COMPUTER SCIENCE AND ENGINEERING

Department of Computer Science and Engineering
College of Engineering

CSE—Computer Science and Engineering

101  Computing Concepts and Competencies
Fall, Spring, Summer. 3(2-2) SA: 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 focal problems, using hardware, multimedia software, communication and networks.

131  Technical Computing and Problem Solving
Fall, Spring. 3(1-3) P: MTH 124 or concurrently) or (MTH 132 or concurrently) or (LBS 118 or concurrently) SA: CPS 131
Use of computing systems for technical problem solving in engineering and science.

231  Introduction to Programming I
Fall, Spring. 4(3-2) P: (LBS 118 or concurrently) or (MTH 124 or concurrently) or (MTH 132 or concurrently) or (MTH 152H or concurrently) RB: 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: CSE 231 and (LBS 118 or MTH 124 or MTH 132 or MTH 152H) 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.

240  Informatics
Fall, Spring, Summer. 3(3-0) P: (CSE 103 or CSE 131 or CSE 231) and (MTH 103 or MTH 116 or MTH 103 or MTH 116 or MTH 124 or MTH 132 or LBS 117 or MTH 124 or MTH 132 or LBS 117) or designated score on Mathematics Placement test R: Approval of department.
Digital representation of objects such as numbers, signals, and 3-D shapes. Algorithms that operate on digital objects. Storage devices and network distribution of digital objects. How information systems support various applications.

260  Discrete Structures in Computer Science
Fall, Spring. 4(4-0) P: MTH 133 or MTH 128 or MTH 153H or LBS 119 SA: CSE 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 Architecture
Fall, Spring. 3(3-0) P: CSE 232 and CSE 260 SA: CPS 320 Not open to students with credit in ECE 331.
Boolean algebra and digital logic. Combinational and sequential circuits. Representations of data and instructions. Architecture and major components of computer systems. Assembly language programming and interfacing to high level languages. Assembler and linker processing.

331  Algorithms and Data Structures
Fall, Spring. 3(3-0) P: 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 teaching minor.
Linear data structures, trees, graphs and algorithms which operate on them. Fundamental algorithms for searching, sorting, string matching, graph problems. Design and analysis of algorithms.

335  Object-oriented Software Design
Fall, Spring. 3(3-0) P: CSE 232 and CSE 260 R: Open only to students in Computer Science or Computer Engineering or the LBS Computer Science field of concentration or the LBS Computer Science coordinate major or the Computer Science disciplinary minor. SA: CSE 370

410  Operating Systems
Fall, Spring. 3(3-0) P: CSE 232 and CSE 260 and (CSE 320 or ECE 331) 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 teaching minor. SA: CPS 410

420  Computer Architecture
Fall, Spring. 3(3-0) P: (CSE 232 and CSE 260) and (CSE 320 or CSE 331) 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 teaching minor. SA: CPS 420

422  Computer Networks
Fall, Spring. 3(3-0) P: (STT 351 or ECE 280) and (CSE 320 or ECE 331) and (CSE 410 or concurrently) R: Open only to students in the Department of Computer Science or the Computer Engineering or LBS Computer Science major or the LBS Computer Science coordinate major or the Computer Science disciplinary teaching minor. SA: CPS 422

425  Introduction to Computer Security
Spring. 3(3-0) P: CSE 422 R: Open to students in Computer Engineering major or in Computer Science major.

429  Interdisciplinary Topics in CyberSecurity
Fall. 3(3-0) Interdepartmental with Criminal Justice. Administered by Computer Science and Engineering. P: CSE 101 or CSE 131 or CSE 231 R: Open to juniors or seniors or graduate students.
Technical, legal, criminal, medical business, and communication aspects of CyberSecurity.

435  Software Engineering
Fall. 3(3-0) P: CSE 320 and CSE 331 and CSE 335 R: Open only to students in the Department of Computer Science or the Computer Engineering or LBS Computer Science major or the LBS Computer Science coordinate major or the Computer Science disciplinary teaching minor. SA: CSE 470
Software lifecycle including specification, design, coding, testing, and verification of a software product. Stepwise refinement and traceability. Software maintenance and documentation.

