806. **Graphic Design**  
Fall, Winter, Spring, Summer. 3 to 12 credits.  
Advanced work in all phases of the area of graphic design leading to independent development.

807. **Industrial Design**  
Fall, Winter, Spring, Summer. 3 to 12 credits.  
Advanced study in the areas of design analysis and product development with emphasis on continued independent development.

808. **Jewelry and Metal**  
Fall, Winter, Spring, Summer. 3 to 12 credits.  
Advanced work in jewelry and metal, and other related areas leading to continued independent development.

809. **Etching**  
Fall, Winter, Spring, Summer. 3 to 12 credits.  
Work in etching leading to expressive independent development.

810. **Lithography**  
Fall, Winter, Spring, Summer. 3 to 12 credits.  
Work in lithographic techniques leading to expressive independent development.

811. **Criticism in Contemporary Art**  
Fall, Winter, Spring. 4(4-0) Approval of department.  
Principles of evaluation in the visual arts today and their use in the studio work of the contemporary artist.

816. **Issues in Contemporary Art**  
Fall. 3(3-0) Graduate students or approval of instructor.  
Impact of technology, new media, exploitation and exhaustion of current styles, new sources of patronage, political control; implications of art systems replacing object art explored in seminars with staff.

820. **Problems in Art Education**  
Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 10 credits. 421 or 422 or a bachelor's degree in art from an accredited institution.

821. **Art Instructional Media Laboratory I—Multi-Media**  
Fall, Winter, Spring, Summer. 4(1-9) May re-enroll for a maximum of 8 credits. Approval of department.  
Investigation of multi-media techniques as media of artistic expression and communication for application to art education or related fields.

822. **Art Instructional Media Laboratory II—Television**  
Fall, Winter, Spring, Summer. 4(1-9) May re-enroll for a maximum of 8 credits. Approval of department. Interdepartmental and jointly administered with the Department of Telecommunication.  
Analysis of teaching video tapes and television programs in art. Utilization of television as a medium of artistic expression and communication for application to art education or related fields.

825. **Seminar in Art Education**  
Fall, Winter, Spring, Summer. 2 to 4 credits. May re-enroll for a maximum of 8 credits. Approval of department.  
Examination and discussion of contemporary thought in the field of art education. Current problems examined within an interdisciplinary framework.

826. **Critical Theory and Aesthetic Experience in Art Education**  
Fall, Winter, Spring, Summer. 3(3-0) Approval of department.  
Theories of art criticism and aesthetic experience. Organization of these concepts for application to art education programs or related fields.

827. **Curriculum Design for Art Education**  
Fall, Winter, Spring, Summer. 3(3-0) Approval of department.  
Factors affecting art curriculum; analysis, preparation and evaluation.

828. **Research Methods for Art Education**  
Fall, Winter, Spring, Summer. 3(3-0) Approval of department.  
Orientation to research; designs and methodologies applicable to the study of problems in art education.

840. **Teaching Seminar—Art Practice**  
Fall, Winter, Spring, Summer. 1 to 3 credits. May re-enroll for a maximum of 6 credits. Approval of department.  
Supervised teaching of college classes in art practice.

899. **Research**  
Fall, Winter, Spring, Variable credit. May re-enroll for a maximum of 12 credits. Approval of department.

899. **Research**  
Fall, Winter, Spring, Variable credit. May re-enroll for a maximum of 12 credits. Approval of department.

ARTS AND LETTERS  
College of Arts and Letters

**390H. Perpectives in Literature**  
Fall. 4(3-0) Juniors, approval of the Honors College.  
Attention will be focused on several major literary works. Students will employ various types of literary analysis, considering themes, ideas, structure, etc., and examining some major trends in contemporary literary criticism.

**391H. Perpectives in Philosophy**  
Winter. 4(3-0) Juniors, approval of the Honors College.  
The two primary areas of concern will be ethics and aesthetics, the emphasis on one or the other to be determined by the professor. The course will include reading of major works, discussion of major figures in the field, and the preparation of a substantial paper.

