

- 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; steady-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 and administered by Electrical Engineering.*  
Plasma oscillation; interaction, electromagnetic fields with plasmas, wave propagation in magnetoionic media; plasma sheath; radiation of electric source in incompressible and compressive plasmas; electroacoustic waves; magnetohydrodynamics; research topics in plasmas.
- AUDIOLOGY AND SPEECH SCIENCES** **ASC**
- College of Communication Arts and Sciences**  
(Name changed effective July 1, 1975. Formerly College of Communication Arts.)
- 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) 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. 5(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 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.
- 490. Research Design in Audiology and Speech Sciences**  
*Fall, Spring. 4(4-0) Self-paced. Senior majors or approval of department.*  
Sampling, measurement, experimental design, data collection, and quantitative procedures as applied to audiology and speech sciences. *Approved through Summer 1980.*
- 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**  
*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.
- 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. 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.

**Descriptions – Audiology and Speech Sciences  
of  
Courses**

**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 medicolegal 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; rehabilitative 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**

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 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 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. 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.

**412. Clinical Biochemistry**

(363.) Winter, Summer. 4(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. 4(4-0) Credit may not be earned in both BCH 401 and BCH 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) BCH 451. Continuation of BCH 451.

**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**

Winter, Summer. 3(3-0) or 5(5-0) May enroll for a maximum of 5 credits in BCH 501 and BCH 502 combined. Winter: College of Human Medicine students; Summer: College of Osteopathic Medicine students.

Basic biochemical principles and terminology of importance in medical biology.