graduate and Professional Studies Programs.** A delay from call to active duty for up to four years is available to outstanding students who desire to earn graduate or professional degrees. Special programs for graduate and professional studies are available to both Regular Army appointees and U.S. Army Reserve appointees in the following areas: medicine, osteopathy, and clinical psychology.

## MILITARY SCIENCE

**MIS 101 Introduction to the Military.** (3) F  
Overview of mission, organization, and structure of the Army and its role in national defense; discussion of current military issues. 3 hours lecture/conference, 2 hours lab.

**102 Land Navigation, First Aid, and Survival.** (3) S  
Introduction to military maps and land navigation; first aid, and lifesaving techniques; basic outdoor survival skills. 3 hours lecture/conference, 2 hours lab.

**201 American Military History.** (3) F  
A study of the role of the military in American life during war and peace from colonial times to the present day. 3 hours lecture/conference, 2 hours lab.

**202 Introduction to Leadership Dynamics.** (3) S  
Introduction to interpersonal dynamics involved in military team operations; theory and application of military leadership principles. 3 hours lecture/conference, 2 hours lab.

**205 ROTC Basic Camp.** (4) SS  
Six-week training program emphasizing practical hands-on skills and leadership development. Taken in lieu of MIS 101, 102, 201, 202. Conducted at Fort Knox, Kentucky.

**301 Advanced Military Science I.** (3) F  
Theory and dynamics of the individual soldier and military units in offensive combat operations. 2 hours lecture-conferences, 1.5 hours of Leadership Practical Application, 1 2-day field exercise, 3 1-day field exercises. Prerequisites: MIS 101 and 102 and 201 and 202 or equivalents. Corequisite: EPE 105 Army Master Fitness.

**302 Advanced Military Science II.** (3) S  
Theory and dynamics of military units in defensive combat operations. 2 hours lecture-conferences, 1.5 hours Leadership Practical Application, 1 3-day field exercise, 2 1-day field exercises. Prerequisites: MIS 101 and 102 and 201 and 202 or equivalents. Corequisite: EPE 105 Army Master Fitness.

**303 ROTC Advanced Camp.** (4) SS  
Six-week training program emphasizing leadership development and advanced military skills, including tactics, land navigation, and physical training. Conducted at Fort Lewis, Washington. Prerequisites: MIS 301, 302.

**401 Advanced Military Science III.** (3) F  
The military legal system; preparation and conduct of military training; leadership development; ethics and professionalism of the military officer. 3 hours lecture-conferences, 2 hours Leadership Practical Application, 1 2-day field exercise, 3 1-day field exercises. Prerequisites: MIS 301, 302. Corequisite: EPE 105 Army Master Fitness.

**402 Advanced Military Science IV.** (3) S  
Military correspondence; career planning and personal affairs in service; conduct of training; leadership development; ethics and professionalism of the military officer. 3 hours lecture, 2 hours Leadership Practical Application, 1 3-day field exercise, 2 1-day field exercises. Prerequisites: MIS 301, 302. Corequisite: EPE 105 Army Master Fitness.

**410 American Defense Policy I.** (3) F  
Evolution, organization, and execution of U.S. national security policy. *General Studies: SB.*

**412 American Defense Policy II.** (3) S  
Contemporary problems and analytical issues in the formation and implementation of U.S. national security. Prerequisite: MIS 410. *General Studies: SB.*

**414 Comparative Defense Policy Analysis.** (3) F  
Historical problems and analytical issues in the evolution, organization, application, and control of effective military establishments in various political systems. *General Studies: SB.*

**416 Soviet/C.I.S. Foreign and Defense Policies.** (3) S  
Analysis of foreign and security policies of the Soviet Union/C.I.S. and of the successor states to the Warsaw Pact. *General Studies: SB.*

**499 Independent Study: National Defense Analysis.** (1–3)

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## Molecular and Cellular Biology

*Director, Interdisciplinary  
Committee on Molecular  
and Cellular Biology  
602/965-0743*

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### BOTANY

Professors: Aronson, Backhaus, Hooper, Trelease, Vermaas; Associate Professors: Roberson, Stutz; Assistant Professors: Frasch, Webber; Assistant Research Scientist: LoBrutto

### CHEMISTRY AND BIOCHEMISTRY

Professors: Bieber, Blankenship, Lohr, Rose; Associate Professors: Allen, Woodbury

### MICROBIOLOGY

Professor: Schmidt; Associate Professors: Hoffman, Jacobs; Assistant Professors: Misra, Stout

### ZOOLOGY

Professors: Chandler, Doane, Hazel, Markow, McGaughey, Satterlie; Associate Professors: Capco, Goldstein, Smith; Assistant Professor: Cooper

The interdisciplinary M.S. and Ph.D. degrees with a major in Molecular and Cellular Biology are administered by the Interdisciplinary Committee on Molecular and Cellular Biology. The participating faculty are drawn primarily from four core departments (the Departments of Botany, Chemistry and Biochemistry, Microbiology, and Zoology), with additional faculty from the Departments of Anthropology and Physics and Astronomy. One striking aspect of studies in this broad area of biological

science is the interdisciplinary nature of the field. Similar approaches and techniques are used for studies of biological systems whether they are viral, bacterial, plant, or animal.

The graduate degrees offered by the faculty through this program prepare students for careers that span traditional disciplinary boundaries. The broad-based training provides the necessary skills for professional careers in academic institutions, governmental institutions, and industry, particularly those related to health and chemical sciences.

For more information, contact the director or refer to the *Graduate Catalog*.

## MOLECULAR AND CELLULAR BIOLOGY

**MCB 500 Research Methods in Molecular and Cellular Biology.** (2) F, S  
Rotation laboratory experiences in which students participate in research under the direction of an MCB faculty member. May be repeated for credit.

**501 Seminar: Molecular and Cellular Biology Colloquium.** (1) F, S  
Presentation of current research by noted researchers in the field. May be repeated for credit.

**555 Advanced Molecular and Cellular Biology I.** (3) F  
Study of structural and functional organization of biomolecules and cells, based on current literature. 3 hours lecture, discussion. May be repeated once for credit. Pre- or corequisites: BIO 543 or equivalent; CHM 461.

**556 Advanced Molecular and Cellular Biology II.** (3) S  
Continuation of MCB 555. 3 hours lecture, discussion. May be repeated once for credit. Pre- or corequisites: BIO 543 or equivalent; CHM 462.

**591 Seminar: Current Literature in Molecular and Cellular Biology.** (1) F, S  
Presentation and discussion of current research in the areas of molecular and cellular biology. May be repeated for credit.

**700 Research Methods in Molecular and Cellular Biology.** (2) F, S  
Rotation laboratory experiences in which students participate in research under the direction of an MCB faculty member. May be repeated for credit.

**701 Seminar: Molecular and Cellular Biology Colloquium.** (1) F, S  
Presentation of current research by noted researchers in the field. May be repeated for credit.

**791 Seminar: Current Literature in Molecular and Cellular Biology.** (1) F, S  
Presentation and discussion of current research in the areas of molecular and cellular biology. May be repeated for credit.

**Omnibus Courses:** See pages 44–45 for omnibus courses that may be offered.

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## Department of Philosophy

Jane Maienschein  
*Chair*  
(PS A524) 602/965-3394

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### REGENTS' PROFESSOR MURPHY

**PROFESSORS**  
CREATH, FITCH, HUMPHREY,  
MAIENSCHIN, WHITE

**ASSOCIATE PROFESSORS**  
ARMENDT, COHEN, GULESERIAN,  
KOBES, MCGREGOR, REYNOLDS

**ASSISTANT PROFESSORS**  
BLACKSON, COWLES,  
DE MARNEFFE, DRESSER,  
O'LEARY-HAWTHORNE

**PROFESSORS EMERITI**  
ARNER, CARNEY, GIESCHEN,  
HOWELLS, LIU, VOTICHENKO

### PHILOSOPHY—B.A.

The major in Philosophy consists of 45 semester hours, 39 of which must be upper-division hours. In addition to the 45 semester hours, the mathematics proficiency requirement must be met by completing MAT 117 or higher. In exceptional cases, up to nine units may be in related fields as approved by the undergraduate advisor. Required courses are as follows:

PHI 301	History of Ancient Philosophy <i>HU, H</i> .....	3
PHI 302	History of Modern Philosophy <i>HU, H</i> .....	3
PHI 305	Ethical Theory <i>HU</i> .....	3
PHI 312	Theory of Knowledge <i>HU</i> .....	3
	or PHI 314 Philosophy of Science <i>HU</i> (3)	
PHI 316	Metaphysics <i>HU</i> .....	3
	or PHI 317 Philosophy of Mind <i>HU</i> (3)	
PHI 333	Introduction to Symbolic Logic.....	3
PHI 350	Philosophical Argument and Exposition <i>L2</i> .....	3

Also required are at least two of the following courses:

PHI 401	Rationalism.....	3
PHI 402	Empiricism <i>HU</i> .....	3

PHI 403	Contemporary Analytic Philosophy <i>HU</i> .....	3
PHI 413	Advanced Symbolic Logic ....	3
PHI 420	Topics in Philosophy.....	3
PHI 494	Special Topics .....	3

Exceptions by special permission of the chair only. PHI 420 may be taken more than once.

Students planning to do graduate work in philosophy should consult an advisor to develop an appropriate selection of courses at the 300 and 400 levels. A minimum grade of "C" is necessary for each course used to fulfill the major requirements. See "Degree Requirements," page 107.

### History and Philosophy of Science.

The Department of Philosophy offers courses bearing the HPS prefix. With the consent of the director of undergraduate studies, these courses may be taken to satisfy the requirements of the Philosophy major.

### MINOR IN PHILOSOPHY

A minor in Philosophy consists of 18 semester hours, of which at least 12 must be in the upper division and approved by an advisor in the department. All courses must be passed with a minimum grade of "C."

### GRADUATE PROGRAM

The Department of Philosophy offers a graduate program leading to the Master of Arts that prepares one for either teaching in a community college or pursuing a Ph.D. in Philosophy. Consult the *Graduate Catalog* for requirements.

### PHILOSOPHY

<b>PHI 101 Introduction to Philosophy.</b> (3) F, S, SS	Exploration of issues that philosophers have traditionally considered, including morality, reality, and knowledge. <i>General Studies: HU.</i>
<b>103 Principles of Sound Reasoning.</b> (3) F, S, SS	Fallacies, validity, and soundness of arguments. May include syllogistic, elementary symbolic, inductive logic, and scientific method. <i>General Studies: L1/HU.</i>
<b>301 History of Ancient Philosophy.</b> (3) F	History of western philosophy from its beginnings through the Hellenistic period. <i>General Studies: HU, H.</i>
<b>302 History of Modern Philosophy.</b> (3) S	History of western philosophy from the Renaissance through Kant. <i>General Studies: HU, H.</i>

### 304 Existentialism and Phenomenology. (3) N

An introduction through the study of major figures, e.g., Kierkegaard, Dostoyevsky, Nietzsche, Husserl, Heidegger, Buber, Sartre, Camus, Merleau-Ponty, and Ricoeur. *General Studies: HU.*

**305 Ethical Theory.** (3) A  
Current theories about the nature of morality (metaethics) and about what is right and wrong (normative ethics). Prerequisite: PHI 306 or 307 or instructor approval. *General Studies: HU.*

**306 Applied Ethics.** (3) F, S, SS  
Philosophical discussion of contemporary moral and political issues, such as abortion, euthanasia, animal rights, affirmative action, and sexual rights. *General Studies: HU.*

**307 Philosophy of Law.** (3) A  
Nature and source of law and its relation to morality. Legal rights, legal enforcement of morals, civil disobedience, liability and responsibility, punishment, judicial reasoning, justice, property, and differences between theories of natural and positive law. *General Studies: HU.*

**308 Philosophy of Art.** (3) A  
Central problems in philosophy of art, e.g., the nature of a work of art, modern and traditional theories of art, aesthetic perception and experience, and objectivity and relativity in art criticism. *General Studies: HU.*

