CD Communication Disorders

CD 277 INTRODUCTION TO DISORDERS OF SPEECH AND LANGUAGE. (3)
An introduction to developmental aspects of speech and language. Definitions, symptomatology, and etiologies of articulation, language, fluency, and voice disorders.

CD 285 APPLIED PHONETICS. (3)
Study of the phonetic structure of the English language with requirement of mastery of International Phonetic Alphabet. Emphasis will be placed on phonetic transcription, and application will be made for students interested in general speech, speech correction, radio, television, and theatre. (Same as COM 285.)

CD 378 ANATOMY AND PHYSIOLOGY OF SPEECH. (3)
A detailed investigation of structures and functions supporting speech production: respiration, phonation, articulation, and resonance. Neural bases of speech and language will also be introduced. Prereq: CDI major or permission of instructor.

CD 379 FUNDAMENTALS OF HEARING. (3)
Investigation of the anatomical, physiological, and neurological bases of hearing; physics of sound; and elementary psychoacoustics. Prereq: CODI major or permission of instructor.

CD 380 PATHOLOGIES OF THE AUDITORY SYSTEM. (3)
Detailed investigation of various definitions, symptomatologies, etiologies, and treatments of hearing impairment. Surveys of definitions, symptomatologies, etiologies, and treatments of central and functional hearing impairment. Prereq: CD 379 or permission of instructor.

CD 382 CLINICAL ORIENTATION IN SPEECH-LANGUAGE PATHOLOGY I. (1)
A lecture-laboratory experience designed to orient the student to the professional activities in speech-language pathology. Lecture: one hour; laboratory: four hours per week. Prereq: CD 277, CODI majors only.

CD 383 CLINICAL ORIENTATION IN SPEECH-LANGUAGE PATHOLOGY II. (1)
A lecture-laboratory experience designed to orient the student to the professional activities in speech-language pathology. Lecture: one hour; laboratory: four hours per week. Prereq: CD 382 or permission of instructor; CODI majors only.

CD 384 INTRODUCTION TO DIAGNOSTIC PROCEDURES IN SPEECH-LANGUAGE PATHOLOGY. (3)
Introduction to the principles, techniques, and tools used to develop and implement a diagnostic protocol. Prereq: CD 588 or permission of instructor; CODI majors only.

CD 511 SPEECH-LANGUAGE DEVELOPMENT AND DISORDERS FOR THE SEVERELY HANDICAPPED. (3)
An introduction to communication development and intervention for language disordered individuals whose language age is at or below four years, including cognitive, social, auditory, visual, and motor components. Topics include prerequisites for language, normal communication development, evaluation of language functioning, and approaches to altering communication behavior. Prereq: CD 277 or EDS 375 or consent of instructor. (Same as EDS 511).

CD 512 SPEECH-LANGUAGE DEVELOPMENT AND DISORDERS FOR THE MILDLY HANDICAPPED. (3)
An introduction to the characteristics of receptive and expressive language disorders in language-disordered children whose language age is four years or higher, including auditory, visual, cognitive, and motor components. Topics include language development, language disorders, language evaluation, and techniques for receptive and expressive language stimulation. Prereq: CD 277 or EDS 375 or permission of instructor. (Same as EDS 512).

CD 514 LANGUAGE DEVELOPMENT THROUGH THE LIFESPAN. (3)
An introduction to the normal development of language in individuals from birth to advanced age. Topics include theories of language acquisition; prelinguistic development; development in each of the language domains (phonology, semantics, morphology, and syntax, and pragmatics); the relationships between oral language, written language, and academic progress; and cultural differences. Prereq: CD 277 or permission of instructor.

CD 515 LANGUAGE ASSESSMENT AND REMEDIATION. (3)
An introduction to the assessment and remediation of language disorders in individuals from birth to adulthood. Topics include characteristics of language disorders, assessment of prelinguistic and linguistic skills, methods of language remediation, and techniques for stimulating the development of prelinguistic and linguistic skills. Prereq: CD 514 or permission of instructor.

CD 521 NONSPEECH COMMUNICATION. (3)
Addresses the use of nonspeech communication systems with moderately to severely handicapped individuals. This course encompasses two basic components: 1) a lecture/discussion component which examines the full range of nonspeech communication systems, including evaluation and training considerations, and 2) a manual sign component which provides students with a basic functional receptive and expressive manual sign vocabulary. Prereq: EDS 375 or equivalent or permission of instructor.

CD 555 PROBLEMS IN COMMUNICATION DISORDERS (Subtitle required). (1-4)
In-depth study of a current topic or issue in communication disorders. A specific topic will be assigned each time the course is offered. May be repeated to a maximum of nine credits.

CD 585 SPEECH SCIENCE. (3)
To provide basic information concerning the physics of sound and the scientific bases of speech production and perception. Emphasis is placed on the acoustic nature of speech and the perception of spoken information. Instrumentation in speech science will be demonstrated. Prereq: CODI major or permission of instructor.

CD 587 AUDIOMETRY. (3)
Introduction to basic clinical techniques for assessing hearing acuity. Topics include principles and techniques of: school age identification audiometry and hearing conservation programs, pure tone air and bone conduction threshold testing, speech audiometry, masking, and audimetric calibration. Prereq: CD 380 or permission of instructor.

CD 588 DISORDERS OF ARTICULATION. (3)
Analysis, identification and management of articulation disorders. Application of physiological-phonological procedures for remediation is included. Prereq: CD 285 and CD 277, or permission of instructor.

CD 591 AURAL REHABILITATION. (3)
Introduction to management strategies, exclusive of language, for the hearing impaired. Topics include: variables affecting hearing handicap, hearing aid characteristics, selection, and orientation; acoustic and visual aspects of speech; auditory and visual perception and training; speech conservation. Prereq: CD 587.

CD 610 ETHICS IN CLINICAL SCIENCES RESEARCH. (1)
Students will examine ethical issues in biomedical research using a case-study approach. Representative issues addressed may include data selection and retention, plagiarism, scientific review of grants and manuscripts, scientific misconduct, and informed consent. Prereq: Graduate student status. (Same as CLS/CNU/PT/RAS 610.)

CD 647 ADVANCED LANGUAGE DISORDERS. (3)
Developmental and structured approaches to language evaluation and remediation. Assessment of language levels, knowledge of the language system and variables influencing language functioning in children in relation to devising intervention strategies. Presentation of remediation techniques for children aged 0 to 21. Prereq: CD 514 and CD 515, or permission of instructor.

CD 655 ADVANCED DIAGNOSTIC PROCEDURES IN SPEECH-LANGUAGE PATHOLOGY. (3)
Study of the principles of assessment and a critical review of existing standardized and non-standardized assessment tools in the field of speech-language pathology. Emphasis on selection of assessment tools for clients from diverse ethnic backgrounds with a variety of communication disorders, administration of selected tools, and organization of diagnostic information. Prereq: CD 384 or permission of instructor; CODI majors only.

CD 656 CLINICAL PRACTICUM IN DIAGNOSTIC PROCEDURES FOR SPEECH-LANGUAGE PATHOLOGY. (1)
Experience in the assessment of speech and language skills in children and adults. Emphasis on organization of all behavioral and test data and on report writing. Laboratory, two hours per week. May be repeated to a maximum of twelve credits. Prereq: CD 382 and CD 383 or equivalent; permission of instructor.

CD 657 CLINICAL PRACTICUM IN SPEECH-LANGUAGE PATHOLOGY. (3)
Experience with children and adults in the management of speech and language disorders. May be repeated to a maximum of twelve credits. Prereq: CD 382 and CD 383 or equivalent; permission of instructor.
This course aims to improve the student's ability to communicate with patients and the U.S. will be studied.

Oral health problems in Kentucky and knowledge of concepts of dental public health and dental epidemiology that are used

#CDE 815 FUNDAMENTALS OF DENTAL PUBLIC HEALTH. (1)

Fundamentals of Dental Public Health is a first year course designed to increase student knowledge of concepts of dental public health and dental epidemiology that are used in population based (community) health care. Oral health problems in Kentucky and the U.S. will be studied.

CDE 824 COMMUNICATION IN THE DENTAL HEALTH CARE SETTING. (1)

This course aims to improve the student’s ability to communicate with patients and the public in an empathetic and professional manner. Methods of obtaining necessary health information from all types of patients are taught. Prereq: Second year standing in the College of Dentistry. (Same as BSC 824.)

CDE 830 DENTAL PRACTICE MANAGEMENT I. (2)

This course is designed to assist the third-year student in examining and formulating attitudes and values regarding current issues in the dental profession and the health care system. A clinical experience introducing students to use of a dental assistant is also included. Students are provided an opportunity to begin a process of career planning by examining how current issues may affect career options and selections in the future prior to a summer dental practice field experience. Lecture, 36 hours; clinic, 15 hours. Prereq: Third-year standing in the College of Dentistry.

CDE 841 DENTAL PRACTICE FIELD EXPERIENCE. (6-10)

Students are provided a full-time, off-campus assignment to a dental practice environment for a period of 6-10 weeks. Students spend an average of 32 hours each week participating in practice management and patient treatment activities under the supervision of a dentist. Approximately eight hours a week are spent in career plan development and in study of the community or region, particularly its health care delivery system and the role of dentistry in that system. Prereq: CDE 830.

CDE 844 DENTAL PRACTICE MANAGEMENT II. (7)

This course will provide fourth-year dental students with information needed to establish, manage and maintain a vital dental practice. Recognizing that the career goals of students vary, the course material will encompass a broad range of management principles. This course also includes a seven-week clinical rotation in dental auxiliary utilization. Lecture, 69 hours; clinic, 147 hours. Prereq: CDE 830 or consent of course director.

CDE 850 COMMUNITY DENTISTRY ELECTIVE. (1-10)

Elective courses offered by the Department of Community Dentistry provide opportunities for further study of or experience in various aspects of community dentistry. Topics may include analysis and evaluation of scientific literature, principles of scientific communication, dental practice field experiences during the summer and academic year, and principles of health care organization. Hours variable, ranging from a minimum of 16 hours lecture/discussion to a maximum of 10 weeks clinical experience. May be repeated to a maximum of 10 credits. Prereq: The minimum year in dental school and any course prerequisites will be announced for each topic.

#CDE 880 TREATMENT OF DENTAL FEAR. (1)

This advanced course in the treatment of dental fear is intended to prepare the student to manage very fearful dental patients. Topics covered include etiologies, diagnosis and types, relaxation and distraction, and case histories. Note: Scheduling for the course will take place outside of regularly scheduled clinic/class time. Prereq: CDS 823 and consent of course director. (Same as BSC 880.)

#CDE 881 COMPUTER APPLICATIONS IN DENTISTRY. (1)

This course introduces the student to a variety of computer applications available for dentistry. Sessions will consist mainly of demonstrations of these applications, but students will also gain hands-on experience wherever possible. Topics include dental imaging and processing, the use of interactive video disk and other computer hardware as instructional tools, accessing national databases and performing literature searches, electronic mail, computer-aided orthodontic diagnosis and treatment, the Internet, and other applications. Note: Scheduling for this class will be outside of regularly scheduled clinic/class time.

#CDE 882 TEAM MANAGEMENT OF LONG TERM CARE RESIDENTS. (1)

Students from the disciplines of dentistry, medicine, pharmacy, physical therapy, and nursing will participate in a three week rotation at a local long term care facility (LTC) designed to orient students to multidisciplinary approach to patient care. During these three weeks the students will explore the various aspects of long term care both through on site experience and didactic involvement with core faculty. A student from each discipline will be assigned to a team to evaluate one or more residents, and to propose an overall treatment course involving several aspects of patient care. Note: Scheduling for this course will occur outside of regularly scheduled clinic/class time for students. Prereq: 3rd or 4th year standing.

CDS Conjoint Dental Science

CDS 611 CHILD GROWTH AND DEVELOPMENT PART I. (2)

A seminar course on nature and physiologic control of physical growth, for graduate students in dentistry. Prereq: Admission to a graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.

CDS 612 CHILD GROWTH AND DEVELOPMENT PART II. (2)

A seminar course for graduate students in dentistry covering emotional and intellectual growth of children, and diseases and congenital anomalies of children. Prereq: Admission to graduate program of the College of Dentistry; D.D.S. or D.M.D. degree.
CDS 631 PRINCIPLES OF DENTAL OCCLUSION.  
This course is designed to give the student as broad as possible a view of the complex subject of dental occlusion. Prereq: Admission to dental graduate program; D.D.S. or D.M.D. degree.

CDS 748 MASTER’S THESIS RESEARCH.  
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Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

CDS 768 RESIDENCE CREDIT FOR THE MASTER’S DEGREE.  
(1-6)
May be repeated to a maximum of 12 hours.

CDS 810 NEW DEVELOPMENTS IN DENTISTRY I.  
(1-2)
This course will cover selected new developments in dentistry or treat with added emphasis established dental skills and knowledge. The topics will be in such areas as the basic sciences, behavioral science, clinical dentistry, dental practice management, and community dentistry. Methods of instruction will vary, depending on topics. When offered, this course will be required of first-year dental students. May be repeated to a maximum of four credits. Prereq: First-year standing in the College of Dentistry; any course prerequisite will be announced.

CDS 812 NORMAL HUMAN GROWTH AND DEVELOPMENT.  
(1)
This is a lecture course which introduces basic concepts of normal human growth and development from birth through adolescence. Lectures emphasize the time-dependent changes that normally occur during physical and psychological maturation. A special emphasis is directed toward basic knowledge and understanding of craniofacial growth and development of the teeth and occlusion. Lecture, 18 hours. Prereq: ANA 530, ANA 536; concur: ANA 532, ANA 534.

CDS 813 MANAGEMENT I: INTRODUCTION TO MANAGEMENT FOR THE DENTIST.  
(2)
In this introductory course in management for the dentist, basic concepts will be presented which can be applied in the management of time, people, facilities and money. Instruction leading to certification in cardiopulmonary resuscitation is also included. Lecture, 45 hours. Prereq: Admission to the College of Dentistry.

CDS 815 INTRODUCTION TO CLINICAL DENTISTRY.  
(4)
This survey course presents an overview of patient examination and evaluation including techniques of examination, diagnostic procedures, preventive dentistry, infection control, charting and record keeping. This course will prepare students for subsequent clinical experiences. Lecture, 42 hours; laboratory, 18 hours. Prereq: Admission to the College of Dentistry.

CDS 816 THE PROFESSION OF DENTISTRY.  
(1)
This course is an introduction to life in the profession of dentistry. The course will explore normal everyday morality, and consider whether a case can be made for an extraordinary morality or ethic for practitioners. The course will conclude with a brief review of the history of dentistry to enable the student to place the profession of dentistry in cultural and historical perspective. Prereq: Admission to the College of Dentistry.

CDS 819 SPECIAL TOPICS IN DENTISTRY.  
(1)
This course will have first-year dental students consider important social, educational, and professional issues they will encounter during dental school and in their careers. The topics range from cultural diversity, professional and academic responsibility, sexual harassment awareness, minority health and related issues, to time management, personality type, and learning/teaching styles. Prereq: First-year standing.

CDS 820 NEW DEVELOPMENTS IN DENTISTRY.  
(1-2)
This course will cover selected new developments in dentistry or treat with added emphasis established dental skills and knowledge. The topics will be in such areas as the basic sciences, behavioral science, clinical dentistry, dental practice management, and community dentistry. Methods of instruction will vary, depending on topics. When offered, this course will be required of second-year dental students. May be repeated to a maximum of four credits. Prereq: Second-year standing in the College of Dentistry; any course prerequisites will be announced.

CDS 821 LOCAL ANESTHESIA.  
(1)
The action and dosage of local anesthetic agents used in dentistry are taught as are the proper injection techniques. The technique of venipuncture and administration of intravenous drugs are also included. Patient evaluation and emergency techniques for cardiac and respiratory resuscitation are reviewed. Lecture, six hours; self-instruction, 10 hours; clinic, five hours. Prereq: ANA 534; corequisite: OBI 822.

CDS 823 MANAGEMENT II: PATIENT COMMUNICATION.  
(1)
The primary purpose of this course is to improve students’ ability to interact with patients in an empathetic and professional manner. Proper management of all assigned patients is required. Instruction leading to recertification in cardiopulmonary resuscitation is provided. Lecture, 26 hours. Prereq: CDS 813.

