

**999 Doctoral Dissertation Research**  
 Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 50 credits in all enrollments for this course.  
 Doctoral dissertation research.

**ASIAN LANGUAGES ASN**

**Department of Linguistics  
 and Germanic, Slavic, Asian  
 and African Languages  
 College of Arts and Letters**

**290 Independent Study**  
 Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Approval of department.  
 Special projects in an Asian Languages arranged by an individual student and a faculty member in areas supplementing regular course offerings.

**291 Special Topics in Asian Languages**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Not open to students with credit in ASN 491.  
 Special topics supplementing regular course offerings proposed by faculty on a group study basis.

**291 Special Topics in Asian Languages**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Not open to students with credit in ASN 491.  
 Special topics supplementing regular course offerings proposed by faculty on a group study basis.

**401 East Asian Cultures (W)**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Not open to students with credit in ASN 491.  
 Special topics supplementing regular course offerings proposed by faculty on a group study basis.

**401 East Asian Cultures (W)**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Not open to students with credit in ASN 491.  
 Special topics supplementing regular course offerings proposed by faculty on a group study basis.

**464 Studies in the Literature of Asia and the Asian Diaspora (W)**  
 Spring, 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. Interdepartmental with English. P:M: Completion of Tier I writing requirement.  
 Selected writers, genres, themes, or regions in Asian and Asian diasporic literature.

**490 Independent Study**  
 Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to juniors or seniors. Approval of department.  
 Special projects in Asian Languages arranged by an individual student and a faculty member in areas supplementing regular course offerings.

**490 Independent Study**  
 Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to juniors or seniors. Approval of department.  
 Special projects in Asian Languages arranged by an individual student and a faculty member in areas supplementing regular course offerings.

**491 Special Topics in Asian Languages**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Not open to students with credit in ASN 491.  
 Special topics supplementing regular course offerings proposed by faculty on a group study basis.

**491 Special Topics in Asian Languages**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Not open to students with credit in ASN 491.  
 Special topics supplementing regular course offerings proposed by faculty on a group study basis.

**ASTRONOMY AND  
 ASTROPHYSICS AST**

**Department of Physics  
 and Astronomy  
 College of Natural Science**

**101 The Celestial Clockworks**  
 Spring. 1(1-0)  
 Relationship between ancient skylore and timekeeping. Establishment of a calendar and celestial navigation. Development of the Greek horoscope as a time recorder and coordinate system.

**201 Astrophysics and Astronomy I**  
 Fall. 3(4-0) P:M: (PHY 183 or PHY 183B or PHY 193H) and (MTH 132 or MTH 152H or LBS 118)  
 Overview of the universe: the celestial sphere, orbits, spectra, the solar system, stars, and stellar evolution.

**202 Astrophysics and Astronomy II**  
 Spring. 4(3-2) P:M: (AST 201) and (PHY 184 or PHY 184B or PHY 294H) and (MTH 234 or concurrently or MTH 254H or concurrently or LBS 220 or concurrently)  
 Interstellar medium, the milky way, galaxies, and the large-scale structure of the universe. Coordinate systems, instruments, and data analysis.

**207 The Science of Astronomy**  
 Fall. 3(3-0) P:M: (PHY 231 or concurrently or PHY 231B or concurrently or ISP 205 or concurrently or PHY 181B or concurrently or PHY 183 or concurrently or PHY 183B or concurrently or LBS 271 or concurrently or PHY 231C or concurrently) and (MTH 116 or concurrently or MTH 114 or concurrently or LBS 117 or concurrently) Not open to students with credit in AST 201.  
 In-depth study of one topic in astronomy with emphasis on key discoveries. Topics may be cosmology, the solar system, and the life of stars. Observing with portable telescopes.

**301 Junior Research Seminar**  
 Fall, Spring. 1(1-0) P:M: (AST 202) and completion of Tier I writing requirement.  
 Preparation and presentation of a review paper on a current topic in astronomy or astrophysics.

**301 Junior Research Seminar**  
 Fall, Spring. 1(1-0) P:M: (AST 202) and completion of Tier I writing requirement.  
 Preparation and presentation of a review paper on a current topic in astronomy or astrophysics.

**310 Directed Studies**  
 Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 4 credits in all enrollments for this course. P:M: (AST 202) R: Approval of department.  
 Individual study or project in astronomy or astrophysics under the direction of a faculty member.

**401 Stars**  
 Fall. 3(3-0) P:M: (AST 202 and PHY 321)  
 Physical processes that determine the structure and evolution of stars. Results of stellar evolution theory. Stellar atmospheres. Observations of stars.

**402 Galaxies**  
 Spring. 3(3-0) P:M: (AST 401 and PHY 481)  
 Contents and dynamics of the milky way. Mass and luminosity distributions of galaxies. Stellar populations. The interstellar medium. Evolution of galaxies. Active galactic nuclei.

**410 Senior Thesis**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 5 credits in all enrollments for this course. P:M: (AST 301) and completion of Tier I writing requirement.  
 Design and execute an original experiment or computation. A written and oral report of the research is required.