**309 Social and Political Philosophy.** (3) A  
Alternative principles and methods relevant to problems of human association and conflict; justice and power, freedom and equality, and autonomy and order are discussed. Prerequisite: PHI 305 or instructor approval. *General Studies: HU.*

**310 Environmental Ethics.** (3) A  
Examination of a full range of philosophical positions pertaining to our moral relationship to the natural world; anthropocentrism, individualism, biocentrism. *General Studies: HU.*

**311 Philosophy in Literature.** (3) A  
Selected works of literature introduce philosophical problems such as the nature of moral goodness and people's relation to the world and other people. *General Studies: HU.*

**312 Theory of Knowledge.** (3) A  
Nature, sources, and limits of human knowledge. Topics may include truth, a priori knowledge, empirical knowledge, perception, induction, and skepticism. Prerequisite: 1 course from among PHI 101, 103, 301, 302, 333, 350. *General Studies: HU.*

**314 Philosophy of Science.** (3) A  
The structure and justification of scientific theories, explanation, and theory change. The roles of observation and laws, theoretical concepts and entities, reduction, probability, confirmation, space and time, and causation. *General Studies: HU.*

**315 Philosophy of Language.** (3) A  
Problems pertaining to the nature of language, including meaning, reference, truth, definition, analyticity, translatability, synonymy, and contributions of contemporary linguistics. Prerequisite: PHI 103 or 333 or 350. *General Studies: HU.*

**316 Metaphysics.** (3) A

Problems pertaining to the nature of reality. Topics may include nature of person, minds, substance, universals, space, time, causation, and modality. Prerequisite: 1 course from among PHI 101, 103, 301, 333, 350. *General Studies: HU.*

**317 Philosophy of Mind.** (3) A

Nature of consciousness. The common sense view of mind, behaviorism, materialism, dualism, functionalism, self-knowledge, and knowledge of other minds. Prerequisite: 1 course from among PHI 101, 103, 301, 302, 333, 350. *General Studies: HU.*

**318 Philosophy of Religion.** (3) A

Classical arguments for the existence of God. The argument from evil against the existence of God. Justification of religious belief. *General Studies: HU.*

**325 Philosophy of Social Science.** (3) N

Philosophical problems surrounding the aims, structure, and methods of the social sciences. *General Studies: HU/SB.*

**332 19th-Century Philosophy.** (3) N

The history of 19th-century philosophical thought, emphasizing either the German or the British traditions. Prerequisite: PHI 302. *General Studies: HU.*

**333 Introduction to Symbolic Logic.** (3) A

Symbolic techniques, emphasizing deductions and proofs in the propositional and first order predicate calculi.

**335 History of Ethics.** (3) A

Major works of moral philosophy, both ancient and modern, such as those by Plato, Aristotle, Hobbes, Hume, Kant, and Mill. Prerequisite: PHI 101 or 306 or 307 or instructor approval. *General Studies: HU.*

**350 Philosophical Argument and Exposition.** (3) S

The development of techniques of philosophical argument and exposition. Frequent written exercises. Course content may vary with instructor. Prerequisites: major; instructor approval. *General Studies: L2.*

**401 Rationalism.** (3) N

Examination of classical philosophical rationalism, as in Descartes, Spinoza, Malebranche, or Leibniz. Contemporary rationalist thought may also be examined. Prerequisites: PHI 302; 1 course from among PHI 305, 309, 312, 316, 317.

**402 Empiricism.** (3) N

Examination of representatives of either classical or contemporary philosophical empiricism, e.g., Bacon, Hobbes, Locke, Butler, Berkeley, Reid, Hume, Mill, Carnap, and Ayer. Prerequisites: PHI 302; 1 course from among PHI 305, 309, 312, 316, 317. *General Studies: HU.*

**403 Contemporary Analytic Philosophy.** (3) A

Aims and methods of such 20th-century philosophers as Frege, Moore, Russell, Wittgenstein, Carnap, Ayer, Wisdom, Ryle, Austin, Strawson, Quine, and Sellars, with application to metaphysics and epistemology. Prerequisites: PHI 302; 1 course from among PHI 312, 314, 315, 316, 317, 401, 402. *General Studies: HU.*

**413 Advanced Symbolic Logic.** (3) N

Properties of formal systems axiomatizing propositional and 1st-order predicate logic. May also include modal logic, number theory, and limits of logicism. Prerequisite: PHI 333.

**420 Topics in Philosophy.** (3) A

Course descriptions on file in department. Topics may be selected from the following:

- (a) History of Philosophy
- (b) Metaphysics/Epistemology
- (c) Philosophy of Language/Logic
- (d) Philosophy of Science
- (e) Value Theory

Courses may be repeated for credit. Prerequisite: one relevant upper-division PHI course or instructor approval.

**591 Seminar.** (1–3) A

Topics may be selected from the following:

- (a) Aesthetics
- (b) Epistemology
- (c) Ethics
- (d) History of Philosophy
- (e) Logic
- (f) Metaphysics
- (g) Philosophy of Language
- (h) Philosophy of Law
- (i) Philosophy of Science
- (j) Social and Political Philosophy

## HISTORY AND PHILOSOPHY OF SCIENCE

**HPS 322 History of Science.** (3) F

Development and application of scientific thinking from ancient times through the 17th century. *General Studies: HU, H.*

**323 History of Science.** (3) S

Development and application of scientific thinking from the 18th century to the present. *General Studies: HU, H.*

**325 History of Chinese Science.** (3) S

Explores development of traditional Chinese science in the context of Chinese thought and society and in comparison with developments elsewhere. Lecture, discussion. Cross-listed as HIS 309.

**330 History of Biology: Conflicts and Controversies.** (3) A

Focuses on the 19th and 20th centuries, considering biology as a discipline, evolution, and problems of heredity, development, and cell theory. Cross-listed as ZOL 316. *General Studies: H.*

**331 History of Medicine.** (3) A

Scientific study of the human body, changing theories of disease, evolution of practical opinions on treatment, and the emerging institutionalization of medical practice. Students may receive credit for this course and BIO 218. Cross-listed as ZOL 318. *General Studies: H.*

**402 Technology, Society, and Human Values.** (3) A

Values that motivate humankind to create technology. Areas of conflict and resolution of conflict between values and technology. Readings and discussions with visiting lecturers. Prerequisite: junior standing.

**410 Professional Values in Science.** (2–3) A

Considers issues related to values in science such as collaboration, finances, legal issues, media, mentoring, ownership of ideas, scientific integrity. Discussion, student projects. Cross-listed as BIO 410.

## Department of Physics and Astronomy

Howard G. Voss

*Chair*

(PS F470) 602/965–3561

### REGENTS' PROFESSOR SPENCE

#### PROFESSORS

BAUER, BURSTEIN, COMFORT,  
A. COWLEY, DOAK, DOW, HANSON,  
HESTENES, JACOB, KAUFMANN,  
LINDSAY, NIGAM, PAGE, SANKEY,  
SMITH, STARRFIELD, TILLERY,  
TSONG, VENABLES,  
VOSS, WYCKOFF

#### ASSOCIATE PROFESSORS

AANNSTAD, ACHARYA, ALARCON,  
BENIN, BENNETT, CHAMBERLIN,  
MARZKE, MENENDEZ, REZ, RITCHIE,  
SCHEINFELD, SCHMIDT,  
TSEN, WINDHORST

#### ASSISTANT PROFESSORS

CULBERTSON, HERBOTS, HESTER

#### PROFESSORS EMERITI

J. COWLEY, KEVANE, LU, MEISTER,  
RAWLS, SNYDER, STEARNS, YALE

### PHYSICS—B.S.

Students majoring in physics may pursue one of two options.

**Option I.** Designed for students who wish to pursue physics at the bachelor or graduate degree levels, option I consists of 45 semester hours plus supporting mathematics courses. Required courses are as follows:

Choose between the two combinations of MAT courses  
below .....12 or 10

MAT 270 Calculus with Analytic  
Geometry I *NI* (4)

MAT 271 Calculus with Analytic  
Geometry II (4)

MAT 272 Calculus with Analytic  
Geometry III (4)

— or —

MAT 290 Calculus I *NI* (5)

MAT 291 Calculus II (5)

PHY 150	Physics I .....4 or PHY 121 University Physics I: Mechanics <i>SI/S2</i> <sup>1</sup> (3) and PHY 122 University Physics Laboratory I <i>SI/S2</i> <sup>1</sup> (1)
PHY 151	Physics II .....4 or PHY 131 University Physics II: Electricity and Magnetism <i>SI/S2</i> <sup>2</sup> (3) and PHY 132 University Physics Laboratory II <i>SI/S2</i> <sup>2</sup> (1)
PHY 201	Mathematical Methods in Physics I .....3
PHY 252	Physics III <i>SI/S2</i> ..... 4
PHY 302	Mathematical Methods in Physics II .....2
PHY 310	Classical Particles, Fields and Matter I .....3
PHY 311	Classical Particles, Fields and Matter II.....3
PHY 314	Quantum Physics I .....3
PHY 315	Quantum Physics II .....3
PHY 333	Electronic Circuits and Measurements.....3
PHY 334	Advanced Laboratory I <i>L2</i> .... 2
PHY 412	Classical Particles, Fields and Matter III.....3
PHY 416	Quantum Physics III.....3
PHY 441	Statistical and Thermal Physics I .....3
PHY 465	Advanced Laboratory II .....2

<sup>1</sup> Both PHY 121 and 122 must be taken to secure S1 or S2 credit.  
<sup>2</sup> Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Additional courses in physics and related fields are selected with the approval of the advisor. French, German, or Russian is strongly recommended to fulfill the foreign language requirement.

**Option II.** The interdisciplinary option II is designed for students who wish to obtain an undergraduate physics preparation for entry into other professions or graduate programs. A total of 53 hours are required, including these courses:

Choose between the two combinations of MAT courses below .....12 or 10

MAT 270	Calculus with Analytic Geometry I <i>NI</i> (4)
MAT 271	Calculus with Analytic Geometry II (4)
MAT 272	Calculus with Analytic Geometry III (4)

— or —

MAT 290	Calculus I <i>NI</i> (5)
MAT 291	Calculus II (5)
PHY 150	Physics I .....4 or PHY 121 University Physics I: Mechanics <i>SI/S2</i> <sup>1</sup> (3) and PHY 122 University Physics Laboratory I <i>SI/S2</i> <sup>1</sup> (1)
PHY 151	Physics II .....4 or PHY 131 University Physics II: Electricity and Magnetism Physics <i>SI/S2</i> <sup>2</sup> (3) and PHY 132 University Physics Laboratory II Physics <i>SI/S2</i> <sup>2</sup> (1)
PHY 201	Mathematical Methods in Physics I .....3
PHY 252	Physics III <i>SI/S2</i> ..... 4
PHY 302	Mathematical Methods in Physics II .....2
PHY 310	Classical Particles, Fields and Matter I .....3
PHY 311	Classical Particles, Fields and Matter II.....3
PHY 314	Quantum Physics I .....3
PHY 315	Quantum Physics II .....3
PHY 333	Electronic Circuits and Measurements.....3
PHY 334	Advanced Laboratory I <i>L2</i> .... 2
PHY 412	Classical Particles, Fields and Matter III.....3
PHY 441	Statistical and Thermal Physics I .....3

<sup>1</sup> Both PHY 121 and 122 must be taken to secure S1 or S2 credit.  
<sup>2</sup> Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

The remaining courses are selected from physics and an area of concentration as approved by the student's advisor. Examples of possible areas of concentration are astronomy, astrophysics, materials science, physical chemistry, applied mathematics, geophysics, biological physics, philosophy of science, scientific journalism, and premedical and prelaw programs. French, German, or Russian is strongly recommended to fulfill the foreign language requirement.

**Course Changes.** The department has established new degree requirements and is in the process of making changes to the course offerings over the next few years. Full details are available from the department.

