

Lower Division

The Department of Computer and Electrical Engineering and Computer Science offers courses on topics of current interest to the community from time to time. Call the department office, (661) 654-3082, to express interest or to inquire concerning offerings.

CMPS 1200 Basic Computer Skills (3)

This course covers computer skills essential to success at a university. Specific applications include the Microsoft Office suite of tools: Word, Excel, PowerPoint and Access. The course material is based on Windows 7 and Microsoft Office 2010. Each week lecture meets for 150 minutes. Prerequisite: None.

CMPS 2010 Programming I: Programming Fundamentals (4)

Introduces the fundamentals of procedural programming and object-oriented programming. Topics include: data types, control structures, functions, arrays, I/O, pointers and dynamic memory allocation, and features of object-oriented programming. The mechanics of compiling, linking, running, debugging and testing within a particular programming environment are covered. Ethical issues and a historical perspective of programming within the context of computer science as a discipline are given. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: (1) MATH 0930; or (2) other satisfaction of the Entry Level Mathematics requirement.

CMPS 2020 Programming II: Data Structures and Algorithms (4)

Builds on the foundation provided by CMPS 2010 to introduce the fundamental concepts of data structures and algorithms that proceed from within the framework of object-oriented programming technology. Topics include: recursion, fundamental data structures (including lists, stacks, queues, hash tables, trees and graphs) and basics of algorithmic analysis. Necessary components of object-oriented programming method will be introduced. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2010 with C- or better.

CMPS 2120 Discrete Structures (4)

Discrete structures and applications in computer science. Provides an introduction to proof techniques, propositional and predicate logic, functions, relations, sets, big-oh notation, counting techniques, summations, recursive definitions, recurrence relations, discrete probability and simple circuit logic. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2010 with a grade of C- or better and one of MATH 1040, 1050, 1060, 2310 or 2510.

CMPS 2240 Computer Architecture I: Assembly Language Programming (4)

Introduction to computer architecture and assembly language programming. Covers number systems and data representation, CISC and RISC instruction set architectures, internal organization of a computer, and basics of logic design. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2010 with a grade of C- or better.

CMPS 2650 Linux Environment and Administration (4)

This course covers common Linux commands, shell scripting, regular expressions, tools and the applications used in a Linux programming environment. The tools to be introduced include make utility, a debugger, advanced text editing and text processing (vi, sed, tr). These basic skills are extended to cover the knowledge and skills critical to administering a multi-user, networked Linux system. Administrative topics include kernel and network configuration, managing daemons, devices, and critical processes, controlling startup and shutdown events, account management, installing software, security issues, shell scripting. Many concepts will be demonstrated during hands-on labs. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: None.

CMPS 2680 Web Programming I (3)

An introduction to webpage layout and design with HTML and CSS and client-side web programming with Javascript. Students will design and create a webpage using technologies covered in the course. Each week lecture meets for 150 minutes. Prerequisite: None.

CMPS 2770 Special Topics (1-3)

A study of programming languages not offered otherwise. Prerequisite: CMPS 2010 with a grade of C- or better or permission of the instructor.

CMPS 2771 Special Topics Laboratory (1)

Optional laboratory for the study of programming languages not offered otherwise. Each week lab meets for 150 minutes. Co-requisite: CMPS 2770. Prerequisite: CMPS 2010 with a grade of C- or better or permission of the instructor.

*Upper Division***CMPS 3120 Algorithm Analysis (3)**

Algorithm analysis, asymptotic notation, hashing, hash tables, scatter tables, and AVL and B-trees, brute-force and greedy algorithms, divide-and-conquer algorithms, dynamic programming, randomized algorithms, graphs and graph algorithms, and distributed algorithms. Each week lecture meets for 100 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2020 with a grade of C- or better and 2120.

CMPS 3140 Theory of Computation (3)

An introduction to computability theory to include finite automata, push-down automata, formal grammars, Turing machines, decidability, intractability and NP-completeness. Each week lecture meets for 100 minutes and lab meets for 150 minutes. Prerequisite: CMPS 3120.

CMPS 3240 Computer Architecture II: Organization (4)

This course focuses on the design of the CPU and computer system at a functional level. Topics include CPU instruction sets and functional units, control unit design, interrupt handling and DMA, I/O support, memory hierarchy, virtual memory, buses and bus timing, and an introduction to instruction level parallelism, multithreading, and multiprocessing. Hardware security issues will also be discussed. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2240 or ECE 3200.