**410 Senior Thesis**  
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 5 credits in all enrollments for this course. P:M: (AST 301) and completion of Tier I writing requirement.  
 Design and execute an original experiment or computation. A written and oral report of the research is required.

**800 Research Methods**  
 Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. P:NM: (AST 801)  
 Apprenticeship in astrophysical research; student will work closely with individual faculty member learning research techniques.

**800 Research Methods**  
 Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. P:NM: (AST 801)  
 Apprenticeship in astrophysical research; student will work closely with individual faculty member learning research techniques.

**801 Introduction to Astrophysics**  
 Fall. 3(3-0)  
 Survey of contemporary astrophysics. Stellar evolution, the structure of the Milky Way, the properties of external galaxies, and cosmology.

**802 Techniques of Modern Astrophysics**  
 Fall, Spring. 3 credits. P:NM: (AST 801)  
 Students are introduced to modern astrophysics through participation in short projects involving literature surveys, professional planning, and research in observational, theoretical, and computational astrophysics.

**810 Radiation Astrophysics**  
 Spring of odd years. 3(3-0) P:NM: (AST 801 and PHY 841)  
 Transfer of radiation through plasmas and processes for emission and absorption of photons. Interpretation of the spectra of stars, interstellar medium, and galaxies.

**810 Radiation Astrophysics**  
 Spring of odd years. 3(3-0) P:NM: (AST 801 and PHY 841)  
 Transfer of radiation through plasmas and processes for emission and absorption of photons. Interpretation of the spectra of stars, interstellar medium, and galaxies.

**820 Advanced Topics in Astrophysics**  
 Fall, Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P:NM: (AST 801)  
 Advanced work in a specialized astrophysical topic.

**830 Galactic and Extragalactic Dynamics**  
 Fall of even years. 3(3-0) P:NM: (AST 801 and PHY 820)  
 Implications of gravitational dynamics and stellar evolution on galactic and extragalactic systems.

**840 Stellar Astrophysics**  
 Spring of even years. 3(3-0) P:NM: (AST 801)  
 Physics of stellar interiors. Methods for calculating stellar models. Principles of stellar evolution.

**850 Electrodynamics of Plasmas**  
 Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering; Physics. Administered by Department of Electrical and Computer Engineering. P:NM: (EE 835 or PHY 488)  
 Plasma kinetic and macroscopic plasma transport theory. Electromagnetic wave propagation and charged particle diffusion processes in plasma. Electromagnetic energy absorption via elastic and inelastic collisions. Dc, rf, and microwave discharges.

**850 Electrodynamics of Plasmas**  
 Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering; Physics. Administered by Department of Electrical and Computer Engineering. P:NM: (EE 835 or PHY 488)  
 Plasma kinetic and macroscopic plasma transport theory. Electromagnetic wave propagation and charged particle diffusion processes in plasma. Electromagnetic energy absorption via elastic and inelastic collisions. Dc, rf, and microwave discharges.

**860 Gravitational Astrophysics and Cosmology (MTC)**  
 Fall, Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.  
 Topics in general relativity, gravitational astrophysics, and cosmology.

**860 Gravitational Astrophysics and Cosmology (MTC)**  
 Fall, Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.  
 Topics in general relativity, gravitational astrophysics, and cosmology.

## Astronomy and Astrophysics–AST

**870 Astronomical Instrumentation and Data Analysis**  
Fall of odd years. 3(3-0) P:NM: (AST 801)  
Theory and techniques of astronomical data acquisition and analysis.

**899 Master's Thesis Research**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to graduate students in Astronomy and Astrophysics.  
MS Thesis Research

**999 Doctoral Dissertation Research**  
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in Astronomy and Astrophysics.  
Doctoral dissertation research.

## AUDIOLOGY AND SPEECH SCIENCES ASC

### Department of Audiology and Speech Sciences College of Communication Arts and Sciences

**113 Oral Communication Principles and Skills**  
Fall, Spring, Summer. 3(2-2)  
Study, development and enhancement of oral communication skills including speech, voice, language and listening.

**203 Introduction to Communication Sciences and Disorders**  
Fall, Spring. 3(3-0) Not open to students with credit in ASC 403.  
Survey of research and practice regarding speech, hearing and language disorders in children and adults.

**214 Anatomy and Physiology of the Speech and Hearing Mechanism**  
Fall. 4(3-2) P:M: (ASC 203 or concurrently)  
Structural and functional analyses of the central and peripheral auditory mechanisms, and of the respiratory, phonatory, and articulatory mechanisms for speech.

**232 Descriptive Phonetics**  
Fall. 2(1-2)  
Principles of speech production. Transcription of speech using the International Phonetic Alphabet.

**255 Speech and Hearing Sciences**  
Spring. 5(4-2) P:M: (ASC 214 and ASC 232 or concurrently) P:NM: One ISP course and completion of the University Mathematics requirement.  
Application of the scientific method to the studies of audition, speech perception and speech production.

