Computers and Their Applications

Use of computers to manage and analyze information across a variety of settings and disciplines. Introduces major categories of computer software, including word processing, spreadsheets and database systems. Covers basic computer concepts and the computer's role in today's society. Significant hands-on work required outside of the class. Not open to CS majors. CEPS students should check with their major department for approval.

Attributes: Environment,TechSociety(Disc)

CS 401 - Computers and Their Applications

Use of computers to manage and analyze information across a variety of settings and disciplines. Introduces major categories of computer software, including word processing, spreadsheets and database systems. Covers basic computer concepts and the computer's role in today's society. Significant hands-on work required outside of the class. Not open to CS majors. CEPS students should check with their major department for approval.

Attributes: Environment,TechSociety(Disc)

CS 408 - Living in a Networked World: The Good, the Bad, and the Ugly

The objective of this course is to explore the implications of living in a networked world. The course surveys the fundamental technologies and practices that make up the Internet and then ask the student to examine the ramifications of using the technologies. Users of the technologies should understand the technology in order to make educated decisions about how to use it safely and effectively. Students have the opportunity to self-publish by using various current technologies including blogs, discussion boards, email and creating web pages using xhtml.

Attributes: Environment,TechSociety(Disc)

CS 410 - Introduction to Scientific Programming

Introduces the concepts and techniques of computer programming. Particular emphasis on computer programming as a problem-solving technique in science and engineering applications. Either the C language or Python is taught and used for assignments. Good programming style is stressed. Significant out-of-class programming required. Not open to students who have completed CS 407, 415, or the equivalent.

Attributes: Environment,TechSociety(Disc)

CS 410C - Introduction to Scientific Programming/C

Introduces the concepts and techniques of computer programming. Particular emphasis on computer programming as a problem-solving technique in science and engineering applications. Good programming style is stressed. Significant out-of-class programming required. Not open to students who have completed CS 415 or equivalent.

CS 410P - Introduction to Scientific Programming/Python

Introduces the concepts and techniques of computer programming. Particular emphasis on computer programming as a problem-solving technique in science and engineering applications. Good programming style is stressed. Significant out-of-class programming required. Not open to students who have completed CS 415 or the equivalent.

CS 411 - From Problems to Algorithms to Programs

This course is an introduction to the design and implementation of computer programs. The basic software development process (modeling, algorithm design, programming, testing and debugging) is illustrated through problem examples. Programming techniques are introduced to allow students to implement and evaluate solutions as programs.

Attributes: Quantitative Reasoning(Disc)

CS 415 - Introduction to Computer Science I

Theory and practice of computer science. Algorithm development and analysis; data abstraction techniques; elementary data structures; dynamic memory manipulation; debugging; and program design issues. Computer systems and applications. Intended for CS majors.

CS 416 - Introduction to Computer Science II

Theory and practice of computer science. Algorithm development and analysis; data abstraction techniques; elementary data structures; dynamic memory manipulation; debugging; and program design issues. Computer systems and applications. Intended for CS majors. Prereq: CS 415.
Experience in working in groups. Prereq: CS 515.

tools. Experience in understanding and debugging software systems.

and implementation using object-oriented principles, patterns, and specification to design, implementation, and system test). Design development cycle of a software system (i.e. from system requirements analysis. Prereq: CS 416 or CS 417.

device-level I/O. Discussion of POSIX 1003.1 Part I Standards. Prereq: CS 520.

CS 599 - Internship
Credits: 1-6
Provides the opportunity to apply academic experience in settings associated with future professional employment. A written proposal for the internship must be approved by the instructor. The proposal must specify what the student will learn from the internship, why the student is properly prepared for the internship and what supervision is available during the internship. A mid-semester report and final report are required. Prereq: permission. May be repeated for a maximum of 4 credits. Only open to Computer Science majors. Cr/F.

CS 712 - Compiler Design
Credits: 4
Formal languages and formal techniques for syntax analysis and parsing; organization of the compiler and its data structures; code generation. LL and LR parsing; automatic generation of scanners and parsers from high level descriptions. Implementation of features from imperative and object-oriented languages. Students required to design and implement a compiler for a simple language. Prereq: CS 520.

CS 620 - Operating System Fundamentals
Credits: 4
Introduces operating system concepts and design. Process and memory management; scheduling; file systems; storage devices; inter-process communication. Prereq: CS 520.

CS 659 - Introduction to the Theory of Computation
Credits: 4

CS 671 - Programming Language Concepts and Features
Credits: 4
Explores the main features of modern, high-level, general purpose programming languages from the user (programmer) point of view. Provides students with an opportunity to use non-imperative programming paradigms, such as object-oriented, functional, and logical, and to learn how specific features of such languages can be used efficiently in solving programming problems. Prereq: CS 520.

