# **COMPUTER SCIENCE**

Computer Science Department (https://www.csuchico.edu/academics/ college/engineering/departments/computer-science/) O'Connell Center 215 530-898-6442 Email: csci@csuchico.edu Chair. Tyson Henry

# Who is Computer Science at Chico State?

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

## We Are Faculty

The Department of Computer Science faculty feel strongly about being actively involved in your education. We are also constantly assessing and updating our curriculum to ensure it reflects the "science" underlying computer science and the current and emerging technologies that our computer science and computer information systems graduates develop and use. Our research in security, data science, computer vision, robotics, bioinformatics, and quantum computing reflects this drive for currency. 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

Students are not nameless faces in a classroom. Computer science professors develop a more personal relationship with us. And the assigned projects have character; they are remarkably effective at demystifying computer technology. We also know that the portrayal of computer science as a solitary endeavor pursued by social misfits is entirely wrong. At Chico State, we have found computer science to be a uniquely human experience. Engineering software is the effort of many people working together, solving large, difficult, captivating problems. Social interaction embodies the student culture here at Chico State.

And the support—help is everywhere. Student tutors are available most of the day, and faculty office hours are plentiful. Study groups are the norm, and there are numerous clubs to join. The most remarkable aspect of being a Chico State computer science student is how friendly and sociable everyone is. Everyone wants you to succeed. We 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 can always help when working through complex material.

## We Are Alumni

Alumni find ourselves returning to the Computer Science Department from which we graduated. We come to hire 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 problemsolving 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 FAANG<sup>1</sup> 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)

<sup>1</sup> 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-scienceconstruction-management/computer-science/computer-informationsystems-bs/)
- Computer Science BS (https://catalog.csuchico.edu/collegesdepartments/college-engineering-computer-science-constructionmanagement/computer-science/computer-science-bs/)

## **Minors**

- Computer Science Minor (https://catalog.csuchico.edu/collegesdepartments/college-engineering-computer-science-constructionmanagement/computer-science/computer-science-minor/)
- Cybersecurity Minor (https://catalog.csuchico.edu/collegesdepartments/college-engineering-computer-science-constructionmanagement/computer-science/cybersecurity-minor/)

#### Certificates

 Data Science Certificate (https://catalog.csuchico.edu/collegesdepartments/college-engineering-computer-science-constructionmanagement/computer-science/data-science-certificate/)

## Graduate

## Master's

- Computer Science MS (https://catalog.csuchico.edu/collegesdepartments/college-engineering-computer-science-constructionmanagement/computer-science/computer-science-ms/)
- Computer Science MS Online (https://catalog.csuchico.edu/collegesdepartments/college-engineering-computer-science-constructionmanagement/computer-science/computer-science-online-ms/)

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

# **Computer Science**

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 🛛 GE

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

1-3 Units

**Prerequisite:** GE Mathematical Concepts/Quantitative Reasoning (2), completion of high school precalculus, or meet requirements for enrollment in MATH 120. Recommended: CSCI 217/MATH 217 (take 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, algorithms, and their role in software design. Students are expected to design, implement, and test several 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; Laptop required, see department for details.

#### CSCI 198 Special Topics

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. (002307) **Grade Basis:** Graded

Repeatability: You may take this course more than once Course Attributes: Lower Division

## CSCI 199 Special Problems

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

**Prerequisite:** GE Mathematical Concepts/Quantitative Reasoning (2); CSCI 111 with a grade of C- or higher. Recommended: CSCI 217/ 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 Mathematical Concepts/Quantitative Reasoning (2) 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 220 Introduction to Cloud Infrastructure and Security3 UnitsPrerequisite: CSCI 111 with a C- or higher.

#### Typically Offered: Spring only

This course provides an introductory understanding of cloud computing infrastructure and security principles. Students explore the basics of cloud computing, including different deployment models (public, private, hybrid), service models (laaS, PaaS, SaaS), security concerns, solutions to cloud-based security shortcomings, and key cloud providers. The course surveys the essential components of cloud infrastructure, such as virtualization, networking, storage, and compute resources. 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; Laptop required, see department for details.

4 Units

6 Units

#### CSCI 221 Assembly Language Programming

**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; Laptop required, see department for details.

#### CSCI 300 Computer Science Seminar

**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)

**Prerequisite:** GE English Composition (1A); 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, and 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 Requirement Course

## CSCI 310 Programming Foundations

**Prerequisite:** Graduate Standing. **Typically Offered:** Fall only

3 Units

1 Unit

3 Units W, GW

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 discussion. (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; Laptop required, see department for details.

#### 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-ofcontrol 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; Laptop required, see department for details.

#### 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; Laptop required, see department for details.

## 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; Laptop required, see department for details.

#### CSCI 370 Introduction to Databases

#### 3 Units

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

## CSCI 385 Introduction to Data Science

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

Prerequisite: Department permission.

Typically Offered: Fall and spring

This internship is offered for 1.0-12.0 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

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**

Prerequisite: Faculty permission.

