120. Topics in Astronomy

Winter, Spring. 4(4-0) AST 119.

Detailed qualitative discussion of currently interesting topics in astronomy. May include such topics as quasars, pulsars, black holes, planetary exploration, cosmology, concepts of relativity.

217. General Astronomy (N)

Fall, Winter, Spring. 4(4-0) MTH 102 or MTH 109 or MTH 111. Students may not receive credit in more than one of the following: AST 119, AST 217, AST 229.

Intended primarily for physical science majors. A semiquantitative presentation of current views of the universe including birth and death of stars, cosmology, comparisons of planets, and life in the universe.

229. General Astronomy

Fall. 4(4-0) PHY 287 or PHY 291H or concurrently; MTH 113. Students may not receive credit in more than one of the following: AST 119, AST 217, AST 229.

Fundamental observations in astronomy and their interpretation through physical laws. Intended for physical science majors and recommended for astrophysics majors. Quantitative discussion of orbital motion, time, telescopes, solar system, stars, galaxies, and cosmology. Limited opportunity for astronomical obsevations.

327. Practical Astronomy

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

Celestial coordinate systems. Time conversion and sidereal time. Atmospheric refraction, parallax, proper motion, aberration, and precession. Star catalogs and ephemerides. Finding charts and setting of equatorial telescopes.

378. Contemporary Astronomy

Winter. 3(3-0) AST 217 or AST 229.

A continuation of General Astronomy with particular emphasis on modern developments. May include such topics as planetary exploration, interstellar matter, star formation, stellar evolution through final stages, supernovae, pulsars, neutron stars, black holes, galaxies, and cosmology.

437. Observatory Practice

Spring. 3(1-4) AST 327 and approval of department.

Stellar photography. Photographic photometry. Photoelectric photometry and corrections for atmospheric extinction. Multicolor photometric systems. Astronomical spectroscopy and radial velocity determinations.

458. Astrophysics

Winter. 3(3-0) AST 217 or AST 229, PHY 289, PHY 395, or approval of department.

Application of physical principles to the atmospheres and interiors of stars to deduce their physical properties. Discussion of radiation, spectra and gas properties.

459. Solar System Physics

Spring. 3(3-0) PHY 289 or approval of department.

Physical properties of the sun, interplanetary space, planets, and satellites as deduced from terrestrial observations and from space probes. Recent results of the NASA space program will be emphasized.

490. Special Problems

Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 10 credits. Approval of department.

Individual study or project under the direction of a faculty member. An oral report on the work may be required in department seminar.

800. Research Methods

Fall, Winter, Spring, Summer. 2(0-6) May reenroll for a maximum of 6 credits. Beginning graduate students. Interdepartmental with and administered by the Department of Physics.

Problems and techniques of current research by taking part in the design and setup of experiments, data taking and reduction; study and practice of theoretical methods. Areas of study: solid state and molecular structure, nuclear, elementary particles, astronomy, astrophysics.

801. Seminar

Winter. 1(1-0) May reenroll for a maximum of 2 credits. Graduate students or approval of department.

Seminars to be presented by both faculty and students to review papers in the current astronomical research literature.

819. Stellar Structure

Spring of even-numbered years. 3(3-0) AST 458 or PHY 395 or approval of department.

Physical properties of the stellar interior. Methods of calculating models. Stellar evolution. Comparison of theory with current observations.

828. Galactic Structure

Winter of even-numbered years. 3(3-0) PHY 427 or approval of department.

Distribution and dynamics of stars and interstellar material in our galaxy. Spiral structure. Galactic evolution.

850. Ionized Gases

Fall. 3(3-0) E E 835 or PHY 448; E E 874. Interdepartmental with Electrical Engineering and the Department of Physics and administered by Electrical Engineering.

Elastic collision processes; Boltzmann equation; moment equations; motion of a charged particle in electrical and magnetic field; individual and collective charged particle behavior; macroscopic properties of plasmas, waves in the fluid plasma; transport phenomena in plasma.