CMPS/MATH 3300 Numerical Analysis (4)

Topics include: computer representation of numbers and round-off errors, algorithms and stability, numerical solutions to nonlinear equations in one variable, direct and iterative methods for solving linear systems of equations, interpolation and polynomial approximation, numerical differentiation and integration, and initial value problems for ordinary differential equations. A computer algebra system (CAS) will be used to program numerical algorithms and identify their limitations. The CAS will also be used on homework and exam problems. Each week lecture meets for 200 minutes. Prerequisites: (1) C- or better in MATH 2020, 2320, or 2520, and (2) C- or better in MATH 2610 or CMPS 2010.

CMPS 3350 Software Engineering (4)

This course is a general introduction to Software Engineering. The course will cover the specification, development, management, and evolution of complex software systems. Students will learn how to cost-effectively apply the methods and theory from Computer Science to solve difficult problems. The course presents a broad perspective on software and system engineering and surveys a wide spectrum of tools and techniques. Students are required to complete a project as part of a small software engineering team. Students will form groups and choose a software project early in the course, then apply methodologies learned in the course to complete their project. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2020 with a grade of C- or better.

CMPS 3390 Client, Server, Internet and Hand-held Device Programming (4)

This course will use Java's features and libraries to explore client-side, server-side, and internet programming. The concepts of multi-threading, synchronization, and network programming (socket and remote-method invocation) will be introduced and used to develop internet client-server programs such as chat room, on-line help, file transfer, etc. The concepts of graphic user interfaces (GUIs) and hand-held devices (such

as Android phones or tablets) will be discussed and applied in student projects. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2020 with a grade of C- or better.

CMPS 3420 Database Systems (4)

Basic issues in data modeling, database application software design and implementation. File organizations, relational model, relational database management systems, and query languages are addressed in detail. Two-tier architecture, three-tier architecture and development tools are covered. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisites: CMPS 2020 with a grade of C- or better and CMPS 2120.

CMPS 3480 Computer Graphics (4)

Introduction to computer graphics hardware, animation, two-dimensional transformations, basic concepts of computer graphics, theory and implementation. Use of graphics API's such as DirectX or OpenGL. Developing 2D graphics applications software. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2020 with a grade of C- or better.

CMPS 3500 Programming Languages (3)

An examination of underlying concepts in high level programming languages and techniques for the implementation of a representative sample of such languages with regard to considerations such as typing, block structure, scope, recursion, procedures invocation, context, binding, and modularity. Features of OOP, thread, synchronization and concurrency, functional function will be discussed. Each week lecture meets for 100 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2020 with a grade of C- or better.

CMPS 3560 Artificial Intelligence (3)

This course is intended to teach the fundamentals of artificial intelligence which include topics such as expert systems, artificial neural networks, fuzzy logic, inductive learning and evolutionary algorithms. Each week lecture meets for 100 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2020 with a grade of C- or better and CMPS 2120.

CMPS 3600 Operating Systems (4)

A study of the introductory concepts in operating systems: historical development of batch, multi-programmed, and interactive systems; virtual memory, process, and thread management; interrupt and trap handlers, abstraction layer, message passing; kernel tasks and kernel design issues; signals and interprocess communication; synchronization, concurrency, and deadlock problems. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2020 with a grade of C- or better.

CMPS 3620 Computer Networks (4)

A study of the theory of computer networking focusing on the TCP/IP Internet protocols and covering the five layers: physical, data link, network, transport, and application. Communication on wired, wireless, and cellular networks will be covered. The course will introduce secure communication and its incorporation into different layers of the model. As part of the laboratory component, students will learn systems programming as it relates to interprocess communication over sockets, I/O handling, process and thread control, and the development of client/server programs. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2020 with a grade of C- or better.

CMPS 3640 Distributed and Parallel Computation (3)

Introduction to core topics in distributed and parallel computation. System models, parallel vs. distributed systems, communication, locality, concurrency, non-determinism, fault tolerance, distributed algorithms, and parallel programming. Each week lecture meets for 100 minutes and lab meets for 150 minutes. Prerequisites: CMPS 3600 and 3620.

CMPS 3650 Digital Forensics (4)

Investigative techniques, evidence handling procedures, forensics tools, digital crime reconstruction, incident response, ethics, and legal guidelines within the context of digital information and computer compromises. Hands-on case studies cover a range of hardware and software platforms and teach students how to gather evidence, analyze evidence, and reconstruct incidents. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Corequisite or prerequisite: CMPS 2010 with a grade of C- or better or CMPS 2650.