CDS 824 PRINCIPLES OF PATIENT MANAGEMENT I.  
(1)
This course presents the rationale for the development of the University of Kentucky College of Dentistry Preliminary, Phase I and Phase II treatment plans and a method of critically evaluating treatment results. Basic UKCD clinical protocol is presented and discussed. Lecture, 25 hours. Prereq: CDS 811 or consent of course director.

CDS 830 NEW DEVELOPMENTS IN DENTISTRY III.  
(1-2)
This course will cover selected new developments in dentistry or treat with added emphasis established dental skills and knowledge. The topics will be in such areas as the basic sciences, behavioral science, clinical dentistry, dental practice management, and community dentistry. When offered, this course will be required of third-year dental students. May be repeated to a maximum of four credits. Prereq: Third-year standing in the College of Dentistry; any course prerequisites will be announced.

CDS 831 CONSCIOUS SEDATION.  
(1)
This course is designed to teach the principles of nitrous oxide-oxygen inhalation sedation and intravenous sedation in dentistry. The management of emergencies associated with these techniques and an introduction to the principles of general anesthesia are also included. Lecture, 21 hours; clinic, four hours. Prereq: CDS 821, OBI 824.

CDS 833 MANAGEMENT III: SPECIAL PATIENT MANAGEMENT.  
(1)
This course introduces the dental student to various incapacitating conditions and teaches the proper methods of physical management of handicapped patients needed to provide dental care. Proper management of all assigned dental patients is required. Instruction leading to recertification in cardiopulmonary resuscitation is also included. Lecture, 26 hours; laboratory, 3 hours; clinic, 3 hours per term. Prereq: CDS 823.

CDS 836 DIAGNOSIS AND MANAGEMENT OF FACIAL PAIN.  
(2)
This course will cover selected new developments in dentistry or treat with added emphasis established dental skills and knowledge. The topics will be in such areas as the basic sciences, behavioral science, clinical dentistry, dental practice management, and community dentistry. Methods of instruction will vary, depending on topics. When offered, this course will be required of fourth-year dental students. May be repeated to a maximum of four credits. Prereq: Fourth-year standing in the College of Dentistry; any course prerequisites will be announced.

CDS 840 NEW DEVELOPMENTS IN DENTISTRY IV.  
(1-2)
This course will cover selected new developments in dentistry or treat with added emphasis established dental skills and knowledge. The topics will be in such areas as the basic sciences, behavioral science, clinical dentistry, dental practice management, and community dentistry. Methods of instruction will vary, depending on topics. When offered, this course will be required of fourth-year dental students. May be repeated to a maximum of four credits. Prereq: Fourth-year standing in the College of Dentistry; any course prerequisites will be announced.

CDS 843 MANAGEMENT IV: GERIATRIC DENTISTRY.  
(2)
Emphasis in this course is placed on developing abilities to make individual treatment decisions for elderly dental patients and acquiring positive attitudes towards the provision of oral health care to the aged. Students will make site visits to residential centers for the elderly. Proper management of all assigned dental patients and instruction leading to recertification in cardiopulmonary resuscitation are also included. Lecture, 23 hours; laboratory, 12 hours. Prereq: CDE 810 and CDS 833 or consent of course director.

CDS 844 DRUG MISUSE, ABUSE AND DEPENDENCY: WHAT DENTISTS NEED TO KNOW.  
(1)
This course is designed to provide new insights and understanding into prevention, recognition and treatment of patients with, and at risk for, drug misuse and abuse. The course enables dental students to understand addiction as primary, chronic and progressive disease and to demonstrate an understanding of the pharmacology, abuse potential, as well as the behavioral and physiological effects of the commonly abused drugs. Emphasis will be on increasing dental students skills and abilities to recognize the signs and symptoms of drug abuse; identify and manage patients at risk for drug problems; and become effective in providing successful care for drug dependent patients while minimizing their potential for relapse.
CE 106 COMPUTER GRAPHICS AND COMMUNICATION. (3)
Introduction to the use of scale, dimensioning, and orthographic projections. Graphical solution of spatial problems. Integrated application of computer graphics. Lecture, two hours; laboratory, four hours per week. Prereq: High school algebra and trigonometry or equivalent.

CE 120 INTRODUCTION TO CIVIL ENGINEERING. (1)
An introduction to the civil engineering profession and the use of computer hardware and software in CE systems analysis and design. Presentations will be used to illustrate the conception, design, construction, and operation processes. Sample problems and class exercises on the various technical areas of civil engineering will make use of existing computer software packages and teamwork principles.

CE 199 TOPICS IN CIVIL ENGINEERING (Subtitle required). (1-4)
An experimental, topical, departmental, or interdisciplinary course devoted to a special topic of current interest to civil engineering and approved by the chairperson of the department of civil engineering and the dean of the college. May be repeated to a maximum of eight credits, but not more than four credits may be earned under the same title. Prereq: Consent of the instructor.

*CE 211 SURVEYING. (4)
A comprehensive course in the art and science of surveying as applied to civil and mining engineering, including the use and care of surveying instruments; measurement of horizontal and vertical distances, angles and directions; collection of ground and underground data for the design and layout of roads, buildings, various mineral workings, and other structures; and some aspects of the precise determination of position and direction for survey control. Lecture, three hours; laboratory, three hours per week. Prereq: CE 106, CE 121 or MNG 101, MA 114. (Same as MNG 211.)

CE 250 TECHNOLOGY AND THE ENVIRONMENT. (3)
An introduction to the issues associated with environmental pollution and the role of technology in the solution to environmental problems. Topics to be discussed include air pollution, water treatment, water pollution sources and control measures, environmental concerns arising from the use of nuclear and fossil fuels, solid and hazardous waste management, and economic and regulatory constraints. This course may not be taken by CE majors.

CE 303 INTRODUCTION TO CONSTRUCTION ENGINEERING. (3)
The study of the planning, administration, and management of construction projects and an introduction to the methodology utilized in executing specified designs. Emphasis is placed on the organization of construction firms, development of construction documents, theory of estimating and quantity take-offs, contractual and management systems, scheduling project administration, and inspection of construction operations. Prereq: Registration in College of Engineering.

CE 331 TRANSPORTATION ENGINEERING. (3)

CE 341 FLUID MECHANICS I. (3)
Fundamental principles of fluid flow. Includes fluids at rest (hydrostatics) and fluids in motion. Continuity, momentum and energy relations, ideal and viscous fluids. Emphasis on incompressible fluids (liquids). Prereq: ME 220 and registration in the College of Engineering.

CE 351 INTRODUCTION TO ENVIRONMENTAL ENGINEERING. (3)
Overview of environmental chemistry and microbiology, water quality, water and wastewater treatment, solid and hazardous wastes management, hazardous waste remediation, and air pollution control. Emphasis on the basic science and engineering principles required to understand both natural and engineered systems, as well as the engineering approach to understanding the natural environment and specific treatment mitigation methods. Prereq: CHE 107, MA 214, PHY 231, and registered in the College of Engineering, or consent of instructor.

*CE 381 CIVIL ENGINEERING MATERIALS I. (3)
A study of the microscopic and macroscopic structures and properties of materials used in civil engineering construction with emphasis on the relationships of their physical and mechanical properties to engineering design and application. Written reports and oral presentation of results will be required. Lecture, two hours; laboratory, three hours per week. Prereq: EM 302 and registration in College of Engineering.

*CE 382 STRUCTURAL MECHANICS. (3)

CE 395 INDEPENDENT WORK IN CIVIL ENGINEERING. (1-6)
Individual work on some selected problem in the field of civil engineering. May be repeated for a maximum of six credits. Prereq: Engineering standing, consent of department chairperson and the instructor.

CE 401 SEMINAR. (1)
A discussion of the ethical and professional aspects of civil engineering practice. Concepts of loss prevention and conflict resolution. Structured small group discussion, oral presentations, and role playing. Lecture, two hours per week. Prereq: Senior classification and engineering standing.

CE 403 CONSTRUCTION METHODOLOGY. (3)
A study of the methodology used in construction, with an emphasis on the selection and application of resources: labor, materials, equipment, money and time. The importance of cost and quality is stressed. Weekly lab periods are used to acquaint the student with actual construction operations. This course may be taken in place of either CE 485G, or CE 486G. Prereq: Consent of instructor.

CE 411G TECHNOLOGY AND THE ENVIRONMENT. (3)
The study of the planning, administration, and management of construction projects and an introduction to the methodology utilized in executing specified designs. Emphasis is placed on the organization of construction firms, development of construction documents, theory of estimating and quantity take-offs, contractual and management systems, scheduling project administration, and inspection of construction operations. Prereq: Registration in College of Engineering.

CE 421 CIVIL ENGINEERING SYSTEMS ANALYSIS. (3)
An introduction to systems analysis and operation research, with applications in civil engineering. Probability and statistics, regression analysis, linear and nonlinear analysis, numerical calculus, linear and nonlinear optimization techniques, and mathematical simulation. Emphasis on setting up mathematical models to analyze civil engineering systems. Prereq: CS 221 or CS 223; or prerequisite or concurrent: CE 303, 331, 341, 382; and engineering standing.

CE 441 FLUID MECHANICS II. (3)
Application of basic fluid mechanics to problems of importance to civil engineering practice. This includes pipe flow (pipe networks), open channel flow, culvert flow, flow through meters, pumps, and turbines. Prereq: CE 341, CS 221 or CS 223 and engineering standing.

CE 451 WATER AND WASTEWATER TREATMENT. (3)
Fundamentals of the design and operation of water and wastewater treatment facilities. Prereq: CE 341, CE 351, and engineering standing or consent of instructor.

CE 460 FUNDAMENTALS OF GROUNDWATER HYDROLOGY. (3)
The first course in the physics of saturated flow in porous media. Topics include groundwater occurrence, Darcian flow, well hydraulics, flow nets and layered systems flow. The basic concepts of pollutant movement and unsaturated flow are introduced and case studies are analyzed. Prereq: ME 330 or CE 341 or consent of instructor. (Same as AEN 438G.)

CE 461G HYDROLOGY. (3)
A study of the factors affecting the occurrence, movement and utilization of water including meteorological considerations, evaporation, transpiration, runoff relationships, hydrograph analysis, and ground water management. Prereq: CE 341, engineering standing or consent of instructor.

CE 471G SOIL MECHANICS. (3)
A study of the strength, deformation and hydraulic properties of soils and their relationship to settlement, stress distribution, earth pressure, bearing capacity and slope stability. Written and oral presentations of student projects will be required. Lecture, two hours; laboratory, three hours per week. Prereq: EM 302; prerequisite or concurrent: GLY 240; and engineering standing or consent of instructor.

CE 482 ELEMENTARY STRUCTURAL DESIGN. (3)
Application of principles of solid mechanics to the design of steel, timber, and reinforced concrete members and structures. Emphasis on basic ideas and their application to practical design of relatively simple structures according to the building code. Credit may not be used to satisfy degree requirements if credit is earned in CE 485G, or CE 486G, or CE 487G. Prereq: CE 382 and engineering standing.

CE 486G REINFORCED CONCRETE STRUCTURES. (3)
Theory and design of beams, slabs, girders and columns as related to building frames and bridges. Introduction to pre-stressed concrete, elastic design and ultimate strength design. Concur: CE 487G; prerequisite: CE 382 and engineering standing, or consent of instructor.
CE 487G STEEL STRUCTURES. (3)

CE 503 CONSTRUCTION ESTIMATING. (3)
This course investigates the principles of predicting and controlling the cost of construction projects. Items studied include feasibility studies, preliminary and detailed estimating, budgeting, monitoring and variance analysis. Computer applications for construction estimating will be stressed. Prerequisite: CE 403 and engineering standing or consent of instructor.

CE 505 CONSTRUCTION PROJECT PLANNING AND MANAGEMENT. (3)
A study of the planning process and fundamental management procedures for construction projects. Special attention given to: planning of methods and resources; use of schedules; monitoring time; managing cash flow and costs; and overall project administration and record keeping. Prerequisite: CE 403 and engineering standing, or consent of instructor.

CE 506 THE ENGINEER, THE LAW, AND THE ENVIRONMENT. (3)
The impact of engineering activities on the environment and the resulting legal implications. The interrelationships between engineering and law as they affect such areas as water quality and pollution, air quality and pollution, noise pollution, visual pollution, land use planning and energy considerations and the conservation and (or) preservation of natural resources. Prerequisites: Engineering standing or consent of instructor.

CE 517 BOUNDARY LOCATION PRINCIPLES. (3)
Procedures for locating or relocating the boundaries of real property; records searching, technical aspects of field work, preparation of descriptions and survey reports, land data systems, legal aspects, special problems. Prerequisite: CE 211 or CE 215, engineering standing or consent of instructor.

CE 518 ADVANCED SURVEYING. (3)
Principles of precise survey procedures in triangulation, trilateration, traverse and leveling; adjustment computations; theory and practice of electronic distance measurement; basic geodesy and state plane coordinate systems; applications to the horizontal and vertical control of engineering projects; review of modern land surveying problems and procedures. Lecture, two hours; laboratory, three hours per week. Prerequisite: MA 214, CE 211 or CE 215, and engineering standing.

CE 521 ENGINEERING ECONOMY. (3)
Economic evaluation and financial analysis of engineering alternatives in which the goal of economic efficiency is applied to engineering design. Prerequisite: Engineering standing.

*CE 531 TRANSPORTATION FACILITIES DESIGN AND OPERATIONS. (3)
Analysis of transportation facilities through a diagnostic study of transportation systems with emphasis on design, capacity and safety. Engineering practice oriented toward open-ended design solutions, mostly focused on roadway design. Prerequisite: CE 211, CE 331, and engineering standing.

CE 533 RAILROAD FACILITIES DESIGN AND ANALYSIS. (3)
Principles of railroad location, construction, rehabilitation, maintenance, and operation with emphasis on track structure design and analysis, bridges and bridge loading, drainage considerations, track geometry effects, and operating systems analysis. Prerequisite: CE 331, CE 381, CE 382; concurrent: CE 471G and engineering standing.

CE 534 PAVEMENT DESIGN, CONSTRUCTION AND MANAGEMENT. (3)
Design, analysis, construction, and management of flexible and rigid pavements. Stress and strains, pavement materials, subgrade soil stabilization, bases and subbases, quality control, drainage, pavement-type selection, and pavement management. Prerequisite: CE 381, prerequisite or concurrent CE 471G, and engineering standing.

CE 539 TRANSPORTATION SYSTEMS DESIGN. (4)
Introduction to the processes and procedures for transportation systems design. Policy design, functional design and sizing, operation and schedule design, location and geometric design, supporting structures design as they individually and collectively affect the efficiency of transportation systems. Written and oral presentation of student projects will be required. Lecture, three hours; laboratory, three hours per week. Prerequisite: CE 211 or CE 215 and CE 331 and engineering standing.

CE 546 FLUVIAL HYDRAULICS. (3)
Rainfall physics, principles of erosion on upland areas and construction sites, sustainable channel design in alluvial material, mechanics of sediment transport, river mechanics, reservoir sedimentation. Prerequisite: CE 461G, ME 330 and engineering standing. (Same as AEN 536.)

CE 549 ENGINEERING HYDRAULICS. (3)
Analysis of flow in closed conduits and natural and artificial open channels. Design of hydraulic structures. Prerequisite: CE 341, CE 441 and engineering standing. (Same as AEN 545.)

CE 556 SOLID AND HAZARDOUS WASTE MANAGEMENT. (3)
Study of the generation and management of solid and hazardous wastes. Application of engineering principles to the collection, transport, processing, resource recovery and ultimate disposal of these wastes. Prerequisite: CE 471G, CE 521 or consent of instructor and engineering standing. (Same as AEN 556.)

CE 560 GROUNDWATER MODELING. (3)
An introduction to the practical aspects of numerical modeling techniques as applied to the solution of groundwater flow and groundwater pollution problems. Steady state and transient models of regional groundwater flow. Effect of river, pumping wells, and natural geological barriers. Models of regional groundwater pollution. Delineation of capture zones and particle tracking models. Modeling of remedial actions at contaminated sites. Prerequisite: CE 461G or equivalent and CS 221 or CS 223 or equivalent.

CE 569 WATER RESOURCES SYSTEM DESIGN. (4)
Application of principles of hydrology, hydraulics, and environmental engineering in the planning, design, and analysis of a comprehensive water resource project. Emphasis on basic ideas and their application to the practical design of water supply, distribution, collection and treatment facilities. Written and oral presentation of student projects will be required. Lecture, three hours; laboratory, three hours per week. Prerequisite: CE 451, 461G, 549 and engineering standing. (Same as AEN 569.)