859. Stellar Atmospheres

Spring of odd-numbered years. 3(3-0) AST 458 or PHY 395 or approval of department.

The physics of radiation and the equation of its transfer. Theory of absorption coefficient and line absorption profile. The gray atmosphere and calculation of model atmospheres.

860. General Relativity and Cosmology I

Fall of even-numbered years. 3(3-0) PHY 858 or approval of department. Interdepartmental with and administered by the Department of Physics.

Conceptual foundations of general relativity theory; elements of tensor calculus; Riemann-Christoffel curvature tensor; the field equations; experimental tests; special solutions; the extension to cosmology.

861. General Relativity and Cosmology II

Winter of odd-numbered years. 3(3-0) PHY 860. Interdepartmental with and administered by the Department of Physics.

Relativistic cosmology: the model universes; stead-state theory; observational evidence and possibilities for decision among models; current problems.

984. Advanced Readings in Physics or Astronomy

Fall, Winter, Spring, Summer. Variable credit. Interdepartmental with and administered by the Department of Physics.

989. Waves and Radiations in Plasmas

Winter of odd-numbered years. 3(3-0) E E 850. Interdepartmental with the Department of Physics, and Electrical Engineering. Administered by Electrical Engineering.

Plasma oscillation; interaction, electromagnetic fields with plasmas, wave propagation in magnetionic media; plasma sheath; radiation of electric source in incompressive and compressive plasmas; electroacoustic waves; magnetohydrodynamics; research topics in plasmas.

AUDIOLOGY AND SPEECH SCIENCES ASC

College of Communication Arts and Sciences

108. Voice and Articulation

Fall, Winter, Spring, Summer. 3(4-0)

The study and development of the skills of voice and articulation.

222. Oral Language Development

Winter, Summer. 3(2-0)

Emergence and development of receptive and expressive aspects of oral language of the child.

227. Physics for Audiology and Speech Sciences

Fall, Spring. 3(3-0) MTH 108. Not open to students with credit in PHY 237. Interdepartmental with and administered by the Department of Physics.

Introductory physics for Audiology and Speech Sciences majors: kinematics, Newtons' Law, conservation of energy and momentum, waves and vibrations, sound propagation, resonance, speech production.

274. Structures and Functions of Speech and Hearing Mechanisms

Fall, Winter. 5(4-2) ASC 108 or approval of department.

Peripheral and central auditory mechanisms and the respiratory, phonatory and articulatory mechanisms for speech.

276. Descriptive Phonetics

Winter, Spring. 3(3-0) ASC 274 or approval of department.

Detailed description of the principles that underlie the production of speech sounds.

277. Scientific Bases of Voice Communication Process

Fall, Spring. 3(3-0) ASC 276 and PHY 237 or approval of department.

Scientific bases of voice communication with special reference to the acoustic aspect of production.

372. Speech Pathology I

Fall, Winter. 3(3-0) ASC 276, ASC 277.

Etiology, symptomatology, and rationale of therapy for speech and language problems.

373. Clinical Procedures in Speech Pathology and Audiology

Winter, Spring. 4(2-2) 2.00 grade-point average in ASC 277 and ASC 372 or approval of department.

Principles underlying the clinical interview and client relationships essential to diagnosis and therapy. Procedures in obtaining, recording, and evaluating test results and therapeutic methods.

444. Oral Language of Urban Areas

Winter, Summer. 3(3-0)

Concentration in the characteristics of language and human communication as these relate to studies and practices of those involved in urban affairs.

454. Introduction to Audiology

Fall, Spring. 5(4-1) ASC 276, ASC 277.

Fundamental aspects of normal hearing; hearing disorders, hearing tests.

460. Aural Rehabilitation

Winter, Summer. 5(4-1) ASC 454 or approval of instructor.

Fundamental aspects of hearing aids, auditory training, and speechreading for the hearing-impaired person.