440  Introduction to Artificial Intelligence
Fall. 3(3-0) P: CSE 331 or CSE 335 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 teaching minor. SA: CPS 440
444 **Information Technology Project Management**

Spring. 3(3-0) Interdepartmental with Information Technology Management. P.M.: ITM 311 R: Open only to seniors in the Specialization in Information Technology. Practical training and experiences in design, testing, and launch of new information technologies and systems.

450 **Translation of Programming Languages**

Spring. 3(3-0) P.M.: (CSE 331 or CSE 335) and (CSE 320 or ECE 331) 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 teaching minor. SA: CPS 450


452 **Organization of Programming Languages**

Fall. 3(3-0) P.M.: (CSE 331 or CSE 335) and (CSE 320 or ECE 331) R: Open only to students in the Department of Computer Science and Engineering or Computer Engineering major or the LBS Computer Science coordinate major or the LBS Computer Science field of concentration or the Computer Science disciplinary teaching minor. SA: CPS 452


460 **Computability and Formal Language Theory**

Fall. 3(3-0) P.M.: CSE 331 R: Open only to students in the Department of Computer Science and Engineering or Computer Engineering major or the LBS Computer Science coordinate major or the LBS Computer Science field of concentration or the Computer Science disciplinary teaching minor. SA: CSE 360

Formal models of computation such as finite state automata, pushdown automata and Turing machines. Formal definitions of languages, problems, and language classes including recursive, recursively enumerable, regular, and context free languages. The relationships among various models of computation, language classes, and problems. Church's thesis and the limits of computability. Proof of program properties including correctness.

471 **Media Processing and Multimedia Computing**

Fall. 3(3-0) P.M.: CSE 320 and (CSE 331 or CSE 335) R: Open only to students in the Department of Computer Science and Engineering or Computer Engineering major or the LBS Computer Science field of concentration or the LBS Computer Science coordinate major or the Computer Science disciplinary teaching minor.

812 Advanced Operating Systems
Spring. 3(3-0) R: 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 Electrical and Computer Engineering.
P: M: ECE 410 SA: EE 813

814 Formal Methods in Software Development
Fall of odd years. 3(3-0) R: 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. Administered by Computer Science and 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.

824 Advanced Computer Networks and Communications
Fall. 3(3-0) R: CSE 422 R: Open only to graduate students in the Department of Computer Science and Engineering. SA: CPS 824
Advanced topics in emerging computer networking technologies, including high-speed wide area networks and local area networks, wireless and mobile computing networks, optical networks, and multimedia networking.

825 Computer and Network Security
Spring. 3(3-0) R: CSE 410 and CSE 422
Threat assessments, secure software, intrusions and intrusion detection.

830 Design and Theory of Algorithms
Fall. 3(3-0) R: 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) R: 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.
Advanced Topics in Distributed integration of visual modules, and recognition of three dimensional objects, and development. 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 degree Plan B individual student project: original research, research replication, or survey and reporting on a topic such as system design and development, or system conversion or installation.

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

Master's thesis research.

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. RB: CSE 802 and CSE 803 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. RB: CSE 422 and CSE 812 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.

Advanced Topics in Distributed Computing Systems

Spring of odd years. 3(3-0) RB: CSE 410 and CSE 812

Advanced topics and developments in Internet computing, distributed algorithm and operating systems, distributed middleware, high-performance distributed computing, peer-to-peer computing, security and fault tolerance of distributed systems, mobile computing, ubiquitous and pervasive computing, and distributed-data management.

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. Interdepartmental with Electrical and Computer Engineering. Administered by Computer Science and Engineering. P:M: CSE 822 R: Open only to students in the Computer Science and Engineering major 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 Electrical and Computer Engineering. SA: EE 921

Topics vary each semester.

Embedded Architectures

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


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 99 credits in all enrollments for this course. R: Open only to Computer Science majors. Approval of department. SA: CPS 999

Doctoral dissertation research.