CE 579 GEOTECHNICAL ENGINEERING. (3)
Application of the principles of soil mechanics and structural mechanics to the design of retaining walls, bracing for excavations, footings, mat and pile foundations and to the analysis of the stability of earth slopes. Prerequisite: CE 471G and engineering standing.

CE 580 BITUMINOUS MATERIALS AND MIXTURES. (3)
Production, specifications, and tests of bituminous materials and paving mixtures; design and evaluation of asphalt concrete for construction and maintenance; inspection, quality control of street, parking and highway paving mixtures. Lecture; two hours; laboratory, three hours per week. Prerequisite: CE 381; concurrent: CE 471G.

CE 582 ADVANCED STRUCTURAL MECHANICS. (3)
Approximate methods of frame analysis; energy principles; flexibility and stiffness methods for trusses, frames, arches, nonprismatic members and flexible connections; supports; influence lines for statically indeterminate structures; introduction to plastic analysis; and use of available computer programs for structural analysis and matrix operations. Prerequisite: CE 382 and engineering standing.

CE 583 SUSPENSION BRIDGES. (3)
Analysis and design of suspension bridges. Derivation of governing equations and application to existing structures. Prerequisite: CE 487G and engineering standing.

CE 586 PRESTRESSED CONCRETE. (3)
Fundamental basis and underlying principles for the analysis and design of prestressed concrete. Working stress and ultimate strength design methods, full and partial prestressing. Design for shear and torsion, deflection, crack control, and long-term effects, and prestress losses. Composite beams, continuous slabs, slabs, short and slender columns, precast structures and their connections. Prerequisite: CE 486G and engineering standing.

CE 589 DESIGN OF STRUCTURAL SYSTEMS. (4)
Design loads and structural systems. Systems concepts in planning analysis, design and construction of structures. Buildings, bridges, special structures and foundations. Computer aided design and drafting (CADD) utilizing microcomputers and the mainframe computer. Written and oral presentations of student projects will be required. Lecture, three hours; laboratory, three hours per week. Prerequisite: CE 487G and CE 486G and engineering standing or consent of instructor; Coreq: CE 579.
CE 599 TOPICS IN CIVIL ENGINEERING  
(Subtitle required).  
A detailed investigation of a topic of current significance in civil engineering such as: design of small earth dams, man and the environment, drilling and blasting, scheduling construction operations, construction equipment and methods, traffic safety, optimum structural design, environmental impact analysis, systems analysis in civil engineering, motor vehicle noise and its control. May be repeated to a maximum of eight credits, but only four credits can be earned under the same title. A particular topic may be offered at most twice under the CE 599 number. Prereq: Variable; given when topic is identified; plus engineering standing.

PREREQUISITE FOR GRADUATE WORK: Students desiring to take any of the following courses should have a thorough working knowledge of chemistry, physics and mathematics. For major work, a candidate must hold a bachelor’s degree in civil engineering or its equivalent.

CE 601 CONSTRUCTION EQUIPMENT.  
(3) 
Analysis of construction equipment use and economics. Selection and matching equipment for productivity and cost effectiveness. Mathematical simulation of construction operations. Prereq: CE 403, CE 503, or consent of instructor.

CE 602 CONSTRUCTION PROJECT MANAGEMENT.  
(3) 
Management of construction projects: planning, estimating, scheduling and control; organization; site management; material management; safety management; quality management; construction labor relations; productivity management; claims. Prereq: CE 503, CE 505, or consent of instructor.

CE 605 NEW ENGINEERING ENTERPRISES.  
(3) 
The course covers the theory and actual practices of organization, management and operation of engineering companies. Primary emphasis on construction companies; however, the principles apply to most service oriented engineering companies. Students will be required to do several independent exercises related to establishing an engineering company. Prereq: CE 505, graduate standing in engineering, or consent of instructor.

CE 633 AIR TRANSPORT ENGINEERING.  
(3) 
Planning location and design of airports, STOL ports, and heliports. Air traffic operations, performance and control as related to facility requirements. Role of governmental agencies. Prereq: CE 551 or consent of instructor.

CE 634 TRAFFIC CHARACTERISTICS.  
(3) 
Vehicle operating characteristics: driver, pedestrian and roadway characteristics as they individually, and collectively as traffic stream characteristics, are related to the planning design and operation of highway facilities. Prereq: CE 331.

CE 635 HIGHWAY SAFETY.  
(3) 
A detailed review of the impacts of safety considerations on highway design and planning, focusing on the highway environment, its users (both vehicles and drivers) and their interactions. The role of special interest groups (tracking industry, insurance agencies) is also examined. Prereq: CE 539 or consent of instructor.

CE 641 MECHANICS OF LIQUID FLOW IN PIPES.  
(3) 

CE 642 OPEN CHANNEL FLOW.  
(3) 
The hydraulics of free surface flow including such topics as uniform flow, varied flow, unsteady flow, the hydraulic jump flow transitions, spillways and channel delivery. Prereq: CE 341. (Same as AEN 642).

CE 651 FUNDAMENTALS OF WATER QUALITY CONTROL I.  
(3) 
Theory and practices of water and wastewater treatment with emphasis on physical and chemical processes for municipal and industrial wastewater treatment. Prereq: CE 451 or consent of instructor.

CE 652 FUNDAMENTALS OF WATER QUALITY CONTROL II.  
(3) 
Theory and practices of wastewater treatment with emphasis on biological treatment processes for municipal and industrial wastewater treatment. Prereq: CE 451 or consent of instructor.

CE 653 WATER QUALITY IN SURFACE WATERS.  
(3) 
Water quality requirements for various beneficial uses. Analysis of dispersion, advection, evaporation, natural aeration, biological oxidation and photosynthesis; their effects on the physical, chemical and biological quality of waters in streams, lakes, reservoirs, estuaries and other surface waters. Eutrophication. Prereq: MA 214 and CE 451, or consent of instructor. (Same as AEN 653).

CE 654 PRINCIPLES OF WATER AND WASTEWATER TREATMENT PROCESSES.  
(3) 
Physical, chemical, and biological principles of water and wastewater treatment processes. Basic concepts such as chemical kinetics and equilibrium, acid-base chemistry, oxidation-reduction reactions and acid mine drainage, reactor design, mass transfer, and microbial metabolism are emphasized. Prereq: CE 451 or consent of instructor.

CE 660 GROUNDWATER HYDROLOGY.  
(3) 
The equations of saturated and unsaturated groundwater flow, the formulation of boundary value problems, and some analytical methods of solution. Solutions using Fourier series, solutions involving the Fourier transform and the Fourier sine and cosine transforms. The Boltzman transformation, development of the Philip solution for horizontal and vertical flow. Mathematical statement of the saturated and unsaturated groundwater pollution problem and some analytical methods of solution. The semigroup solution of the resulting evolution equation, examples of solutions using the Laplace transform and the Fourier transform, more complex solutions in two-dimensional and three-dimensional domains, solutions for distributed sources in time and in space, solutions for time-varied boundary conditions. Prereq: MA 214, CE 461G or equivalent. (Same as AEN 638).

CE 662 STOCHASTIC HYDROLOGY.  
(3) 

CE 665 WATER RESOURCES SYSTEMS.  
(3) 
Application of systems analysis, mathematical modeling, and optimization in water resources management and design. Solution of engineering problems found in water supply, water quality, urban drainage, and river basin development and management by use of linear, nonlinear, and dynamic programming models. Prereq or concur: CE 421 and CE 569 or consent of instructor. (Same as AEN 665).

CE 667 STORMWATER MODELING.  
(3) 
Introduction to deterministic and parametric modeling approaches for mathematically simulating stormwater runoff and quality. Emphasis on modeling concepts and model formulation. Analysis of deterministic component models and their linkage. Formulation of existing parametric models. Presentation of methods for parameter optimization and regionalization. Demonstration of linkage between the two approaches with illustrative examples. Prereq: CE 341 and CE 461G, or consent of instructor. (Same as AEN 667).

CE 671 ADVANCED SOIL MECHANICS.  
(3) 
Detailed study of soil behavior. Specific topics include soil classification and structure, strength and deformational behavior, compaction, consolidation, and stress distribution in earth masses. Prereq: CE 471G or consent of instructor.

CE 676 GROUNDWATER AND SEEPAGE.  
(3) 

CE 679 GEOTECHNICAL EARTHQUAKE ENGINEERING.  
(3) 

CE 681 ADVANCED CIVIL ENGINEERING MATERIALS.  
(3) 

CE 682 ADVANCED STRUCTURAL ANALYSIS.  
(3) 
Theory and application of energy principles for plane and space frames; material and geometric nonlinearities; and nonlinear solution schemes. Prereq: CE 582 or consent of instructor.

CE 684 SLAB AND FOLDED PLATE STRUCTURES.  
(3) 
Design and analysis of reinforced concrete floor slabs and folded plate roofs. Elastic and inelastic methods. Prereq: CE 582 or consent of instructor.
CE 789 TOPICS IN CIVIL ENGINEERING
(Subtitle required.) (1-4)
An advanced level presentation of a topic from one of the major areas of civil engineering such as hydraulics, geotechnics, structures, transportation, surveying, or water resources. Course with a given subtitle may be offered not more than twice under this number. Prereq: Variable; given when topic identified; graduate standing.

CE 748 MASTER’S THESIS RESEARCH. (0)
Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

CE 749 DISSERTATION RESEARCH. (0)
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

CE 768 RESIDENCE CREDIT FOR MASTER’S DEGREE. (1-6)
May be repeated to a maximum of 12 hours.

CE 769 RESIDENCE CREDIT FOR DOCTOR’S DEGREE. (0-12)

CE 772 EXPERIMENTAL METHODS IN SOIL MECHANICS. (3)
A comprehensive study, including literature review, and experimentation of the instrumentation, methods, and problems associated with the measurement of the behavior and the properties of soil. Laboratory and field methods used in research and practice. Lecture and recitation, two hours; laboratory, three hours. Prereq or concur: CE 503, 505, 602.

CE 744 ADVANCED GEOTECHNICAL ENGINEERING. (3)
Application of the principles of soil mechanics to the design and analysis of foundations and earth structures. Prereq: CE 579 and CE 671 or consent of instructor.

CE 782 DYNAMICS OF STRUCTURES. (3)

CE 784 SHELL STRUCTURES. (3)
Design and analysis of reinforced concrete shell structures, including domes, barrel shells, hyperbolic paraboloids and cylindrical tanks. Prereq: CE 684 or consent of instructor.

CE 790 SPECIAL RESEARCH PROBLEMS IN CIVIL ENGINEERING. (1-6)
Individual work on some selected problems in one of the various fields of civil engineering. Laboratory, six hours. May be repeated to a maximum of nine credits. Prereq: Consent of the chairperson of the department.

CE 791 SPECIAL DESIGN PROBLEMS IN CIVIL ENGINEERING. (1-6)
Individual work on some selected problems in one of the various fields of civil engineering. Laboratory, six hours. May be repeated to a maximum of nine credits. Prereq: Consent of the chairperson of the department.
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CHE 633 PHYSICAL ORGANIC CHEMISTRY. (3)
An advanced presentation of the mechanisms of organic reactions, the experimental methods used to elucidate these mechanisms, and the effect of changing structure and reaction conditions on the reactivity of organic molecules. Prereq: CHE 538.

CHE 643 SPECTROSCOPY AND PHOTOPHYSICS. (3)
An integrated treatment of modern spectroscopy and photophysics. Topics to include atomic spectroscopy, microwave, infrared and UV-visible spectroscopy of diatomic and polyatomic molecules, lasers, creation and detection of excited states, fluorescence, phosphorescence, radiationless processes and photochemical transformations. Prereq: CHE 547 or CHE 440G/442G or permission of instructor.

CHE 646 CHEMICAL KINETICS. (3)
Studies of chemical reactions from the standpoint of velocity and mechanism. Prereq: CHE 442G.

CHE 710 TOPICS IN INORGANIC CHEMISTRY. (2-4)
Discussion of topics of recent interest in inorganic chemistry, including physical methods, syntheses, and structural theories. May be repeated to a maximum of 12 credits. Prereq: CHE 610 or 612.

CHE 736 TOPICS IN ORGANIC CHEMISTRY. (2-4)
Selected topics which may include heterocyclic organic compounds, natural and synthetic dyes, carbohydrates, nitrogen compounds, and recent advances in the field of organic chemistry. May be repeated to a maximum of 12 credits.

CHE 746 TOPICS IN PHYSICAL CHEMISTRY. (2-4)
Selected topics which may include photochemistry, structure of crystals, molecular spectra, nature of the chemical bond, and other recent advances in the field of physical chemistry. May be repeated to a maximum of 12 credits. Prereq: CHE 442G.

CHE 748 MASTER’S THESIS RESEARCH. (0)
Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

CHE 749 DISSERTATION RESEARCH. (0)
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

CHE 768 RESIDENCE CREDIT FOR MASTER’S DEGREE. (1-6)
May be repeated to a maximum of 12 hours.

CHE 769 RESIDENCE CREDIT FOR DOCTOR’S DEGREE. (0-12)
May be repeated indefinitely.

CHE 772 SEMINAR IN CHEMISTRY INSTRUCTION. (1)
A seminar for teaching assistants on the methods and techniques of effective instruction in laboratory and recitation classes in chemistry. Required of all new graduate teaching assistants. Prereq: Admission to M.S. or Ph.D. program in chemistry.

CHE 776 GRADUATE SEMINAR. (1)
Reports and discussions on recent research and current literature. Required of all graduate students. May be repeated for a total of eight credits.

CHE 779 MEMBRANE SCIENCES COLLOQUIUM. (1)
Outstanding membrane scientists present their current research on biological and/or synthetic membranes. Students read a pertinent paper by the speaker prior to his/her talk and write a short paper on the talk; especially important is relevance of the main points of the talk to membrane science in general and the student’s own research in particular. May be repeated to a maximum of six credits. (Same as BCH/CME/PHA/PHR 779.)

CHE 780 INDIVIDUAL WORK IN CHEMISTRY. (1-5)
Selected library and laboratory problems in conformance with the student’s interest will be attacked and pursued under the direction of a suitable staff member who is proficient in the area under investigation.

CHE 790 RESEARCH IN CHEMISTRY. (1-12)
Work may be taken in the following fields, subject to the approval of the Departmental Graduate Committee: analytical chemistry, industrial chemistry, inorganic chemistry, organic chemistry, radiochemistry, or physical chemistry. May be repeated indefinitely.

CJT Communication, Journalism, Telecommunications – Graduate Courses

CJT 601 PROSEMINAR IN COMMUNICATION. (3)
Introduction to graduate study; theory and systems, research strategies. Prereq: Graduate standing in communication or consent of instructor.

CJT 608 MASS COMMUNICATIONS AND SOCIETY. (3)
A study of the ways in which the communications media play their roles in contemporary society with special attention to the major functions, rights, and responsibilities of media and individuals. Prereq: Graduate standing in communication or consent of instructor.

CJT 615 PROSEMINAR IN COMMUNICATION AND INFORMATION SYSTEMS. (3)
This course is an introductory graduate-level survey of theory and research on human communication mediated by communication and information technologies. This course is designed to cover the areas not typically addressed in traditional courses on mass or interpersonal communication, including theory and research on the use of computers and electronic communication over a variety of communication and information systems. Prereq: Graduate standing in communication or consent of instructor.

CJT 619 PROSEMINAR IN INTERNATIONAL/INTERCULTURAL COMMUNICATION. (3)
Examines important issues in communication from a global perspective. In-depth study of international communications systems, international information flow, problems that occur in communicating with members of different cultures or subcultures, and development of theories and strategies for improving international communications at the mass, organizational, and interpersonal levels. Prereq: CJT 601 and graduate standing in communication or consent of instructor.

CJT 625 PROSEMINAR IN ORGANIZATIONAL COMMUNICATION. (3)
This course is an introductory graduate-level survey of theory and research in the area of organizational communication and related topics. Students will be exposed to a variety of current theoretical perspectives and methodological orientations. Prereq: Graduate standing in communication or consent of instructor.

CJT 630 PROSEMINAR IN MASS MEDIA LAW AND PUBLIC POLICY. (3)
Study of mass communication law and policy-making. Intensive review of court decisions, statutes and administrative rules and regulations regarding libel, privacy, public access to government meetings and documents, intellectual property, broadcast regulation, commercial and corporate speech, obscenity and protection of news sources. Prereq: CJT 601 and graduate standing in communication or consent of instructor.

