424B. Advanced Graphic Design

(ART 424, ART 424B.) Winter. 5 to 10 credits. 424A.

Advanced problem solving involving existing media of graphic expression. Study of graphic equivalents of literal images and ideas in the creation of posters, trademarks and magazine and book covers.

424C. Advanced Graphic Design

(ART 424, ART 424C.) Spring. 5 to 10 credits. 424B.

Graphic design workshop. Advanced study of type faces, paper, light-sensitive materials, etc. Major emphasis on individual independent study.

428. Advanced Sculpture

(ART 428.) Fall, Winter, Spring, Summer. 5 to 10 credits. May re-enroll for a maximum of 35 credits. 328.

Continuation of 328. Problems in carving, modeling, casting in wax, clay, plaster, direct metal, etc.

431. Advanced Ceramics

(ART 431.) Fall, Winter, Spring, Summer. 5 to 10 credits. May re-enroll for a maximum of 35 credits. 341.

Continuation of 341 with increased opportunity for supervised individual study.

433. Advanced Composition and Painting

(ART 433.) Summer. 3 to 6 credits. May re-enroll for credit. 353, 355 or approval of department.

Continuation of 353 or 355 with increased opportunity for supervised independent development.

435. Advanced Painting

(ART 435.) Fall, Winter, Spring, Summer. 5 to 10 credits. May re-enroll for a maximum of 30 credits. 340, 355.

Continuation of 355 with increased opportunity for supervised independent development.

440. Special Problems

(ART 440.) Fall, Winter, Spring, Summer. 2 to 5 credits. Approval of department.

Advanced work developed from special interest areas.

444. Industrial Design II

(ART 444.) Fall, Winter, Spring, Summer. 5 to 10 credits. May re-enroll for a maximum of 35 credits. 344, approval of department.

Continuation of 344 with a broader choice of projects in industrial design and increased emphasis on independent development.

449. Advanced Jewelry

(ART 449.) Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 12 credits. 391, approval of department.

Continuation of 391 with augmented opportunities for independent development and additional techniques.

800. Studio Problems

(ART 800.) Fall, Winter, Spring, Summer. 1 to 6 credits.

Studio problems in drawing, painting, printmaking, graphic design, industrial design, interior design, advertising design, sculpture-carving, sculpture-direct metal, ceramics.

801. Painting

(ART 801.) Fall, Winter, Spring, Summer. 3 to 12 credits.

Advanced work in a variety of painting media with strong emphasis on independent development.

802. Drawing

(ART 802.) Fall, Winter, Spring, Summer. 3 to 12 credits.

Advanced work in drawing employing a variety of media and calculated to contribute to development in related areas of art practice.

803. Sculpture

(ART 803.) Fall, Winter, Spring, Summer. 3 to 12 credits.

Advanced work in a variety of three dimensional media with strong emphasis on individual development.

804. Ceramics

(ART 804.) Fall, Winter, Spring, Summer. 3 to 12 credits.

Advanced work in pottery involving a variety of experiences and leading to independent development.

805. Serigraphy

(ART 805.) Fall, Winter, Spring, Summer. 3 to 12 credits.

Work in silk screen printmaking techniques leading to independent expressive development.

806. Graphic Design

(ART 806.) 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

(ART 807.) 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. Crafts

(ART 808.) 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.

820. Problems in Art Education

(ART 820.) Fall, Winter, Spring. 1 to 5 credits. May re-enroll for a maximum of 15 credits. 421 or 422 or a bachelor's degree in art from an accredited institution.

821. Art Instructional Media Laboratory I—Multi-Media

(ART 821.) Fall, Winter, Spring, Summer. 4(1-9) May re-enroll for a maximum of 8 credits. Certified classroom teachers with a bachelor's degree and a major in art.

Experimentation with art techniques, films, filmstrips, slides, photographs, audio tapes and various projection devices for purposes of developing art teaching materials of both aesthetic and educational value.

822. Art Instructional Media Laboratory II—Television

(ART 822.) Fall, Winter, Spring, Summer. 4(1-9) May re-enroll for a maximum of 8 credits. T R 437 or experience in the television field. Interdepartmental and administered jointly with the Television and Radio Department.

Review and analysis of teaching video tapes and television programs in art. Students may write television scripts, design sets and props, and teach in a taped or live closed-circuit or open channel program.

