922 Interpersonal Communication
Fall. 3(3-0)
Theory and research in interpersonal communication. Role of communication in processes such as interpersonal influence and relationship development.

990 Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in Communication. Approval of department. Individualized study under faculty direction.

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

COMMUNICATION ARTS AND SCIENCES CAS
College of Communication Arts and Sciences

192 Environmental Issues Seminar
Fall. Spring. 1 credit. A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Natural Science, Agriculture and Natural Resources, Engineering, Social Science. Administered by Natural Science. R: Open only to students in the College of Agriculture and Natural Resources or the College of Engineering or the College of Natural Science or the College of Communication Arts and Sciences or College of Social Science. Approval of college. Environmental issues and problems explored from a variety of perspectives, including legal, scientific, historical, political, socio-economic, and technical points of view.

299 Media Writing
Fall, Spring, Summer. 3(1-4)
Writing for mass media.

492 Special Topics
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 16 credits in all enrollments for this course. R: Approval of college. Varied topics pertaining to the study of communication processes.

825 Mass Communication and Public Health
Fall. 3(3-0) RB: Academic or professional background in mass communication and/or health. Health communication campaigns in domestic and international contexts. Focus on principles of effective communication.

826 Health Communication for Diverse Populations
Spring. 3(3-0) RB: Academic or professional background in mass communication and/or health. Theory, research, and practice of communicating with specialized populations in clinical and public health contexts. Emphasis on interpersonal and small-group strategies.

892 Special Topics
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 16 credits in all enrollments for this course. R: Open only to graduate students in the College of Communication Arts and Sciences or approval of college. Varied topics pertaining to advanced study of communication processes.

992 Doctoral Seminar
Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 15 credits in all enrollments for this course. R: Open only to Ph.D. students in Mass Media and Communication or approval of college. Topics on theoretical and research issues in communication and mass media.

993 Research Internship
Fall, Spring, Summer. 1 credit. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Ph.D. students in Mass Media. Participation in faculty research projects.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Ph.D. students in Mass Media. Doctoral dissertation research.

COMPUTER SCIENCE AND ENGINEERING CSE
Department of Computer Science and Engineering
College of Engineering

101 Computing Concepts and Competencies
Fall, Spring. 3(2-2) P.M: (MTH 103 or MTH 110 or MTH 116 or LBS 117 or MTH 124 or MTH 132 or MTH 152H) RA: CPS 100, CPS 130
Core concepts in computing including information storage, retrieval, management, and representation. Applications from specific disciplines. Applying core concepts to design and implement solutions to various local problems. Using hardware, multimedia software, communication and networks.

131 Introduction to Technical Computing
Fall, Spring. 3(2-2) P.M: (EE 331 or MTH 103 or MTH 110 or MTH 116 or LBS 117 or MTH 124 or MTH 132 or MTH 152H) RA: CPS 131
Use of computing systems for technical communications and problem solving in engineering, mathematics, and science. Development and use of mathematical models suitable for computer representation, solution, graphical display, and animation.

231 Introduction to Programming 1
Fall, Spring. 4(3-2) P.M: (LBS 118 or MTH 124 or MTH 132 or MTH 152H) RA: (CSE 131) SA: CSE 230
Introduction to object-centered programming using C++. Design, implementation and testing of programs to solve problems in engineering, mathematics and science. Programming fundamentals, functions, classes, arrays, and pointers.

232 Introduction to Programming II
Fall, Spring. 4(3-2) P.M: (CSE 231) SA: CSE 330
Continuation of object-centered programming using C++; development of classes and reliable software. Data structures and their encapsulation: stacks, queues, lists, trees, and hash tables. Algorithms operating on data structures. Object-oriented design and programming.

260 Discrete Structures in Computer Science
Fall, Spring. 4(4-0) P.M: (MTH 133 or MTH 126 or MTH 153H or LBS 119) SA: CPS 260

290 Independent Study in Computer Science
Fall, Spring. 1 credit. A student may earn a maximum of 3 credits in all enrollments for this course. R: Approval of department; application required. SA: CPS 290
Supervised individual study in an area of computer science.

291 Selected Topics in Computer Science
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Approval of department. SA: CPS 291
Topics selected to supplement and enrich existing courses and lead to the development of new courses.

320 Computer Organization and Assembly Language Programming
Fall, Spring. 4(3-2) P.M: (CSE 232 and CSE 260) SA: CPS 320 Not open to students with credit in EE 331.
Machine representation of data and instructions. Machine organization, primary storage, registers, arithmetic logic unit, control unit, operations. Assembly language programming, interface to high level languages. Assemblers and loaders.

331 Algorithms and Data Structures
Fall, Spring. 4(3-2) P.M: (CSE 232 and CSE 260) R: Open only to students in the Department of Computer Science and Engineering or Computer Engineering majors or the LBS Computer Science coordinate major or the Computer Science disciplinary minor.
Linear data structures, trees, and graphs and algorithms which operate on them. Fundamental algorithms for searching, sorting, string matching, graph problems, and their analysis.