*CJT 631 PROSEMINAR IN INTERPERSONAL COMMUNICATION. (3)
An advanced presentation of the mechanisms of organic reactions, the experimental methods used to elucidate these mechanisms, and the effect of changing structure and reaction conditions on the reactivity of organic molecules. Prereq: CHE 538.

CJT 645 PROSEMINAR IN MASS COMMUNICATION THEORY. (3)
The course reviews existing and emerging theoretical, perspectives relevant to the context of interpersonal communication. Emphasis is on theories of message production and reception, identity management, relationship development, and related processes. Methods of investigation unique to the study of interpersonal interaction are also addressed. Students are expected to be familiar with general communication theory and basic research methods prior to enrolling in the course.

CJT 650 COMMUNICATION, LANGUAGE AND CULTURE. (3)
A study of the role of language and culture in the practice of communication within and across cultural communities. Prereq: Graduate standing in communications or consent of instructor.

*CJT 651 COMMUNICATION THEORY. (3)
Examination and critical analysis of the major theories of communication processes, including systems theory, structural theories and semiotics, behaviorism, symbolic interactionism, theories of the social construction of reality, and other theoretical approaches to the study of communication. Prereq: Graduate standing or consent of instructor.
CJT 665 COMMUNICATIONS RESEARCH METHODS. (3)
The scientific method. Communications research as a part of social science research.
Study and practice of quantitative and qualitative behavioral research techniques which
apply to communication. Prereq: Graduate standing in communication or consent of
instructor.

CJT 667 QUALITATIVE METHODS IN COMMUNICATION RESEARCH. (3)
Goals, epistemology and methods of qualitative inquiry in communication. Strengths
and limitations of different qualitative research methodologies. Distinctive contributions
of qualitative research to theory and practice of communication.

CJT 671 PROSEMINAR IN HEALTH COMMUNICATION. (3)
This course is designed to provide a broad introduction to communication in a health
care context. Topics addressed are patient-provider communication, small group
communication, communication in health care organizations, intercultural communi-
cation in health care, and health images in the mass media. Prereq: Graduate standing
in communication or consent of instructor.

CJT 682 COMMUNICATION AND PERSUASION. (3)
An advanced course examining the literature in communication and attitude change.
Issues in measurement, theory, and philosophical orientation are central. Covers
communication broadly, including interpersonal, mediated, and mass communication.
Prereq: Graduate standing in communications or consent of instructor.

CJT 686 INTERNSHIP IN COMMUNICATION. (3)
Field experience for candidates for the M.A. degree in any field of communications
through work in industry, government, education, research or business agencies.
Laboratory, 12 hours per week. Prereq: Admission to M.A. program and 18 hours of
graduate work. Consent of DGS required.

CJT 700 DIRECTED READING IN COMMUNICATION. (1-3)
Individual reading study on some communications aspects not treated in depth in a
regular course or of topical interest. Advance consultation regarding reading list and
examination procedure required. May be repeated to a maximum of 12 credits.
Prereq: Graduate standing in communication or consent of instructor.

CJT 715 SEMINAR IN COMMUNICATION AND INFORMATION SYSTEMS (Subtitle Required). (3)
An in-depth examination of a selected topic or set of issues within the general area of
recent theory and research on communication and information systems. These could
include topics such as: media choice decisions, communication patterns in organiza-
tions, on-line communities within professions, bibliometric analysis, personal identity
in cyberspace, issues in the use of public and private information, or human-computer
interaction. May be repeated to a maximum of six credits under a different subtitle.
Prereq: CJT 601 and graduate standing in communication or consent of instructor.

CJT 719 SEMINAR IN INTERNATIONAL/ INTERCULTURAL COMMUNICATION (Subtitle required). (3)
Special Topics/Issues in International/Intercultural Communication examines the
current and the alternative perspectives in the field of study. Topics/Issues such as the
New World Information and Communication Order, Information/Communication
Technologies, Communication and Development, Transborder Data Flows, etc., are
studied. May be repeated to a maximum of six credits. Prereq: CJT 619 and graduate
standing in communication or consent of instructor.

CJT 721 SEMINAR IN INTRAPERSONAL COMMUNICATION. (3)
The investigation of a single category of theoretical approaches to communication
processing within a single organism. May be repeated. Prereq: Graduate standing in
communication or consent of instructor.

CJT 725 SEMINAR IN ORGANIZATIONAL COMMUNICATION: (Subtitle required). (3)
This course is concerned with theory and research relevant to organizational commu-
nication and related areas of interest. Special attention is given to various topics relevant
to a specific subtitle. May be repeated to a maximum of six credits under a different
subtitle. Prereq: Graduate standing in communication or consent of instructor.

CJT 730 SEMINAR IN MASS MEDIA AND PUBLIC POLICY (Subtitle required). (3)
The role of mass communications media in making public policy and the effects of public
policies on the mass media. One subject area will be investigated each semester; typical
topics are (1) political campaign communications; (2) censorship; (3) controversial
public issues; (4) rights; (5) international and world agreements. May be repeated to
a maximum of six credits under a different subtitle. Prereq: CJT 630 and graduate standing
in communication or consent of instructor.

CJT 731 SEMINAR IN INTERPERSONAL COMMUNICATION (Subtitle required). (3)
Consideration of special problems in interpersonal communication with emphasis on
emergence of theory and implications for further research. May be repeated to a maximum
of six credits under a different subtitle. Prereq: CJT 631 and graduate standing in
communication or consent of instructor.

CJT 745 SEMINAR IN MASS COMMUNICATION (Subtitle required). (3)
Consideration of selected topics in mass communication theory and research. May be
repeated under a different subtitle to a maximum of six credits. Prereq: Graduate standing
in communication or consent of instructor.

CJT 749 DISSERTATION RESEARCH. (0-12)
Half-time to full-time work on thesis. May be repeated to a maximum of six semesters.
Prereq: All course work toward the degree must be completed.

CJT 768 RESIDENCE CREDIT FOR THE MASTER'S DEGREE. (1-6)
May be repeated to a maximum of 12 hours.

CJT 769 RESIDENCE CREDIT FOR DOCTOR'S DEGREE. (0-12)
May be repeated indefinitely. Prereq: Satisfactory completion of Qualifying Examination
(third year).

CJT 771 SEMINAR IN HEALTH COMMUNICATION. (3)
A topical seminar discussing issues in the field of health communication from a variety
of perspectives, e.g., the relevance of interpersonal, international and intercultural and
mass communication processes to the quality and availability of health care. May be
repeated to a maximum of six credits.

CJT 775 SEMINAR IN HEALTH COMMUNICATION CAMPAIGNS. (3)
The role of communication in public health campaigns. Includes theories relevant to
such campaigns, campaign effects studies, methods of evaluation, and message design
and targeting principles. Prereq: CJT 645 and graduate standing in communication or
consent of instructor.

CJT 780 SPECIAL TOPICS IN COMMUNICATION (Subtitle required). (3)
Professors will conduct research seminars in topics or problems in which they have
special research interests. May be repeated to a maximum of six credits. Prereq: At least
one year of graduate study in communication.

CJT 781 DIRECTED STUDY IN COMMUNICATION. (1-6)
To provide advanced students with an opportunity for independent work to be conducted
in regular consultation with the instructor. May be repeated to a maximum of six credits.
To be used for independent work.) Prereq: Consent of instructor.
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLA 100 ANCIENT STORIES IN MODERN FILMS</td>
<td>(3)</td>
<td>This course will view a number of modern films and set them alongside ancient literary texts which have either directly inspired them or with which they share common themes. In the first part of the course, we will consider the relationship between ancient Greek epic, tragic, and comic literature and the modern cinema. In the second part, we will look at a number of ways in which the city of Rome has been treated as both a physical place and as an idea or ideal in the works of both ancient Romans and modern film-makers.</td>
</tr>
<tr>
<td>CLA 101 ELEMENTARY LATIN</td>
<td>(4)</td>
<td>A survey of major forms of art in ancient Western Asia, Greece, and Rome, with emphasis on the comparative typology and cultural significance of the monuments.</td>
</tr>
<tr>
<td>CLA 131 MEDICAL TERMINOLOGY FROM GREEK AND LATIN</td>
<td>(3)</td>
<td>Latin and Greek roots, prefixes, and suffixes as found in medical terminology. Primarily for pre-medical, pre-dental, pre-nursing and pre-veterinary students, but others will be admitted for help in vocabulary building.</td>
</tr>
<tr>
<td>CLA 135 GREEK AND ROMAN MYTHOLOGY</td>
<td>(3)</td>
<td>Greek myths studied both from the standpoint of their meanings to the Greeks and Romans and from the standpoint of their use in later literature and in everyday life.</td>
</tr>
<tr>
<td>CLA 201 INTERMEDIATE LATIN</td>
<td>(3)</td>
<td>Selections from a wide range of authors will be included in order to demonstrate the diversity and appeal of Latin literature. Emphasis is placed on developing reading ability. May be repeated to a maximum of nine credits with different topics.</td>
</tr>
<tr>
<td>CLA 202 INTERMEDIATE LATIN</td>
<td>(3)</td>
<td>A continuation of CLA 101. Prereq: CLA 101 or the equivalent.</td>
</tr>
<tr>
<td>CLA 210 THE ART OF GREECE AND ROME</td>
<td>(3)</td>
<td>A survey of the major forms of art in ancient Greece and Rome, with emphasis on the comparative typology and cultural significance of the monuments.</td>
</tr>
<tr>
<td>CLA 219 THE ANCIENT NEAR EAST AND GREECE TO THE DEATH OF ALEXANDER THE GREAT</td>
<td>(3)</td>
<td>Covers the birth of civilization in Egypt and Mesopotamia, and the history of the ancient Near East and Greece to the conquest of Greece by Philip of Macedon. (Same as HIS 229.)</td>
</tr>
<tr>
<td>CLA 229 THE ANCIENT NEAR EAST AND GREECE TO THE DEATH OF ALEXANDER THE GREAT</td>
<td>(3)</td>
<td>Covers the development of ancient Greece, the Roman Republic, and the Roman Empire to the death of Constantine. (Same as HIS 230.)</td>
</tr>
<tr>
<td>CLA 229G THE ANCIENT NEAR EAST AND GREECE TO THE DEATH OF ALEXANDER THE GREAT</td>
<td>(3)</td>
<td>A study of the epic genre as developed in the works of major Greek and Latin writers. Attention will be focused on the efforts of the Christian community to achieve its own identity and to resolve the conflicts which it faced with Judaism, the Graeco-Roman world and within itself.</td>
</tr>
<tr>
<td>CLA 230 THE Hellenistic WORLD AND ROME TO THE DEATH OF CONSTANTINE</td>
<td>(3)</td>
<td>A study of Greek and Roman art in the Hellenistic World, the Roman Republic, and the Roman Empire. Emphasis will be placed on the cultural dimension of each form and the contributions made by individual authors. Emphasis will be placed on Greek tragedy and Roman comedy.</td>
</tr>
<tr>
<td>CLA 230G THE Hellenistic WORLD AND ROME TO THE DEATH OF CONSTANTINE</td>
<td>(3)</td>
<td>A study of Greek and Roman art in the Hellenistic World, the Roman Republic, and the Roman Empire. Emphasis will be placed on the cultural dimension of each form and the contributions made by individual authors. Emphasis will be placed on Greek tragedy and Roman comedy.</td>
</tr>
<tr>
<td>CLA 245G HEROIC IDEAL: GREEK AND ROMAN EPIC</td>
<td>(3)</td>
<td>A study of the epic genre as developed in the works of major Greek and Latin writers. Attention will be focused on the cultural background of each author and his contribution to the genre as a whole. In addition to Homer and Virgil, the course will normally include the study of Apollonius and Lucan.</td>
</tr>
<tr>
<td>CLA 246G CLASSICAL DRAMA: TRAGEDY AND COMEDY IN GREECE AND ROME</td>
<td>(3)</td>
<td>A study of the development of tragedy and comedy in the ancient world. Attention will be focused on the cultural dimension of each form and the contributions made by individual authors. Emphasis will be placed on Greek tragedy and Roman comedy.</td>
</tr>
<tr>
<td>CLA 390 ROMAN, JEW AND GREEK: BACKGROUND TO CHRISTIANITY</td>
<td>(3)</td>
<td>A survey of the development of Christian literature in the first four centuries. Attention will be focused on the efforts of the Christian community to achieve its own identity and to resolve the conflicts which it faced with Judaism, the Graeco-Roman world and within itself.</td>
</tr>
<tr>
<td>CLA 395 INDEPENDENT STUDY IN GREEK</td>
<td>(1-3)</td>
<td>Study of an author (e.g. Plato), a work (e.g. the Iliad), or a topic (e.g. prose syntax and style). All readings are in Greek. May be repeated to a maximum of 12 credits with different topics. Prereq: CLA 252 or equivalent, and consent of director of undergraduate studies and instructor.</td>
</tr>
<tr>
<td>CLA 425G THE HERCULES IDEA: GREEK AND ROMAN DRAMA</td>
<td>(3)</td>
<td>A study of the epic genre as developed in the works of major Greek and Latin writers. Attention will be focused on the cultural background of each author and his contribution to the genre as a whole. In addition to Homer and Virgil, the course will normally include the study of Apollonius and Lucan.</td>
</tr>
<tr>
<td>CLA 426G CLASSICAL DRAMA: TRAGEDY AND COMEDY IN GREECE AND ROME</td>
<td>(3)</td>
<td>A survey of the development of tragedy and comedy in the ancient world. Attention will be focused on the cultural dimension of each form and the contributions made by individual authors. Emphasis will be placed on Greek tragedy and Roman comedy.</td>
</tr>
<tr>
<td>CLA 509G SPECIAL TOPICS IN CLASSICAL LITERATURE IN TRANSLATION (Subtitle required)</td>
<td>(3)</td>
<td>Each offering of the course is devoted to advanced study of a particular topic in classical literature not covered in other CLA courses, or to a topic in the history of European and North American Latin-language literature, or the classical literary tradition. Examples of such topics are Greek and Latin historiography, classical rhetoric, Latin satire, classical philosophical prose, classical literature and the modern cinema, Latin literature of the Middle Ages and Renaissance. Lectures and discussions, assigned and supplementary readings, paper writing. May be repeated to a maximum of nine credits with different topics.</td>
</tr>
<tr>
<td>CLA 599 GREEK AND LATIN LITERATURE IN TRANSLATION (Subtitle required)</td>
<td>(3)</td>
<td>An historical introduction to the development of Roman Law, from the Twelve Tables through the Codex Justinianus. (Same as HIS 599.)</td>
</tr>
<tr>
<td>CLA 601 LITERATURE MASTERPIECES OF GREECE AND ROME</td>
<td>(3)</td>
<td>A survey of major Greek and Roman literary works. Emphasis will be focused on the various genres of Classical literature, and the course will include comparative analysis of Greek and Latin literary pieces.</td>
</tr>
<tr>
<td>CLA 602 LATIN LITERATURE I (Subtitle required)</td>
<td>(3)</td>
<td>An introduction to the literature of Imperial Rome with selected readings of complete works from the major Latin authors. Lectures and class discussions on the various genres, styles, and themes of Latin literature. Topics vary every time the course is offered. May be repeated once under a different subtitle. Prereq: CLA 202 or equivalent.</td>
</tr>
<tr>
<td>CLA 603 LATIN LITERATURE II (Subtitle required)</td>
<td>(3)</td>
<td>An introduction to the literature of Imperial Rome with selected readings of complete works from the major Latin authors. Lectures and class discussions on the various genres, styles, and themes of Latin literature. Topics vary every time the course is offered. May be repeated once under a different subtitle. Prereq: CLA 202 or equivalent.</td>
</tr>
<tr>
<td>CLA 604 LATIN LITERATURE III (Subtitle required)</td>
<td>(3)</td>
<td>An introduction to the literature of Imperial Rome with selected readings of complete works from the major Latin authors. Lectures and class discussions on the various genres, styles, and themes of Latin literature. Topics vary every time the course is offered. May be repeated once under a different subtitle. Prereq: CLA 202 or equivalent.</td>
</tr>
<tr>
<td>CLA 605 ROMAN LITERATURE AND SOCIETY (Subtitle required)</td>
<td>(3)</td>
<td>A study of one or more works selected from prose writings from the beginnings of Roman literary history to 31 B.C. Authors include Cicero, Caesar, Sallust, and others; genres include history, philosophy, rhetoric and oratory, letters, and others. Textual analysis is emphasized, with lectures and class discussion on the literary milieu. Topics vary every time the course is offered. May be repeated to a maximum of nine credits under a different subtitle. Prereq: CLA 301 or equivalent.</td>
</tr>
</tbody>
</table>
CLA 523 ROMAN REPUBLICAN POETRY (Subtitle required). (3)
A study of one or more works selected from poetry from the beginning of Roman literature to 1 B.C. Authors include Virgil, Horace, Propertius, Tibullus, Ovid, Juvenal, Martial, and others; genres include epic, lyric, elegiac, satire, pastoral, and others. Textual analysis is emphasized, with lectures and class discussion on the literary milieu. Topics vary every time the course is offered. May be repeated to a maximum of nine credits under a different subtitle. Prereq: CLA 301 or equivalent.