470. Communication Disorders

Spring, Summer. 3(3-0) Juniors. Not open to Audiology and Speech Sciences majors.

An overview of communication disorders; the professions of speech and language pathology and audiology and their relationships to allied professions.

474. Clinical Practicum in Speech and Language Pathology

Fall, Winter, Spring, Summer. 1 credit. May reenroll for a maximum of 2 credits. Grade of 2.0 or better in both ASC 372 and ASC 373.

Therapeutic experience in speech and language pathology.

476. Speech Pathology II: Diagnostics

Fall, Winter, Spring, Summer. 5(3-2) ASC 474 or approval of department.

Test procedures and analysis; spervised clinical experience in language and speech evaluations and report writing.

477. Methods in Public School Speech and Hearing Therapy

Fall, Winter, Spring. 4(3-4) ASC 372. Must be taken prior to term of student teaching.

Administration and organization, procedures and materials in public school speech and hearing therapy.

499. Independent Study

Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 12 credits. Approval of department.

801. Advanced Study of Articulatory Behavior

Summer. 4(3-2) Approval of department.

Theoretical and pragmatic implications of the interrelationships of articulatory behavior and language production, especially as related to investigating procedures and results.

810. Audiologic Calibration Standards

Summer. 4(3-2) ASC 854 or ASC 833A and ASC 833B; ASC 880A; approval of department.

Contemporary electro-acoustic and other measurement standards for audiometers, sound level meters, earphones, hearing aids, and related devices; current issues in standards development; laboratory in applied measurement.

831. Speech and Hearing Problems of Adults

A. Aphasia

Winter. 4(4-0)

Neuropathology, symptomatology, and speech and language habilitation and rehabilitation of individuals with aphasia.

B. Voice Disorders

Spring. 4(3-0)

Etiology, symptomatology, and therapeutic procedures for disorders of voice. Speech pathologist and audiologist in relation to other disciplines in the rehabilitation of adults with voice disorders.

832. Speech and Hearing Evaluation and Therapy

A. Hearing Handicap

Summer. 4(2-2)

A theoretical approach to the study of the aural rehabilitative process.

B. Apraxia and Dysarthria

Spring. 4(4-0)

Neuropathology, symptomatology, and speech and language habilitation and rehabilitation of individuals with apraxia and dysarthria, including those with cerebral palsy.

C. Delayed Language Development

Winter. 4(3-0)

Evaluative techniques including audiometry, psychometry, and case history as aids to the differential evaluation of delayed language development.

D. Mental Retardation

Summer. 4(3-0)

Language behavior and speech development of the mentally retarded as related to all facets of personal-social development and adjustment.

E. Stuttering

Fall. 4(4-0)

Longitudinal studies of stuttering theories and the therapies accompanying them.

F. Cleft Palate

Summer. 4(3-1)

Etiology, symptomatology, structural and functional consideration of cleft palate. Therapeutic procedures for the speech habilitation of cleft palate individuals.

833. Specialized Clinical Audiology.

A. Differential Audiometry

Fall. 4(3-0)

Pure tone audiometric tests as an aid to the otologist in evaluating the pathology of hearing loss; including the development of norms. Consideration of monorganic loss.

B. Speech Audiometry and Evaluation of Hearing Aids

Fall. 4(4-0)

Speech audiometry; principles and methods in the selection of hearing aids; physical characteristics of hearing aids.

C. Industrial Audiology

Spring. 4(2-2)

Evaluation of the role of the audiologist in industry emphasizing identification procedures, damage-risk criteria, measurement and control of noise, conservation procedures, and medico-legal problems.

D. Advanced Audiological Evaluation

Winter. 4(3-2)

Theory, administration and evaluation of selected tests of the peripheral and central auditory system.

E. Pediatric Audiology

Winter. 4(2-2)

Evaluative procedures including play audiometry, language assessment, abnd case studies as aids to the differential diagnosis of auditory disorders in children; habilitative procedures for the acoustically handicapped child.

