Who is Computer Science at Chico State?
Computer Science at Chico State is defined by its faculty, students, and alumni.

We are Faculty
We faculty in the Department of Computer Science feel strongly about being actively involved in your education. Our classes are taught by us, the faculty, not by assistants. We are also constantly assessing and updating our curriculum to ensure it reflects not only the “science” underlying computer science, but also the current and emerging technologies that our computer science and computer information systems graduates develop and use. This drive for currency is reflected in our research in areas such as security, data science, computer vision, robotics, bioinformatics, and quantum computing. We invite you to contact us, come for a visit, and apply. We love what we do. Let us share our enthusiasm with you and help you discover the same passion we and our students share for computer science.

We are Students
We students spend a lot of time with each other. We work well together and are establishing lasting friendships. We even created our own Computer Science Discord server where someone is always available to help when working through difficult material.

We are Alumni
We alumni find ourselves returning to the Computer Science Department from which we graduated. We come to hire the new graduates into the companies we now work for, knowing they have the same preparation that put us on a path to success. We serve on the department’s Industry Advisory Board, ensuring the program’s continued strength and relevance. We even visit the student’s Discord server to reminisce and help the occasional student who wanders into our conversation with a question.

“I found a job within a couple months of graduating. The education enables one to speak fluently about many computer science topics, and the clubs enable one to tackle and practice myriad problem-solving skills for the technical aspects of interviews. The education provides real opportunity that I am thankful for. As well as what I hope are lifelong friends, in both faculty and alumni.” —Stephen Anderson (Computer Science, ’21)

“I got a FAANG¹ internship during my rising senior summer. With my practical experience from Chico State classes and professors I was able to execute well during my internship and received a full-time return offer. After some experience at my first company, I used my class assignments to prep for another FAANG company, which I was given an offer that I took. I consistently stack up and over-perform against fellows from Ivy Leagues and other tech colleges, and all of this from a college that I was able to graduate from without taking out loans.” —James Krepelka (Computer Science, ’15)

¹ FAANG: prominent technology companies Facebook, Amazon, Apple, Netflix, and Google

Programs
Undergraduate
Bachelor’s
• Computer Information Systems BS (https://catalog.csuchico.edu/colleges-departments/college-engineering-computer-science-construction-management/computer-science/computer-information-systems-bs/)
• Computer Science BS (https://catalog.csuchico.edu/colleges-departments/college-engineering-computer-science-construction-management/computer-science/computer-science-bs/)

Minors
• Computer Science Minor (https://catalog.csuchico.edu/colleges-departments/college-engineering-computer-science-construction-management/computer-science/computer-science-minor/)

Certificates
• Data Science Certificate (https://catalog.csuchico.edu/colleges-departments/college-engineering-computer-science-construction-management/computer-science/data-science-certificate/)

Graduate
Master’s
• Computer Science MS (https://catalog.csuchico.edu/colleges-departments/college-engineering-computer-science-construction-management/computer-science/computer-science-ms/)

See Course Description Symbols and Terms (https://catalog.csuchico.edu/academic-standards-policies/course-description-symbols-terms/) for an explanation of course description terminology and symbols, the course numbering system, and course credit units.
Computer Information Systems

CINS 220  PCs and Peripherals  
Typically Offered: Fall and spring  
This course focuses on the hardware and software of the modern PC, currently available peripherals and upgrades, and the basics of networking. Included will be a survey of the pros and cons of different hardware choices for various PCs, peripherals, and networking options. 2 hours activity, 2 hours discussion.  (002337)  
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units  
Course Attributes: Lower Division  

CINS 242  Information Systems Design  
Prerequisite: CSCI 111 with a grade of C or higher.  
Typically Offered: Fall only  
Systems analysis and design, and the role of Information Systems in organizations. Emphasis is on the project-team design approach. Operational criteria, system feasibility, requirements, and cost trade-offs. Integration of personnel, equipment, hardware, and software. 3 hours discussion.  (002377)  
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units  
Course Attributes: Lower Division  

CINS 370  Introduction to Databases  
Prerequisite: CSCI 211; CSCI 217 or MATH 217, both with a grade of C or higher.  
Typically Offered: Fall and spring  
This course provides an introduction to the theory and methodology for database design and implementation. Topics may include a survey/lecture component as well as a project component. The survey component covers entity-relationship modeling, relational algebra and calculus theories, data definition and data manipulation languages such as SQL, file structures, transactions, concurrency control, recovery, tuning and optimization, and object-oriented databases. The project entails requirements definition, design, and implementation of a database application. 2 hours activity, 2 hours discussion.  (002338)  
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units  
Course Attributes: Upper Division  