**Emphasis in Astronomy**

The astronomy faculty offer courses in astronomy both for nonscience majors and for science and physics majors. For an emphasis in astronomy, the following courses (or their equivalents) should be taken:

AST 321	Introduction to Planetary and Stellar Astrophysics <i>SI/S2</i> <sup>1</sup> ..... 3
AST 322	Introduction to Galactic and Extragalactic Astrophysics <i>SI/S2</i> <sup>2</sup> ..... 3
AST 421	Astrophysics I.....3
AST 422	Astrophysics II .....3
AST 499	Independent Study.....3

<sup>1</sup> Both AST 113 and 321 must be taken to secure S1 or S2 credit.  
<sup>2</sup> Both AST 114 and 322 must be taken to secure S1 or S2 credit.

**MINOR IN ASTRONOMY**

The minor in Astronomy consists of a minimum of 24 semester hours. Required courses are as follows:

AST 125	Astronomy Laboratory I.....1
AST 126	Astronomy Laboratory II.....1
AST 321	Introduction to Planetary and Stellar Astrophysics <i>SI/S2</i> ..... 3
AST 322	Introduction to Galactic and Extragalactic Astrophysics <i>SI/S2</i> ..... 3
PHY 150	Physics I .....4 or PHY 121 University Physics I: Mechanics <i>SI/S2</i> <sup>1</sup> (3) and PHY 122 University Physics Laboratory I <i>SI/S2</i> <sup>1</sup> (1)
PHY 151	Physics II .....4 or PHY 131 University Physics II: Electricity and Magnetism <i>SI/S2</i> <sup>2</sup> (3) and PHY 132 University Physics Laboratory II <i>SI/S2</i> <sup>2</sup> (1)
PHY 252	Physics III <i>SI/S2</i> ..... 4

<sup>1</sup> Both PHY 121 and 122 must be taken to secure S1 or S2 credit.  
<sup>2</sup> Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Electives are chosen with the approval of an astronomy advisor from upper-division courses in physics and astronomy.



**MINOR IN PHYSICS**

The minor in Physics consists of a minimum of 27 semester hours. Required courses are as follows:

PHY 150	Physics I .....4 or PHY 121 University Physics I: Mechanics <i>SI/S2</i> <sup>1</sup> (3) and PHY 122 University Physics Laboratory I <i>SI/S2</i> <sup>1</sup> (1)
PHY 151	Physics II .....4 or PHY 131 University Physics II: Electricity and Magnetism <i>SI/S2</i> <sup>2</sup> (3) and PHY 132 University Physics II Laboratory <i>SI/S2</i> <sup>2</sup> (1)
PHY 201	Mathematical Methods in Physics I .....3
PHY 252	Physics III <i>SI/S2</i> ..... 4
PHY 310	Classical Particles, Fields and Matter I .....3
PHY 311	Classical Particles, Fields and Matter II.....3
PHY 314	Quantum Physics I .....3

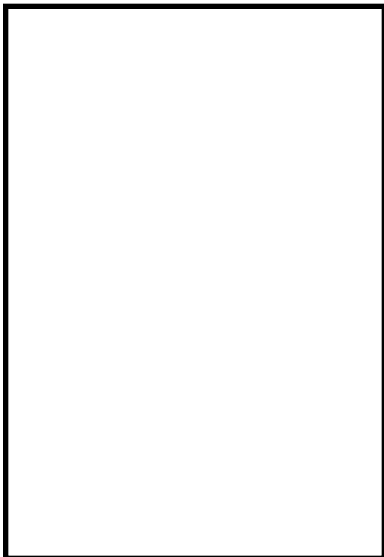
<sup>1</sup> Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

<sup>2</sup> Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Electives are chosen with the approval of the physics advisor from upper-division courses in physics and astronomy.

**SECONDARY EDUCATION—  
B.A.E.**

**Physics.** Two options are available for physics as the major teaching field.



*Option One.* The major teaching field consists of 42 semester hours. Required courses are as follows:

PHY 150	Physics I <sup>1</sup> ..... 4 or PHY 121 University Physics I: Mechanics <i>SI/S2</i> <sup>2</sup> (3) and PHY 122 University Physics Laboratory I <i>SI/S2</i> <sup>2</sup> (1)
PHY 151	Physics II <sup>1</sup> ..... 4 or PHY 131 University Physics II: Electricity and Magnetism <i>SI/S2</i> <sup>3</sup> (3) and PHY 132 University Physics Laboratory II <i>SI/S2</i> <sup>3</sup> (1)
PHY 201	Mathematical Methods in Physics I .....3
PHY 252	Physics III <sup>1</sup> <i>SI/S2</i> ..... 4
PHY 310	Classical Particles, Fields and Matter I .....3
PHY 311	Classical Particles, Fields and Matter II.....3
PHY 314	Quantum Physics I .....3
PHY 333	Electronic Circuits and Measurements.....3
PHY 480	Methods of Teaching Physics.....3 or PHY 484 Internship: Physics Teaching (3)

<sup>1</sup> PHY 111, 112, 113, and 114 or equivalents may be substituted for PHY 150, 151, and 252 on approval of the advisor.

<sup>2</sup> Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

<sup>3</sup> Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Electives are chosen in physics or other closely related fields, subject to the approval of the advisor.

*Option Two.* The interdisciplinary 60-hour option two consists of 30 semester hours in physics and an additional 30 semester hours in either chemistry (see page 124) or mathematics (see page 164). The physics portion of this program requires the following courses:

PHY 150	Physics I <sup>1</sup> ..... 4 or PHY 121 University Physics I: Mechanics <i>SI/S2</i> <sup>2</sup> (3) and PHY 122 University Physics Laboratory I <i>SI/S2</i> <sup>2</sup> (1)
PHY 151	Physics II <sup>1</sup> ..... 4 or PHY 131 University Physics II: Electricity and Magnetism <i>SI/S2</i> <sup>3</sup> (3) and PHY 132 University Physics Laboratory II <i>SI/S2</i> <sup>3</sup> (1)
PHY 252	Physics III <sup>1</sup> <i>SI/S2</i> ..... 4

PHY 310	Classical Particles, Fields and Matter I .....3
PHY 311	Classical Particles, Fields and Matter II.....3
PHY 333	Electronic Circuits and Measurements.....3
PHY 361	Introductory Modern Physics.....3 or PHY 314 Quantum Physics I (3)
PHY 480	Methods of Teaching Physics.....3 or PHY 484 Internship: Physics Teaching (3)

<sup>1</sup> PHY 111, 112, 113, and 114 or equivalents may be substituted for PHY 150, 151, and 252 on approval of the advisor.

<sup>2</sup> Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

<sup>3</sup> Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

Electives to complete the 30-hour physics portion are chosen from physics or closely related fields, subject to the approval of the physics advisor.

*Minor Teaching Field.* The minor teaching field consists of 24 semester hours. Required courses are as follows:

PHY 150	Physics I <sup>1</sup> ..... 4 or PHY 121 University Physics I: Mechanics <i>SI/S2</i> <sup>2</sup> (3) and PHY 122 University Physics Laboratory I <i>SI/S2</i> <sup>2</sup> (1)
PHY 151	Physics II <sup>1</sup> ..... 4 or PHY 131 University Physics II: Electricity and Magnetism <i>SI/S2</i> <sup>3</sup> (3) and PHY 132 University Physics Laboratory II <i>SI/S2</i> <sup>3</sup> (1)
PHY 252	Physics III <sup>1</sup> <i>SI/S2</i> ..... 4
PHY 314	Quantum Physics I .....3 or PHY 361 Introductory Modern Physics (3)
PHY 480	Methods of Teaching Physics.....3 or PHY 484 Internship: Physics Teaching (3)

<sup>1</sup> PHY 111, 112, 113, and 114 may be substituted for PHY 150, 151, and 252, or equivalents, on approval of the advisor.

<sup>2</sup> Both PHY 121 and 122 must be taken to secure S1 or S2 credit.

<sup>3</sup> Both PHY 131 and 132 must be taken to secure S1 or S2 credit.

The remaining hours are selected from upper-division courses in physics or astronomy (including AST 125 and 126), subject to approval of the advisor.

## GRADUATE PROGRAMS

The Department of Physics and Astronomy offers programs leading to the degrees of Master of Science, Master of Natural Sciences, and Doctor of Philosophy. Consult the *Graduate Catalog* for requirements.

## PHYSICS

*Changes are planned for some PHY courses. Note statements about the timing of these changes.*

**PHY 101 Introduction to Physics.** (4) F, S Emphasizes applications of physics to life in the modern world. Understanding of elementary algebra is presumed. 3 hours lecture, 1 recitation, 2 hours lab. *General Studies: S1/S2.*

**105 Basic Physics.** (3) F One-semester survey of the principles of physics. Primarily for students who intend to take PHY 121, 131 but have not taken high school physics. 3 hours lecture, 1 recitation. Prerequisites: algebra and trigonometry.

**111 General Physics.** (3) F, S, SS Noncalculus treatment of the principles of physics for nonphysics majors. Students whose curricula require a laboratory course must also register for PHY 113. 3 hours lecture, 1 recitation. Prerequisite: trigonometry. *General Studies: S1/S2 (if credit also earned in PHY 113).*

**112 General Physics.** (3) F, S, SS Continuation of PHY 111. Students whose curricula require a laboratory course must also register for PHY 114. Prerequisite: PHY 111. *General Studies: S1/S2 (if credit also earned in PHY 114).*

**113 General Physics Laboratory.** (1) F, S, SS Elementary experiments in physics. 2 hours lab. Outside preparation for experiments and report writing are required. May be taken concurrently with, or subsequent to, PHY 111. *General Studies: S1/S2 (if credit also earned in PHY 111).*

**114 General Physics Laboratory.** (1) F, S, SS See PHY 113. May be taken concurrently with, or subsequent to, PHY 112. *General Studies: S1/S2 (if credit also earned in PHY 112).*

**121 University Physics I: Mechanics.** (3) F, S, SS Kinematics, Newton's laws, work, energy, momentum, conservation laws, dynamics of particles, solids, and fluids. 3 hours lecture, 1 hour recitation. Prerequisite: MAT 270 or 290 or instructor approval. *General Studies: S1/S2 (if credit also earned in PHY 122).*

**122 University Physics Laboratory I.** (1) F, S, SS Lab accompanying PHY 121. Pre- or corequisite: PHY 121. *General Studies: S1/S2 (if credit also earned in PHY 121).*

**131 University Physics II: Electricity and Magnetism.** (3) F, S, SS Electric charge and current, electric and magnetic fields in vacuum and in materials, and in-

duction. AC circuits, displacement current, and electromagnetic waves. 3 hours lecture, 1 hour recitation. Prerequisites: MAT 271 or 291 or instructor approval; PHY 121. Corequisite: MAT 272 or instructor approval. *General Studies: S1/S2 (if credit also earned in PHY 132).*

**132 University Physics Laboratory II.** (1) S, SS Lab accompanying PHY 131. Pre- or corequisite: PHY 131. *General Studies: S1/S2 (if credit also earned in PHY 131).*

**150 Physics I.** (4) S Introductory physics for majors. Kinematics, Newton's Laws, basic forces, energy, momentum, special relativity. 3 hours lecture, 3 hours lab. Prerequisite: MAT 270 or 290 or equivalent.

**151 Physics II.** (4) F Continuation of PHY 150. Electromagnetic fields; Ampere's and Faraday's Laws; Maxwell's equations; basic circuit elements. 3 hours lecture, 3 hours lab. Prerequisites: MAT 271 (or 291 or equivalent); PHY 121 and 122 or PHY 150.

**190 Seminar: Physics as a Curriculum and a Profession.** (1) F, S Seminar for new Physics majors. Instruction and information on curriculum, departmental functions, and professional preparation. Weekly meetings and excursions. Pass/fail grading.

**201 Mathematical Methods in Physics I.** (3) S Differential equations, linear equations, vectors, matrices, Fourier series, statistics, numerical methods. 2 hours lecture, 2 hours lab. Prerequisites: MAT 272; PHY 252 or equivalent.