F. Geriatric Audiology

Summer. 4(4-0) ASC 460 or approval of department.

Causes and descriptions of hearing loss associated with aging; audiologic evaluation and rehabilitation of older people with emphasis on amplification needs.

853. Speech Perception: Theory and Measurement

Spring. 4(4-0) Approval of department.

Evaluation and analysis of various theories of speech perception and their implications for speech and language pathologists, audiologists, and speech and hearing scientists.

854. Psychophysics and Theories of Audition

Winter. 4(4-0) Approval of instructor.

Nature of auditory stimuli and the results of psychophysical experimentation in audition.

874. Speech and Hearing Problems in Public Schools

Summer. 4(3-0) May reenroll for a maximum of 16 credits.

Graduate seminar in speech and hearing involving problems that arise in relation to speech and hearing therapy in the public schools.

875A. Clinical Practicum in Speech and Language Pathology

Fall, Winter, Spring, Summer. 1 credit. ASC 474. May reenroll for a maximum of 8 credits.

Directed diagnostic, therapeutic, and prognostic experience in speech and language pathology.

875B. Clinical Practicum in Audiology

Fall, Winter, Spring, Summer. 1 credit. ASC 454. May reenroll for a maximum of 8 credits.

Directed diagnostic, therapeutic and prognostic experience in audiology in various clinical settings.

876. Communication Disorders: Neuroanatomy-Neurophysiology

Fall. 4(3-1) Approval of department.

Neuroanatomical and neurophysiological correlates of speech, language, and hearing.

880A. Algorithms for Speech and Hearing Sciences

Fall. 4(4-0)

A discussion of useful algorithms applicable to quantification of phenomena related to audiology and speech sciences.

880B. Acoustic Phonetics

Winter. 4(2-2) ASC 880A or approval of department.

An analytic study of the acoustics of speech.

880C. ***Instruments and Electronics for Audiology and Speech Sciences***
Spring. 4(3-3) ASC 880B or approval of department.
A discussion of the electronic principles and instruments necessary to measure parameters related to hearing and speech processes.

880D. ***Experimental Phonetics***
Summer. 4(4-0) ASC 880C or approval of department.
Critical review of the literature in experimental phonetics. Selected papers on acoustic and physiological phonetics and realted fields are presented in seminar fashion.

899. ***Master's Thesis Research***
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

940. ***Seminar in Audiology and Speech Sciences***
Spring, Summer. 4(2-0) May reenroll for a maximum of 16 credits.

990. ***Special Problems in Audiology and Speech Sciences***
Fall, Winter, Spring, Summer. 1 to 6 credits.
Special projects in audiology and speech sciences.

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

BIOCHEMISTRY BCH

College of Agriculture and Natural Resources
College of Human Medicine
College of Natural Science
College of Osteopathic Medicine

200. ***Introduction to Biochemistry***
Winter, Summer. 5(5-0) Credit may not be earned in both BCH 200 and BCH 401. General chemistry; one term organic chemistry. Not acceptable for a B.S. degree in biochemistry.
Survey of biochemistry emphasizing the major metabolic activities of living organisms.

400H. ***Honors Work***
Fall, Winter, Spring. Variable credit. Approval of department.
Assigned reading and experimentation.

401. ***Basic Biochemistry***
Fall, Spring. 5(5-0) Credit may not be earned in both BCH 200 and BCH 401. One year organic chemistry or CEM 242; not open to biochemistry majors.
A one-term presentation of biochemistry emphasizing structure and function of major biomolecules, metabolism and regulation. Examples used for illustrative purposes will emphasize the mammalian organism.

404. ***General Biochemistry Laboratory***
Winter, Spring. 3(1-6) Analytical chemistry; BCH 401 or BCH 451.
Experimental aspects of biochemistry.

405. ***Biochemistry Laboratory***
Fall, Spring. 3(0-9) BCH 453 or concurrently; BCH 404; undergraduate biochemistry majors or approval of department.
Advanced undergraduate laboratory to illustrate modern biochemical methods and techniques.