CINS 448  Computer Security  
Prerequisite: CSCI 211; CINS 220, CSCI 221 or EECE 237, all with a grade of C or higher.  
Typically Offered: Fall and spring  
This course provides a broad overview of some of the more technical aspects of Information Systems Security. The content is designed to prepare students for the Certified Information Systems Security Professional/Associate (CISSP/A) examination from the International Information Systems Security Certification Consortium (ISP2), including a discussion of each of the following topics: security management practices; access control systems; telecommunication and network security; cryptography; security architecture and models; operations security; applications and systems development; business continuity planning and disaster recovery planning; law, investigation, and ethics; and physical security. 3 hours lecture.  (020232)  
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units  
Course Attributes: Upper Division  

CINS 465  Web Programming Fundamentals  
Prerequisite: CINS 370 with a grade of C or higher, CSCI 211 and MINS 335, or MINS 325 and MINS 335.  
Typically Offered: Fall and spring  
A hands-on project course that examines languages, tools, protocols, and techniques for developing interactive and dynamic web applications. Topics include the model-view-controller pattern, document object model, server side and client side scripting, using a server side database, and web applications security. The course includes several web projects using a web programming framework. 3 hours discussion.  (002368)  
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units  
Course Attributes: Upper Division  

CINS 467  Web and Mobile App Development  
Prerequisite: CINS 370 (with a grade of C or higher), CSCI 211 and MINS 335, or MINS 325 and MINS 335.  
Typically Offered: Fall and spring  
A hands-on project course that examines languages, tools, protocols, and techniques for developing robust client-side applications for mobile and web apps. Topics include the model-view-controller, cloud service integration, REST, Progressive Web Apps, app publishing, and application security. The course includes several projects using across-platform programming framework. 3 hours discussion.  (002365)  
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units  
Course Attributes: Upper Division; Laptop required  

CINS 490  Computer Information Systems Capstone  
Prerequisite: CINS 370 with a grade of C or higher; CINS 465 or CINS 467 with a grade C or higher; Senior Standing.  
Typically Offered: Fall and spring  
This capstone course provides a culminating activity in computer information systems. Students work independently to specify, design, develop, test, and document a complete information systems application under faculty supervision. Students present status reports at weekly meetings, and present their finished project at the end of the semester. 9 hours supervision.  (020996)  
Grade Basis: Report in Progress: Graded  
Repeatability: You may take this course for a maximum of 3 units  
Course Attributes: Upper Division  

CINS 548  Advanced Computer Security  
Prerequisite: CINS 448 with a grade of C or higher.  
Typically Offered: Fall only  
This course provides advanced training in the engineering and management of information systems security, particularly those systems that play a role in U.S. national security, and is aimed at professionals who plan to work either as contractors or federal employees in the area of national security or defense. The course also prepares students for the Information Systems Security Engineering Professional (ISSEP) certification test prepared by the International Information Systems Security Certification Consortium (ISP2) in collaboration with the National Security Agency. Specific areas of concentration are systems security engineering; certification and accreditation (CA); technical management; and U.S. Government Information Assurance (IA) regulations. 3 hours lecture.  (020234)  
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units  
Course Attributes: Upper Division
### Computer Science

**CISN 570  Advanced Database Management Systems**  
3 Units  
*Prerequisite:* CISN 370 with a grade of C or higher or MINS 335.  
*Typically Offered:* Fall only  
Course topics include database application programming using a high performance, high concurrency multi-user database management system. This course covers the SQL programming language including Data Definition Language, Data Manipulation Language, and Data Control Language. The course then focuses on a procedural database programming language including control structures, composite datatypes, explicit cursors, exception handling, and writing embedded SQL applications. 2 hours activity, 3 hours lecture. (002381)  
*Grade Basis:* Graded  
*Repeatability:* You may take this course for a maximum of 3 units  
*Course Attributes:* Upper Division

**CSCI 101  Introduction to Computer Science**  
3 Units  
*Typically Offered:* Fall and spring  
Students who have had limited experience with computers should take CSCI 101 before CSCI 111. CSCI 101 provides an overview of the fundamentals of computer science. Number systems and data representation are introduced. An overview of hardware, including the control unit, memory, the ALU, and I/O is provided. Software is introduced with an overview of operating systems, programming languages, applications, and software tools. Students are exposed to common operating systems and applications. Student also design and implement several programs. 2 hours activity, 2 hours discussion. (002280)  
*Grade Basis:* Graded  
*Repeatability:* You may take this course for a maximum of 3 units  
*Course Attributes:* Lower Division

**CSCI 102  Living With Technology**  
3 Units  
*Typically Offered:* Fall and spring  
This course explores the impact of technology on our lives. Aspects of our complex technological society are investigated through study of the various forms technology takes, and readings in contemporary literature regarding the impact these technologies have on individuals. Students are encouraged to reflect on technology in their own lives through journaling, and to discourse with their peers on the benefits and harm to individuals, society, and humanity that modern technology presents. 3 hours discussion. (020623)  
*General Education:* Lifelong Learning and Self-Development (E)  
*Grade Basis:* Graded  
*Repeatability:* You may take this course for a maximum of 3 units  
*Course Attributes:* Lower Division; Sustainable Course