370 Software Engineering
Fall, Spring. 4(3-2) P.M: (CSE 232 and CSE 260) R: Open only to students in the Department of Computer Science and Engineering or the Computer Engineering major or the LBS Computer Science field of concentration or the LBS Computer Science coordinate major or the Computer Science disciplinary minor. SA: CPS 470, CSE 470
Software life cycle including specification, design, coding, testing, and verification of a software product. Stepwise refinement and rapid prototyping. Software portability, reusability and maintenance.
807 Computer System Performance and Measurement
Spring of odd years. (3-0) Interdepartmental with Electrical and Computer Engineering. RB: (CSE 410 and STT 441) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 807

808 Modelling and Discrete Simulation
Fall of odd years. 3(3-0) RB: (CSE 232 and STT 441) R: Open only to majors in Computer Science and Engineering or approval of department. SA: CPS 808

809 Algorithms and Hardware Implementation
Fall. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. SA: ECE 809
Arithmetic, signal processing, and image processing algorithms. Array structures: systolic architecture, data flow structure, neural network architecture. Performance analysis.

812 Advanced Operating Systems
Spring. 3(3-0) RB: (CSE 410 and CSE 420) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 812
Parallel and distributed operating systems. Load sharing, scheduling, reliability, recovery, memory management. Distributed file systems, distributed agreement, and object-oriented operating systems.

813 Advanced VLSI Design
Spring. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. P: M: (ECE 410) SA: ECE 813

814 Formal Methods in Software Development
Fall of odd years. 3(3-0) RB: (MTH 472) R: Open only to majors in the Department of Computer Science and Engineering or approval of department. SA: CPS 814
Formal specification languages, integrating verification with development. Design and the implementation of term project.

820 Advanced Computer Architecture
Fall, Spring. 3(3-0) Interdepartmental with Electrical and Computer Engineering. RB: (CSE 410 and CSE 420) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 820
Instruction set architecture, Pipelining, vector processors, cache memory, high bandwidth memory design, virtual memory, input and output. Benchmarking techniques. New developments related to single CPU systems.

822 Parallel Processing in Computer Systems
Spring. 3(3-0) Interdepartmental with Electrical and Computer Engineering. RB: (CSE 820) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 822
Massively parallel SIMD processors, multiprocessor architectures, interconnection networks, synchronization and communication. Memory and address space management, process management and scheduling. Parallel compilers, languages, performance evaluation.

830 Design and Theory of Algorithms
Fall, Spring. 3(3-0) RB: (CSE 232 and CSE 460) R: Open only to majors in the Department of Computer Science and Engineering or approval of department. SA: CPS 830
Analysis of algorithms. Algorithm design techniques. Efficient algorithms for classical problems. Intractable problems and techniques to handle them.

835 Algorithmic Graph Theory
Fall. 3(3-0) RB: (CSE 232 and CSE 460 and MTH 314) R: Open only to majors in the Department of Computer Science and Engineering or approval of department SA: CPS 835
Classical concepts in Graph Theory. Algorithmic aspects of graphs such as finding paths, network flow, spanning trees and matching.

838 Design of Parallel Algorithms
Spring. 3(3-0) RB: (CSE 420 and CSE 830) R: Open only to majors in the Department of Computer Science and Engineering or approval of department. SA: CPS 838
Current research topics and issues. Models of parallel computation. Implementation of algorithms on SIMD and MIMD machines. Relationship to VLSI.

841 Artificial Intelligence
Fall. 3(3-0) RB: (CSE 440) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 841
Types of intelligence, knowledge representation, cognitive models. Goal-based systems, heuristic search and games, expert systems. Language understanding, robotics and computer vision, theorem proving and deductive systems, and learning.

845 Introduction and Laboratory in Knowledge-Based Systems
Spring. 4(3-2) RB: (CSE841) or equivalent. R: Open only to students in the Department of Computer Science and Engineering. Approval of department needed for non-majors. SA: CPS 845
Principled development and deployment of knowledge-based systems. Extensive reading in the historical literature of rule-based systems and approaches to topic-specific architectures for problem solving. Issues in knowledge acquisition, design problem solving, and qualitative modeling.

847 Machine Learning
Spring. 3(3-0) P: M: (CSE 841) RB: Algorithms, programming in C or equivalent, probability and statistics, artificial intelligence. R: Open only to students in the Department of Computer Science and Engineering or approval of department.
Computational study of learning and data mining. Strengths and limitations of various learning paradigms, including supervised learning, learning from scalar reward, unsupervised learning, and learning with domain knowledge.

848 Evolutionary Computation
Fall of even years. 3(3-0) RB: (CSE 841 and CSE 440) R: Open only to students in the Department of Computer Science and Engineering or approval of department.
Investigation of evolutionary computation from a historical, theoretical and application viewpoint. Readings from the present literature, experiments with provided software on the application of evolutionary computation principles.

