119. General Astronomy

Fall, Winter, Spring, Summer. 4(4-0) Not open to engineering or physical science majors. Students may not receive credit in more than one of the following: 119, 217, 229.

A qualitative presentation of man's current view of the universe including birth and death of stars, cosmology, comparisons of planets, and life in the universe.

120. Topics in Astronomy

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

Detailed qualitative discussion of currently interesting topics in astronomy. Quasars, pulsars, black holes, planetary exploration, cosmology, concepts of relativity.

217. General Astronomy

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

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

229. General Astronomy

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

327. Practical Astronomy

Fall. 3(3-0) 217 or 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) 217 or 229.

A continuation of General Astronomy with particular emphasis on modern developments. Includes interstellar matter, star formation, stellar evolution through final stages, supernovae, pulsars, neutron stars, galaxies and cosmology.

437. Observatory Practice

Spring. 3(1-4) 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) 217 or 229, PHY 289, 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 re-enroll for a maximum of 10 credits. Approval of department.

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

800. Research Methods

Fall, Winter, Spring Summer. 2(0-6) May re-enroll 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 re-enroll 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) 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

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

Elastic collision processes; Boltzmann equation; moment equations; basic plasma phenomena; motion of a charged particle in electrical and magnetic field; individual and collective charged particle behavior.

859. Stellar Atmospheres

Spring of odd-numbered years. 3(3-0, 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) 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

Fall of even-numbered years. 3(3-0) 850. Interdepartmental with the Department of Physics and Electrical Engineering, and 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*

093. Remedial Speech

Fall, Winter, Spring, Summer. 0(2-0) [2(2-0)]†.

Special help in relieving or compensating for disorders of speech.

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.

274. Structures and Functions of Speech and Hearing Mechanisms

Fall, Winter. 3(3-0) 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) 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) 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. 5(3-0) 276, 277.

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

*Name changed effective July 1, 1975. Formerly College of Communication Arts.

†See page A-2, item 3.

373. Clinical Procedures in Speech Pathology and Audiology

Winter, Spring. 4(2-2) 2.00 grade-point average in 277 and 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) 276, 277.

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

460. Aural Rehabilitation

Winter Summer. 5(4-1) 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 re-enroll for a maximum of 2 credits. Grade of 2.0 or better in both 372 and 373.

Therapeutic experience in speech and language pathology.

476. Speech Pathology II: Diagnostics

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

Test procedures and analysis; supervised 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) 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 re-enroll for a maximum of 12 credits. Approval of department.

801. Advanced Study of Articulatory Behavior

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

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

831. Speech and Hearing Problems of Adults

A. Neuropathologies of Speech

Winter. 4(3-0)

Neuropathology, symptomatology, and speech and language rehabilitation of adults.

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. Cerebral Palsy

Spring. 4(3-0)

Etiology, symptomatology, structural and functional consideration of cerebral palsy. Therapeutic procedures for the speech of the cerebral palsied.

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(3-0)

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 nonorganic 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(3-1)

Theory, administration and evaluation of selected tests including Bekesy, EDR, EEG, and advanced speech-audiometric tests.

E. Pediatric Audiology

Winter. 4(2-2)

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

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

Summer. 4(3-0)

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 re-enroll 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. 474. May re-enroll 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. 454. May re-enroll 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) 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) 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) 880C or approval of department.

Critical review of the literature in experimental phonetics. Selected papers on acoustic and physiological phonetics and related fields are presented in seminar fashion.

899. Research

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

940. Seminar in Audiology and Speech Sciences
Spring, Summer. 4(2-0) May re-enroll for 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. 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 200 and 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.

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

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 200 and 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; 401 or 451.
Experimental aspects of biochemistry.

451. Biochemistry
Fall. 4(4-0) Credit may not be earned in both 401 and 451. One year organic chemistry or CEM 242.
A comprehensive presentation of biochemistry designed for undergraduate biochemistry majors, students of medicine, and other students desiring an intensive treatment of the subject.

452. Biochemistry
Winter. 4(4-0) 451.
Continuation of 451.

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

499. Research
Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll 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
Winter, Summer. 3(3-0) or 5(5-0) May enroll for a maximum of 5 credits in 501 and 502 combined. Winter: College of Human Medicine students; Summer: College of Osteopathic Medicine students.
Basic biochemical principles and terminology of importance in medical biology.

502. Medical Biochemistry
Fall. 2(2-0) Three credits in 501. Not open to students with five credits in 501.
A continuation of 501.

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

804. Advanced Biochemistry Laboratory
Fall. 3(0-8) Analytical chemistry; 801 and 811, or concurrently; biochemistry majors or approval of department.
Experiments to be selected from a representative group illustrating modern biochemical research.

805. Advanced Biochemistry Laboratory
Winter. 3(0-8) 804; 812 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) 805; 813 or concurrently; biochemistry majors or approval of department.
Special experiments in advanced laboratory techniques.

811. Advanced Biochemistry
Fall. 4(4-0) One year of organic chemistry, one year of physical chemistry, one term of introductory biochemistry, 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) 811
Continuation of 811.

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

855. Special Problems
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 12 credits. Approval of department.
Consideration of current problems.

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

952. Plant Physiology and Biochemistry I
Winter of odd-numbered years. 3(3-0) Approval of department. Interdepartmental with the Department of Botany and Plant Pathology.
Selected topics concerning photosynthesis and related processes.

955. Plant Physiology and Biochemistry II
Winter of even-numbered years. 3(3-0) Approval of department. Interdepartmental with the Department of Botany and Plant Pathology.
Metabolic pathways of unique significance to plants.

960. Selected Topics in Biochemistry
Fall, Winter, Spring, Summer. 1(1-0) or 2(2-0) May re-enroll for a maximum of 6 credits if a different topic is taken. Approval of department.
Topics will be selected from the areas of biochemical genetics, biochemistry of development, biochemical evolution, complex proteins, lipid metabolism, immunochemistry, hormones, control mechanisms and structure of biological macromolecules.

961. Selected Topics in Biochemistry
Fall, Winter, Spring, Summer. 1(1-0) or 2(2-0) May re-enroll for a maximum of 6 credits if a different topic is taken. Approval of department.
Topics will be selected from the areas of bioenergetics, bioinstrumentation, complex carbohydrates, mechanisms of enzyme action, natural products, carbohydrate metabolism, mass spectrometry and biochemistry of isoprenoid compounds.

978. Seminar in Biochemistry
Fall, Winter, Spring. 0 or 1(1-0)
Presentation and discussion of reports by graduate students on biochemical topics of current interest.

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