**333 Oral Language Development**  
Fall, Spring. 3(3-0) P:M: (PSY 101) and (LIN 401 or ENG 302 or LIN 200) R: Not open to freshmen.  
Development of receptive and expressive aspects of child language.

**344 Evaluation Procedures in Audiology**  
Fall. 4(3-2) P:M: (ASC 255) and completion of Tier I writing requirement. R: Open only to juniors or seniors in the Department of Audiology and Speech Sciences.

Classification of hearing disorders. Behavioral and electrophysiological measurement of hearing, including subjective and objective testing procedures.

**364 Evaluation Procedures in Speech-Language Pathology**  
Fall. 4(3-2) P:M: (ASC 255 and ASC 333) and completion of Tier I writing requirement. R: Open only to juniors or seniors in the Department of Audiology and Speech Sciences.

Evaluation procedures in speech-language pathology, test procedures, evaluation of results, and report writing.

**394 Guidelines for Clinical Practice**  
Fall, Spring, Summer. 2(2-0) P:M: (ASC 344 and ASC 364) R: Open only to juniors or seniors in the Department of Audiology and Speech Sciences.

Policies and practices operative in speech and hearing clinics. Interviewing techniques. Behavioral observation and data collection. Behavior management. Counseling. Session plan and report writing.

**433 Language Dialect Differences in Applied Contexts**  
Spring. 3(3-0) P:M: (ASC 364)

Regional, ethnic, and cultural characteristics of American English. Comparison of speech-language differences and disorders.

**443 Aural Rehabilitation**  
Spring. 3(3-0) P:M: (ASC 344) R: Open only to juniors or seniors in the Department of Audiology and Speech Sciences.

Fundamental aspects of auditory rehabilitation, including individual and group amplification systems, auditory training, speechreading, and counseling with children and adults.

**463 Intervention Procedures in Speech-Language Pathology**  
Spring. 3(3-0) P:M: (ASC 364) R: Open only to juniors or seniors in the Department of Audiology and Speech Sciences.

Intervention procedures for individuals with developmental and acquired communication disorders.

**473 Phonological Disorders in Children**  
Spring. 3(3-0) P:M: (ASC 463 or concurrently)

Phonological theory, speech perception and production, nature of normal/abnormal phonological development. Preparing assessment and treatment plans, applying treatment principles to different populations and cultural groups. Practice with narrow phonetic transcription of speech and phonological process analysis.

**483 School-Based Communication Disorders Programs**  
Spring. 3(3-0) P:M: (ASC 463 or concurrently) and (ASC 394 or concurrently) R: Open only to juniors or seniors in the Department of Audiology and Speech Sciences.

Administrative and regulatory aspects of school-based programs for persons with communication disorders.

**490 Independent Study**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Approval of department.

Individualized student activities in human communication sciences and disorders.

**494 Clinical Practicum in Communication Disorders**  
Fall, Spring, Summer. 2 credits. A student may earn a maximum of 4 credits in all enrollments for this course. P:M: (394 and 463) P:NM: A minimum of 25 hours of approved clinical observation. R: Open only to juniors or seniors in the Department of Audiology and Speech Sciences. Approval of department.

Supervised clinical experiences, working with individuals who have speech, language and/or hearing disorders.

**803 Research Methods in Communication Sciences and Disorders**  
Fall. 3(3-0) R: Open only to graduate students in Audiology and Speech Sciences.

Hypothesis generation, experimental design, data collection, data analysis and presentation.

**813 Neuroanatomy and Neurophysiology of Speech, Language, and Hearing**  
Fall. 3(3-0) R: Open only to graduate students in Audiology and Speech Sciences.

Structural and functional descriptions of the nervous system as it relates to communication sciences and disorders.

**823A Acquired Language Disorders**  
Spring. 3(3-0) P:NM: (ASC 813 or concurrently) R: Open only to graduate students in Audiology and Speech Sciences.

Neuropathology, symptomatology, and speech-language rehabilitation of individuals with aphasia and related disorders.

**823B Motor Speech Disorders**  
Fall. 3(3-0) P:NM: (ASC 813 or concurrently) R: Open only to graduate students in Audiology and Speech Sciences.

Neuropathology, symptomatology, and speech-language habilitation and rehabilitation of individuals with motor speech disorders.

**823C Voice Disorders**  
Summer. 3(3-0) R: Open only to graduate students in Audiology and Speech Sciences.

Etiology, symptomatology, diagnosis, and treatment of voice disorders in children and adults.

**823D Fluency Disorders**  
Fall. 3(3-0) R: Open only to graduate students in Audiology and Speech Sciences.

History, theories, symptomatology, diagnosis, and treatment of fluency disorders in children and adults.

**823E Assessment of Childhood Language Disorders**  
Fall. 3(2-2) R: Open only to graduate students in the Department of Audiology and Speech Sciences.

Evaluation of language disorders of preschool, school-aged, and adolescent populations.