412. ***Clinical Biochemistry***
(363.) Winter, Summer. 3(2-3) BCH 401; CEM 162. Medical Technology majors. Not acceptable for a B.S. degree in biochemistry. Others: approval of department.
Quantitative clinical laboratory methods.

451. ***Biochemistry***
Fall. 3(3-0) Credit may not be earned in both BCH 401 and BCH 451. One year organic chemistry or CEM 242.
A comprehensive survey of biochemistry with emphasis on the properties and functions of biomolecules, energy-yielding and energy-requiring processes, and the transfer of genetic information.

452. ***Biochemistry***
Winter. 3(3-0) BCH 451.
Continuation of BCH 451.

453. ***Biochemistry***
Spring. 3(3-0) BCH 452.
Continuation of BCH 452.

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

499. ***Research***
Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits. Approval of department.
A course designed to give qualified undergraduate students an opportunity to gain experience in biochemical research.

501. ***Medical Biochemistry***
Summer. 3(3-0) Open only to students in the professional programs in the College of Human Medicine and the College of Osteopathic Medicine.
Basic Biochemical principles and terminology of importance in medical biology.

502. ***Medical Biochemistry***
Fall. 3(3-0) BCH 501 or approval of department.
A continuation of BCH 501.

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

511. ***Medical Biochemistry I***
Winter. 4(4-0) One year of organic chemistry. Open only to students in the professional programs in the College of Human Medicine and the College of Osteopathic Medicine.
Basic biochemical principles and terminology with emphasis on metabolism and function of biomolecules of importance in medical biology.

512. ***Medical Biochemistry II***
Spring. 3(3-0) BCH 511.
Basic biochemical principles and processes pertinent to specific areas of human pathophysiology.

801. ***Biochemical Research Methods***
Fall. 1(0-3) One year of organic chemistry or CEM 242; BCH 451 or BCH 811, or concurrently.
Discussions and demonstrations of selected experiemental techniques of wide application in biochemistry.

804. ***Advanced Biochemistry Laboratory***
Fall. 1 to 3 credits. May reenroll for a maximum of 6 credits. Analytical chemistry; BCH 801 and BCH 811, or concurrently; biochemistry majors or approval of department.
Experiments to be selected from a representative group illustrating modern biochemical research.

806. ***Advanced Biochemistry Laboratory***
Spring. 3(0-8) BCH 805; BCH 813 or concurrently; biochemistry majors or approval of department.
Special experiments in advanced laboratory techniques.
Approved through Spring 1981.

811. ***Advanced Biochemistry***
Fall. 4(4-0) One year of organic chemistry, one year of physical chemistry, one term of introductory biochemistry, BCH 801 taken previously or concurrently, or approval of department. Limited to graduate students in biochemistry or other students needing a similar professional preparation.
The structure and function of biomolecules, energy transformations and chemical reactions in living cells, regulation of cell reactions, and the replication of living organisms.

812. ***Advanced Biochemistry***
Winter. 4(4-0) BCH 811.
Continuation of BCH 811.

813. ***Advanced Biochemistry***
Spring. 4(4-0) BCH 812.
Continuation of BCH 812.

821. ***Biochemical Mechanism and Structure I***
Fall. 2(2-0) BCH 401, one year of organic chemistry and physical chemistry or concurently; or approval of department.
Structures, methods of structural analysis, synthesis, and reactions mechanisms of biological substances including protein, carbohydrates, lipids, porphyrins, phosphate esters, enzymes and coenzymes.

822. ***Biochemical Mechanism and Structure II***
Winter. 2(2-0) BCH 821 or approval of department.
Continuation of BCH 821.

831. ***Physiological Biochemistry I***
Winter. 3(3-0) BCH 401.
Physiological biochemistry, with emphasis on metabolic interpretation of normal and altered physiological states of the human organism and appropriate animal models.