CLA 526 ROMAN IMPERIAL PROSE (Subtitle required). (3)
A study of one or more works selected from prose writings from approximately 31 B.C. to the end of the Western Empire. Authors include Livy, Petronius, Tacitus, Pliny, Suetonius, Seneca, Quintilian, Augustine, and others; genres include history, philosophy, biography, letters, fiction, and others. Textual analysis is emphasized, with lectures and class discussion on the literary milieu. Topics vary every time the course is offered. May be repeated to a maximum of nine credits under a different subtitle. Prereq: CLA 301 or equivalent.

CLA 527 ROMAN IMPERIAL POETRY (Subtitle required). (3)
A study of one or more works selected from poetry from approximately 31 B.C. to the end of the Roman Empire. Authors include Virgil, Horace, Propertius, Tibullus, Ovid, Juvenal, Martial, and others; genres include epic, lyric, elegiac, satire, pastoral, and others. Textual analysis is emphasized, with lectures and class discussion on the literary milieu. Topics vary every time the course is offered. May be repeated to a maximum of nine credits under a different subtitle. Prereq: CLA 301 or equivalent.

CLA 556 GREEK DRAMATIC LITERATURE. (3)
A study of the Greek drama through selected plays of the major tragic and comic writers. Emphasis on textual analysis with lectures and class discussions on the authors’ literary milieu. Prereq: CLA 252 or equivalent.

CLA 557 GREEK HISTORICAL LITERATURE. (3)
A study of the Greek historiographical tradition as exemplified in Herodotus, Thucydides and other Greek historians. Emphasis on textual analysis with lectures and class discussions on the authors’ literary milieu. Prereq: CLA 252 or equivalent.

CLA 601 STUDIES IN GREEK LITERATURE I (Subtitle required). (3)
Intensive study of an author, a literary form or a problem in the period from Homer through the Fifth Century, B.C. Considerable attention will be focused on secondary sources; students will write papers and present oral reports in class. May be repeated to a maximum of nine hours.

CLA 602 STUDIES IN GREEK LITERATURE II (Subtitle required). (3)
Intensive study of an author, a literary form or a problem in the period from the Fourth Century, B.C. through the Third Century, A.D. Considerable attention will be focused on secondary sources; students will write papers and present oral reports in class. May be repeated to a maximum of nine hours.

CLASSICS IN GENERAL
CLA 511, 512 STUDIES IN ROMAN PHILOLOGY. (3 ea.)
Courses to meet the needs of students in various areas of Roman philology, e.g., in Latin literature, in Roman civilization, in Latin linguistics, etc. May be repeated to a maximum of nine hours. Prereq: Consent of instructor.

CLA 580 INDEPENDENT WORK IN CLASSICS. (3)
Intensive study of an author, a literary form, or a problem in the period of the Roman Republic. Considerable attention to secondary sources; students will write papers and present oral reports in class. May be repeated to a maximum of nine hours. Prereq: Consent of instructor.
CLS 501 SEMINAR IN ADVANCED HEMATOLOGY. (2)
Study of the biochemical aspects of blood cell physiology and kinetics as applied to practice in the clinical hematology laboratory and a review of current related literature. This course is designed for practicing clinical laboratory professionals as to the clinical application of the subject matter. Emphasis will concentrate on the understanding of clinical chemistry. Prereq: CHE 105, 107 and 115, CHE 230 or CHE 236 or equivalent and consent of instructor.

#CLS 520 REPRODUCTIVE LABORATORY SCIENCE. (3)
This is a course designed to educate students in basic theories, procedures and quality assurance concepts of assisted reproduction. It will consist of two lectures per week and a limited number of three-hour laboratories. Computer-assisted instruction and video-tapes will also be used. Prereq: Admission to the professional CLS program; or a baccalaureate degree with CLS certification; or consent of instructor.

CLS 610 ETHICS IN CLINICAL SCIENCES RESEARCH. (1)
Students will examine ethical issues in biomedical research using a case-study approach. Representative issues addressed may include data selection and retention, plagiarism, scientific review of grants and manuscripts, scientific misconduct, and informed consent. Prereq: Graduate student status. (Same as CD/CNU/PT/RAS 610.)

CLS 801 INTRODUCTION TO LABORATORY METHODOLOGY. (1)
This course is designed to develop basic laboratory skills needed for the clinical laboratory sciences curriculum. Required for new junior students. Lecture, one hour; laboratory, four hours for four weeks. Prereq: Admission to the clinical laboratory sciences professional program.

CLS 802 CLINICAL LABORATORY METHODS. (1)
This is a four-week course designed to develop skills and didactic content related to laboratory techniques and procedures common to all areas of the clinical laboratory. Required for second-semester juniors in the CLS professional curriculum. There will be a total of eight lectures and eight laboratory periods in the course. Lecture, two hours; laboratory, six hours per week. Prereq: Admission to the professional curriculum or consent of instructor.

CLS 815 HISTOTECHNOLOGY I. (3)
The study of basic principles of fixation, processing, infiltration, and embedding techniques and their application for human and animal tissues. Lecture, two hours; laboratory, two hours per week. Prereq: High school science courses.

CLS 816 HISTOTECHNOLOGY II. (3)
The study of principles and applications of microtomy, frozen sectioning and some special staining techniques.

CLS 822 BIOCHEMISTRY FOR CLINICAL SCIENCES. (3)
A presentation of the biochemistry of carbohydrates, lipids, proteins, amino acids and nucleic acids and exploration of major metabolic pathways as the basis of clinical chemistry. Case studies will be used to emphasize the role of biochemistry in the understanding of clinical chemistry. Prereq: CHE 105, 107 and 115, CHE 230 or CHE 236 or equivalent and consent of instructor.

CLS 832 GENERAL CLINICAL CHEMISTRY AND INSTRUMENTATION. (4)
A course covering the theory and practice of general clinical chemistry laboratory testing. Emphasis is on laboratory testing, quality control, introduction of instrumentation principles, troubleshooting potential laboratory problems and concern for the accuracy of patient results and their confidentiality. Lecture, four hours per week; laboratory, 12 hours per week for seven weeks. Prereq: Admission to the clinical laboratory sciences professional program, Biochemistry (CLS 822 or equivalent) may be taken concurrently.

CLS 833 CLINICAL HEMATOLOGY AND BODY FLUID ANALYSIS. (4)
This course will cover the basic theory and practice of clinical hematology, hemostasis and body fluids. Both manual and automated techniques in blood cell and body fluid analysis will be covered. Laboratory reporting, quality control and concern for the patient will be emphasized throughout the course. Lecture, four hours per week; laboratory, 12 hours per week for seven weeks. Prereq: Admission to the Clinical Laboratory Sciences professional program.

CLS 835 CLINICAL IMMUNOLOGY. (4)
An overview of immunology with a molecular biological basis for the immune responses and the role of genetics in immunological disorders. Molecular biological techniques in the modern clinical laboratory will be emphasized. Prereq: MLT/CLT certification or consent of instructor.

CLS 836 LABORATORY ORGANIZATION AND MANAGEMENT. (3)
An overview of management with an emphasis of problem solving in the clinical laboratory setting. Content will include the management process, managing change, motivation, personnel issues, regulatory issues, delegation, problem solving, leadership, quality improvement strategies and techniques and other relevant topics. Prereq: Admission to the Clinical Laboratory Sciences professional program.

CLS 838 INTRODUCTION TO IMMUNOHEMATOLOGY. (4)
Introduction to the principles and practice of blood banking including blood group systems, routine serologic testing, blood collection and processing and component therapy. Lecture, four hours; laboratory 12 hours per week for six weeks. Prereq: CLS 835 or consent of instructor.

CLS 839 SCIENTIFIC WRITING AND PRESENTATIONS. (2)
An introduction to basic research skills including computer assisted search of professional literature, critical analysis of journal reports, design of a simple research study and the necessary skills for both oral and poster presentations of research findings. Two lectures/discussion per week. Prereq: Admission to the Clinical Laboratory Science professional program or consent of instructor.

CLS 843 ADVANCED CLINICAL HEMATOLOGY. (3)
A study of the principles of hemostatic disease processes with emphasis on correlation of laboratory data with disease quality control and problem solving. The lectures will cover the major hemostatic disorders as well as advanced techniques for evaluation of blood cells such as cytochemistry, cytoflow and molecular biological methods. The laboratories will be devoted to practice in blood cell identification and problem solving using case studies and problem based learning techniques. Lecture, four hours per week; laboratory 12 hours per week for five weeks. Prereq: CLS 833 or MLT/CLT certification or consent of instructor.

CLS 844 ADVANCED CLINICAL CHEMISTRY. (4)
A study of specialized clinical chemistry testing which will include toxicology, therapeutic drug monitoring, endocrine function and testing as well as quality assurance issues. The theory and evaluation of methodologies involved in the quantitation of these substances and compounds will be discussed in lecture and demonstrated in laboratory. Lecture, four hours per week; laboratory, 12 hours per week for six weeks. Prereq: Admission to the Clinical Laboratory Sciences professional curriculum, CLS 832 or CLS 872; biochemistry and immunology courses, or consent of instructor.

CLS 845 CLINICAL IMMUNOLOGY AND SEROLOGY I. (3)
An overview and introduction to the field of immunology will be presented with a focus as to the clinical application of the subject matter. Emphasis will concentrate on the molecular and genetic aspects as they relate to disorders of the immune system. Wherever possible, modern advances such as molecular biological techniques will be emphasized. Prereq: Admission to the Clinical Laboratory Sciences professional program or consent of instructor.

CLS 848 ADVANCED IMMUNOHEMATOLOGY. (4)
This course emphasizes clinical interpretation and problem solving. Antibody identification, selection of blood components, transfusion complications, hemolytic disease of the newborn, autoimmune hemolytic anemias and quality assurance are included. Lecture, four hours; laboratory, 12 hours per week for six weeks. Prereq: CLS 838 or MLT/CLT certification or consent of instructor.

CLS 851 INTRODUCTION TO CLINICAL BACTERIOLOGY. (4)
This course will cover medically significant bacteria, including commensals and normal flora, as well as pathogens. Also covered will be microbial physiology, interactions between host and pathogenic bacteria, and the clinical and epidemiological consequences of these interactions. The laboratory will cover conventional microscopic, cultural and immunological techniques used for the recovery, isolation and identification of clinically significant bacteria. Lecture, four hours per week; laboratory, 12 hours per week. Prereq: Admission to the Clinical Laboratory Sciences program or consent of instructor.

CLS 855 CLINICAL IMMUNOLOGY AND SEROLOGY II. (3)
An overview and introduction to the field of immunology will be presented with a focus as to the clinical application of the subject matter. Emphasis will concentrate on the molecular and genetic aspects as they relate to disorders of the immune system. Wherever possible, modern advances such as molecular biological techniques will be emphasized. Lecture, two hours; laboratory, three hours per week. Prereq: CLS 845 or consent of instructor.
CLS 856 ADVANCED MICROBIOLOGY. (4)
Course content will cover medically important bacteria, with an emphasis on anaerobes and mycobacteria, and clinically significant fungi, parasites and viruses. The laboratory will focus on the isolation and identification of pathogenic and opportunistic fungi, viruses, parasites, and difficult-to-isolate bacteria from clinical specimens. Knowledge from Clinical Bacteriology will be applied, and theories and advanced techniques used for the diagnosis of bacterial, viral, and parasitic human disease will be presented. Lecture; four hours per week; laboratory, eight hours per week for seven weeks. Prereq: Admission to the Clinical Laboratory Sciences professional program, completion of CLS 851 or equivalent or consent of instructor.

CLS 860 BLOOD COLLECTION I. (1)
Experience collecting venous blood specimens for laboratory testing. Students will receive instructions on proper procedures for phlebotomy and will practice on mannequin arms and each other prior to collecting blood from adult ambulatory and bed patients. Offered on a Pass/Fail basis only. Prereq: Admission to the Clinical Laboratory Sciences program or consent of instructor.

CLS 861 BLOOD COLLECTION II. (1)
Advanced experience in collecting venous blood and capillary blood specimens for many types of studies. This will include collection from pediatric and nursery patients. Offered on a Pass/Fail basis only. Prereq: Admission to the Clinical Laboratory Sciences professional program or consent of instructor.

CLS 867 EDUCATIONAL PRINCIPLES IN CLS. (1)
This course provides the skills necessary to prepare, present and evaluate educational presentations and student supervision in the clinical laboratory and continuing education environments. Students develop a presentation which includes topic selection, writing educational objectives, selecting audiovisual equipment, preparing audiovisual and handout materials, writing evaluation questions and an oral presentation. The principles of clinical education supervision are also provided. Prereq: Admission to the Clinical Laboratory Sciences professional program or consent of instructor.

CLS 871 SURVEY OF HEMATOLOGY AND LABORATORY MATH. (2)
An overview of basic mathematical computations used in common laboratory procedures. A review of structure, function and identification of abnormal blood cells. Prereq: Associate degree in Medical Laboratory Technology.

CLS 872 CLINICAL CHEMISTRY SURVEY. (1)
An overview of the theory and practice of clinical chemistry, including instrumentation and calculations. Prereq: Admission to the Clinical Laboratory Sciences program or consent of instructor.

CLS 873 CLINICAL MICROBIOLOGY SURVEY. (2)
This course is designed as an overview of medically significant bacteria including pathogens, commensals and those which comprise normal flora. The course will review basic morphology, microbial physiology as well as interaction between the host and pathogen. New procedures for isolation and identification of clinically significant bacteria will be emphasized. Recent taxonomic changes will also be discussed. Prereq: Admission to the Clinical Laboratory Science Program or permission of the instructor.

CLS 874 SURVEY OF IMMUENOHEMATOLOGY. (1)
This course is an overview of blood banking including important blood group systems, compatibility testing procedures and collection and processing of blood and blood components. Emphasis is placed on current regulations and standards for blood banks. Prereq: Admission to the Clinical Laboratory Science Program or permission of the instructor.

CLS 880 CLINICAL PRACTICUM IN CLINICAL LABORATORY SCIENCES. (8)
A supervised clinical practicum which integrates theory and practice in routine clinical chemistry, hematology, blood bank and microbiology. In addition, students will present 1-2 case studies that address the role of the clinical laboratory in diagnosis and treatment of disease. Offered on a Pass/Fail basis only. Laboratory, 30-40 hours per week for eight weeks. Prereq: Completion of junior year clinical laboratory science courses.

CLS 881 ADVANCED IMMUENOHEMATOLOGY. (1-4)
A supervised clinical practicum in which the student reviews routine blood banking and is then exposed to advanced/specialized techniques in the area of immunohematology. These may include but not be limited to tissue typing and bone marrow/stem cell transplant technology. Offered on a Pass/Fail basis only. Laboratory, 35-40 hours per week. The number of credits will depend on the student’s prior experience and interests. Prereq: CLS 880 or MLT/CLT certification.

CLS 882 ADVANCED CLINICAL CHEMISTRY PRACTICUM. (1-4)
A supervised clinical practicum in which the student is exposed to advanced/specialized techniques in the area of clinical chemistry. These may include but not be limited to toxicology methods, molecular biological methods and blood gas analysis. Offered on a Pass/Fail basis only. Laboratory, 35-40 hours per week. The number of credits will depend on the student’s prior experience and interests. Prereq: CLS 880 or MLT/CLT certification.