1-3 Units

1-12 Units

1-3 Units

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

3 Units

3 Units

#### CSCI 411 Advanced Algorithms

## 3 Units

**Prerequisite:** CSCI 311 with a grade of C- or higher or Classified Computer Science Graduate Standing.

Typically Offered: Fall and spring

Students design, implement, and analyze algorithms for solving problems. Topics include greedy algorithms, dynamic programming, graphs (topological sort, strongly connected components), shortest paths (Bellman-Ford, Floyd-Warshall), minimum spanning trees (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), and advanced topics. This course integrates knowledge of data structures, algorithms, and programming. 3 hours lecture. (002371)

## Grade Basis: Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division; Laptop required, see department for details.

## CSCI 415 Theory of Computation

3 Units

**Prerequisite:** CSCI 311 with a grade of C- or higher. **Typically Offered:** Fall and spring

An introduction to formal languages, grammars, and automata theory. Topics include finite automata, regular expressions, context-free grammars, Turing machines, computability, and complexity including P and NP classes, NP complete classes and problems, and undecidable problems. 3 hours lecture. (022576)

Grade Basis: Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division; Laptop required, see department for details.

#### CSCI 417 Applied Linear Algebra for Computer Science 3 Units

**Prerequisite:** CAGD 280, CSCI 211, or MECH 208 each with a grade of Cor higher; or classified graduate standing.

#### Typically Offered: Spring only

In this course, linear algebra is studied from a computer science (CS) and algorithmic perspective, emphasizing its critical role in various CS domains. The course is centered around real-world CS applications and hands-on programming exercises. Students not only master the core concepts of vectors and matrices but also recognize their practical utility in contemporary computational challenges in CS. Throughout the course, students are exposed to a programming language of the instructor's choosing and use it to delve into an array of CS applications such as combinatorial optimization, image compression via principal component analysis (PCA), computer graphics, page rank algorithm, machine learning, and scientific visualization. 3 hours lecture. (022545) **Grade Basis:** Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division; Laptop required, see department for details.

#### CSCI 430 Software Engineering

**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; Laptop required, see department for details.

#### CSCI 431W Usability Engineering (W) 3 Units GE, W

**Prerequisite:** GE English Composition (1A), GE Critical Thinking (1B), GE Oral Communication (1C), GE Mathematical Concepts/Quantitative Reasoning (2); or faculty permission.

#### 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 Behavioral Sciences (UD4); 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, see department for details.; Writing Course

#### CSCI 440 Operating Systems

4 Units

3 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. (002328)

#### Grade Basis: Graded

**Repeatability:** You may take this course for a maximum of 4 units **Course Attributes:** Upper Division; Laptop required, see department for details.

# CSCI 446 Introduction to Computer Networks and Network Management

**Prerequisite:** CSCI 211; CSCI 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 448 Cybersecurity

#### 3 Units

Prerequisite: CSCI 211 and CSCI 220, CSCI 221 or EECE 237, all with a grade of C- or higher; or Classified Computer Science Graduate Standing. Typically Offered: Fall and spring

In line with the National Institute of Standards and Technology (NIST) National Initiative for Cybersecurity Education (NICE) cybersecurity workforce, this course offers a blend of theoretical knowledge and handson lab experiences across nine key cybersecurity domains: open source intelligence, cryptography, password cracking, log analysis, network traffic analysis, forensics, web application exploitation, scanning, and enumeration and exploration. The course also readies students for CompTIA Security+ examination. 3 hours lecture. (020232) Grade Basis: Graded

Repeatability: You may take this course for a maximum of 3 units Course Attributes: Upper Division; Laptop required, see department for details.

#### CSCI 485 Advanced Topics in Data Science

3 Units Prerequisite: CSCI 385 or MATH 385; or admission to the MS in Data

Science and Analytics.

Typically Offered: Spring only

This course focuses on critical concepts and practical tools in data science, preparing students to tackle complex, real-world problems. The course covers key areas such as linear algebra fundamentals for data science with applications to regression and dimension reduction. Students explore predictive modeling techniques, cross-validation, and model assessment while addressing the ethical implications of predictive analytics and data privacy. Through hands-on projects, students learn to collaborate effectively using modern version control tools, apply SQL for relational database queries, and practice communicating technical results to diverse audiences. Emphasis is placed on real-world applications, integrating theory with practical skills in data science workflows. 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; Laptop required, see department for details.

#### CSCI 490 Capstone

#### 3 Units

1-3 Units

Prerequisite: CSCI 430; CSCI 565, CSCI 567, or MATH 485; senior standing.

Typically Offered: Fall and spring

This capstone course provides a culminating activity in computer science, computer information systems, or data science. Students 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 projects 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**

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**

#### 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

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 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; Laptop required, see department for details.

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; Laptop required, see department for details.

#### CSCI 515 Compiler Design

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; Laptop required, see department for details.

#### 1-3 Units

3 Units

3 Units

3 Units

3 Units

#### 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; Laptop required, see department for details.

## CSCI 520 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; or Classified Computer Science Graduate Standing.

## Typically Offered: Spring only

This course introduces the practice of quantum computation and algorithms in computer science. Topics include the mathematics to understand the relationship between physical systems and quantum computation. Implemented algorithms 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 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, see department for details.