CMPS 3680 Web Programming II (3)

Languages, principles and techniques fundamental to web application development on the server side. The latest languages and technologies are addressed, to include ASP, PHP, Perl, Python. Each week lecture meets for 100 minutes and lab meets for 150 minutes. Prerequisites: CMPS 2010 with a grade of C- or better and CMPS 2680 or instructor approval.

CMPS 3770 Special Topics (1-3)

This course will be used to supplement other courses with additional work at the intermediate level. Course is repeatable, but only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit towards the major requirements. Prerequisite: CMPS 2020 with a grade of C- or better or permission of instructor.

CMPS 3771 Special Topics Laboratory (1)

Optional laboratory for the study of topics at the intermediate level. Course is repeatable, but only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit towards the major requirements. Corequisite: CMPS 3770. Prerequisite: CMPS 2020 with a grade of C- or better or permission of the instructor.

CMPS 4210 Advanced Computer Architecture (4)

Foundations of parallelism in computer architecture. This course concentrates on the quantitative principles of computer architecture, instruction set and addressing design, instruction-level parallelism (ILP), compiler considerations for parallelism, cache and memory design, multiprocessor (including multi-core processors) and thread-level parallelism (TLP). A constant theme is how the hardware can achieve greater efficiency by exploiting various types of parallelism. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 3240.

CMPS/MATH 4300 Applied Cryptography (4)

An introduction to cryptography, history and its present day use. Topics include: symmetric ciphers, hash functions, public-key encryption, data integrity, digital signatures, key establishment, key management, prime generation, integer factorization, discrete logarithms, pseudo-random number generation, and computational complexity. Each week lecture meets for 200 minutes. Prerequisites: (1) C- or better in MATH 2020, 2320, or 2520, and (2) C- or better in MATH 3000 or CMPS 2120.

CMPS 4350 Advanced Software Engineering (4)

Continuation of the introductory software engineering course. Methods and tools for the implementation, integration, testing and maintenance of large, complex software systems. Program development and test environments. Group laboratory project. Technical presentation methods and practice. Ethical and societal issues in software engineering. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 3350.

CMPS 4420 Advanced Database Systems (4)

A wide range of topics such as query processing and optimization, object-oriented database systems, distributed database systems, database warehousing and data mining will be discussed. The course will also be used to introduce emerging issues related to database systems. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 3420.

CMPS 4450 Data Mining and Visualization (4)

Knowledge discovery in and visualization of large datasets, including data warehouses and text-based information systems. Topics covered include data mining concepts, information retrieval, analysis methods, storage systems, visualization, implementation and applications. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 3120.

CMPS/ECE 4460 Image Processing (4)

Digital image acquisition, image enhancement and restoration, image compression, computer implementation and testing of image processing techniques. Students gain hands-on experience of complete image processing systems, including image acquisition, processing, and display through laboratory experiments. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: ECE 3040.

CMPS/ECE 4470 Computer Vision (4)

Imaging formation, early vision processing, boundary detection, region growing, two-dimensional and three-dimensional object representation and recognition techniques. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: MATH 2320 or 2520 and (CMPS 3120 or ECE 3040).

CMPS 4490 Game Design (4)

The course will cover fundamental concepts behind designing a game engine. The concepts, theories, and programming aspects of physics engine, graphics engine, and control engine will be covered. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 3350 or 3480 or 3120.

CMPS 4500 Compiler Design (4)

An introduction to compiler design and construction. Coverage includes lexical, syntactic, and semantic analysis, top-down and bottom-up parsing, code generation, and error detection. Theoretical topics include finite and push-down automata. Students will implement a compiler front-end. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 3500 or permission of the instructor.

CMPS 4510 Vulnerability Analysis (4)

Identification and quantification of security weaknesses in programs, systems and networks. Topics include professional ethics, static binary analysis, dynamic binary analysis, anti-analysis techniques, risk assessment, penetration testing, vulnerability classification and mitigation techniques. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 2240 and 3500.

CMPS 4560 Advanced Artificial Intelligence (4)

This course is intended to teach about advances in artificial intelligence. It includes advanced topics on artificial neural networks such as distributed and synergistic neural network models, hybrid artificial intelligence techniques such as neuro-fuzzy models, advanced machine learning techniques and meta-heuristic evolutionary algorithms. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisite: CMPS 3560.

CMPS 4620 Network and Computer Security (4)

Fundamentals of network and computer security and information assurance. Topics covered include basic cryptography, authentication, access control, formal security policies, assurance and verification, trusted OS design, and network attacks. Methods to provide better security at both the system and network level will be presented, particularly with respects to risk analysis, cost-benefit analysis, and psychological acceptability. Ethics and legal issues related to security research will also be discussed. Each week lecture meets for 150 minutes and lab meets for 150 minutes. Prerequisites: CMPS 2020 with a grade of C- or better and either CMPS 3620 or 3650.