CLS 883 ADVANCED CLINICAL HEMATOLOGY PRACTICUM. (1-4)
A supervised clinical practicum in which the student is exposed to advanced/specialized techniques in the area of clinical hematology. These may include but not be limited to flow cytometry, electron microscopy, and specialized techniques in body fluids and hemostasis. Offered on a Pass/Fail basis only. Laboratory, 35-40 hours per week. The number of credits will depend on the student’s prior experience and interests. Prereq: CLS 880 or MLT/CLT certification.

CLS 884 ADVANCED CLINICAL MICROBIOLOGY PRACTICUM. (1-4)
A supervised clinical practicum in which the student is exposed to advanced/specialized techniques in the area of clinical microbiology. These may include but not be limited to virology, parasitology, mycology and the use of probes to identify microorganisms. Offered on a Pass/Fail basis only. Laboratory, 35-40 hours per week. The number of credits will depend on the student’s prior experience and interests. Prereq: CLS 880 and MLT/CLT certification.

CLS 885 SPECIAL TOPICS PRACTICUM. (1-8)
This course offers students an opportunity to observe and learn in areas of clinical laboratory sciences not found in the routine laboratory, such as flow cytometry, electron microscopy, DNA analysis. Rotations are arranged to meet needs of each student. May be repeated to a maximum of eight credits. Laboratory, 35-40 hours per week. Prereq: Enrollment in CLS professional program or consent of Division Chair.

CLS 890 RESEARCH IN CLINICAL LABORATORY SCIENCES. (5)
Students will participate in defining and solving problems within the clinical laboratory. Students will apply the principles of research technique to identify, correlate and analyze problems arising from technical methods, disease correlation, or other pertinent problem areas in laboratory sciences. Students will use library sources, computer skills, and presentation skills in the pursuit of solutions to identified problems. Lecture, eight hours; laboratory, 16 hours per week for five weeks. Prereq: CLS 839 and senior standing within the professional curriculum.

CLS 895 ADVANCED TOPICS IN CLINICAL LABORATORY SCIENCES (INDEPENDENT STUDY). (1-6)
An elective for students in selected subjects in-depth or carry out a limited laboratory project. Prereq: Consent of Division Chair.

CME Chemical Engineering

CME 006 THE ENGINEERING PROFESSION (JUNIOR AND SENIOR). (0)
Activities of the Student Chapter of the American Institute of Chemical Engineers (for junior and senior year chemical engineering students). Lecture: one hour per week. May be repeated three times. Prereq: Chemical engineering major.

CME 101 INTRODUCTION TO CHEMICAL ENGINEERING. (1)
An introduction to the chemical engineering profession including: problem-solving techniques, use of computers, computer problems and lectures by practitioners.

CME 200 PROCESS PRINCIPLES. (3)
A course in material and energy balances, units, conversions, tie elements, recycle, bypass, equations of state, heat effects, phase transitions, and the first and second laws of thermodynamics applications in separation processes involving equilibrium reactions and energy exchange. Prereq: CHE 115, CS 221; “C” grade or better in MA 113; “C” average or better in CHE 105 and CHE 107; or prereq or concur: MA 114, PHY 231.

CME 320 ENGINEERING THERMODYNAMICS. (4)

CME 330 FLUID MECHANICS. (3)
Introduction to the physical properties of fluids, fluid statics. Equations of conservation of mass, momentum and energy for systems and control volumes. Dimensional analysis and similarity. Principles of inviscid and real fluid flows; flow through pipes and around bodies. Application and design of fluid handling systems. Prereq: Engineering standing, ME 220 or CME 200, CS 221 and MA 214. (Same as ME 330.)
CME 395 SPECIAL PROBLEMS IN CHEMICAL ENGINEERING. (1-3)
Individual work on some selected problems in the field of chemical engineering. May be repeated one time. Prereq: Engineering standing and approval of the chairperson of the department.

CME 404G POLYMERIC MATERIALS. (3)
Relating properties to structure; properties of polymer materials, mechanical, electrical and thermal properties of amorphous and crystalline polymers, molding and fabrication, polymers as additives, biomedical application, selection of polymers, design. Prereq: Engineering standing, CHE 230 or CHE 236, MSE 301, or consent of instructor. (Same as MSE 404G.)

CME 415 SEPARATION PROCESSES. (3)
Separations based on both equilibrium stage concepts and mass transfer rate control are addressed for a range of chemical process operations, including distillation, gas absorption, extraction, adsorption, and membrane-based processes. Design problems are conceived to require computer-aided modeling and analysis. Prereq: CME 320, engineering standing.

CME 420 PROCESS MODELING IN CHEMICAL ENGINEERING. (3)
Applications of principles of material and energy balances, thermodynamics, heat and mass transfer, physical chemistry and numerical methods to problems in separation and transport processes and reactive systems. Prereq: CS 221, MA 214; or prereq or concur: CME 320, ME 330, engineering standing.

CME 425 HEAT AND MASS TRANSFER. (4)
Fundamental principles of conduction and convective heat transfer, and diffusional and convective mass transfer. Design applications to heat exchanges and packed bed absorbers. Prereq: CME 320, ME 330, engineering standing.

CME 433 CHEMICAL ENGINEERING LABORATORY. (3)
A laboratory course emphasizing experimental work in the areas of fluid flow, heat transfer, mass transfer, and chemical reaction kinetics. Special consideration is given to the development of experimental acumen, mathematical and statistical data handling, report writing, and oral presentation. Lecture, one hour; laboratory, six hours per week. Prereq: CME 415, 420, 425; concur: CME 550, engineering standing.

CME 455 CHEMICAL ENGINEERING PROCESS DESIGN I. (3)
A lecture and problem-solving course devoted to the study of chemical engineering economics as it applies to the design of chemical process units and systems. Prereq: CME 415, CME 420, CME 425, ME 330, CS 221, and engineering standing.

CME 456 CHEMICAL ENGINEERING PROCESS DESIGN II. (4)
A lecture and problem-solving course intended to combine the principles of chemical engineering with optimization as they apply to the design of chemical processes. Results of each design case studied will be presented by both oral and written reports. Prereq: COM 199, CME 455, CME 550 and engineering standing.

CME 462 PROCESS CONTROL. (3)
Basic theory of automatic control devices and their application in industrial chemical plants is emphasized. Identification of control objectives, appropriate measurements and manipulations, and possible loops between these, requires integration of the control system with the original process design. Interactions between process units are analyzed using well-known analytical tools and design strategies. Prereq: Consent of instructor.

CME 470 PROFESSIONALISM, ETHICS AND SAFETY. (1)
Detailed lectures and supervised discussions on standards of ethics and safety as they relate to the engineering profession. Emphasis will be on safety in plant design and safety practice in the laboratory and plant. Sociologic problems inherent with air, water, and waste management and professional ethics will be addressed. Prereq: Engineering standing.

CME 471 SEMINAR. (1)
Students carry out literature searches on assigned topics in engineering, prepare for and deliver formal and informal talks at least every two weeks, and submit written summaries of these presentations. Lecture, two hours per week. Prereq: COM 199 and engineering standing.

CME 505 ANALYSIS OF CHEMICAL ENGINEERING PROBLEMS. (3)
The application of differential and integral equations to traditional and non-traditional chemical engineering problems. Prereq: CME 425, CME 550 concurrent or consent of instructor.

CME 515 AIR POLLUTION CONTROL. (3)

CME 550 CHEMICAL REACTOR DESIGN. (3)
A lecture and problem course dealing with interpretation of rate data and development of performance equations for single and multiple reactor systems. A design problem will be selected for an industrially important chemical reaction system requiring computer solution. Prereq: CS 221, CME 420, CME 425, and engineering standing, or consent of instructor.

CME 554 CHEMICAL AND PHYSICAL PROCESSING OF POLYMER SYSTEMS. (3)
Theory related to the chemical and physical processing of polymer systems, polymer chemistry, non-Newtonian flow behavior, stress and strain tensors, polymer processing operations and technology. Prereq: CME 232 and CME 425, or consent of instructor. (Same as MIE 554.)

CME 558 PRINCIPLES OF POLYMER CHARACTERIZATION AND ANALYSIS. (3)
A lecture course exploring the fundamental chemical and physical aspects of a range of characterization methods as applied to polymeric systems; the primary objective will be the development of a broad understanding of the various tools available for polymer characterization both on the molecular level and as bulk materials. Prereq: CME 320, ME 330, or consent of instructor. (Same as MIE 558.)

CME 580 DESIGN OF RATE AND EQUILIBRIUM PROCESSES FOR WATER POLLUTION CONTROL. (3)
The design of chemical and physical processes for the removal and concentration of organic, inorganic, and particulate pollutants from aqueous solution/suspension: adsorption, destabilization, disinfection, membrane processes, thermal processes, flow through beds of solids, etc. Prereq: CME 440G, CME 425 and prereq or concur: CME 550 or consent of instructor.

CME 593 FUEL SCIENCE. (3)
This course is concerned with the structure, chemistry, processing, utilization, environmental aspects, and conversion of hydrocarbon resources: petroleum, natural gas, coal, oil shale, and heavy oil. The laboratory component, which is taught off-campus at the Center for Applied Energy Research, covers characterization methods for fossil fuels. Prereq: CME 230, CHE 232, and CHE 440G.

CME 599 TOPICS IN CHEMICAL ENGINEERING. (3)
A detailed investigation of a topic of current significance in chemical engineering such as: contemporary energy topics, fuels development, membrane science, computer control of chemical processing. A particular topic may be offered twice under the CME 599 number. May be repeated to a maximum of six credits. Prereq: Engineering standing.

PREREQUISITE FOR GRADUATE WORK: Students desiring to take any of the following courses should have a thorough working knowledge of chemistry, physics, and mathematics. For major work, a candidate must hold a bachelor’s degree in chemical engineering or its equivalent.

CME 620 EQUILIBRIUM THERMODYNAMICS. (3)
The criteria for physical and chemical equilibria, including: predictive equations, solution theory, chemical activity, coupled chemical equilibria, and external constraints. Emphasis may be on vapor-liquid equilibrium, chemical reaction equilibrium, or complex ionic equilibria in dilute aqueous solutions and suspensions. Prereq: CME 440G and CME 320 or consent of instructor.

CME 621 NONEQUILIBRIUM THERMODYNAMICS. (3)
An introductory course in the thermodynamics of irreversible processes, including: phenomenological equations relating flows and forces, Onsager’s law, and entropy production in continuous processes. Prereq: CME 620, or ME 620, or consent of instructor.

CME 625 PROPERTIES OF GASES AND LIQUIDS. (3)
Development, discussion and application of intermolecular force laws as they apply to gases, liquids and mixtures: Chapman-Enskog kinetic theory, virial theorem, Buckingham (6-exp) potential, and theoretical and semitheoretical predictive equations. Estimation of thermodynamic and transport properties. Prereq: CME 620, CME 630, or consent of instructor.
Graduate Studies Committee. May be repeated to a maximum of two semesters. Prereq: Graduate Research in Chemical Engineering on a topic approved by the Department to a maximum of 12 credits. Prereq: Approval of the departmental director of Graduate Independent study, design, or research in chemical engineering topics. May be repeated to a maximum of six credits. (Same as BCH/CHE/PHA/PHR 779.)

CME 748 MASTER’S THESIS RESEARCH. (0) Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

CME 749 DISSERTATION RESEARCH. (0) Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

CME 750 SIGNATURED RESEARCH. (1-6) May be repeated to a maximum of 12 hours.

CME 768 RESIDENCE CREDIT FOR THE MASTER’S DEGREE. (1-6) May be repeated to a maximum of 12 hours.

CME 769 RESIDENCE CREDIT FOR THE DOCTOR’S DEGREE. (0-12)

CME 771 SEMINAR. (0) Review of current literature in the field of chemical engineering, general discussion and presentation of papers on departmental research. Lecture, one hour per week. Required for all graduate students in chemical engineering.

CME 779 MEMBRANE SCIENCES COLLOQUIUM. (1) Outstanding membrane scientists present their current research on biological and/or synthetic membranes. Students read a pertinent paper by the speaker prior to his/her talk and write a short paper on the talk; especially important is relevance of the main points of the talk to membrane science in general and the student’s own research in particular. May be repeated to a maximum of six credits. (Same as BCH/CHE/PHA/PHR 779.)

CME 780 SPECIAL PROBLEMS IN CHEMICAL ENGINEERING. (1-3) Independent study, design, or research in chemical engineering topics. May be repeated to a maximum of 12 credits. Prereq: Approval of the departmental director of Graduate Studies.

CME 790 RESEARCH IN CHEMICAL ENGINEERING. (1-9) Graduate Research in Chemical Engineering on a topic approved by the Departmental Graduate Studies Committee. May be repeated to a maximum of two semesters. Prereq: Consent of the Director of Graduate Studies.

CME 630 TRANSPORT I. (3) A unified study of physical rate processes in liquids and vapors, including: mass, energy, and momentum transport, transport in chemically reacting systems, similarities, turbulence modeling, buoyance-induced transport and multicomponent diffusion. Prereq: ME 330, CME 425, CME 505 concurrent or consent of instructor.

CME 631 TRANSPORT II. (3) A continuation of Transport I. Interphase transport of mass, energy, and momentum is discussed. Boundary Layer theory is applied to combined transport and chemical reaction. Theories of turbulent transport are examined. Prereq: CME 630 or consent of instructor.


CME 637 BIOLOGICAL TRANSPORT PHENOMENA. (3) Selected topics concerning momentum and mass transfer in the cardiopulmonary system. Prereq: CME 630 or consent of instructor.

CME 650 ADVANCED CHEMICAL REACTOR DESIGN. (3) Rate expressions for heterogeneous reaction kinetics; energy and mass transport within and external to reacting porous catalysts; design equations for multiphase fixed and moving bed reactors. Prereq: CME 550, CME 630, CME 505, or instructor consent.

CME 671 BASIC ELECTRODE PROCESSES IN ELECTROCHEMICAL ENGINEERING. (3) Provides engineers with an introduction to electrochemical theory and measurement techniques, including relaxation methods. Selected topics in equilibrium electrochemistry, generalized theory of reversibility, double layer structural effects on charge transfer rates, organic redox reactions, chemical power systems, and biomedical engineering. Prereq: CME 620 or consent of instructor.

CME 680 BIOCHEMICAL ENGINEERING. (3) Principles and design of processes involving biochemical reactions, including aerobic and anaerobic respirations and fermentations, and involving pure and mixed cultures. Energy considerations, heat and mass transfer, biochemical kinetics, and application to biological waste treatment. Prereq: CME 550, CME 630, CHE 440G or consent of instructor.

CME 695 RESEARCH IN FRAGMENTATION. (1-3)

CNU 601 CLINICAL NUTRITION. (4) An analysis of the process by which man ingests, assimilates and utilizes all of the constituents of food in health and disease. Relationship of biochemical and physiological factors to the nutrient requirements of the human body. Evaluation of dietary status and rationale of dietary management. Course to be taught by lectures, clinical rounds, conferences and written and oral case studies. Prereq: PGY 502, 503; consent of instructor. BCH 501 to be taken concurrently.

CNU 602 CURRENT TOPICS IN CLINICAL NUTRITION. (1) This course is designed to develop in students independent thinking and critical analysis related to various clinical nutrition issues. These skills will be developed through reading assignments related to clinical nutrition. Prereq: CNU 601.

CNU 603 NUTRITIONAL IMMUNOLOGY. (3) Theories and mechanisms of immunity will be introduced. The effects of nutrition on immunity will be discussed from experimental and clinical perspectives. A lecture and problem-based learning approach with incorporation of student presentations, three hours per week. Prereq: PGY 412G and CNU 601, or consent of instructor.

CNU 604 LIPID METABOLISM. (3) Emphasis on factors influencing the absorption of fats and fatty acids, distribution and incorporation of fatty acids into body tissues, the biosynthesis of and catabolism of fatty acids, as well as cholesterol, bioactive eicosanoid production and the involvement of fats in the disease process. Lecture and problem-based learning approach with incorporation of student presentations, three hours per week. Prereq: BCH 401G and PGY 412G or consent of instructor.

CNU 605 WELLNESS AND SPORTS NUTRITION. (3) Emphasis is directed toward nutrition as applied to prevention of disease through lifestyle management and the application of nutrition in exercise and sport. Targeted focus areas are: body composition and energy expenditure, the metabolic basis of weight management, nutrient needs throughout the lifecycle, the metabolic changes associated with obesity, behavioral management of obesity, nutrient metabolism and exercise, water and electrolyte balance during exercise, nutritional ergogenic aids, nutrition-strength and performance enhancement. Prereq: PGY 412G, and BCH 401G or equivalent or consent of instructor. (Same as PT 605.)

