

**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. 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 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.

**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: Completion of Tier I writing requirement.  
 Preparation and presentation of a review paper on a current topic in astronomy or astrophysics.

**303 Planetary System Astronomy**  
 Fall of even years. 3(3-0) P:M: (PHY 183 or PHY 193H or PHY 183B) and (MTH 132 or MTH 152H or LBS 118) SA: AST 201  
 Origin and nature of the solar system. Planets of the solar system and other star systems. Asteroids, meteorites, and comets. Determination of time and celestial coordinates.

**304 Stars**  
 Spring of odd years. 3(3-0) P:M: (PHY 184 or PHY 184B or PHY 294H) and (AST 303) and (MTH 234 or concurrently or MTH 254H or concurrently or LBS 220 or concurrently) SA: AST 401  
 Physical processes that determine the structure and evolution of stars. Observations of stars and star clusters. Spectra of stars.

**307 The Milky Way**  
 Fall of odd years. 3(3-0) P:M: (PHY 183 or PHY 193H or PHY 183B) and (MTH 132 or MTH 152H or LBS 118) SA: AST 202  
 Structure and history of the Milky Way Galaxy. Stellar populations. Interstellar medium.

**308 Galaxies and Cosmology**  
 Spring of even years. 3(3-0) P:M: (AST 307) and (PHY 184 or PHY 184B or PHY 294H) and (MTH 234 or concurrently or MTH 254H or concurrently or LBS 220 or concurrently) SA: AST 402  
 Structure and content of galaxies beyond the Milky Way. Active galaxies and quasars. The expanding universe. Modern cosmological models.

**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. R: Approval of department.  
 Individual study or project in astronomy or astrophysics under the direction of a faculty member.

**312 Observational Astronomy**  
 Spring. 1(0-2) P:M: (AST 303 or AST 307)  
 Basic observational techniques in astronomy. Stellar photometry and spectroscopy.

**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.

## AUDIOLOGY AND SPEECH SCIENCES ASC

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

**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, Spring. 2(1-2)  
 Principles of speech production. Transcription of speech using the International Phonetic Alphabet.

**303 Hearing Science**  
 Fall. 3(2-2) P:M: (MTH 106 or MTH 152H or MTH 110 or MTH 201 or MTH 116 or STT 200 or MTH 124 or STT 201 or MTH 132) RB: Completion of one ISP course. SA: ASC 255  
 Physical and psychological aspects of sound and their measurement. Emphasis on the understanding of human communication and its disorders.

**313 Speech Science**  
 Spring. 3(2-2) P:M: (ASC 214 and ASC 232 or concurrently) RB: Completion of one ISP course SA: ASC 255  
 Processes underlying the production and perception of speech. Understanding human communication and its disorders.

**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**  
 Spring. 4(3-2) P:M: (ASC 303) and completion of Tier I writing requirement.  
 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 313) and completion of Tier I writing requirement.  
 Evaluation procedures in speech-language pathology. Test procedures. Analysis of results. Report writing.

**394 Observation and Analysis of Clinical Practice**  
 Fall, Spring, Summer. 1(0-2) P:M: (ASC 344 and ASC 364)  
 Case presentations. Interviewing techniques. Behavioral observation and data collection. Behavior management. Counseling. Session plan and report writing.

**403 Communication Sciences and Disorders**  
 Fall. 3(3-0) R: Not open to freshmen or sophomores. Not open to students in the Department of Audiology and Speech Sciences. Not open to students with credit in ASC 203.  
 Research and practice regarding communication disorders and the professions of speech-language pathology and audiology.

**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 Rehabilitative Audiology**  
 Fall. 3(3-0) P:M: (ASC 344)  
 Fundamental aspects of auditory rehabilitation. 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)  
 Intervention procedures for individuals with developmental and acquired communication disorders.