860 Foundations of Computing
Spring. 3(3-0) RB: (CSE 460) R: Open only to majors in the Department of Computer Science and Engineering or approval of department. SA: CPS 860

870 Advanced Software Engineering
Spring. 3(3-0) RB: (CSE 470) R: Open only to majors in the Department of Computer Science and Engineering or approval of department. SA: CPS 870
Methods and techniques supporting later lifecycle activities, including software testing and maintenance, reuse, and reverse engineering. Domain-specific software engineering methods. Human-computer interfaces, distributed systems, and visualization techniques.

880 Advanced Database Systems
Fall. 3(3-0) RB: (CSE 480) R: Open only to majors in the Department of Computer Science and Engineering or approval of department. SA: CPS 880
Distributed and object-oriented databases and knowledgebase systems. Design theory, query optimization, and transaction processing.

885 Artificial Neural Networks
Fall. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. SA: CPS 885

890 Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Computer Science or Electrical Engineering majors. Approval of department. SA: CPS 890
Independent study of some topic, system, or language not covered in a regular course.
Selected Topics
Fall, Spring. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to Computer Science or Electrical Engineering majors. Approval of department. SA: CPS 891

Master’s Project
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to Computer Science majors. Approval of department. SA: CPS 898

Master’s Thesis Research
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to Computer Science majors. Approval of department. SA: CPS 899

Selected Topics in Recognition by Machine
Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 902

Advanced Topics in pattern recognition and computer vision such as Markov random fields, modeling and recognition of three dimensional objects, and integration of visual modules.

Selected Topics in Computer Networks and Distributed Systems
Spring of even years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 910

Advanced topics and developments in high-bandwidth computer networks, protocol engineering, and distributed computer systems.

Formal Methods in Software Development
Fall. 3(3-0) P:M: (CSE 814) RB: Undergraduate courses in software engineering and in logic. R: Open only to students in the Department of Computer Science and Engineering. SA: CPS 914

Current research in selected areas of software engineering such as: approaches for the incorporation of formal methods in software development; current projects using formal methods in software engineering; object-oriented analysis and development techniques; and approaches for the incorporation of user-interface analysis and design in software development.

Selected Topics in High Performance Computer Systems
Spring of odd years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P:M: (CSE 822) R: Open only to Computer Science and Engineering majors or approval of Department. SA: CPS 920

Design of high performance computer systems. Seminar format.

Advanced Topics in Digital Circuits and Systems
Fall, Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. SA: EE 921

Advanced topics vary each semester.

Testable and Fault-tolerant Digital Systems
Fall of odd years. Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. RB: (ECE 809 and ECE 813) SA: EE 921A


Embedded Architectures
Fall of odd years. Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. RB: (ECE 809 and ECE 813) SA: EE 921B


Electronic Systems Packaging
Fall of odd years. Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. RB: A basic background in electronics and electromagnetics. VLSI packaging technology, thermal management, electrical design, switching noise, multi-chip packaging, materials, device assembly, RF device packaging, and electrical testing.

Selected Topics in Artificial Intelligence
Fall. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. RB: (CSE 841) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 941

Topic such as second generation expert systems, human factors, natural language processing, speech understanding, neural networks, genetic algorithms and opportunistic planning.

Selected Topics in Algorithms and Complexity
Spring of odd years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. RB: (CSE 830 and CSE 860) R: Open only to graduate students in the Department of Computer Science and Engineering. Approval of department. SA: CPS 960

Current research in the general theory of algorithms and computational complexity.

Selected Topics in Database Systems
Spring. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. RB: (CSE 880) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 980

Recent developments in areas such as distributed and parallel database systems, object oriented database systems, knowledgebase and expert database systems.

Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 72 credits in all enrollments for this course. R: Open only to Computer Science majors. Approval of department. SA: CPS 999

Doctoral dissertation research.

Counseling, Educational Psychology and Special Education

Department of Counseling, Educational Psychology, and Special Education

College of Education

Reflections on Learning
Fall, Spring, Summer. 3(3-0) Interdepartmental with Teacher Education. Administered by Department of Teacher Education.

Students' experiences as learners in comparison to psychological, sociological, and anthropological theories and assumptions about learning and teaching in and out of school.

Diverse Learners in Multicultural Perspective
Fall, Spring, Summer. 3(2-2) Interdepartmental with Teacher Education. Not open to students with credit in TE 250. Communicative, linguistic, physical, sensory, behavioral, affective, and cognitive differences in learning in multicultural classrooms. Factors that mediate access to knowledge.

Dynamics of Personal Adjustment
Fall, Spring, Summer. 3(3-0) Psychological theories of human adjustment. Implications for effective learning, self-development, and adaptation.

Substance Abuse
Fall. Spring. 3(3-0) Effects of mood-altering chemicals. Treatment approaches and resources. Special emphasis on adolescent users.

Introduction to Students With Mild Impairments (W)
Spring. 3(2-2) P:M: Completion of Tier I writing requirement. R: Open only to students admitted to the teacher certification program in emotional impairment or learning disabilities. Learning and emotional impairments. Characteristics, causes, educational approaches, theories, and issues pertaining to students with mild impairments.