CS 696W - Independent Study
Credits: 1-6
Individual projects developed and conducted under the supervision of a faculty member. Prereq: permission of faculty supervisor and department chairperson. May be repeated for credit.

CS 699 - Internship
Credits: 1-6
Provides the opportunity to apply academic experience in settings associated with future professional employment. A written proposal for the internship must be approved by the instructor. The proposal must specify what the student will learn from the internship, why the student is properly prepared for the internship and what supervision is available during the internship. A mid-semester report and final report are required. Prereq: permission. May be repeated for a maximum of 4 credits. Only open to Computer Science majors. Cr/F.

CS 671 - Programming Language Concepts and Features
Credits: 4
Explores the main features of modern, high-level, general purpose programming languages from the user (programmer) point of view. Provides students with an opportunity to use non-imperative programming paradigms, such as object-oriented, functional, and logical, and to learn how specific features of such languages can be used efficiently in solving programming problems. Prereq: CS 520.

CS 696W - Independent Study
Credits: 1-6
Individual projects developed and conducted under the supervision of a faculty member. Prereq: permission of faculty supervisor and department chairperson. May be repeated for credit. Writing intensive. Attributes: Writing Intensive Course

CS 699 - Internship
Credits: 1-6
Provides the opportunity to apply academic experience in settings associated with future professional employment. A written proposal for the internship must be approved by the instructor. The proposal must specify what the student will learn from the internship, why the student is properly prepared for the internship and what supervision is available during the internship. A mid-semester report and final report are required. Prereq: permission. May be repeated for a maximum of 4 credits. Only open to Computer Science majors. Cr/F.

CS 671 - Programming Language Concepts and Features
Credits: 4
Explores the main features of modern, high-level, general purpose programming languages from the user (programmer) point of view. Provides students with an opportunity to use non-imperative programming paradigms, such as object-oriented, functional, and logical, and to learn how specific features of such languages can be used efficiently in solving programming problems. Prereq: CS 520.

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CS 699 - Internship
Credits: 1-6
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CS 671 - Programming Language Concepts and Features
Credits: 4
Explores the main features of modern, high-level, general purpose programming languages from the user (programmer) point of view. Provides students with an opportunity to use non-imperative programming paradigms, such as object-oriented, functional, and logical, and to learn how specific features of such languages can be used efficiently in solving programming problems. Prereq: CS 520.
CS 723 - Performance Evaluation of Computer Systems
Credits: 4
Introduces the main concepts, techniques, and tools needed to evaluate
the performance of computer systems under various configurations and
workloads. The techniques allow one to perform capacity planning based
on quality of service requirements of users and workload characteristics.
Course is mainly based on the use of analytic queuing network models
of computers systems. The performance techniques are applied to study
the performance of centralized, distributed, parallel, and client/server
systems. The course also discusses performance measuring tools for
operating systems such as Unix and Windows NT. Prereq: CS 620 and
(MATH 539 or MATH 644).

CS 725 - Computer Networks
Credits: 4
Introduction to fundamental concepts of computer networks and
exploration of widely-used networking technologies. Topics include
principles of congestion and error control; network routing; local,
wireless and access networks; application protocol design; and network
programming. In-depth discussion of the Internet suite of protocols.
Prereq: CS 520.

CS 730 - Introduction to Artificial Intelligence
Credits: 4
In-depth introduction to artificial intelligence, concentrating on aspects
of intelligent problem-solving. Topics include situated agents, advanced
search techniques, knowledge representation, logical reasoning
reasoning techniques, reasoning under uncertainty, advanced planning and control,
and learning. Prereq: CS 515.

CS 730W - Introduction to Artificial Intelligence
Credits: 4
In-depth introduction to artificial intelligence, concentrating on aspects
of intelligent problem-solving. Topics include situated agents, advanced
search techniques, knowledge representation, logical reasoning
techniques, reasoning under uncertainty, advanced planning and control,
and learning. Prereq: CS 671. Writing intensive.

Attributes: Writing Intensive Course

CS 733 - Mobile Robotics
Credits: 4
An introduction to the foundational theory and practices in mobile
robotics. Topics include Kinematics of wheeled mobile robots, Sensors
for mobile robots, Robot navigation and perception, Robot vision,
Localization and mapping of mobile robots. Hands-on experience directed
towards implementation with a real robot. Prereq: Programming course of
Permission of instructor.

CS 735 - Introduction to Parallel and Distributed Programming
Credits: 4
Programming with multiple processes and threads on distributed
and parallel computer systems. Introduces programming tools and
techniques for building applications on such platforms. Course
requirements consist primarily of programming assignments. Prereq:
CS 520.