**CSCI 111  Programming and Algorithms I**  
4 Units  
*Prerequisite:* GE Mathematics/Quantitative Reasoning (B4) requirement; MATH 119 (or completion of high school precalculus), MATH 120, or meet the Math department's requirements for enrollment in MATH 120. Recommended: CSCI 217 or MATH 217 (may be taken concurrently).  
*Typically Offered:* Fall and spring  
A first-semester programming course, providing an overview of computer systems and an introduction to problem solving and software design using procedural object-oriented programming languages. Coverage includes the software life cycle, as well as algorithms and their role in software design. Students are expected to design, implement, and test a number of programs. 2 hours activity, 3 hours lecture. (002281)  
*Grade Basis:* Graded  
*Repeatability:* You may take this course for a maximum of 4 units  
*Course Attributes:* Lower Division

**CSCI 198  Special Topics**  
1-3 Units  
*Prerequisite:* Department permission.  
*Typically Offered:* Fall and spring  
This course is for special topics offered for 1.0-3.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. 3 hours supervision. (021848)  
*Grade Basis:* Graded  
*Repeatability:* You may take this course more than once  
*Course Attributes:* Lower Division

**CSCI 199  Special Problems**  
1-3 Units  
*Prerequisite:* Faculty permission.  
*Typically Offered:* Fall and spring  
This course is a special topic offered for 1.0-3.0 units. You must register directly with a supervising faculty member. 0 hours supervision. (021848)  
*Grade Basis:* Credit/No Credit  
*Repeatability:* You may take this course for a maximum of 6 units  
*Course Attributes:* Lower Division

**CSCI 211  Programming and Algorithms II**  
4 Units  
*Prerequisite:* GE Mathematics/Quantitative Reasoning (B4) requirement; CSCI 111 with a grade of C or higher. Recommended: CSCI 217 or MATH 217 (may be taken concurrently).  
*Typically Offered:* Fall and spring  
A second semester object-oriented programming course in computer science that emphasizes problem solving. This course continues the study of software specification, design, implementation, and debugging techniques while introducing abstract data types, fundamental data structures and associated algorithms. Coverage includes dynamic memory, file I/O, linked lists, stacks, queues, trees, recursion, and an introduction to the complexity of algorithms. Students are expected to design, implement, test, and analyze a number of programs. 2 hours activity, 3 hours lecture. (002282)  
*Grade Basis:* Graded  
*Repeatability:* You may take this course for a maximum of 4 units  
*Course Attributes:* Lower Division

**CSCI 217  Discrete Mathematics**  
3 Units  
*Prerequisite:* GE Mathematics/Quantitative Reasoning Ready, CSCI 111 with a grade of C or higher (may be taken concurrently), MATH 119 (or equivalent).  
*Typically Offered:* Fall and spring  
Offers an intensive introduction to discrete mathematics as used in computer science. Topics include sets, relations, propositional and predicate logic, basic proof methods including mathematical induction, digital logic circuits, complexity of algorithms, elementary combinatorics, and solving linear recurrence relations. 3 hours discussion. (005550)  
*Cross listing(s):* MATH 217  
*Grade Basis:* Graded  
*Repeatability:* You may take this course for a maximum of 3 units  
*Course Attributes:* Lower Division
CSCI 221  Assembly Language Programming  3 Units
Prerequisite: CSCI 211 with a grade of C or higher. CSCI 217 or MATH 217 recommended.
Typically Offered: Inquire at department
Topics include number systems and their rules for arithmetic; basic central processing unit (CPU) organization concepts such as registers, data paths, the arithmetic and logic unit (ALU) and the interface to random access memory (RAM); instruction formats, addressing modes and their uses with a variety of data structures; and parameter passing techniques including the use of a stack frame. The use of good programming methodologies to develop and document algorithms at the assembly language level is emphasized. 2 hours activity, 2 hours lecture. (002290)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division

CSCI 300  Computer Science Seminar  1 Unit
Prerequisite: CSCI 211 with a grade of C or higher.
Typically Offered: Fall and spring
This course exposes students to computer science topics not normally covered in the computer science curriculum. Guest speakers include faculty (including from other departments), students, alumni, and members of the computing industry. Topics include current computer science research and software development issues. Specific topics may include software development tools, bioinformatics, human computer interaction, security, machine learning, specific corporate approaches to software development, dev-ops, software job interviews, programming languages, simulation, graphics, game development, web and mobile applications, cloud computing, and networks. 1 hour lecture. (021889)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 301W  Computer's Impact on Society (W)  3 Units, W, GW
Prerequisite: GE Written Communication (A2) requirement; Junior standing.
Typically Offered: Fall and spring
Impact of computers and high-tech systems on people, institutions, organizations, and environment. Examines the following: law, medicine, education, government, data banks, privacy, computer security, changing work, automation, robots, expert systems, AI, social responsibility, ethics, war, conflict resolution. Includes weekly reading, midterm, and final writing projects. Weekly lectures, discussions, films, and writing. No programming. 3 hours discussion. (002309)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment

CSCI 310  Programming Foundations  6 Units
Prerequisite: Graduate Standing.
Typically Offered: Fall only
An accelerated object-oriented programming course that prepares students without sufficient undergraduate preparation for the graduate program in computer science. Coverage includes software specification, design, implementation, debugging techniques, dynamic memory, I/O, linked lists, stacks, queues, recursion, trees, search structures, hashing, heaps, sorting algorithms, graph algorithms, and an introduction to the complexity of algorithms. Foundational data structures and algorithms are studied and analyzed using both mathematical and empirical measurements. The course includes a number of large programming assignments focusing on object-oriented software engineering and algorithm development. 2 hours activity, 5 hours lecture. (022021)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

CSCI 311  Algorithms and Data Structures  4 Units
Prerequisite: CSCI 211 with a grade of C or higher; CSCI 217 or MATH 217 with a grade of C or higher.
Typically Offered: Fall and spring
This course focuses on object-oriented methodologies in designing and implementing a variety of data structures and algorithms. Coverage includes recursion, trees, search structures, hashing, heaps, sorting algorithms, and graph algorithms. Data structure and algorithm combinations will be studied and analyzed along with their relative merits using both mathematical and empirical measurements. The course includes a number of large programming assignments focusing on object-oriented software engineering and algorithm development. Students will be required to design, implement, test, and analyze their programs in at least one object-oriented language. 2 hours activity, 3 hours lecture. (002325)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

CSCI 315  Programming Languages  3 Units
Prerequisite: CSCI 311 with a grade of C or higher.
Typically Offered: Spring only
An investigation into the structure and syntax of current programming languages, including binding, scoping, data types, transfer-of-control structures, subprograms, abstract data types, object-oriented programming, and logical and functional programming. 3 hours discussion. (002323)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division
CSCI 344  Shell Programming  3 Units  
Prerequisite: CSCI 211 with a grade of C or higher; CSCI 217 or MATH 217 with a grade of C or higher.
Typically Offered: Spring only
This course examines the tools that allow software engineers to automate frequently performed operations and workflows, manipulate text and data, and develop software more quickly and easily than compiled languages. Shell programming in BASH or a similar shell, text processing languages such as sed and awk, and a scripting language such as Python or Ruby are covered. This course is recommended for students pursing careers in software development and/or information systems. 2 hours activity, 2 hours discussion. (002330)
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 345  Linux System Administration  3 Units  
Prerequisite: CSCI 211 with a grade of C or higher; CSCI 217 or MATH 217 with a grade of C or higher.
Typically Offered: Fall only
This course guides students through the fundamentals of Linux system administration. Topics include an exploration of the Linux Standard Base, user account and file system management, process and service management, operating system installation and configuration, and virtual and cloud environments. 2 hours activity, 2 hours discussion. (002372)
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 385  Introduction to Data Science  3 Units  
Prerequisite: CSCI 111, MATH 130, or MATH 230; MATH 109 or MATH 120.
Typically Offered: Fall only
Data Science is the science of learning from data in order to gain useful predictions and insights. The course provides an overview of the wide area of data science, with a particular focus on the tools required to store, clean, manipulate, visualize, model, and ultimately extract information from various sources of data. Topics include the analytics life cycle, data integration and modeling in R/Python, relational databases and SQL, text processing and sentiment analysis, and data visualization. Emphasis is placed on reproducible research, code sharing, version control, and communicating results to a non-technical audience. 3 hours discussion. (021756)
Cross listing(s): MATH 385
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 389  Industry Internship  1-3 Units  
Prerequisite: Department permission.
Typically Offered: Fall and spring
This internship is offered for 1.0-3.0 units. Students must register directly with a supervising faculty member. 3 hours supervision. (002342)
Grade Basis: Credit/No Credit  
Repeatability: You may take this course for a maximum of 15 units
Course Attributes: Upper Division

CSCI 398  Special Topics  1-3 Units  
Prerequisite: Department permission.
Typically Offered: Fall and spring
This course is for special topics offered for 1.0-3.0 units. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. 3 hours lecture. (002350)
Grade Basis: Graded  
Repeatability: You may take this course more than once
Course Attributes: Upper Division

CSCI 399  Special Problems  1-3 Units  
Prerequisite: Faculty permission.
Typically Offered: Fall and spring
This course is a special topic offered for 1.0-3.0 units. You must register directly with a supervising faculty member. Independent study and investigation of special problems in student’s area of concentration. Both registration and study plan must have approval of the instructor and the department chair. 9 hours supervision. (002351)
Grade Basis: Credit/No Credit  
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