840. Teaching Seminar—Art Practice

(ART 840.) 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

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

ARTS AND LETTERS A L

College of Arts and Letters

390H. Perspectives 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 theme, idea, structure, etc., and examining some major trends in contemporary literary criticism.

391H. Perspectives 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. Perspectives 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.

ASTRONOMY AST

College of Natural Science

119. General Astronomy

Fall, Winter, Spring, Summer. 4(4-0) Not open to engineering or physical science majors or minors.

Physical nature of solar system, star clusters, and galaxies as seen by modern astronomers. Limited opportunity for astronomical observations.

217. General Astronomy

Fall, Winter, Spring. 4(4-0) MTH 102. Not open to engineering or physical science majors or minors.

Descriptive course intended primarily for physical science majors. A semi-quantitative discussion of time, telescopes, the solar system, stars, clusters of stars, galaxies, and cosmology. Limited opportunity for astronomical observations.

327. Practical Astronomy

Fall. 3(3-0) 217, 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 Astronomical Concepts

Winter of odd-numbered years. 3(3-0) 217, MTH 113. Not open to astrophysics majors for credit.

Interstellar matter and star formation. Deaths of stars: supernovae, white dwarfs, neutron stars, pulsars. Radio astronomy; quasars; X-ray sources. Galaxies, clusters of galaxies, the expanding universe and cosmology.

381. Astronomy for Teachers

Summer. 3(3-0) Summer Institute participant.

Selected topics in descriptive astronomy of special importance in teaching. Methods of distance determination. Important properties of stars, our galaxy, and the universe.

437. Observatory Practice

Fall. 3(1-4) 217 and MTH 113.

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) PHY 289 or approval of department.

Properties of a gas under conditions of astrophysical interest. Atomic spectroscopy. Emission and absorption of radiation. Physical properties of stellar atmospheres and other astronomical objects as inferred from the spectra.

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. 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.

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.

839. Celestial Mechanics

Spring of even-numbered years. 3(3-0) PHY 427 or approval of department.

Two-body, three-body, and n-body problems. Orbital elements. Potential of solid objects. Orbital motion and perturbations for planets, rockets, and satellites.

850. Ionized Gases

Spring. 3(3-0) E E 835 or PHY 448. Interdepartmental with 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. 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

Fall of even-numbered years. 3(3-0) PHY 859 or approval of department. Interdepartmental with and administered by the Physics Department.

The relativistic gravitational field equations will be developed and experimental evidence for their validity will be discussed; various relativistic cosmological models and their relation to astronomical evidence will be presented.

989. Waves and Radiations in Plasmas

Fall of even-numbered years. 3(3-0) E E 850. Interdepartmental with 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

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.

276. Descriptive Phonetics

(275.) Fall, Spring. 3(3-0)

Detailed description of the principles that underlie the production of speech sounds.

277. Scientific Bases of Voice Communication Process

(275.) Winter, Spring. 3(3-0)

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.

373. Clinical Procedures in Speech Pathology and Audiology

Winter, Spring, Summer. 4(2-2)

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

Spring, 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. Audiology I

Fall, Winter, Spring, Summer. 5(4-1) 276, 277.

Fundamental aspects of hearing; nature, testing and rehabilitation.

460. Audiology II

Winter, Spring. 5(3-0) 454 or approval of department.

Theory and methodology in the teaching of lipreading and auditory training to the acoustically handicapped.

470. Speech Correction for Teachers

Fall, Winter, Spring, Summer. 3(3-0) Juniors. Not open to speech pathology and audiology majors.

Meeting needs of the speech handicapped child in classroom.

473. Speech Pathology II: Diagnostics

Fall, Winter, Spring, Summer. 5(3-2) 372, 373 and 2 credits of 474 or approval of department.

Test procedures and analysis; supervised clinical experience in language and speech evaluations and report writing.

474. Clinical Practice in Speech Correction

Fall, Winter, Spring, Summer. 1 to 3 credits. May re-enroll for credit. Six credits required for certification. No more than 2 credits may be taken during the preprofessional program. 372.

475. Structures and Functions of Speech and Hearing Mechanisms

(854A.) Fall. 3(3-0) Approval of department.

Peripheral and central auditory mechanisms and the respiratory, phonatory and articulatory mechanisms for speech.

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.

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 Loss

Summer. 4(2-0)

Review, evaluation, and development of techniques employed in lipreading training, auditory training, hearing aid orientation, and counseling for the acoustically handicapped.

B. Cerebral Palsy

Spring. 4(3-0)

Etiology, symptomatology, structural and func-