CNU 606 MOLECULAR BIOLOGY APPLICATIONS IN NUTRITION. (2) Focus will be on the use of the most recently developed techniques and model systems in molecular biology for studying nutrient regulation of gene expression. Examples include current problems in nutrition such as models for engineering plants containing more desirable nutrient sources (fats); for studying effects of various nutrients in transgenic mice on tumor suppressor genes and oncogene expression, that are important in cancer prevention; and for studying nutrient effects on genes that modulate obesity. Prereq: BCH 501 and 502 or equivalent; or BCH 401G and consent of instructor.

CNU 610 ETHICS IN CLINICAL SCIENCES RESEARCH. (1) Students will examine ethical issues in biomedical research using a case-study approach. Representative issues addressed may include data selection and retention, plagiarism, scientific review of grants and manuscripts, scientific misconduct, and informed consent. Prereq: Graduate student status. (Same as CD/CLS/PT/RAS 610.)

CNU 701 ADVANCED CLINICAL NUTRITION. (4) A course dealing primarily with the clinical application of the principles of nutrition, e.g., gastrointestinal disease and nutrition, nutrition and cancer, electrolytes and acid-base balances, drug-nutrient interactions, nutrition in the burn patient and pediatric nutrition. Prereq or concur: CNU 601.

CNU 702 CLINICAL NUTRITION PROBLEM-BASED CASE STUDIES. (1-5) A problem-based learning approach to case studies is integrated with a traditional didactic approach to offer options in therapeutic nutrition, health promotion and/or management. Efforts are directed toward patient, worksite and laboratory data interpretation as well as patient education. Students are directed to develop independent critical thinking related to case presentations regarding rotations through various medical or health services e.g. surgery, pediatrics, nutrition consultation, health promotion and wellness, hospital administration. Prereq: CNU 601, CNU 701, admission to CNU graduate program.

CNU 780 CLINICAL NUTRITION RESEARCH. (1-5) This course is designed to expose students to scientific research methods, including library research, laboratory experience, data preparation and analysis, etc., utilizing a project of mutual interest to the student and instructor. One semester required, credits to be arranged. May be repeated to a maximum of five credits.
COM 101 INTRODUCTION TO COMMUNICATIONS. (3)
An introduction to the process of communication as a critical element in human interaction and in society. Designed to enhance effective communication and informed use of the mass media.

COM 181 BASIC PUBLIC SPEAKING. (3)
A course designed to give the student platform experience in the fundamentals of effective speaking.

COM 184 INTERCOLLEGIATE DEBATING. (1)
Preparation for and participation in intercollegiate debating. May be repeated to a maximum of two credits.

COM 199 PRESENTATIONAL COMMUNICATION SKILLS. (1)
Introduces students to fundamental oral communication skills needed to prepare and present messages effectively. Note: This course will not substitute for the three-credit course COM 181, Basic Public Speaking. It will count toward partial completion of the oral communication skills component of the University Studies Program.

COM 249 MASS MEDIA AND MASS CULTURE. (3)
An examination of the interplay between the technology and content of the mass communications media and culture. Prereq: COM 101 or SOC 101 or its equivalent. (Same as SOC 249.)

COM 252 INTRODUCTION TO INTERPERSONAL COMMUNICATION. (3)
Examines basic verbal and nonverbal elements affecting communication between individuals in family, peer group, and work contexts. Course requires participation in activities designed to develop interpersonal communication skills. Topics include: strategy development, relationship and conversation management, effective listening, conflict management, and public speaking. Preparation for and participation in intercollegiate debating. May be repeated to a maximum of four credits.

COM 285 APPLIED PHONETICS. (3)
Study of the phonetic structure of English language with requirement of mastery of international Phonetic Alphabet. Emphasis will be placed on phonetic transcription, and application will be made for students interested in general speech, speech correction, radio, television, and theatre. (Same as EDS 285.)

COM 287 PERSUASIVE SPEAKING. (3)
A study of the processes involved in attitude change, with emphasis on the preparation and delivery of persuasive messages.

COM 288 ORAL INTERPRETATION. (3)
An analysis of prose and poetry for oral interpretation. Helpful to those who plan to teach literature.

COM 319 WORLD MEDIA SYSTEMS. (3)
A comparison of the communications media in different countries of the world and the theories used to justify them. How various political and social systems affect the media and how the media affect the societies in which they exist. Prereq: COM 101, TEL 101 or consent of instructor. (Same as TEL 319.)

COM 325 BUSINESS AND INDUSTRIAL COMMUNICATION. (3)
Reviews the principles of communication in organizations. The most common organizational communication variables are reviewed, e.g., communication distortion, conflict, power, managerial leadership style, roles, interviewing, information overload and underload. Emphasis is on application of the principles reviewed to the organizational setting. Simulations, exercises, case studies, and visits to organizations are used to accomplish this goal. Enrollment priority given to College of Communications majors.

COM 350 LANGUAGE AND COMMUNICATION. (3)
An introductory survey course covering syntactic, semantic, and pragmatic aspects of language as they relate to communication. Language learning, sign typologies, psycholinguistics, and the nature of meaning are selected topic areas. Emphasis is on behavioral, communication approach. Not open to students who have completed a 300-level (or above) linguistic class.

COM 351 INTRODUCTION TO COMMUNICATION THEORY. (3)
Considers various theoretical perspectives which lead to a more thorough understanding of communication processes. Begins with discussion of the development of theory and inquiry. Includes perspectives of systems, cognitive, behavioral, affective, symbolic interactionist, dramatic, cultural and social reality, interpretive and critical theories.

COM 365 INTRODUCTION TO COMMUNICATION RESEARCH METHODS. (3)
An introduction to the methods of philosophy of scientific research into the origins, nature, and effects of communication processes. Provides skills necessary for designing research projects and for interpreting and critically evaluating research results. Prereq: One course in statistics.

COM 381 MANAGING COMMUNICATION IN LARGER GROUPS: THE PARLIAMENTARY PROCESS. (3)
A study of the principles and history governing decision-making in voluntary organizations and deliberative assemblies. Social and political rationales for group activity, as well as principles of decision making in small groups and larger assemblies. Emphasis is on both traditional and newer forms of parliamentary practice.

COM 395 INDEPENDENT WORK. (1-3)
Research and study of special topics in communication. The student proposes the specific study to be undertaken and formally contracts with a faculty supervisor for guidance and evaluation. Ordinarily, projects will require the production of written materials as a basis for the evaluation. May be repeated to a maximum of six credits. Prereq: Either a major and a standing of 3.0 in COM courses or consent of instructor.

COM 399 INTERNSHIP IN COMMUNICATION. (1-6)
Provides field-based experience in communication through work in industry, government, education, etc. Pass-fail only. May be repeated to a maximum of six credits. A maximum of these credit hours may be counted toward the communication major. Prereq: 2.6 GPA (with 3.0 GPA in major courses), junior/senior Communication majors only, consent of Department Internship Director prior to registration, and completion of departmental learning contract.

COM 419 INTERNATIONAL AND INTERCULTURAL COMMUNICATION. (3)
Studies interpersonal and media communication systems and policies of various cultures within and across nations. Considers the social, economic, and political implications of advances in communication technology. Prereq: COM 319.
COM 449 SOCIAL PROCESSES AND EFFECTS OF MASS COMMUNICATION. (3)
The relationship between the organization of modern society and its communication media. Special emphasis is given in the way in which cultural processes and social change have an impact upon the mass media, and upon the way in which the mass media influence cultural processes and social change. The social-psychological bases of communication are studied within a context of theory and research. Prereq: SOC/COM 249 or its equivalent. (Same as SOC/EDC 449.)

COM 452 STUDIES IN INTERPERSONAL COMMUNICATION. (3)
Examines current theory and research on the nature and development of interpersonal communication ability. Topics include: foundations of communicative development, development of strategic communicative skills, relational communications, conversation analysis, cultural and institutional influences on the development of interpersonal communication ability. Prereq: COM 252.

COM 453 MASS COMMUNICATION AND SOCIAL ISSUES. (3)
A course devoted to the examination of criticism of the mass media and an evaluation of the relationship of mass communication to contemporary social issues. Prereq: COM 249 or TEL 101. (Same as TEL 453.)

COM 454 HONORS SEMINAR IN COMMUNICATION. (3)
Intensive study of a communication topic in professional, theoretical, and research methodology areas of communication. This seminar will not count toward a communication major; it will count toward credits for graduation. Prereq: 3.3 GPA in communication major.

COM 482 PERSUASION. (3)
The principles and methods of persuasion. Of particular benefit to teachers, lawyers, business majors, and other persons whose work is concerned with motivating human conduct.

COM 483 STUDIES IN ARGUMENTATION. (3)
A study of the theories of argumentation and debate as derived from rhetorical, philosophical and psychological sources; critical examination of representative examples of oral argument.

COM 525 ORGANIZATIONAL COMMUNICATION. (3)
This course reviews theories and research relevant to an understanding of the organizational communication process. Emphasis is on communication in an organization at the interpersonal, small group and whole organizational level. Prereq: COM 325 or consent of the instructor.

COM 555 CYBERSPACE AND COMMUNICATION. (3)
An examination of the political, social, and behavioral effects of on-line communication systems, including systems for various forms of personal communication, information retrieval, transaction processing, monitoring, and other purposes. Lecture, three hours; laboratory, one hour per week. Prereq: TEL 201 or TEL 355 and a research methods course (TEL 300, COM 365, or equivalent), or consent of instructor. (Same as TEL 555.)

COM 571 HEALTH COMMUNICATION. (3)
This course offers a broad introduction to communication in health care delivery from a variety of perspectives, combining interpersonal, organizational, and semiotic approaches. Prereq: Consent of instructor.

COM 581 STUDIES IN SMALL GROUP COMMUNICATION CONTEXTS. (3)
Examines current theory and research on the nature and development of small group discussion. Includes topics of leadership, interpersonal relations and roles, group goals vs. individual goals, and networks. Prereq: COM 281.

COM 584 TEACHING OF SPEECH COMMUNICATION. (3)
An analysis of the field of speech education as related to the teacher of speech.

COM 591 SPECIAL TOPICS IN COMMUNICATION (Subtitle required). (1)
Intensive study of a specialized topic area in communication. May be repeated to a maximum of six credits under different subtitles. A maximum of three credits can be counted toward a Communication major. Lecture, three hours per week for five weeks. Prereq: Consent of instructor.

CPC 501 PERSPECTIVES IN RELIGION AND HEALTH. (3)
An interdisciplinary study of significant religious components in health. Prereq: Consent of instructor.

CPC 899 CLINICAL PASTORAL PRACTICUM. (1-2)
Students participate in a program of supervised learning consistent with one unit of CPE, according to Standards of the Association for Clinical Pastoral Education, Inc. Each student is assigned to at least one area of the University Hospital for clinical pastoral work. Evening, weekend, and/or overnight assignments may be expected. The course work consists of instruction, group interaction, and experience with patients in the University Hospital. An individualized learning contract is required for each student. May be repeated to a maximum of 18 credits. Offered on a pass/fail basis only. Prereq: Baccalaureate degree, consent of instructor.

CS 100 THE COMPUTER SCIENCE PROFESSION. (1)
An introductory seminar which covers the fundamental activities, principles, and ethics of the computer science profession. An overview of the discipline of computer science, examples of careers, the history of computing and experience with elementary computing tools are included.

CS 101 INTRODUCTION TO COMPUTING I. (3)
An introduction to computing and its impact on society from a user’s perspective. Topics include computation using spreadsheets, beautification using text formatters and word processors, information management with database managers, and problem solving through program design and implementation using a simple programming language. Not open to students who have received credit for higher level computer science courses.

CS 115 INTRODUCTION TO COMPUTER PROGRAMMING. (3)
This course teaches introductory skills in computer programming using an object-oriented computer programming language. There is an emphasis on both the principles and practice of computer programming. Covers principles of problem solving by computer and requires completion of a number of programming assignments.

CS 215 INTRODUCTION TO PROGRAM DESIGN, ABSTRACTION, AND PROBLEM SOLVING. (4)
The course teaches introductory object-oriented problem solving, design, and programming engineering. An equally balanced effort will be devoted to the three main threads in the course: concepts, programming language skills, and rudiments of object-oriented programming and software engineering. Prereq: CS 115.

CS 216 INTRODUCTION TO SOFTWARE ENGINEERING. (3)
Software engineering topics to include: life cycles, metrics, requirements specifications, design methodologies, validation and verification, testing, reliability and project planning. Implementation of large programming projects using object-oriented design techniques and software tools in a modern development environment will be stressed. Prereq: CS 215.

CS 221 FIRST COURSE IN COMPUTER SCIENCE FOR ENGINEERS. (2)
Characteristics of a procedure-oriented language; description of a computer as to internal structure and the representation of information; introduction to algorithms. Emphasis will be placed on the solution of characteristic problems arising in engineering. Prereq: MA 113. Not open to students who have received credit for CS 150.

CS 222 COMPUTER SCIENCE FOR ELECTRICAL ENGINEERS. (3)
Characteristics of a procedure-oriented language; high-level description of computer structure and representation information schemes; introduction to algorithm development and design. Emphasis will be placed on the programming tools used in software engineering. Tools suitable for programming development on microcomputers will be emphasized. Not open to students who have received credit for CS 212 or CS 221.

CS 223 COMPUTER SCIENCE FOR CIVIL ENGINEERS. (2)
An introduction to computer-assisted problem solving for civil engineering students using a microcomputer based procedure-oriented language; a description of internal structure and representation of information; an introduction to algorithms. Emphasis will be placed on the solution of characteristic problems arising in civil engineering. Prereq: MA 113, CE 121.
CS 275 DISCRETE MATHEMATICS. (4)

CS 315 ALGORITHM DESIGN AND ANALYSIS. (3)

CS 321 INTRODUCTION TO NUMERICAL METHODS. (3)

CS 335 GRAPHICS AND MULTIMEDIA. (3)
This course focuses on the graphical human-machine interface, covering the principles of windowing systems, graphical interface design and implementation, and processing graphical data. There is an emphasis on medium-scale programming projects with graphical user interfaces using a high-level procedural programming language and concepts such as object-oriented design. Prereq: CS 216 and engineering standing.

CS 340 DISCRETE STRUCTURES IN COMPUTER SCIENCE. (3)
Topics include permutations, combinations and partitions; inclusion-exclusion principle; generating functions and recurrence relations; elementary algorithms concerning graphs and trees; generation of random combinatorial and graphical examples; Boolean algebra, Boolean functions, switching circuits and mathematical logic; introduction to algebraic coding theory. Prereq: CS 245 and CS 270. Restricted to computer science, electrical engineering, mathematics and mathematical sciences majors. Others by permission. (Same as MA 340.)

CS 375 LOGIC AN THEORY OF COMPUTING. (3)

CS 380 MICROCOMPUTER ORGANIZATION. (3)
Hardware and software organization of a typical computer: machine language and assembler language programming, interfacing peripheral devices, and input/output programming; real-time computer applications, laboratory included. Prereq: EE 280 or CS 245. (Same as EE 380.)

CS 395 INDEPENDENT WORK IN COMPUTER SCIENCE. (2)
A course for computer science majors only. A problem, approved by the chairperson of the department, provides an opportunity for individual research and study. May be repeated to a maximum of six credits. Prereq: Major and a standing of 3.0 in the department and consent of instructor.

CS 405G INTRODUCTION TO DATABASE SYSTEMS. (3)
Study of fundamental concepts behind the design, implementation and application of database systems. Brief review of entity-relationship, hierarchial and network database models and an in-depth coverage of the relational model including relational algebra and calculus, relational database theory, concepts in schema design and commercial database languages. Prereq: CS 315 and graduate or engineering standing.

CS 415G GRAPH THEORY. (3)
Theory of linear undirected graphs, including definitions and basic concepts, trees, connectivity, traversability, factorization, planarity and matrices. In addition, algorithm for finding spanning trees, testing connectivity, finding Euler trails, finding a maximum matching in a bipartite graph, and testing planarity will be presented at appropriate times. Applications of algorithms to operations research, genetics and other areas. About 55 percent of the course will be on general theory of graphs, 30 percent on algorithms and 15 percent on applications of these algorithms. Prereq: Consent of instructor. (Same as MA 415G.)