CSCI 411  Advanced Algorithms and Complexity  4 Units  
Prerequisite: CSCI 311 with a grade of C or higher.
Typically Offered: Fall and spring
Students design, implement, and analyze algorithms for solving problems. Topics include dynamic programming, graphs (topological sort, strongly connected components), shortest paths (Bellman-Ford, Floyd-Warshall), minimum spanning tree (Kruskal’s), flow network (max flow, min cut, maximum bipartite matching), string search (suffix tree, suffix array, Burrows-Wheeler’s Transform), longest common prefix array. In addition, basic automata computability and complexity are covered, including finite automata, regular expressions, context free grammars, Turing machines, P and NP classes, and NP complete classes and problems. This course integrates knowledge of data structures, algorithms, and programming. 4 hours discussion. (002371)
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

CSCI 420  Applied Quantum Computing for Computer Scientists  3 Units  
Prerequisite: CSCI 311 with a grade of C or higher; MATH 109, MATH 120, or MATH 315.
Typically Offered: Spring only
This course introduces the practice of quantum computation and algorithms in computer science. Topics covered include the mathematics to understand the relationship between physical systems and quantum computation. Algorithms to be implemented include Deutsch’s mapped function algorithm, Grover’s search algorithm, Simon’s periodicity algorithm, and Shor’s prime factorization algorithm. Other concepts include quantum error correction, and quantum cryptography. Students will develop their code on a quantum computer. 2 hours activity, 2 hours lecture. (022275)
Grade Basis: Graded  
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Laptop required
CSCI 430  Software Engineering  3 Units
Prerequisite: CSCI 311 with a grade of C or higher.
Typically Offered: Fall and spring
An overview of software engineering principles, practice, and tools. Topics include: agile software engineering methodologies, requirements engineering, test-driven development, software design patterns, MVC architecture, version control, software metrics, and static analysis. Students work in groups to design and implement a semester-long open source software project. 2 hours activity, 2 hours discussion. (002310)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 431W  Usability Engineering (W)  3 Units GE, W
Prerequisite: GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
Usability Engineering is the craft of designing and evaluating how people interact with products and technology. In this course, students learn qualitative and quantitative methods for conducting behavioral research to investigate human-computer interaction (HCI) and to iteratively improve user experience (UX) design of digital interfaces. Students engage in team projects and conduct user research to design, evaluate and revise interactive prototypes following the user-centered design process. 2 hours activity, 2 hours discussion. (020615)
General Education: Upper-Division Social Sciences (UDD); Innovation, Design, and the Arts Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Laptop required; Writing Course

CSCI 440  Operating Systems  4 Units
Prerequisite: CSCI 221 or EECE 237; CSCI 311 all with a grade of C or higher.
Typically Offered: Fall and spring
Operating system fundamentals, including history, process and thread management, concurrency with semaphores and monitors, deadlocks, storage management, file systems, I/O, and distributed systems. 2 hours activity, 3 hours discussion. (002258)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

CSCI 446  Introduction to Computer Networks and Network Management  3 Units
Prerequisite: CSCI 211; CINS 220, CSCI 221, or EECE 237 all with a C or higher.
Typically Offered: Fall and spring
This course is an introduction to basic networking technologies and network management concepts, including major network operating systems, communication architecture focusing on ISO and Internet models with discussion of current standards and protocols. Significant laboratory work using current networking equipment reinforces lectures and provides fundamental experience with router and switch management. 3 hours laboratory, 2 hours lecture. (002340)
Cross listing(s): EECE 446
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 485  Advanced Topics in Data Science  3 Units
Prerequisite: CSCI 385 or MATH 485; MATH 456 (may be taken concurrently).
Typically Offered: Spring only
Getting connected to current events in Data Science and building an online presence. Ethics of predictive analytics and privacy and open data. Reporting and dissemination of research using interactive dashboards and web-publishing. Introduction to current scalable technologies to handle Big Data. Introduction to advanced statistical analysis and machine learning techniques for Data Science. 3 hours lecture. (021890)
Cross listing(s): MATH 485
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 490  Computer Science Capstone  3 Units
Prerequisite: CSCI 430; CINS 465, CINS 467, or MATH 485; Senior Standing.
Typically Offered: Fall and spring
This capstone course provides a culminating activity in computer science. Students will work independently to specify, design, develop, test, and document a complete software application under faculty supervision. Students present status reports at weekly meetings, and present their finished project at the end of the semester. 9 hours supervision. (002343)
Grade Basis: Report in Progress: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 498  Topics in Computer Science  1-3 Units
Typically Offered: Inquire at department
This course is a special topic offered for 1.0-3.0 units. Exploration of selected topics in Computer Science. Consult semester schedules for specific listings. Standard letter grading only. 3 hours discussion. (002389)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Upper Division

CSCI 499  Special Problems  1-3 Units
Prerequisite: Faculty permission.
Typically Offered: Fall and spring
This course is an independent study of special problems offered for 1.0-3.0 units. You must register directly with a supervising faculty member. 3 hours supervision. (002390)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