**252 Physics III.** (4) S '98 Continuation of PHY 151. Wave physics, oscillations, harmonic systems, physical optics, thermodynamics, kinetic theory. 3 hours lecture, 3 hours lab. Prerequisites: MAT 272 or equivalent; PHY 131 and 132 or PHY 151 or equivalent. *General Studies: S1/S2.*

**302 Mathematical Methods in Physics II.** (2) F Continuation of PHY 201. Vector calculus, complex variables, partial differential equations, special functions, numerical methods. 1 hour lecture, 3 hours lab. Prerequisites: PHY 201 or equivalent.

**310 Classical Particles, Fields and Matter I.** (3) F '96 Particle kinematics, mechanics, conservation laws, particle motion in force fields, dynamics of two-body systems, reference frames, rigid body motion, relativity. Prerequisites: PHY 201 and 252 or equivalent. Corequisites: PHY 302 or 314 or instructor approval.

**311 Classical Particles, Fields and Matter II.** (3) S '97 *Effective spring 1997; replaces PHY 331.* Electrostatic and gravitational fields, Poisson and Laplace equations, dielectric materials, magnetic fields and materials, magnetic induction, Faraday's Law. Prerequisites: PHY 302, 310. Corequisite: PHY 315 or instructor approval.

**314 Quantum Physics I.** (3) F '96 Photons, models of the atom, wave properties of matter, introduction to wave mechanics, 1-dimensional systems in quantum mechanics. Prerequisites: PHY 201 and 252 or equivalents. Corequisites: PHY 302 and 310 or instructor approval.

**315 Quantum Physics II.** (3) S *Effective spring 1997; replaces PHY 471.* General principles of quantum mechanics, 3-dimensional problems, approximation methods, spin, introduction to many-particle systems. Prerequisites: PHY 302, 310, 314. Corequisite: PHY 311 or instructor approval.

**322 Analytical Mechanics.** (3) S *Effective spring 1998.* Lagrange's and Hamilton's equations; constraints; coupled oscillators; elements of continuum mechanics; elasticity and hydrodynamics. Prerequisite: PHY 310.

**333 Electronic Circuits and Measurements.** (3) F Basic principles of electronic circuit analysis and measurement techniques using modern instrumentation and computer-aided analysis of data. 1 hour lecture, 3 hours lab. Equivalent effort outside of the lab is required. Corequisite: PHY 201 or instructor approval.

**334 Advanced Laboratory I.** (2) S *Effective spring 1997; replaces PHY 334.* Selected experiments from contemporary physics. Emphasis on modern instrumentation, computer-assisted acquisition and analysis of data, and report form writing. Lecture, lab. Prerequisites: PHY 310, 314, 333.

**361 Introductory Modern Physics.** (3) F, S Special relativity and introductory quantum theory with applications drawn from atomic, nuclear, and solid state physics. 3 hours lecture, 1 recitation. Prerequisite: PHY 131.

**412 Classical Particles, Fields and Matter III.** (3) F *Effective fall 1997; replaces PHY 332.* Electromagnetic fields of moving charges, Maxwell's equations, harmonic phenomena, oscillations, waves, electromagnetic radiation, covariant electromagnetism, introduction to general relativity. Prerequisites: PHY 302, 310, 333. Corequisite: PHY 416 or instructor approval.

**416 Quantum Physics III.** (3) F *Effective fall 1997; replaces PHY 472.* Introduction to the quantum theory of atoms, molecules, solids and nuclei, Dirac's equation. Prerequisites: PHY 311, 315. Corequisite: PHY 412 or instructor approval.

**420 Research Paper.** (1) F, S *Effective spring 1997.* Scientific report writing. Culminates in a paper based on library or laboratory research or both. Taken in conjunction with other courses as approved. Conference. Prerequisite: instructor approval.

**441 Statistical and Thermal Physics I.** (3) F *Effective fall 1997; replaces PHY 441.* Statistical and experimental basis of heat, temperature, and entropy. Mechanical and statistical basis of the laws of thermodynamics. Applications of macroscopic thermodynamics. Phase equilibrium. Prerequisites: PHY 201, 314.

- 442 Statistical and Thermal Physics II.** (3) S  
*Effective spring 1998; replaces PHY 442.*  
Principles and applications of statistical mechanics. Quantum statistics of ideal gases and simple solids. Equilibrium of phases and chemical species. Transport theory. Irreversible processes and fluctuation. Prerequisite: PHY 302, 310, 441.
- 452 Physical Optics.** (3) F  
*Effective fall 1997; replaces PHY 452.*  
Principles of reflection, refraction, diffraction. Additional topics from contemporary optics may include Fourier transform spectroscopy, linear systems theory, holography. 2 hours lecture, 2 hours lab. Prerequisites: PHY 302, 311, 315. Corequisite: PHY 412.
- 462 Nuclear and Particle Physics.** (3) S  
*Effective spring 1998; replaces PHY 462.*  
Static properties of nuclei, natural and induced radioactivity, nuclear reactions, nuclear models and energy levels, mesons and hyperons, and interaction of photons and electrons with matter. Prerequisite: PHY 315.
- 465 Advanced Laboratory II.** (2) F, S  
*Effective fall 1997; replaces PHY 465.*  
Continuation of PHY 334. Students are encouraged to substitute laboratory research project in consultation with faculty sponsor. Prerequisite: PHY 334.
- 466 Advanced Laboratory III.** (1–3) F, S  
*Effective spring 1998; replaces PHY 466.*  
Continuation of PHY 465. Prerequisite: PHY 465.
- 480 Methods of Teaching Physics.** (3) S  
Evaluation of various approaches to the teaching of high school physics. Preparation of demonstrations and experiments. Organization of a laboratory. Designed for secondary school physics teachers. Prerequisite: instructor approval.
- 481 Solid State Physics.** (3) S  
*Effective spring 1998; replaces PHY 481.*  
Structure, elastic properties, and dynamics of crystals; electron motions in crystals under applied fields. Prerequisite: PHY 315.
- 484 Internship: Physics Teaching.** (1–4) F, S, SS  
Preparation for high school physics teaching. Student works closely with a faculty member in the elementary physics program. May be repeated for a total of 6 semester hours. Prerequisite: instructor approval.
- 495 Project Research.** (1–3) F, S  
Supervised project in physics or astrophysics. May be repeated for credit. *Note:* Approval of faculty member under whose direction the work is to be done must be obtained before registration. Prerequisite: instructor approval.
- 501 Methods of Theoretical Physics.** (3) F, S  
Provides mathematical foundations for graduate students in basic and applied physics. Complex variables, vector spaces, operators, matrices, ordinary differential equations, integral equations and transforms, and special functions. May include additional topics. Prerequisites: PHY 201 and 302 or instructor approval.
- 502 Methods of Theoretical Physics.** (3) F, S  
Continuation of PHY 501. Prerequisite: PHY 501.
- 503 Physical Applications of Group Theory.** (3) N  
Fundamentals and applications of the theory of finite and continuous groups as they occur in physics. Atomic, molecular, solid state, and elementary particle physics. Prerequisite: instructor approval.
- 521 Classical Mechanics.** (3) F  
Variational principles, Lagrange's and Hamilton's equations, rigid body motion, canonical transformations, Hamilton-Jacobi theory. Prerequisite: PHY 310.
- 522 Advanced Topics in Classical Mechanics.** (3) S  
Continuum mechanics, elements of hydrodynamics, elasticity theory, and special relativity. Prerequisites: PHY 322, 521.
- 523 Relativity.** (3) N  
Special and general theories of relativity. Prerequisites: PHY 522 and 532 or instructor approval.
- 531 Advanced Electricity and Magnetism.** (3) F  
Electrostatics and magnetostatics; potential theory and theory of constitutive relations; Maxwell's equations; the wave equation, plane electromagnetic waves, cavities, and wave guides. Prerequisite: PHY 311 or instructor approval.
- 532 Electrodynamics.** (3) S  
Special theory of relativity, covariant formulation of electromagnetic interactions; inhomogeneous wave equations, Lienard-Wiechert potentials, and radiation fields; interactions of charged particles and electromagnetic waves, scattering, dispersion. Prerequisites: PHY 412 and 531 or instructor approval.
- 541 Statistical Physics.** (3) F  
Probability theory and principles of statistical inference; evaluating experimental data; foundations of statistical mechanics; general laws of thermodynamics from microscopic theories; calculation of specific properties of bulk matter. PHY 442 recommended. Prerequisites: PHY 315, 441.
- 542 Advanced Topics in Statistical and Thermal Physics.** (3) S  
Theory of irreversible processes, Onsager-reciprocity laws, and the fluctuation-dissipation theorem; relaxation and transport processes in fluids and plasmas; Liouville equation; the BBGKY hierarchy of distribution functions; kinetic theory; hydrodynamics from many-body theory; phase changes and equilibrium; ferromagnetism. Prerequisite: PHY 541.
- 551 X-Ray and Electron Diffraction.** (3) S  
Fresnel and Fraunhofer diffraction in integral formulation; diffraction of X-rays and neutrons by crystal lattices; structures of solids, including crystal structure analysis; theory and techniques of electron microscopy/diffraction of crystalline/noncrystalline specimens. Prerequisite: PHY 481 or instructor approval.
- 561 Nuclear Physics.** (3) F, S  
Two nucleon interaction, Clebsch-Gordon coefficients, internucleon forces, meson theory and high energy scattering, nuclear binding energy, nuclear models, transition probability estimates, nuclear reactions, and beta decay. Prerequisites: PHY 462 and 576 or instructor approval.
- 562 Nuclear Physics.** (3) F, S  
Continuation of PHY 561. Prerequisite: PHY 561 or instructor approval.
- 568 Elementary Particle Physics.** (3) N  
Classification of particles; phenomenology of strong, electromagnetic and weak interactions, cross sections, and decay rates; isotopic spin and higher symmetries; structure of reaction amplitudes. Prerequisite: PHY 577.
- 569 Elementary Particle Theory.** (3) N  
Continuation of PHY 568. Prerequisite: PHY 568.
- 576 Quantum Theory.** (3) F, S  
Abstract approach to quantum mechanics in Hilbert space; observables and their corresponding operators, eigenstates, and eigenvalues; quantum dynamics; approximation methods; systems of identical particles; angular momentum and group representation theory; collision processes; relativistic quantum theory. Prerequisites: PHY 315, 521.
- 577 Quantum Theory.** (3) F, S  
Continuation of PHY 576. Prerequisite: PHY 576.
- 578 Relativistic Quantum Theory.** (3) F, S  
Relativistic 1-particle equations, Klein-Gordon equation, Dirac equation, 2d quantization, theory of scattering, S-matrix, Feynman diagrams, quantum electrodynamics, and renormalization procedures. Prerequisite: PHY 577.
- 579 Relativistic Quantum Theory.** (3) F, S  
Continuation of PHY 578. Prerequisite: PHY 578.
- 581 Solid State Physics.** (3) F  
Quantum theory of solids, including phonons, lattice specific heats, band structure models, Fermi surfaces, thermal expansion, plasmons, electron-phonon interactions, and scattering by lattice defects. Pre- or corequisites: PHY 416, 481, 576.
- 582 Solid State Physics.** (3) S  
Elements of transport theory, thermal conduction, electronic conduction in metals, mobility in semiconductors, Hall effect, magnetoresistance, and selected topics of current research. Prerequisite: PHY 581.
- 587 Quantum Optics.** (3) F, S  
Quantization of the electromagnetic field. Quantum theory of coherence, photon counting, photon states, lasers, density operators, and atomic Raman scattering. Prerequisite: PHY 315.
- 588 Quantum Optics.** (3) F, S  
Continuation of PHY 587. Prerequisite: PHY 587.