**392H. Perpectives in History**  
Spring. 4(3-0) Juniors, approval of the Honors College.  
The focus will be on the nature of international diplomacy in the 20th century, the development of nationalism, the balance of power system, the influence of new ideologies, and the developments of the power structure since 1945.

**393H. Perpectives in 20th Century Arts: 1900-1920**  
Fall. 3(3-0) Juniors, approval of Honors College.  
Reaction to Naturalism across the arts traced in Symbolism and Expressionism as interrelated phenomena in response to the crisis of confidence in European institutions.

**394H. Perpectives in 20th Century Arts: 1920-1945**  
Winter. 3(3-0) Juniors, approval of Honors College.  
Formalist analysis of art elements examined across the arts in Cubism, Surrealism and new musical structures as positive response to war, depression and dictatorship.

**395H. Perpectives in Contemporary Arts: Post-war Period**  
Spring. 3(3-0) Juniors, approval of Honors College.  
The function of avant-garde arts after World War II to the present studied in the new dimensions of an environment created by new technology and the mass media explosion.

**450. Arts Management**  
Fall, Winter, Spring. 2 to 6 credits. May re-enroll for a maximum of 9 credits if different topic is taken. Seniors or Graduate Students or approval of department.  
Administration of arts organizations, management of facilities, understanding operational methods and procedures of performing companies, financial structure and funding of art centers, study of audience development, contemporary trends in arts management field.

**491H. Perpectives in the Social Sciences and Humanities**  
Fall, Winter, Spring. 2 to 6 credits. May re-enroll for a maximum of 12 credits if different topic is taken. Juniors, approval of Honors College, or approval of instructor. Interdepartmental with the College of Social Science and Justin Morrill College.  
An integration of subject matter and methodologies of several disciplines as they are relevant to particular topic areas.

**999. Research**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 8 credits. Approval of college.

ASTRONOMY AND ASTROPHYSICS*  
College of Natural Science

**109. Astronomical Fiction**  
Winter. 1(1-0) 119 concurrently.  
Concurrent readings of works of science fiction to assist the visualization of the concepts presented in AST 119.

**117. Introductory Observing**  
Fall, Spring. 1(0-2) 119, or 217, or 229 or concurrently and approval of department.  
Observations of celestial objects, constellation identification, and occasional planetarium exercises.

*Name changed effective March 1, 1974.  
Formerly Astronomy.
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.
A detailed qualitative discussion of currently interesting topics in astronomy. Quasars, pulsars, black holes, planetary exploitation, cosmology, concepts of relativity.

217. General Astronomy
Fall, Winter. 4(4-0) MTH 108 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 semi-quantitative 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. 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(3-4) 217 or 229, MTH 113.

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 main stages, supernovae, pulsars, neutron stars, galaxies and cosmology.

437. Observatory Practice
Spring. 3(4-0) 327 and approval of department.

455. Astrophysics
Winter. 3(3-0) 217 or 229, PHY 289, or approval of department.
Application of physical principles to the atmosphere or 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, nucleons, 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) PHY 448 or PHY 458 or approval of department.

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), 459 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 338 or approval of department. Interdepartmental with and administered by the Department of Physics.
Conceptual foundations of general relativity; elements of tensor calculus; Riemann-Cartesian 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 338 or approval of department. 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.

954. 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) PHY 492, or approval of department.
Plasma oscillation; interaction, electromagnetic fields with plasmas, wave propagation in magnetohydrodynamic waves; radiation of electric sources in incompressive and compressive plasmas; electroacoustic waves; magnetohydrodynamics; research topics in plasmas.

AUDIOLOGY AND SPEECH SCIENCES

College of Communication Arts and Sciences* ASC

003. Remedial Speech
Fall, Winter, Spring, Summer. 0(2-6)
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. 3(3-0)
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) 105 or approval of department.
Perception 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.