CSCI 499H  Honors Research Project/Thesis  3 Units
Prerequisite: Acceptance into Honors in the Major program.
Typically Offered: Fall and spring
Open by invitation to computer science majors with a GPA of 3.5 or higher in the major. This Honors in the Major course focuses on the development of a creative research project in computer science, its presentation, discussion of relevant research materials, and the reporting of findings. 9 hours supervision. (002391)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division
CSCI 511 Advanced Object-Oriented Programming 3 Units
Prerequisite: CSCI 311 with a grade of C or higher.
Typically Offered: Fall only
This course is dedicated to the analysis, design, and implementation of programming problems using an object-oriented approach. Modern object-oriented languages are utilized. Topics include inheritance, the underlying implementation of polymorphism, exception handling, extending existing system libraries, and approaching algorithm development from an object-oriented perspective. 3 hours lecture. (002356)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 511H Object-Oriented Programming - Honors 3 Units
Prerequisite: CSCI 311 with a grade of C or higher; acceptance into Honors in the Major program.
Typically Offered: Fall only
Honors version of CSCI 511. In addition to completing all course requirements for CSCI 511, the student is required to research a topic related to Object-Oriented Programming, and propose an independent study to be completed during the following semester. A written research report and proposal is required. A grade of B or higher in this course is necessary in order to use it to earn the Honors in the Major distinction. 3 hours discussion. (020790)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 515 Compiler Design 3 Units
Prerequisite: CSCI 311 with a grade of C or higher.
Typically Offered: Fall and spring
The elements of lexical, syntactical, and semantic analysis including finite and push-down automata, top-down and bottom-up parsing, error detection and recovery, semantic actions and code generation. 3 hours discussion. (002369)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 515H Compiler Design - Honors 3 Units
Prerequisite: CSCI 311 with a grade of C or higher, acceptance into Honors in the Major Program.
Typically Offered: Fall and spring
The elements of lexical, syntactical, and semantic analysis including finite and push-down automata, top-down and bottom-up parsing, error detection and recovery, semantic actions, and code generation. Honors students enrolled in this course are required to implement a significant additional feature in the semester project and to develop an approved proposal in the area of languages/compilers for their Honors Research Project/Thesis. 3 hours discussion. (020185)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 540 Systems Programming 3 Units
Prerequisite: CSCI 440 with a grade of C or higher.
Typically Offered: Fall only
A hands-on project course that examines the development of systems software. It provides an introduction to writing low level programs in the UNIX/Linux environment. Topics include using system calls, processes, threads, concurrency, process/thread synchronization, signals, and interprocess communication. The course includes several large programming projects which provide students solid experience in lower level programming. 3 hours discussion. (002378)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 546 Computer Network Management 3 Units
Prerequisite: CSCI 446 with a grade of C or higher.
Typically Offered: Spring only
This course covers advanced network management concepts and implementations including a network operating system, workstation management, and domain administration. Coverage also includes TCP/IP administration and router/hub management. The course provides hands-on experience on network management in a laboratory environment. 3 hours laboratory, 2 hours lecture. (002382)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 551 Numerical Methods and Parallel Programming 3 Units
Prerequisite: CSCI 440 with a grade of C or higher, MATH 109 or MATH 120.
Typically Offered: Fall and spring
Surveys numerical methods and parallel programming. Parallel architectures and algorithms for scientific programming applications, solution of simultaneous linear and non-linear equations, iterative techniques, matrix methods, and error analysis. Development of parallel algorithms, with a focus on efficient implementation and performance. 2 hours activity, 2 hours discussion. (002332)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 555 Advanced Web and Mobile App Development 3 Units
Prerequisite: CINS 467 with a grade C or higher.
Typically Offered: Spring only
A hands-on project course that examines languages, tools, protocols, and techniques for developing robust server-side interfaces and how to integrate them into cross-platform apps. Topics include the model-view-controller pattern, server-side scripting, using a server-side database, REST, the gRPC remote procedure call framework, web applications security, and hosting robustness. The course includes several projects using a web programming framework and integration into cross-platform client-side apps. 3 hours lecture. (022409)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Laptop required
CSCI 566 Computer Graphics Programming 3 Units
Prerequisite: CSCI 311 with a grade of C or higher.
Typically Offered: Fall only
This course covers algorithms and data structures in computer graphics. Topics include output primitives and their attributes, 2-D and 3-D geometric transformations and viewing, 3-D object modeling, parallel and perspective projections, visible surface detection, illumination models, and rendering algorithms. 3 hours discussion. (002363)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 580 Artificial Intelligence 3 Units
Prerequisite: CSCI 311 with a grade of C or higher.
Typically Offered: Fall and spring
This course introduces the basic principles, techniques, and applications of artificial intelligence. This course is organized in three sections: search, logic, and learning. Topics include but are not limited to problem-solving, heuristic search, genetic algorithm, game-playing, constraint-satisfaction problems, propositional and predicate logic, knowledge representation, feed-forward neural networks, and decision trees. Students implement and analyze artificial intelligence algorithms. 3 hours discussion. (002360)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 580H Artificial Intelligence - Honors 3 Units
Prerequisite: CSCI 311 with a grade of C or higher, acceptance into Honors in the Major program.
Typically Offered: Fall and spring
An introduction to the basic principles, techniques, and applications of Artificial Intelligence. Coverage includes knowledge representation, logic, inference, problem solving, search algorithms, game theory, perception, learning, planning, and agent design. Students program with AI language tools. Additional areas may include expert systems, machine learning, natural language processing, and computer vision. Honors students enrolled in this course are held to more rigorous standards and expectations in both assignments, participation, and examination than students in CSCI 580. They are also expected to perform preliminary work for the follow-up course, typically in the form of a literature review and proposal. 3 hours discussion. (021882)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 581 Machine Learning 3 Units
Prerequisite: CSCI 311 with a grade of C or higher; MATH 109 or MATH 120.
Typically Offered: Fall only
This course introduces students to the concepts, theories, and experimental methods of machine learning. This course develops a broad understanding of the issues in implementing machine learning algorithms and systems, especially as they relate to modern data-intensive problems. Topics include but are not limited to experimental design, supervised learning (linear and non-linear regression, parametric and nonparametric learning, support vector machines, Bayesian networks, Hidden Markov Models, and advanced neural networks), unsupervised learning (clustering, dimensionality reduction, and kernel methods), ensemble approaches, learning theory, and reinforcement learning. Students implement and analyze machine learning algorithms. 3 hours discussion. (022009)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 581H Machine Learning- Honors 3 Units
Prerequisite: CSCI 311 with a grade of C or higher.
Typically Offered: Fall and spring
This course introduces students to the concepts, theories, and experimental methods of machine learning. This course develops a broad understanding of the issues in implementing machine learning algorithms and systems, especially as they relate to modern data-intensive problems. Topics include but are not limited to experimental design, supervised learning (linear and non-linear regression, parametric and nonparametric learning, support vector machines, Bayesian networks, Hidden Markov Models, and advanced neural networks), unsupervised learning (clustering, dimensionality reduction, and kernel methods), ensemble approaches, learning theory, and reinforcement learning. Students implement and analyze machine learning algorithms. Honor students enrolled in this course are held to more rigorous standards and expectations in assignments, participation, and examinations than students in CSCI 581. Students are also expected to perform preliminary work for the follow-up course, typically in the form of a literature review and proposal. 3 hours discussion. (022108)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