## ASTRONOMY

- AST 111 Introduction to Solar Systems Astronomy.** (3) F  
History; properties of light; instruments; study of solar system and nearby stars. For non-science majors. Optional lab (AST 113). *General Studies: S1/S2 (if credit also earned in AST 113).*
- 112 Introduction to Stars, Galaxies, and Cosmology.** (3) S  
Structure and evolution of stars; star clusters; galaxies; cosmology. For non-science majors. Optional lab (AST 114). *General Studies: S1/S2 (if credit also earned in AST 114).*
- 113 Astronomy Laboratory I.** (1) F  
Astronomical observations and experiments designed to help the student become familiar with the sky, telescopes, and astronomical measurements. 2.5 hours lab. Pre- or corequisites: AST 111 or 321; a working knowledge

of high school algebra and geometry. *General Studies: S1/S2 (if credit also earned in AST 111 or 321).*

**114 Astronomy Laboratory II.** (1) S  
Similar to AST 113, but material chosen to supplement AST 112 and 322. 2.5 hours lab. Pre- or corequisites: AST 112 or 322; a working knowledge of high school algebra and geometry. *General Studies: S1/S2 (if credit also earned in AST 112 or 322).*

**321 Introduction to Planetary and Stellar Astrophysics.** (3) F  
Physical laws; celestial mechanics; properties of planets, the sun, and other stars; formation and evolution of stars and planetary systems. Prerequisites: MAT 270 or 290; PHY 150. *General Studies: S1/S2 (if credit also earned in AST 113).*

**322 Introduction to Galactic and Extragalactic Astrophysics.** (3) S  
Evolved stars; introduction to relativity; galaxies and interstellar matter; structure and dynamics of galaxies; cosmology. Prerequisite: AST 321 or instructor approval. *General Studies: S1/S2 (if credit also earned in AST 114).*

**421 Astrophysics I.** (3) F  
Aspects of observational astronomy; atomic properties of matter; stellar atmospheres; stellar structure, evolution; nucleosynthesis; compact objects; close binary systems. Prerequisites: AST 321; PHY 311, 314.

**422 Astrophysics II.** (3) S  
Interstellar medium; gaseous nebulae; shock waves; stellar dynamics; star clusters and stellar populations; galaxies and their evolution; cosmology. Prerequisites: AST 321; PHY 412.

**PHYSICAL SCIENCES**

**PHS 110 Fundamentals of Physical Science.** (4) F, S  
One-semester survey of the principles of physics and chemistry. Understanding of elementary algebra is presumed. 3 hours lecture, 2 hours lab. *General Studies: S1/S2.*

**361 Science and Society.** (2) F, S  
Fundamental principles of physical science as a creative human enterprise, and its relationship to technology and the environment.

**362 Science and Society.** (2) F, S  
See PHS 361.

**375 The Energy Crisis.** (2-3) F, S  
Current problems in energy resources, production, consumption, and conservation. No physics or mathematics prerequisites. Students registered for 3 hours participate in lecture and discussion.

**410 Origins of the Physical Sciences.** (3) N  
Origins of astronomy, chemistry, physics, and mathematics in the cultures of Mesopotamia, Egypt, China, and India.

**411 Development of the Physical Sciences.** (3) N  
Hellenistic mathematics, physics, chemistry, and astronomy; Arabs and the physical sciences and their role in spreading the physical sciences to Europe; the development of the physical sciences in Europe until the time of Newton.

**Department of Political Science**

**Stephen G. Walker**  
*Chair*  
**(SS 410) 602/965-6551**

**REGENTS' PROFESSOR**  
MILLER

**PROFESSORS**  
BERMAN, CHAUDHURI, DAGGER, JONES, McDONOUGH, McGOWAN, SIMON, WALKER, YOUNGBLOOD

**ASSOCIATE PROFESSORS**  
ASHLEY, CRITTENDEN, DANTICO, KAHN, KENNEY, MITCHELL, OLSON, READER, STOOKEY

**ASSISTANT PROFESSORS**  
BOWER, DOTY, ELMAN, HERRERA, REYNOLDS, SIMHONY, WARNER

**ASSISTANT INSTRUCTIONAL PROFESSIONAL**  
KEATING

**PROFESSORS EMERITI**  
ALISKY, JO, KAMINSKY, MASON, PEEK, RICE, SWAGERT, WHITE, WOLF

**POLITICAL SCIENCE—B.A.**

The B.A. in Political Science consists of 42 semester hours, of which 30 must be in political science and 12 in related fields consisting of courses selected from the Departments of Anthropology, Economics, Geography, History, Psychology, and Sociology and the Women's Studies Program. At least 15 hours in political science must be in upper-division courses. The following courses are required:

POS 101	Political Ideologies <i>SB</i> .....	3
POS 110	Government and Politics <i>SB</i> .. 3 or POS 310 American National Government <i>SB</i> (3)	3
POS 150	Comparative Government <i>SB, G</i> ..... 3 or POS 160 Global Politics <i>SB, G</i> (3)	3
POS 301	Empirical Political Inquiry <i>SB</i> .....	3

Students who major in Political Science must have a minimum GPA of 2.00 for all courses that count toward the major. Upper-division courses that

count toward the major must have "C" grades or better; no more than one "D" grade in a lower-division course may be counted in the major. See "Degree Requirements," page 107. No more than six hours of POS 484 Internship may be applied to the major.

**POLITICAL SCIENCE—B.S.**

The B.S. in Political Science consists of 48 semester hours, of which 36 must be in political science and 12 in related fields consisting of courses selected from the Departments of Anthropology, Economics, Geography, History, Psychology, and Sociology and the Women's Studies Program. At least 21 hours in political science must be in upper-division courses. The following courses are required:

POS 101	Political Ideologies <i>SB</i> .....	3
POS 110	Government and Politics <i>SB</i> .. 3 or POS 310 American National Government <i>SB</i> (3)	3
POS 150	Comparative Government <i>SB, G</i> ..... 3 or POS 160 Global Politics <i>SB, G</i> (3)	3
POS 301	Empirical Political Inquiry <i>SB</i> .....	3
POS 401	Political Statistics <i>N2</i> .....	3

Students who major in Political Science must have a minimum GPA of 2.00 for all courses that count toward the major. Upper-division courses that count toward the major must have "C" grades or better; no more than one "D" grade in a lower-division course may be counted in the major. See "Degree Requirements," page 107. No more than six hours of POS 484 Internship may be applied to the major.

**Asian Studies Emphasis.** Students majoring in Political Science may elect to pursue an Asian Studies emphasis combining courses from the major with selected outside courses of wholly Asian content. See "Asian Studies," pages 110-111 for more information.

**Latin American Studies Emphasis.** Students majoring in Political Science may elect to pursue a Latin American Studies emphasis combining courses from the major with selected outside courses of wholly Latin American content. See "Latin American Studies," page 111, for more information.

**NOTE:** For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 71-94. For graduation requirements, see pages 66-70. Omnibus courses are offered that are not listed in the catalog; see pages 44-45.

## MINOR IN POLITICAL SCIENCE

The minor in Political Science consists of 18 semester hours in political science courses, 12 hours of which must be upper-division courses. Students who minor in Political Science must have two courses from among:

POS 101	Political Ideologies <i>SB</i> .....	3
POS 110	Government and Politics <i>SB</i> .....	3
	or POS 310 American National Government <i>SB</i> (3)	
POS 150	Comparative Government <i>SB, G</i> .....	3
POS 160	Global Politics <i>SB, G</i> .....	3

Students who minor in Political Science must have a minimum GPA or 2.00 for all courses that count toward the minor. Upper-division courses that count toward the minor must have “C” grades or better; no more than one “D” in a lower-division course may be counted toward the minor. No more than three hours of POS 484 Internship and three hours of POS 499 Independent Study may be applied to the minor.

## SECONDARY EDUCATION— B.A.E.

**Political Science.** The major teaching field consists of 45 semester hours, 30 of which must be in political science and 15 in closely related fields. The following six courses are required:

POS 101	Political Ideologies <i>SB</i> .....	3
POS 110	Government and Politics <i>SB</i> .....	3
	or POS 310 American National Government <i>SB</i> (3)	
POS 150	Comparative Government <i>SB, G</i> .....	3
	or POS 160 Global Politics <i>SB, G</i> (3)	
POS 301	Empirical Political Inquiry <i>SB</i> .....	3
POS 417	The Arizona Political System <i>SB</i> .....	3
POS 480	Methods of Teaching Government .....	3

Courses may be substituted for POS 417 and 480 with departmental approval.

Students who pursue this academic specialization in political science must have a minimum GPA of 2.00 for all courses that count toward the major. Upper-division courses that count toward the major must have “C” grades or better; no more than one “D” grade in a lower-division course may be counted in the academic specialization.

No more than six hours of POS 484 Internship may be applied to the major.

The minor teaching field consists of 24 semester hours in political science courses. The following six courses are required:

POS 101	Political Ideologies <i>SB</i> .....	3
POS 110	Government and Politics <i>SB</i> .....	3
	or POS 310 American National Government <i>SB</i> (3)	
POS 150	Comparative Government <i>SB, G</i> .....	3
	or POS 160 Global Politics <i>SB, G</i> (3)	
POS 301	Empirical Political Inquiry.....	3
POS 417	The Arizona Political System <i>SB</i> .....	3
POS 480	Methods of Teaching Government .....	3

Courses may be substituted for POS 417 and 480 with departmental approval.

Students who pursue this academic specialization in political science must have a minimum GPA of 2.00 for all courses that count toward the academic specialization. Upper-division courses that count toward the academic specialization must have “C” grades or better; no more than one “D” grade in a lower-division course may be counted in the minor.

**Social Studies.** See page 188.

## GRADUATE PROGRAMS

The Department of Political Science offers programs leading to the M.A. and Ph.D. degrees. Consult the *Graduate Catalog* for requirements.

### POLITICAL SCIENCE

**POS 101 Political Ideologies.** (3) F, S  
Leading political ideas and belief systems, e.g., Marxism, liberalism, conservatism, theories of democracy, and alternative futures. *General Studies: SB.*

**110 Government and Politics.** (3) F, S  
Major institutions of modern government and processes of individual and group political activity, with emphasis on the American experience. Meets the federal government requirement for teacher certification. Not open to students with credit for POS 310. *General Studies: SB.*

**150 Comparative Government.** (3) F, S  
Political institutions and processes in selected foreign countries, including origins, strengths, and weaknesses of contemporary political systems and political development. *General Studies: SB, G.*

**160 Global Politics.** (3) F, S  
The nature of contemporary world politics through the study of both general theoretical topics and specific geographical areas. *General Studies: SB, G.*

**220 Political Issues and Public Policy.** (3) A  
The nature of contemporary world politics through the study of both general theoretical topics and specific geographical areas. *General Studies: SB.*

**230 Current Issues in National Politics.** (3) F, S  
Major issues facing national governments in the domestic field. *General Studies: SB.*

**240 Introduction to Southeast Asia.** (3) F  
An interdisciplinary introduction to the cultures, religions, political systems, geography, and history of Southeast Asia. Cross-listed as ASB 240/GCU 240/HIS 240/REL 240. *General Studies: G.*

**260 Current Issues in International Politics.** (3) F, S  
An analysis of major current problems in world politics. *General Studies: SB, G.*

**270 American Legal System.** (3) F, S  
Concepts, institutions, classifications, and functions of law. The role of the courts and the impact of judicial decision making on social change. *General Studies: SB.*

**301 Empirical Political Inquiry.** (3) F, S  
Logic of political inquiry, including research problems, concepts, hypotheses, theories, measurement, data collection, and analysis. *General Studies: SB.*

**310 American National Government.** (3) F, S  
Powers, functions, and agents of American political institutions. Meets the federal government requirement for teacher certification. Not open to students with credit for POS 110. *General Studies: SB.*

**311 Arizona Constitution and Government.** (2) F, S  
Constitution and government of the State of Arizona. Not open to students having credit for POS 316 or 417. Meets the Arizona constitution requirement for teacher certification. May not be counted for the major or a teaching major or minor in Political Science. *General Studies: SB.*

**313 The Congress.** (3) A  
Lawmaking process in the U.S. Congress. *General Studies: SB.*

**314 The American Presidency.** (3) A  
Office, role, and power of the American presidency in the American political system. *General Studies: SB.*