CS 745 - Formal Specifications and Verification of Software Systems
Credits: 4
Course focuses on the formal specification and verification of reactive
systems, most notably concurrent and distributed systems. Topics
relevant to these systems, such as non-determinism, safety and liveness
properties, asynchronous communication or compositional reasoning, as
discussed. We rely on a notation (TLA+, the Temporal Logic of Actions)
and a support tool (TLC, the TLA+ Model Checker). Prereq: CS 520 and
CS 659.

CS 750 - Machine Learning
Credits: 4
An introduction to fundamental concepts and common methods in
machine learning. In addition to theoretical topics, the course involves
hands-on experience in making predictions using synthetic and real-world
datasets. Prereq: MATH 539 or MATH 644, and Programming course or
Permission of instructor.

CS 753 - Information Retrieval
Credits: 4
Fundamental algorithms and techniques for text processing and text-
based information retrieval systems. Topics include how to build an end-
to-end information retrieval system, such as a Web search engine. Prereq:
CS 515.

CS 757 - Mathematical Optimization for Applications
Credits: 4
This course introduces the foundations of mathematical optimization
and reinforces them via applications. The content includes convex
optimization, first and second-order methods, constrained problems,
duality, linear and quadratic programming, as well as discrete and
non-convex optimization. Applications will focus on machine learning
methods but also include problems from engineering and operations
research. Prereq: MATH 426; Programming proficiency in MATLAB, R,
Java, C, Python, or equivalent.

CS 758 - Algorithms
Credits: 4
An introduction to important concepts in the design and analysis of
algorithms and data structures, including implementation, complexity
analysis, and proofs of correctness. Prereq: CS 515 and CS 659.

CS 760W - Introduction to Human-Computer Interaction
Credits: 4
Human-computer interaction is a discipline concerned with the design,
evaluation, and implementation of interactive computing systems for
human use and with the study of major phenomena surrounding them.
Prereq: CS 619 and CS 620. Writing intensive.

Attributes: Writing Intensive Course

CS #767 - Interactive Data Visualization
Credits: 4
Detailed discussion of how an understanding of human perception can
help us design better interactive displays of data. Topics include color,
space perception, object perception and interactive techniques. Students
write interactive programs, give presentations and undertake a project
designing and evaluating a novel display technique. Prereq: instructor’s
permission.

CS 767W - Interactive Data Visualization
Credits: 4
Detailed discussion of how an understanding of human perception can
help us design better interactive displays of data. Topics include color,
space perception, object perception and interactive techniques. Students
write interactive programs, give presentations and undertake a project
designing and evaluating a novel display technique. Prereq: instructor’s
permission. Writing intensive.

Attributes: Writing Intensive Course

CS 770 - Computer Graphics
Credits: 4
Input-output and representation of pictures from hardware and software
points of view; interactive techniques and their applications; three-
dimensional image synthesis techniques and their applications. Prereq:
CS 671.
CS 771 - Web Programming Paradigms
Credits: 4
In this course you will learn languages to program the Web. Languages integrated into browsers, like JavaScript, and languages invoked on the server, like Ruby. You will also learn about frameworks, like Rails, and various techniques used to support the programming process. In addition, you will learn languages you will need to create, modify, and process Web documents. Although we will learn how to read and write in these languages, our primary goal will be an understanding of how the design of these multi-paradigm dynamic languages support the process of developing Web applications. Prereq: CS 671.

CS 775 - Database Systems
Credits: 4
Introduction to database management systems — design, implementation, and usage — with focus on the relational model. Data description, manipulation, and query language in the context of MySQL. Schema design and normalization; indexes, transaction processing. Web access of databases (PHP); overview of XML and noSQL systems. No credit if credit earned for IT 775. Prereq: CS 515 and MATH 531.

CS 780 - Topics
Credits: 1-4
Material not normally covered in regular course offerings. May be repeated for credit.

CS 791 - Senior Project I
Credits: 2
The principal goal of CS 791 is to develop precise functional specifications for the senior projects as well as a complete software design specification. The course will review and expand upon design concepts presented in previous courses, including UML, and CRC approach, and design patterns. Students apply these concepts to the design of their own senior projects. A significant component of the design includes specifications of the testing methodology to be used. Prereq: CS 619. Computer Science and CS: Bioinformatics majors only.

CS 792 - Senior Project II
Credits: 2
Continuation of CS 791: Senior Project I. Students complete the project by implementing their design. Students work in teams. Successful completion of this course fulfills the Capstone Experience requirement for Computer Science majors. Prereq: CS 791. Writing intensive.
Attributes: Writing Intensive Course

CS 799 - Thesis
Credits: 4
Students work under the direction of a faculty sponsor to plan and carry out independent research resulting in a written thesis. Required for honors-in-major. Prereq: Permission. May be repeated to 8 credits.
Attributes: Writing Intensive Course