CSCI 582 Bioinformatics 3 Units
Prerequisite: CSCI 311 with a grade of C or higher; MATH 105, MATH 314, or MATH 350 (may be taken concurrently).
Typically Offered: Spring only
An introduction to computational methods for Next Generation Sequencing data analysis. Topics include mapping sequenced reads back to a reference genome; approximate string matching; intro to biostatistics; probability distribution, hypothesis testing; identification of SNPs (single polymorphisms); analysis of RNA-seq data; mapping RNA-seq reads, identification of splice-junctions, analysis of gene expression; genome-wide associative analysis of methylation and gene expression. 3 hours discussion. (021619)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division
<table>
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<th>Course Code</th>
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<td>Robotics and Machine Intelligence</td>
<td>3</td>
<td>CSCI 211, EECE 237 both with a grade of C or higher; MATH 109 or MATH 120.</td>
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<td>Graduate Graded</td>
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<tr>
<td>CSCI 598</td>
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<td>1-4</td>
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<td>CSCI 611</td>
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<td>CSCI 612</td>
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<td>CSCI 620</td>
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<td>CSCI 630</td>
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<td>CSCI 651</td>
<td>Applied Graph Theory</td>
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<td>CSCI 311 and classified graduate standing.</td>
<td>Fall only</td>
<td>Graduate Division</td>
</tr>
</tbody>
</table>

**Course Attributes:**
- **Repeatability:** You may take this course for a maximum of 3 units
- **Grade Basis:** Graduate Graded
- **Laptop required:**
CSCI 682  Topics in Artificial Intelligence  3 Units
Prerequisite: Classified graduate standing.
Typically Offered: Inquire at department
Further study of selected advanced topics in artificial intelligence as presented in recently published journals; possible emphasis on research interests and/or projects of faculty in the department. Consult the Graduate Coordinator to determine how many units may be counted toward your major. 3 hours lecture.  (002402)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 12 units
Course Attributes: Graduate Division

CSCI 689  Internship  1-3 Units
Typically Offered: Fall and spring
0 hours supervision.  (020142)
Grade Basis: Report in Progress: CR/NC
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division