CS 416G PRINCIPLES OF OPERATIONS RESEARCH. (3)
The course is an introduction to modern operations research and includes discussion of modeling, linear programming, dynamic programming, integer programming, scheduling and inventory problems and network algorithms. Prereq: MA 213 or equivalent. (Same as MA 416G.)

CS 420G COMPILERS FOR ALGORITHMIC LANGUAGES. (3)
The techniques of processing, specifying, and translating high-level computer languages are studied. Topics include finite state machines and lexical analysis, context-free grammars for language specification, attributed translation grammars, language parsing, and automatic generation of compilers by SLR, LALR, and other methods of analyzing context-free grammars. Other topics may include code optimization, semantics of programming languages and top-down parsing. Prereq: CS 370. Restricted to computer science and electrical engineering majors. Others by permission.

CS 422 NUMERICAL SOLUTIONS OF EQUATIONS. (3)
Linear equations: Gaussian elimination, special linear systems, orthogonalization, eigenproblem, iterative methods. Nonlinear equations: solutions of equations in one variable, solutions of systems of nonlinear equations. Optimization. Prereq: CS/MA 321 and MA 322; or consent of instructor. (Same as MA 422.)

CS 450G FUNDAMENTALS OF PROGRAMMING LANGUAGES. (3)
An intensive study of fundamental programming concepts exhibited in current high-level languages. Concepts include recursion, iteration, coroutines, multiprocessing, backtracking, pattern-matching, parameter passing methods, data structures, and storage management. Typical languages studied are SNOBOL, LISP, PASCAL, and APL. Prereq: CS 370. Restricted to computer science and electrical engineering majors. Others by permission.

CS 463G LOGIC AND ARTIFICIAL INTELLIGENCE. (3)
The course covers the basic techniques of artificial intelligence as well as the logical apparatus necessary for understanding the material. The students learn basics of knowledge representation, search techniques, and artificial intelligence systems. Prereq: CS 315, CS 375, and graduate or engineering standing.

CS 470G INTRODUCTION TO OPERATING SYSTEMS. (3)
This course provides an introduction and overview of operating system design, internals, and administration. Topics include classical operating systems (process management, scheduling, memory management, device drivers, file systems), modern operating systems concepts (kernel/microkernel designs, concurrency, synchronization, interprocess communication, security and protection), and operating system administration. Prereq: CS 315, CS 380, and graduate or engineering standing.

CS 471G NETWORKING AND DISTRIBUTED OPERATING SYSTEMS. (3)
Broad overview of concepts in networking and distributed operating systems with examples. Topics will include protocol stacks, link, network, transport, and application layers; network management, the client-server model, remote procedure calls, and case studies of distributed OS and file systems. Prereq: CS 315 and graduate or engineering standing.

CS 480G ADVANCED COMPUTER ARCHITECTURE. (3)
This course focuses on advanced computer architectures and low-level system software. Topics include RISC architectures, vector and multiprocessor architectures, multiprocessor memory architectures, multiprocessor interconnection networks, peripheral devices such as disk arrays, NICs and video/audio devices, device drivers, interrupt processing, advanced assembly language programming techniques, and assemblers, linkers, and loaders. Prereq: CS/EE 380 and graduate or engineering standing.

CS 485G TOPICS IN COMPUTER SCIENCE (Subtitle required). (2-4)
Studies of emerging research and methods in computer science. A review and extension of selected topics in the current literature. When the course is offered, a specific title with specific credits, the number of hours in lecture-discussion and laboratory will be announced. Lecture/discussion, two-four hours; laboratory, zero-four hours per week. May be repeated to a maximum of eight credits under different subtitles. Prereq: Variable, given when topic is identified; or consent of instructor.

CS 499 SENIOR DESIGN PROJECT. (3)
Projects to design and implement complex systems of current interest to computer scientists. Students will work in small groups. Prereq: CS 315 and engineering standing.

CS 505 ADVANCED CONCEPTS IN DATABASE SYSTEMS. (3)
The course introduces a variety of modern techniques in database and distributed database systems. The major topics include but are not limited to: object-oriented database systems, distributed and heterogeneous databases and knowledge based systems (including discussion on logic in databases and logical equivalence of various logical and database languages). The prime concern of this course is to teach a variety of methods that would allow to apply database techniques to a solution of database problems in those areas where the traditional relational database methods are not viable. Prereq: CS 405 and engineering standing.
CS 515 ALGORITHM DESIGN. (3)
The design and analysis of efficient algorithms on data structures for problems in sorting, searching, graph theory, combinatorial optimization, computational geometry, and algebraic computation. Algorithm design techniques: divide-and-conquer, dynamic programming, greedy method, and randomization, approximation algorithms. Prereq: CS 315 and engineering standing.

CS 521 COMPUTATIONAL SCIENCES. (3)
Study of computer science techniques and tools that support computational sciences and engineering. Emphasis on visualization, performance evaluation, parallel computing, and distributed computing. Prereq: CS 115, CS/EE 380, and engineering standing.

CS 522 MATRIX THEORY AND NUMERICAL LINEAR ALGEBRA I. (3)

CS 535 INTERMEDIATE COMPUTER GRAPHICS. (3)
Three-dimensional graphics primitives such as 3D viewing, lighting, shading, hidden line/surface removal, and more advanced topics such as solid modeling, image storage and representation, advanced raster graphics architecture and algorithms, advanced modeling techniques, and animation will be covered. Prereq: CS 335, CS 315, CS 321, and engineering standing.

CS 537 NUMERICAL ANALYSIS. (3)
Floating point arithmetic. Direct methods for the solution of systems of linear algebraic equations. Polynomial and piecewise polynomial approximation, orthogonal polynomials. Numerical integration: Newton Cotes formulas and Gaussian quadrature. Basic methods for initial value problems for ordinary differential equations. The emphasis throughout is on the understanding and use of software packages for the solution of commonly occurring problems in science and engineering. Prereq: CS/MA 521 or equivalent or graduate standing or consent of instructor. Knowledge of a procedural computer language is required. (Same as EGR/MA 537.)

CS 538 NUMERICAL ANALYSIS II. (3)
A continuation of CS/EGR/MA 537. Roots of a nonlinear equation and minimization of a function of a single variable. Linear difference equations. Numerical methods for ordinary differential equations: initial value problems, and elementary techniques for two-point boundary value problems. Prereq: A grade of B or better in CS/MA 521 or CS/EGR/MA 537 or equivalent. (Same as MA 538.)

CS 541 ADVANCED COMPILER DESIGN I. (3)
A study of the theory and practice of implementing compilers for high-level languages with emphasis on the use of compiler-compilers for automatic generation of compiler systems. Topics include specification of languages by grammars, LR, SLR, LALR, and LL parsing algorithms, lexical analysis, syntax directed translation, code optimization and generation, and data flow analysis. Prereq: CS 420G or CS 550 or CS 575. Restricted to computer science and electrical engineering majors. Others by permission.

CS 555 LOGIC FOR COMPUTER SCIENCE. (3)
The course exposes students to intermediate areas of logic, model theory, recursion theory and set theory (basic undergraduate logic is covered by CS 245). It creates foundations for Theory (CS 575 and subsequent courses), Artificial Intelligence (CS 560, CS 660), Expert Systems, and Natural Language Processing areas. Prereq: CS 245.

CS 560 ARTIFICIAL INTELLIGENCE. (3)
This course is primarily concerned with general problem-solving methods: production systems, searching of graphs, and automated theorem-proving methods, in particular the resolution method and its variants. Topics include methods of heuristics, games on trees, and minimax methods, as well as a study of various knowledge-representation schemes such as frames, prototypes, predicate logic and basic methodology of expert systems. Prereq: CS 245, CS 340, and CS 370.

CS 570 MODERN OPERATING SYSTEMS. (3)
Brief review of classical operating system concepts (process and memory management, process coordination, device drivers, file systems, starvation/deadlock). Modern topics of files systems (log-structured file systems, distributed file systems, memory-based file systems), operating systems (monolithic, communication-kernel, distributed, shared memory), multiprocessor issues (scheduling, synchronization, IPC), security (internet attacks, encryption, defenses). Inspection and modification of actual operating system code (Linux). Prereq: CS 470 and engineering standing.

CS 575 THEORETICAL ASPECTS OF COMPUTING. (3)
Theoretical considerations in computer science. Topics include computability, unsolvability, automata and formal language theory, verification, and computational complexity. Prereq: CS 340. Restricted to computer science and electrical engineering majors. Others by permission.

CS 585 INTERMEDIATE TOPICS IN COMPUTER SCIENCE (Subtitle required). (3)
Topics to be selected by staff. May be repeated to a maximum of six credits, but only three credits may be earned by a student under the same topic. Prereq: Restricted to computer science and electrical engineering majors. Others by permission.

CS 587 MICROCOMPUTER SYSTEMS DESIGN. (3)
A course in the design of microcomputer systems for hardware engineers which includes the following topics: use of uncommitted logic arrays in instruction set design; hardware support for operating systems and programming languages; customizing microcomputers for specific execution environments; and control of concurrency. Prereq: EE 5581 and EE 5583, or consent of instructor, engineering standing or upper division computer science standing. (Same as EE 587.)

CS 610 MASTER’S PROJECT. (3)
Design and implementation of a large computing project under the supervision of a member of the graduate faculty. Prereq: Satisfactory completion of the departmental foundational examinations.

CS 612 INDEPENDENT WORK IN COMPUTER SCIENCE. (1-3)
Reading course for graduate students in computer science. May be repeated to a maximum of nine credits. Prereq: Overall standing of 3.0, and consent of instructor.

CS 622 MATRIX THEORY AND NUMERICAL LINEAR ALGEBRA II. (3)

CS 630 GEOMETRIC MODELING. (3)
This course discusses methods for design, modeling, representation, and generation of solids. Topics of curve design, surface design, solid modeling, shapes, and inter-section methods will be covered. Prereq: CS 545, CS 321.

CS 635 IMAGE PROCESSING. (3)
The course outlines applications of image processing and addresses basic operations involved. Topics covered include image perception, transforms, compression enhancement, restoration, segmentation, and matching. Prereq: Graduate standing and consent of instructor. (Same as EE 635.)

CS 636 COMPUTER VISION. (3)
Topics of human visual system will be discussed first. Then approaches to implementation of visual processes by computers will be described. Prereq: CS/EE 635.

CS 641 ADVANCED COMPILER DESIGN II. (3)
Optimization, special purpose languages, compiler-compiler, industrial compiler practice. Prereq: CS 541 or consent of instructor.

CS 642 DISCRETE EVENT SYSTEMS. (3)
The objective of the course is to prepare students for research in the field of supervisory control of discrete event systems (DES’s). Logical models, supervising control. Stability and optimal control of DES, complexity analysis and other related research areas will be covered. Prereq: Graduate standing or consent of instructor. (Same as EE 642.)

CS 645 COMPUTER NETWORKS. (3)
The focus of the course will be on learning various principles and techniques employed in the development of computer communication networks. A study of International Standards Organization’s (ISO) seven layer Open Systems Interconnections (OSI) model and the U.S. Department of Defense’s ARPA Internet model will be covered. The course will cover details of link and network layer under the OSI model, will examine the model of internetworking with particular emphasis on DARPA Internet. Prereq: CS 570.

CS 650 PROBLEM SEMINAR. (3)
A seminar on the identification, analysis, formulation and solution of problems amenable to computer solution. Presupposes knowledge of calculus and programming. Prereq: Consent of instructor.
CS 655 DESIGN OF PROGRAMMING LANGUAGES. (3)
A study of techniques for designing programming languages and implementing processors for them. Emphasis is placed on programming languages exhibiting powerful and high level features such as nondeterminism and pattern-directed procedure invocation. The course includes the writing of actual processors. Prereq: CS 575 or CS 580.

CS 660 TOPICS IN ARTIFICIAL INTELLIGENCE
(Subtitle required.) (3)
Advanced topics chosen from the following: knowledge representation, knowledge acquisition, problem solving, very high-level programming languages, expert systems, intelligent and deductive databases, automated theorem proving. May be repeated to a maximum of six credits, but only three credits may be earned under the same topic. Prereq: CS 505 and CS 560 or consent of instructor.

CS 674 HEURISTIC ALGORITHMS. (3)
Advanced topics in algorithm design emphasizing the application of various heuristics. The course will treat active research topics. These topics include graph algorithms, parallel algorithms, randomization, linear and integer programming, VLSI and geometry problems. Prereq: CS 575 and CS 580.

CS 675 THEORY OF COMPUTATION. (3)
Computability by Turing Machines and algorithms. The predicate calculus, syntax, semantics, natural deduction, and the resolution method. Program verification and flowchart schemes. The fixpoint theory of programs. Prereq: CS 575.

CS 676 PARALLEL ALGORITHMS. (3)
The study of intrinsic parallelism in computational problems and the design of fast and efficient parallel algorithms. Parallel algorithms for prefix computation, selection, merging, sorting, routing, arithmetic, graph, and systolic algorithms. Prereq: CS 580.

CS 677 COMPUTATIONAL GEOMETRY. (3)
Design and analysis of algorithms and data structures for geometric problems. The particular groups of problems addressed include convex hull construction, proximity, Voronoi diagrams, geometric search, intersection. Prereq: CS 580.

CS 679 ADVANCED GRAPH ALGORITHMS. (3)
The design of algorithms for graph problems. In particular, the design of efficient algorithms for optimization problems on graphs, such as minimum spanning tree, shortest paths, maximum matching and maximum flow problems. Design of heuristic (approximation) algorithms. Search trees, heaps, and their self-adjusting variants. Methods of estimating algorithm performance: worst-case analysis, average-case analysis, amortization. Prereq: CS 580 or consent of instructor.

CS 680 SEMINAR IN COMPUTER SCIENCE. (2)
May be repeated to a maximum of four credits. Prereq: Consent of instructor, or two 500-level computer science courses.

CS 682 SWITCHING THEORY. (3)
Application of the symbolic logic of Boole and Schroeder to the design of switching systems. Topics include Boolean algebra, Boolean analysis, the solution of logic equations, the minimization of Boolean formulas, and the diagnosis of failures in digital systems. Prereq: EE 280 or consent of instructor. (Same as EE 682.)

CS 683 FINITE-STATE MACHINES. (3)

CS 685 SPECIAL TOPICS IN COMPUTER SCIENCE (Subtitle required). (3)
Topics to be selected by staff. May be repeated to a maximum of six credits but only three credits may be earned under the same topic. Prereq: Consent of instructor or two 500-level computer science courses.

CS 686 SPECIAL TOPICS IN THE THEORY OF COMPUTATION (Subtitle required). (3)
Advanced topics in the theory of computation and the design and analysis of algorithms, including heuristic approaches for algorithm design, parallel computation, flow problems, parallel and concurrent processes and other areas of current research interest. Prereq: Consent of instructor or CS 575 and 580.

CS 687 SPECIAL TOPICS IN SOFTWARE (Subtitle required). (3)
Topics to be selected by staff. May be repeated to a maximum of six credits but only three credits may be earned under the same topic. Prereq: Consent of instructor or two 500-level computer science courses.

CS 688 NEURAL NETWORKS. (3)
The purpose of this course is to introduce various aspects of the neural networks and neurocomputing. The course starts with an introduction to Learning Machines and analyzes various learning algorithms such as Hebbian, Grossberg's and Kohonen's learning algorithms. Some of the neural networks that will be studied in detail are: Backpropagation nets, Hopfield nets, Adaptive Resonance Theory, Adaline and Madalines, Kohonen's Self learning nets, BAMS, Neocognition, etc. Students will implement a minimum of three learning algorithms. Prereq: Graduate standing. (Same as EE 688.)

CS 689 SPECIAL TOPICS IN NUMERICAL COMPUTING (Subtitle required). (3)
Prereq: Consent of instructor or two 500-level computer science courses.

CS 690 OPERATING SYSTEMS THEORY. (3)
An advanced study of operating systems theory including cooperating sequential processes, processor scheduling, paging systems, and memory management. Prereq: CS 570.

CS 748 MASTER'S THESIS RESEARCH. (0)
Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

CS 749 DISSERTATION RESEARCH. (0)
Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

CS 768 RESIDENCE CREDIT FOR MASTER'S DEGREE. (1-6)
May be repeated to a maximum of 12 hours.

CS 769 RESIDENCE CREDIT FOR DOCTOR'S DEGREE. (0-12)
May be repeated indefinitely.