**315 The Supreme Court.** (3) A  
Role of the Supreme Court in American society and politics; examination of decision-making process and impact of decisions; restraint versus activism. *General Studies: SB.*

**316 State and Local Government.** (3) A  
Survey of the operations, problems, and policies of state and local governments in the United States. *General Studies: SB.*

**320 Public Administration.** (3) A  
Role of the administrator in the political process with an examination of the basic concepts of bureaucracy. *General Studies: SB.*

**325 Public Policy Development.** (3) A  
Relationships between policy development and administrative processes as affected by the various roles of legislative bodies, executive, and administrative agencies. *General Studies: SB.*

**331 Public Opinion.** (3) A  
Formation, expression, and influence of individual and organized opinion on political institutions. *General Studies: SB.*

- 332 American Political Parties.** (3) A  
Development of the American party system. Party organization and functions. *General Studies: SB.*
- 333 Interest Groups.** (3) A  
Examines how minority, corporate, labor, farm, consumer, environmental, health, education and public interest groups, and single issue movements influence government. *General Studies: SB.*
- 336 Electoral Behavior.** (3) A  
Voting behavior and the attitudes, perceptions, and activities of the citizenry in the political process. *General Studies: SB.*
- 340 History of Political Philosophy I.** (3) A  
Western political philosophers and their theories to the 17th century. *General Studies: HU, H.*
- 341 History of Political Philosophy II.** (3) A  
Western political philosophers and their theories from the 17th to the 20th century. *General Studies: HU, H.*
- 346 Problems of Democracy.** (3) A  
Issues and problems in democratic theory, e.g., the nature of democracy, majority rule, representation, equality, and the value of political participation. *General Studies: HU.*
- 350 Comparative Politics.** (3) A  
Theoretical approaches and political institutions, such as parties, pressure groups, legislatures, and executives, from a cross-national perspective. *General Studies: SB, G.*
- 356 Western Europe.** (3) A  
Structures and behavior of governmental institutions and political processes in selected countries of Western Europe. *General Studies: SB, G.*
- 357 South Asia Politics.** (3) A  
Analysis of the political culture, politics, and political systems of South Asia. Lecture, discussion.
- 358 Southeast Asia.** (3) A  
Political background, governmental institutions, political dynamics, and developmental problems of Southeast Asian nations. *General Studies: SB, G.*
- 359 African Politics and Society.** (3) N  
Comparative analysis of socio-economic forces, political processes, and government institutions in Africa south of the Sahara. *General Studies: SB, G.*
- 360 World Politics.** (3) A  
Theory and practice of statecraft as applied to selected issues, regions, or eras. *General Studies: SB, G.*
- 361 American Foreign Policy.** (3) A  
United States in world affairs; foreign policy since World War I. Techniques in formulating American foreign policies. *General Studies: SB, G.*
- 364 U.S. National Security Analyses.** (3) A  
A theoretical and empirical assessment of U.S. national security policy in the post-cold war era. *General Studies: SB.*
- 370 Law and Society.** (3) A  
Analysis of debates among social scientists and legal theorists concerning the relationship between "law" and "society." *General Studies: SB.*
- 401 Political Statistics.** (3) F, S  
Basic concepts in statistics as they facilitate the description, explanation, and prediction of social and political phenomena. *General Studies: N2.*
- 410 Urban Government and Politics.** (3) A  
Governmental organizations, decision-making structures, and problems of urban political systems. *General Studies: SB.*
- 417 The Arizona Political System.** (3) N  
Contemporary political problems within the context of Arizona's political, social, and constitutional frameworks. Meets the Arizona Constitution requirement for teacher certification. *General Studies: SB.*
- 422 Politics of Bureaucracy.** (3) N  
Bureaucracy as a political entity; internal dynamics of public agencies; the relationship between public agencies and other political entities. *General Studies: SB.*
- 423 Politics of Budgeting.** (3) N  
The policy process in budgeting; strategies used to influence this process and recent reforms in public budgeting. *General Studies: SB.*
- 426 Elements of Public Policy.** (3) A  
Each section may cover one of the following topics: consumer protection, natural resources, criminal justice, environmental protection, science and technology, or theories of public policy. May be repeated for credit when topics vary. *General Studies: SB.*
- 431 Campaigns and Elections.** (3) A  
Examine campaigns from a multitude of perspectives including the politician, reporter, campaign strategist, and voter. Lecture, discussion. *General Studies: SB.*
- 433 Money and Politics.** (3) A  
The role of money and special interests in elections, campaign politics, and public policy-making in American politics. Lecture, discussion. *General Studies: SB.*
- 434 Media and Politics.** (3) A  
The study of mass media and politics in the United States, e.g., media and elections, media and government. Lecture, discussion. *General Studies: SB.*
- 435 Women and Politics.** (3) N  
Women's roles in various political contexts. Focus varies with instructor. *General Studies: SB.*
- 439 Minority Group Politics in America.** (3) N  
Role of minority groups in American politics. *General Studies: SB, C.*
- 442 American Political Thought.** (3) A  
Political theories and movements from the colonial period to the present. *General Studies: HU.*
- 443 Topics in Contemporary Political Theory.** (3) A  
Major problems and theories in contemporary political thought. *General Studies: HU.*
- 445 Asian Political Thought.** (3) A  
Contemporary political ideas and theories in selected Asian countries, including the impact of Marxist and non-Marxist theories on revolutionary processes. *General Studies: SB, G.*
- 450 Russia and Successor States.** (3) A  
Description and analysis of political institutions and practices in Russia and successor states. *General Studies: SB, G.*
- 451 China, Japan, and the Koreans.** (3) A  
A comparative analysis of the political modernization experiences of China, Japan, and the two Koreas, focusing on their differing reactions to the West. *General Studies: SB, G.*
- 452 China.** (3) A  
Background of the Communist revolution, political processes, and developmental problems in China from a comparative perspective. *General Studies: G.*
- 453 South America.** (3) A  
Governmental institutions, political processes, and developmental problems of the South American states. *General Studies: SB, G.*
- 454 Mexico.** (3) A  
Mexican federal, state, and local governmental institutions. *General Studies: SB, G.*
- 455 Central America and the Caribbean.** (3) A  
Governmental institutions, political processes, and developmental problems of the nation-states and dependent areas of Central America and the Caribbean. *General Studies: SB, G.*
- 459 South and Southern Africa.** (3) A  
Post-apartheid South African government and politics; South Africa and the southern African region; regional security and development. *General Studies: SB, G.*
- 463 Inter-American Relations.** (3) A  
Diplomatic relations among the Latin American states. Development of U.S. foreign policy toward Latin America. *General Studies: SB, G.*
- 465 International Organization and Law.** (3) A  
History, practical political significance, and future of international institutions, transnational regimes, and international law. *General Studies: SB, G.*
- 467 International Security.** (3) A  
Examination of issues affecting the international security of states and peoples, e.g., military, economic, technological, environmental, and demographic. *General Studies: SB, G.*
- 468 Comparative Asian Foreign Policies.** (3) A  
Foreign policies of the Asian states, emphasizing their security relations and movements toward regionalism. *General Studies: SB, G.*
- 471 Constitutional Law I.** (3) A  
Development of the U.S. Constitution as reflected in decisions of the Supreme Court; jurisdiction and organization of the federal courts; judicial review; separation of powers; federalism; the commerce clause; national taxing and spending power; state police power. *General Studies: SB.*
- 472 Constitutional Law II.** (3) A  
Development of the U.S. Constitution as reflected in decisions of the Supreme Court: due process; equal protection of laws; individual rights; civil liberties. *General Studies: SB.*
- 480 Methods of Teaching Government.** (3) N  
Methods of instruction, organization, and presentation of subject matter in political science. Prerequisite: 15 hours in political science or instructor approval.
- 485 Political Economy.** (3) A  
Problems, policies, and possibilities of various political-economic systems and the interrelationship of capitalism, socialism, and democracy. *General Studies: SB.*

**486 International Political Economy.** (3) A  
Contending approaches to historical and contemporary issues of international political economy, including global welfare, equality, ecology, and peace. *General Studies: SB, G.*

**494 Special Topics in Political Science.** (3) A  
Chosen from the various fields of political science.

**498 Pro-Seminar.** (3) A  
Small group study and research for advanced students within their major area. Prerequisite: major in the department or instructor approval. *General Studies: L2.*

**501 Methods of Political Science.** (3) A  
Problems of method and knowledge in political science, strategies of political inquiry, and issues in philosophy of social science.

**502 Philosophy of Political Inquiry.** (3) A  
Problems of knowledge and method in political science, with attention to both empirical and evaluative analysis.

**503 Empirical Political Inquiry.** (3) A  
Research methods and techniques of the discipline, emphasizing empirical foundations and analytic methods employed in subfields. Prerequisites: POS 401 or equivalent; instructor approval.

**530 American Politics.** (3) A  
Examines major debates in the study of American political processes. Covers parties, media, elections, public opinion, nominations, and social choice theory. Seminar.

**532 American Political Institutions.** (3) N  
Examines major debates in the study of American governmental institutions. Covers legislative branch, executive branch, judicial branch, and interest groups. Seminar.

**545 Themes in Political Thought.** (3) N  
Examination of a particular theme or problem in political thought from both a historical and contemporary perspective. Seminar. Prerequisite: instructor approval. Course may be repeated with approval of the director of graduate studies.

**550 Comparative Politics.** (3) A  
Surveys major approaches across topical areas such as revolutions, authoritarianism, policy processes, interest groups, and electoral politics. Focus varies with instructor. Seminar.

**560 International Relations.** (3) A  
Surveys major theoretical approaches and debates in international relations. Seminar.

**563 Comparative Asian Security Policies.** (3) N  
Analyzes domestic and international constraints, belief systems, and economic components in security decisions by major powers and Asian nations. Seminar. Prerequisite: instructor approval.

**591 Seminar.** (3) A  
(a) American Politics  
(b) Comparative Politics  
(c) Global Politics  
(d) Political Theory

**598 Special Topics.** (3) A  
(a) American Politics  
(b) Comparative Politics  
(c) Global Politics  
(d) Political Theory

**601 Advanced Experimental Research.** (3) N  
Introduces experimental and quasi-experimental research designs in political research, including laboratory techniques and topics in

the analysis of variance. Prerequisite: POS 503 or equivalent.

**602 Advanced Survey Research.** (3) N  
Presents design and conduct of political surveys, including sampling, instrument design, scaling, and statistical and graphical analysis of survey data. Prerequisite: POS 503 or equivalent.

**603 Polimetrics I.** (3) A  
Introduces theory and practice of linear regression analysis. Provides skills to read, understand, and evaluate professional literature using regression analysis. Prerequisites: POS 401 and 503 or instructor approval.

**604 Polimetrics II.** (3) A  
Apply quantitative techniques to research topics producing publishable papers through exposure to time-series, logit and probit, and simultaneous equations. Prerequisites: POS 401 and 503 and 603 or instructor approval.

**635 State Politics and Public Policy.** (3) N  
Introduction to comparative state policy emphasizing policy or performance differences among the states and the reasons for these differences. Seminar. Prerequisites: POS 530 and 603 or instructor approval.

**636 Electoral Behavior.** (3) N  
Introduces fundamental concepts of electoral behavior. Emphasizes presidential elections and examines why people vote and how their votes are determined. Seminar. Prerequisites: POS 530 and 603 or instructor approval.

**638 Law and Politics.** (3) N  
Emphasizes research into such topics as constitutional law, women and the law, American legal system, judicial process, and judicial selection. Seminar. Prerequisite: instructor approval.

**651 Politics of Change and Development.** (3) N  
Examines contending approaches to national, social, and political change. Seminar. Prerequisite: instructor approval.

**660 The Modern World System.** (3) N  
Theoretically driven, historical analysis of the organization and operation of the international political economy since the 16th century. Seminar. Prerequisite: instructor approval.

**661 The State.** (3) N  
Examines theories of state, state-society relations, and interstate politics emphasizing questions of sovereignty, territoriality, violence, representation, democracy, and change. Seminar. Prerequisite: instructor approval.