CMPS 4770 Special Topics (1-3)

This course will often be used to supplement other courses with additional work at a more advanced level. Course is repeatable, but only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit towards the major requirements. Prerequisite: CMPS 2020 with a grade of C- or better or permission of instructor.

CMPS 4771 Special Topics Laboratory (1)

Optional laboratory for the study of topics at a more advanced level. Course is repeatable, but only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit towards the major requirements. Corequisite: CMPS 4770. Prerequisite: CMPS 2020 with a grade of C- or better or permission of the instructor.

CMPS 4800 Undergraduate Research (1-4)

Independent study into a research topic under the supervision of a faculty member. Students will establish the research goals and objectives with their faculty supervisor. Course is repeatable, but only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit towards the major requirements. Prerequisite: Permission of the instructor.

CMPS 4860 Internship in Computer Science (1-4)

Internships may be arranged by the department with various agencies, businesses, or industries. The assignments and coordination of work projects with conferences and reading, as well as course credits, evaluation, and grading are the responsibility of the faculty liaison (or course instructor), working with the field supervisor. Offered on a credit, no-credit basis only. The department will determine the number of credit units offered. Course is repeatable, but only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit towards the major requirements. Prerequisite: Permission of the instructor.

CMPS 4870 Cooperative Education (1-4)

The Cooperative Education program offers a sponsored learning experience in a work setting, integrated with a field analysis seminar. The field experience is contracted by the Cooperative Education office on an individual basis, subject to approval by the department. The field experience, including the seminar and reading assignments, is supervised by the cooperative education coordinator and the faculty liaison (or course instructor), working with the field supervisor. Students are expected to enroll in the course for at least two quarters. The determination of course credits, evaluation, and grading are the responsibility of the departmental faculty. Offered on a credit, no-credit basis only. The department will determine the number of credit units offered. Course is repeatable, but only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit towards the major requirements. Prerequisite: Permission of the instructor.

CMPS 4890 Experiential Prior Learning (1-4)

Majors in Computer Science with significant prior experience in computers may have some of their experience count for academic credit toward their degree. In order to be considered for experiential learning credit the student must have completed CMPS 2020 and have the approval of the department. Only a combined total of 4 units of CMPS 377x, 477x, and 48xx may be used for elective credit towards the major requirements. Prerequisite: CMPS 2020 with a grade of C- or better and permission of the instructor.

CMPS 4910 Senior Project I (2)

After consultation with the faculty supervisor and investigation of relevant literature, the student(s) shall prepare a substantial project with significance in the designated area. The timeline, teamwork responsibilities, milestones, and presentation(s) will be scheduled. Prerequisites: At least 12 units of 3000- or 4000-level CMPS coursework.

CMPS 4928 Senior Project II (2)

This is the completion phase of the project. Students will present a project report to the entire class, explaining the nature of the work, the finished product, and its relationship to the field. Students will demonstrate proficiency in critical thinking, information literacy, written communication, and quantitative reasoning in their written project report. Additionally, students will demonstrate an understanding of their academic pursuits by reflecting on their studies of the arts, humanities, natural sciences, behavioral sciences, and social sciences. Prerequisite: CMPS 4910 and completion of at least 90 units. Prerequisite or Corequisite: Completion of or concurrent enrollment in all GE course requirements for computer science majors. Satisfies general education requirement Capstone.

CMPS 4960 Leadership in Computer Science (1-2)

Leadership in computer science related activities that meet campus and/or community needs. Offered on a credit, no-credit basis only. Course is repeatable. Course credits cannot be used as elective credit towards the major requirements, but can be used as additional university units. Prerequisite: Permission of the instructor.

CMPS 4970 Service Learning in Computer Science (1-2)

Service learning in computer science related activities that meet campus and/or community needs. Students will design and/or implement a service learning project in consultation with their faculty supervisor and, if applicable, community partners. Offered on a credit, no-credit basis only. Course is repeatable. Course credits cannot be used as elective credit towards the major requirements, but can be used as additional university units. Prerequisite: Permission of the instructor.

CMPS 4980 Teaching in Computer Science (1-2)

Experience supporting teaching activities in department courses, providing tutoring in the department tutoring center, leading problem solving sessions, and/or supporting other instructional activities in the department. Offered on a credit, no-credit basis only. Course is repeatable. Course credits cannot be used as elective credit towards the major requirements, but can be used as additional university units. Prerequisite: Permission of the instructor.