CSCI 693  Research Methods in Computer Science  3 Units
Prerequisite: Candidate status.
Typically Offered: Fall and spring
This course interweaves three distinct themes (investigation, experimentation, and technical writing), that culminate in a comprehensive research project, written report, presentation, and oral defense. First, the students are immersed into the research process within Computer Science. This includes an understanding of the role, ethics, and responsibility of researchers in Computer Science. The second focus is on rigorous design of experiments for the purpose of testing research hypotheses, simulations, and models, and interpreting the results of those experiments. Finally, proficiency in communication of scientific ideas and findings will be addressed, from intensive reading, critiques, technical writing and oral presentations. 9 hours supervision.  (020616)
Grade Basis: Report in Progress: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division; Laptop required

CSCI 697  Independent Study  1-6 Units
Prerequisite: Classified graduate standing, faculty permission.
Typically Offered: Fall and spring
This course is an independent study offered for 1.0-6.0 units. You must register directly with a supervising faculty member. Independent study and investigation of special problems in student's area of concentration. Both registration and study plan must have approval of the instructor and the student's graduate advisory committee chair. 9 hours supervision.  (002451)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Graduate Division

CSCI 698  Seminar in Advanced Topics  3 Units
Typically Offered: Inquire at department
This course is a seminar offered for 1.0-3.0 units. Typical subjects in past semesters have included microprogramming theory, operating system development, software engineering principles, data communications, analysis of algorithms, and program optimization. Consult the Class Schedule for listing and prerequisites. 2 hours activity, 2 hours discussion.  (002446)
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division

CSCI 699P  Master's Project  3 Units
Prerequisite: Candidate status.
Typically Offered: Fall and spring
You must register directly with a supervising faculty member. Independent study and investigation of special problems in student's area of concentration. Both registration and study plan must have approval of the instructor and the student's graduate advisory committee chair. Master's Project courses earn a Credit grade upon completion. 9 hours supervision.  (002461)
Grade Basis: Report in Progress: CR/NC
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division

CSCI 699T  Master's Thesis  1-6 Units
Prerequisite: Candidate status.
Typically Offered: Fall and spring
This course is offered for 1.0-6.0 units. You must register directly with a supervising faculty member. Independent study and investigation of special problems in student's area of concentration. Both registration and study plan must have approval of the instructor and the student's graduate advisory committee chair. Master's Thesis courses earn a Credit grade upon completion. 9 hours supervision.  (002453)
Grade Basis: Report in Progress: CR/NC
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Graduate Division

Computer Science Education

CSED 500  Computational Thinking  3 Units
Typically Offered: Summer session only
This course explores broad concepts and applications of Computer Science including Human-Computer Interaction, problem solving, web design, programming, computing and data analysis, and robotics. The course introduces programming in a graphical, block-based development environment. Synchronous online activity; tablet, laptop, or desktop computer is required. 3 hours lecture.  (022210)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division; Laptop required

CSED 501  Computing Practice and Programming  3 Units
Typically Offered: Summer session only
In a broad introduction to Computer Science, this course emphasizes problem solving by collaboratively designing, developing, and evaluating algorithms. The class explores creative development, abstraction, data representation, computer systems and networks, and impacts of computing while learning the fundamentals of high-level programming in Python. Synchronous online discussion and laboratory; laptop or desktop computer is required. 3 hours lecture.  (022211)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division; Laptop required
CSED 510 Technology for Computer Science Education 2 Units
Prerequisite: CSED 500, CSED 501 or CSCI 111.
Typically Offered: Fall only
Hardware and software technologies evolve rapidly. This course provides an overview of components and integrated systems of computers and networking. Students complete a supervised project to plan and integrate educational technologies for Computer Science classrooms. The project explores technology for supporting evidence-based pedagogy to foster interactive, creative, and inclusive Computer Science education. Asynchronous online lecture and supervised project. 6 hours supervision. (022212)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Upper Division; Laptop required

CSED 511 Computing in Society 2 Units
Prerequisite: CSED 500, CSED 501, or CSCI 111.
Typically Offered: Spring only
Computers are ubiquitous and influential in shaping 21st century society. This course discusses the impacts of computers on individuals and on society. It also addresses issues of inclusion and equity in Computer Science pedagogy and relates contemporary social issues to the discipline. Students complete a supervised project to develop educational materials for Computer Science classrooms that contextualize computing in society. 6 hours supervision. (022280)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Upper Division

CSED 590 Software Design, Data Structures, and Algorithms 4 Units
Prerequisite: CSCI 111 or CSED 501.
Typically Offered: Summer session only
This course explores the design and construction of software applications by adopting the Agile software development process. Students practice the fundamentals Object-Oriented Programming with the Java programming language. Concepts include primitive types and operations, objects and classes, boolean expressions, decisions, iteration, single- and multi-dimensional arrays, inheritance, recursion, sorting, and searching. Projects involve software engineering practices and tools, including professional integrated development environments (IDE), to create real software applications. 4 hours lecture. (022284)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division; Laptop required

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Abbas Attarwala 2022
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Doctor of Philosophy

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Doctor of Philosophy Virginia Polytechnic Institute

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