**662 International Organization.** (3) N  
History, practical political significance, and future of international institutions, transnational regimes, and other approaches to international organization. Seminar. Prerequisite: instructor approval.

**664 War, Peace, and Conflict Processes.** (3) N  
The systematic analysis of the causes of war, the preconditions for peace, and approaches to the resolution of conflict. Seminar. Prerequisite: instructor approval.

**665 Foreign Policy Theory.** (3) N  
Examines foreign policy theory and methods. Development and critique of research designs analyzing foreign policy processes within and among nations. Seminar. Prerequisite: instructor approval.

**792 Research.** (3) F, S  
Projects in various areas of political science. Prerequisite: doctoral student.

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## Department of Psychology

J. Jay Braun  
Chair  
(PSY 237) 602/965-3326

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### REGENTS' PROFESSORS CIALDINI, EISENBERG

### PROFESSORS

AIKEN, BARRERA, BERNAL, BRAUN, BRAVER, CHASSIN, HAYGOOD, HOMA, KAROLY, KENRICK, KILLEEN, KNIGHT, LANYON, LINDER, OKUN, PARKINSON, PRESSON, REICH, RUSSO, SADALLA, SANDLER, SOMERVILLE, WEST, WOLCHIK, ZAUTRA

### ASSOCIATE PROFESSORS

CASTRO, CHARTIER, FABRICIUS, FEHR, LESHOWITZ, MacKINNON, NAGOSHI, NEMEROFF, NEUBERG, ROSSI, SAENZ, STONE, VANORDEN

### ASSISTANT PROFESSORS

CASTENEDA, DAVIS, GOLDINGER, GONZALES, MADDOX, NEISEWANDER

### LECTURERS

BARTON, BOHNSACK, WEIGAND

### PROFESSORS EMERITI

BARDRICK, JONES, LEVINE, MEYERSON, VESTRE

The Department of Psychology maintains an Undergraduate Advisement Office staffed by trained personnel. All Psychology majors are encouraged to meet with an undergraduate advisor once each semester to ask questions regarding the choice of courses. Failure to do so may prevent graduation at the expected time. It is the responsibility of the student to consult with an undergraduate advisor.

### PSYCHOLOGY—B.A.

The B.A. in Psychology consists of 31 semester hours in psychology, including at least 15 upper-division semester hours. Required courses, which must be passed with a minimum grade of "C," are as follows:

PGS	101	Introduction to Psychology <i>SB</i> .....	3
PGS	315	Personality Theory and Research <i>SB</i> .....	3
		or PGS 341 Developmental Psychology <i>SB</i> (3) or PGS 350 Social Psychology <i>SB</i> (3)	

PSY 230	Introduction to Statistics N2..	3
PSY 290	Research Methods LI/S2.....	4
PSY 323	Sensation and Perception.....	3
	or PSY 320 Learning and Motivation (3) or PSY 324 Memory and Cognition (3) or PSY 325 Physiological Psychology (3)	

Also required are one additional upper-division PSY course (excluding PSY 490 and 499); two additional upper-division PGS or PSY courses; and two additional psychology courses, excluding PGS 270. No more than a total of three hours in PGS 399 and 499 and PSY 499 combined may be used to complete the 15 hours of upper-division requirements. Students may take a maximum of six hours of PGS 399 and six hours of PGS 499 and PSY 499 combined. Eighteen hours in courses related to psychology must be passed with a minimum grade of "C." They must be approved by an undergraduate advisor and include MAT 119 (or higher) in addition to one course from among the following:

CSE 100	Introduction to Computer Science I .....	3
CSE 181	Applied Problem Solving with BASIC N3 .....	3
CSE 183	Applied Problem Solving with FORTRAN N3 .....	3

See "Degree Requirements," page 107.

**PSYCHOLOGY—B.S.**

The B.S. in Psychology consists of 31 semester hours in psychology, including at least 15 upper-division hours. Required courses, which must be passed with a minimum grade of "C," are as follows:

PGS 101	Introduction to Psychology SB.....	3
PGS 315	Personality Theory and Research SB .....	3
	or PGS 341 Developmental Psychology SB (3) or PGS 350 Social Psychology SB (3)	
PSY 230	Introduction to Statistics N2..	3
PSY 290	Research Methods LI/S2.....	4
PSY 323	Sensation and Perception.....	3
	or PSY 320 Learning and Motivation (3) or PSY 324 Memory and Cognition (3) or PSY 325 Physiological Psychology (3)	

Also required are one additional upper-division PSY course (excluding PSY 490 and 499); two additional upper-division PGS or PSY courses; and two additional psychology courses excluding PGS 270. No more than a total of three hours in PGS 399 and 499 and PSY 499 combined may be used to complete the 15 hours of upper-division requirements. Students may take a maximum of six hours of PGS 399 and six hours of PGS 499 and PSY 499 combined. Eighteen hours in courses related to psychology must be passed with a minimum grade of "C." They must be approved by an undergraduate advisor and include MAT 210 Brief Calculus; one life science lab course (BIO, MIC, or ZOL); one physical science lab course (AST, CHM, GLG, or PHY); and one course from among the following:

CSE 100	Introduction to Computer Science I .....	3
CSE 181	Applied Problem Solving with BASIC N3 .....	3
CSE 183	Applied Problem Solving with FORTRAN N3 .....	3

Further, the science courses taken to satisfy the B.S. requirements cannot be used to meet the College of Liberal Arts and Sciences natural science distribution requirements. See "Degree Requirements," page 107.

**MINOR IN PSYCHOLOGY**

The minor in Psychology consists of 22 hours in psychology, including the following:

PGS 101	Introduction to Psychology SB.....	3
PGS 315	Personality Theory and Research SB .....	3
	or PGS 341 Developmental Psychology SB (3) or PGS 350 Social Psychology SB (3)	
PSY 230	Introduction to Statistics N2..	3
PSY 290	Research Methods LI/S2.....	4
PSY 323	Sensation and Perception.....	3
	or PSY 320 Learning and Motivation (3) or PSY 324 Memory and Cognition (3) or PSY 325 Physiological Psychology (3)	

Two additional upper-division PGS or PSY courses are required.

A maximum of three hours of research (PGS 399, 499; PSY 499) may

be used to meet the minor requirements. Students with an appropriate equivalent course may exclude PSY 230 from the requirements. All courses must be passed with a minimum grade of "C."

**SECONDARY EDUCATION—B.A.E.**

**Psychology.** The minor teaching field consists of 24 semester hours. See a departmental advisor.

**Social Studies.** See page 188.

**GRADUATE PROGRAMS**

The Department of Psychology offers programs leading to the Ph.D. degree. Consult the *Graduate Catalog* for requirements.

**PSYCHOLOGY (PGS)**

**PGS 101 Introduction to Psychology.** (3) F, S, SS  
Major areas of theory and research in psychology. Participation in department-sponsored research or an educationally equivalent alternative activity is required. *General Studies: SB.*

**222 Human Sexual Behavior.** (3) F, S  
Patterns of sexual behavior, including variations and deviations; theories of sexual attraction, sex differences, and sexual dysfunction and treatment. Prerequisite: PGS 101. *General Studies: SB.*

**270 Psychology of Adjustment.** (3) F, S, SS  
Principles of mental health, adjustment, conflict, stress, and coping processes derived from clinical and experimental research. Intended for nonmajors; cannot be used for major credit. Prerequisite: PGS 101 *General Studies: SB.*

**304 Effective Thinking.** (3) A  
Understanding and improving your intellectual and behavioral skills; information analysis, inference, logic, problem solving, and decision making. Prerequisite: MAT 119 or PSY 230 or equivalent. *General Studies: L1.*

**306 Environmental Psychology.** (3) F, S, SS  
Concepts and research strategies in the study of behavior in interaction with physical environment. Prerequisite: PGS 101. *General Studies: SB.*

**315 Personality Theory and Research.** (3) F, S, SS  
Definition and description of personality in terms of theoretical and methodological approaches. Prerequisites: PGS 101; PSY 290. *General Studies: SB.*

**341 Developmental Psychology.** (3) F, S  
Behavior development analyzed in terms of psychological principles. Current research in human development. Prerequisites: PGS 101; PSY 290. *General Studies: SB.*

**NOTE:** For the General Studies requirement, codes (such as L1, N3, C, and H), and courses, see pages 71–94. For graduation requirements, see pages 66–70. Omnibus courses are offered that are not listed in the catalog; see pages 44–45.



**344 Directed Child Study.** (3–4) F, S, SS Theories and methods of intervention with preschool children and supervised practicum in the Child Study Laboratory. 1 hour lecture, 6–8 hours practicum. Prerequisite: CDE 232 or PGS 341; instructor approval. *General Studies: L2.*

**350 Social Psychology.** (3) F, S, SS Human social behavior, including such concepts as aggression, attraction, attribution, conformity, groups, helping, person perception, and persuasion. Prerequisite: PGS 101. *General Studies: SB.*

**351 Honors Social Psychology.** (3) N A critical analysis of human social behavior for honors students; topics include stereotyping, social influence, attraction, aggression, helping, groups, and attitudes. Lecture, discussion. Open only to students without previous credit for PGS 350. Prerequisites: PGS 101; honors standing; instructor approval. *General Studies: L2/SB.*

**365 Community Psychology.** (3) F, S Mental health and psychological well-being in the community, emphasizing current issues and related research. Prerequisite: PGS 315 or 350. *General Studies: SB.*

**399 Supervised Research.** (1–3) F, S, SS Experience within the context of current faculty research projects. Student is assigned responsibility depending on qualifications. “Y” grade only. May be repeated for a total of 6 hours. Prerequisites: approval of faculty member before registration; “B” average in major. Pre- or corequisite: PSY 230 or equivalent.

**414 History of Psychology.** (3) F, S Historical development of psychology from its philosophical beginnings to the present. Prerequisites: PGS 101; PSY 230, 290. *General Studies: L2/SB.*

**427 Psychology of Aging.** (3) N Analysis of loss, maintenance, and gain associated with cognitive and affective aging. Individual differences in coping with normative life transitions. Prerequisites: PGS 101, 341. *General Studies: L2/SB.*

**430 Industrial Psychology.** (3) F, S, SS Organizations and management systems; motivation and work performance; human factors in systems design and evaluation; personnel selection and testing. Prerequisite: MGT 301 or PGS 101.

**431 Gender Role Development.** (3) N Theories and research in the development of sexual identification; concepts of femininity and masculinity; social roles and attitudes. Prerequisite: PGS 341. *General Studies: L2/SB.*

**441 Cognitive Development.** (3) F, S Experimental and theoretical literature in child development and behavior. Prerequisite: PGS 341 or instructor approval. *General Studies: L2/SB.*

**442 Life Span Development.** (3) N Methods and findings of recent studies of the development, growth, and problems of adolescents and adults, with implications for education. Prerequisite: PGS 341. *General Studies: SB.*

**443 Abnormal Child Psychology.** (3) F, S The major disorders of childhood and adolescence (e.g., autism, hyperactivity, phobias, and delinquency) are covered, including cause, diagnosis, treatment, and prevention. Prerequisites: PGS 101 and 1 course from

among PGS 315, 341, 350 or instructor approval. *General Studies: L2/SB.*

**444 Adolescent Psychology and Psychopathology.** (3) N An advanced level survey of normal adolescent psychological development and psychological disorders of this age period. Lecture, discussion. Prerequisites: PGS 101, 341; PSY 290. *General Studies: L2.*

**445 Child Language and Drawing.** (3) F Language acquisition and developmental changes in drawing, considered in the context of cognitive developmental stages. Children’s representation and communication of knowledge through language and drawing. Prerequisite: PGS 341. *General Studies: SB.*

**446 Social Development.** (3) N Theory, research, and issues regarding social development are discussed. Example topics: formation of attachments, prosocial development, and gender-role development. Lecture, seminar. Prerequisite: PGS 341. *General Studies: L2.*

**450 Social Perception and Cognition.** (3) N A critical analysis of human social perception and social cognition. Topics include attribution, inference, memory, attention, impression formation, stereotype change. Lecture, discussion. Prerequisites: PGS 101, 350. *General Studies: L2.*

**451 Stereotyping, Prejudice, and Discrimination.** (3) N A critical investigation of the processes underlying, and the factors contributing to, stereotyping, prejudice, and discrimination. Lecture, discussion. Prerequisites: PGS 101, 350. *General Studies: L2.*

**452 Applied Social Psychology.** (3) F The study of applications of social psychological theory and concepts in natural settings; research design and data analysis. Lecture, lab-type activities. Prerequisites: PGS 101, 350; PSY 230. *General Studies: L2.*

**453 Organizational Behavior.** (3) N A survey of psychological theory and research as applied to the behavior of individuals in organizational settings. Lecture, discussion. Prerequisites: PGS 101, 350.

**458 Group Dynamics.** (3) F Theories and methods of group leadership, group effectiveness, communication within groups, and relations between groups and individual members. Prerequisite: PGS 350.

**461 Interpersonal Influence.** (3) N Principles and procedures that affect the process of social influence, consideration of attitudinal, compliance inducing, and perceptual influences. Prerequisite: PGS 350. *General Studies: SB.*

**462 Health Psychology.** (3) F, S Contributions of psychology to health promotion and illness prevention, adaptation to acute and chronic illness, and to the health care system. Prerequisites: PSY 230, 290.

**463 Advanced Psychology of Adjustment.** (3) F Critical analysis and effective expression of psychological theory and research of the topic of adjustment. Lecture, discussion, writing. Prerequisites: PSY 230, 290; completion of 1st-year English requirements; L1 course. *General Studies: L2.*

**464 Minority Issues in Psychology.** (3) S Psychological issues relating to the diversity of human cultural experiences and among ethnic minorities in the U.S. Prerequisite: PSY 290.

**465 Psychology of Stress and Coping.** (3) F Readings in theory and research in the area of stress and coping. Lecture, discussion, class presentations. Prerequisites: PGS 315 or 350; PSY 290. *General Studies: L2.*

**466 Abnormal Psychology.** (3) F, S, SS Historical and current definitions, theory, and research concerning abnormal behavior. Major categories of psychopathology, including related treatment approaches. Prerequisites: PGS 101; PSY 290. *General Studies: SB.*

**467 Psychology of Magical Beliefs.** (3) N The psychological nature and bases of magical beliefs and their impact on health behaviors, eating practices, and interpersonal relations. Lecture, seminar. Prerequisites: PGS 315 and 466 and PSY 434 or instructor approval. *General Studies: L2.*

**468 Psychology and Law.** (3) F, S Theories, research, and practice in psychology as related to law, including criminal, civil, domestic relations, and professional issues. Lecture, discussion. Prerequisite: PGS 101.

**471 Personnel Testing.** (3) S Methods and theory of psychological testing; various types of psychological tests; consideration of ethical, social, and legal aspects of testing. Prerequisites: MGT 311 or PGS 430; PGS 101; 1 course in statistics.

**472 Clinical Psychology.** (3) F, S Clinical psychology as a science and profession. Historical development, methods of interviewing, assessment, and therapeutic intervention. Prerequisite: PGS 466.

## PSYCHOLOGY (PSY)

**PSY 230 Introduction to Statistics.** (3) F, S, SS Basic concepts in descriptive and inferential statistics, emphasizing applications to psychology. The course has both self-paced (PSI) and lecture sections. Prerequisites: MAT 117; PGS 101. *General Studies: N2.*

**290 Research Methods.** (4) F, S Planning, execution, analysis, and reporting of experiments. Literature, procedures, and instruments in representative areas of psychological research. 3 hours lecture, 3 hours lab. Prerequisite: PSY 230. *General Studies: L1/S2.*

**320 Learning and Motivation.** (3) F, S, SS Principles of conditioning and motivation; approaches to learning, including acquisition of verbal materials, concepts, and motor skills; memory and transfer. Prerequisite: PSY 290.

**323 Sensation and Perception.** (3) F, S Underlying processes of vision, audition, and the other senses. Application of current research and theory in a laboratory environment. Prerequisite: PSY 290 or instructor approval.

**324 Memory and Cognition.** (3) F, S, SS Processes underlying information storage and retrieval, including different kinds of memory, forgetting, depth of processing, and control processes. Prerequisite: PSY 290.

**325 Physiological Psychology.** (3) F, S, SS Relationships of physiological processes to behavior. Emphasis is on nervous system functioning. Prerequisites: PSY 290 or 2 courses in biological science; instructor approval.

**330 Statistical Methods.** (3) S Advanced application of statistics to psychology. Highly recommended for students inter-

ested in attending graduate school. 3 hours lecture, 1 hour lab. Prerequisite: PSY 230. *General Studies: N2.*

**390 Experimental Psychology.** (3) S  
Continuation of concepts in PSY 290, with emphasis on multifactor designs and programmatic sequence of experiments. Lecture, lab. Prerequisite: PSY 290. *General Studies: L2.*

**420 Analysis of Behavior.** (3) N  
Research, applications, and philosophy of the analysis and control of human behavior. Prerequisite: PSY 290. *General Studies: L2.*

**424 Genetic Psychology.** (3) S  
Introduction to the concepts, methodologies, and findings of behavioral genetics for Psychology majors. Prerequisites: PGS 101; PSY 230, 290. *General Studies: L2.*

**425 Biological Bases of Behavior.** (3) N  
Critical study of physiological psychology; brain mechanisms underlying motivation, and learning. Prerequisite: PSY 325. *General Studies: L2.*

**426 Neuroanatomy.** (4) N  
Structure and function of mammalian brain, including sheep brain dissection. 3 hours lecture, 3 hours lab. Prerequisite: PSY 325 or equivalent. *General Studies: L2.*

**433 Human Psychophysiology.** (3) S  
Emphasis on human physiological-behavioral relationships. Topics include physiological change associated with imagery, stress, attention, skill learning, lying, and biofeedback. Prerequisite: PSY 325.

**434 Cognitive Psychology.** (3) S  
The human organism as a processor of information, from perception to cognition. Abstract concepts, semantic memory, attention, and mental imagery. Prerequisite: PSY 323 or 324 or instructor approval. *General Studies: L2.*

**437 Human Factors.** (3) F  
Emphasis on human factors in high technology systems. Specific topics include systems development, systems analysis techniques, displays, and controls. Prerequisites: PSY 290 and upper-division standing or instructor approval. *General Studies: L2.*

**470 Psychopharmacology.** (3) F, S  
Basis of drug action at physiological and behavioral levels. Psychological and medical applications and limitations of drugs used in the treatment of mental illness. Prerequisites: PSY 325; 1 semester each of biology and chemistry.

**490 Course Programming.** (2) F, S  
Supervised experience in the development and administration of programmed instruction. Designed for students who proctor self-paced or personalized courses. May be repeated for a total of 4 credits. Prerequisites: PSY 230; instructor approval.

**501 Supervised Teaching.** (4) F  
Experience in and examination of perspectives on teaching undergraduate psychology. Prerequisites: graduate standing in psychology; instructor approval.

**506 Survey of Research in Environmental Psychology.** (3) F  
Major topics and paradigms in the study of person-environment relationships. Prerequisite: instructor approval.

**512 Advanced Learning.** (3) N  
Principles and theories of learning, emphasizing research literature. Prerequisite: instructor approval.

**524 Advanced Physiological Psychology.** (3) N  
Contributions of physiological processes and brain function to fundamental behavioral processes. Prerequisite: instructor approval.

**528 Sensation and Perception.** (3) N  
Principles of sensory and perceptual processes, emphasizing research literature. Prerequisite: instructor approval.

**529 Correlation and Psychometric Theory.** (3) S  
Principles of correlational techniques, including regression and multiple correlation. Psychometric theory, including reliability and validity. Prerequisite: instructor approval.

**530 Intermediate Statistics.** (3) F  
Continuation of PSY 529. Psychological statistics, emphasizing the analysis of variance and the design of experiments. Prerequisite: PSY 529 or instructor approval.

**535 Cognitive Processes.** (3) N  
Theoretical/empirical treatment of the human organism as a processor of information, including abstraction, memory structure, problem solving, and thinking. Prerequisite: instructor approval.

**541 Research in Cognitive Development.** (3) N  
Theoretical and empirical issues in the study of children's knowledge and cognitive processes. Comparison of research in Piagetian and other traditions. Prerequisite: admission to Psychology Ph.D. program or instructor approval.

**542 Social Development.** (3) N  
Major issues in the area of social development are topics for review and critique. Theory, research, and content are covered. Prerequisite: instructor approval.

**543 Moral Development.** (3) N  
A variety of issues in moral development, including positive and negative behaviors, are considered. Theory and research are major foci. Prerequisite: instructor approval.

**550 Advanced Social Psychology.** (3) F, S  
Theory and research concerning interpersonal perception, decision making, attitude formation and change, group processes, social motivation, and interaction processes. Prerequisite: instructor approval.

**551 Advanced Social Psychology.** (3) F, S  
Continuation of PSY 550. Prerequisite: PSY 550 or instructor approval.

**553 Social Influence.** (3) N  
Research literature relevant, for example, to attitude formation and change, conformity, obedience, power, compliance, and altruism. Prerequisite: PSY 551 or instructor approval.

**555 Experimental and Quasi-Experimental Designs for Research.** (3) N  
Review of research techniques. Laboratory and field research analyzed; applications to specific topics. Prerequisite: instructor approval.

**556 Social Perception.** (3) N  
Theoretical and empirical implications of topics in social perception and cognition, e.g., attribution, attraction, and impression formation. Prerequisite: PSY 551 or instructor approval.

**558 Interpersonal Processes.** (3) N  
One or more topics chosen from the following: empathy, modeling, vicarious processes, contagion, group phenomena, social communication, and behavior exchange. Prerequisites: PSY 550 and 551 or instructor approval.

**569 Advanced Study of Personality.** (3) N  
Personality as a theoretical concept in psychology, including definitional problems, behavioral and traditional approaches, the measurement of personality, and current research issues. Prerequisite: instructor approval.

**572 Psychological Assessment.** (3) F  
Theory and research on assessment of personality, psychopathology, and intelligence, and construction of psychological assessment instruments. Prerequisite: admission to clinical Ph.D. program or instructor approval.

**573 Psychopathology.** (3) F  
Theory and research relating to the contribution of psychological, social, physiological, and genetic factors to the development and persistence of abnormal behavior. Prerequisite: admission to Psychology Ph.D. program or instructor approval.

**574 Psychotherapy.** (3) S  
A detailed survey of the theoretical and empirical literature relating to verbal psychotherapy and interviewing methods. Structured role-playing practice in the major procedures. Prerequisite: admission to the clinical Ph.D. program or instructor approval.

**575 Behavior Therapy.** (3) F  
Theory and research relating to the use of behavior therapy in modifying abnormal behavior. Structured practice. Prerequisite: admission to the clinical Ph.D. program or instructor approval.

**578 Child Psychopathology.** (3) N  
Major theories and research related to the development of deviant behaviors in children, including some supervised experience in child assessment. Prerequisite: PSY 572 or instructor approval.

**582 Community Psychology.** (3) SS  
Community systems, intervention techniques, consultation models, history and current status of community mental health movement, and conceptualization of the roles of community psychologists in social system intervention. Prerequisite: advanced standing in Psychology Ph.D. program or instructor approval.

**588 Consultation Methods.** (3) N  
Several theories and strategies of organizational consultation. The development of consultative skills through simulation and practical experience. Prerequisite: advanced standing in Psychology Ph.D. program or instructor approval.

**624 Clinical Neuroscience.** (3) S  
An examination of the biological underpinnings of psychological disorders at the molecular, cellular, and system levels (schizophrenia, depression, anxiety, etc.). Lecture, pro-seminar. Prerequisites: graduate standing; instructor approval.