## CSCI 540 Systems Programming

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; Laptop required, see department for details.

#### CSCI 546 Network Forensics

**Prerequisite:** CSCI 446, EECE 446, or MINS 346 with a grade of C- or higher.

#### Typically Offered: Spring only

This course provides an in-depth understanding of the principles and techniques used in network forensic, including the collection, preservation, analysis, and presentation of digital evidence from networkbased incidents. The course covers the role of network forensic in incident response and cybercrime investigations. Students learn about the various tools and techniques used in network forensic including network capture, traffic analysis, and log analysis. Students gain handson experiences using these tools through various labs and case studies. 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; Laptop required, see department for details.

## CSCI 548 Digital Forensics

3 Units

**Prerequisite:** CSCI 448 with a grade of C- or higher or Classified Computer Science Graduate Standing.

#### Typically Offered: Fall only

This course provides an understanding of foundational terms, concepts, elements, and the overarching goals that drive a digital forensic investigation. Topics include how to utilize and analyze data with leading open-source digital forensic tools, conduct comprehensive disk and file system analysis, examine and interpret operating system and associated artifacts, evaluate various internet artifacts including browser histories and email data, and analyze files to construct incident timelines based on forensic evidence. This course includes several real-world challenges. 3 hours lecture. (020234)

#### Grade Basis: Graded

3 Units

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division; Laptop required, see department for details.

CSCI 551 Numerical Methods and Parallel Programming4 UnitsPrerequisite: CSCI 440 with a grade of C- or higher; MATH 109 orMATH 120; or Classified Computer Science Graduate Standing.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, 3 hours lecture. (002332)

#### Grade Basis: Graded

**Repeatability:** You may take this course for a maximum of 4 units **Course Attributes:** Upper Division; Laptop required, see department for details.

#### CSCI 565 Server Side App Development

3 Units

**Prerequisite:** CSCI 370 with a grade of C- or higher, CSCI 211 and MINS 335, or MINS 325 and MINS 335, or Classified Computer Science Graduate Standing.

Typically Offered: Fall and spring

A hands-on project course emphasizing server-side full-stack

development 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, ORM, REST, the gRPC remote procedure call framework, web applications security, and hosting robustness. The course includes several projects using a server-side web programming framework and integration with client-side applications. 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, see department for details.

#### **CSCI 566 Computer Graphics Programming**

Prerequisite: CSCI 311 with a grade of C- or higher.

3 Units

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; Laptop required, see department for details.

#### CSCI 567 Client Side App Development

3 Units

**Prerequisite:** CSCI 370 with a grade of C- or higher, CSCI 211 and MINS 335, or MINS 325 and MINS 335, or Classified Computer Science Graduate Standing.

#### Typically Offered: Fall and spring

A hands-on project course emphasizing client-side full-stack development 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, see department for details.

## CSCI 570 Advanced Database Management Systems 3 Units

**Prerequisite:** CSCI 370 with a grade of C- or higher, MINS 335, or Classified Computer Science Graduate Standing.

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, 2 hours discussion. (002381) **Grade Basis:** Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division

#### **CSCI 580** Artificial Intelligence

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)

3 Units

3 Units

Grade Basis: Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division; Laptop required, see department for details.

#### CSCI 580H Artificial Intelligence - Honors

**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 Al 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

3 Units

Prerequisite: CSCI 311 with a grade of C- or higher; MATH 109 or MATH 120; or Classified Computer Science Graduate Standing. 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 dataintensive 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; Laptop required, see department for details.

#### CSCI 581H Machine Learning- Honors

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 dataintensive 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; Laptop required, see department for details.

#### **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 RNAseq 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; Laptop required, see department for details.

#### CSCI 585 Robotics and Machine Intelligence

3 Units

Prerequisite: CSCI 211, EECE 237 both with a grade of C- or higher; MATH 109 or MATH 120; or Classified Computer Science Graduate Standing.

#### Typically Offered: Spring only

This course introduces students to the field of robotics by emphasizing the use of software to model, task, localize, navigate, and control mobile and manipulator robot systems. Topics include various case studies of robot architectures and algorithms that facilitate teleoperation, automation, and levels of autonomous tasking and intelligent operation (e.g., sensor fusion, perception, reactive reasoning, intelligent navigation, vision, machine learning, etc.). Students develop and/or configure software for a robot system by researching and experimenting with hardware, robot operating systems and simulation tools. ECC compliant laptop required. 2 hours activity, 2 hours lecture. (002361) Grade Basis: Graded

Repeatability: You may take this course for a maximum of 3 units Course Attributes: Upper Division; Laptop required, see department for details.

1-4 Units

CSCI 598 Adv Topic in Computer Science Typically Offered: Inquire at department

This course is a special topic offered for 1.0-4.0 units. Exploration of selected topics in Computer Science. Consult semester schedules for specific listings. Standard letter grading only. 0 hours discussion. (020184)

Grade Basis: Graded

Repeatability: You may take this course more than once Course Attributes: Upper Division

CSCI 605 Data Structures and Algorithms for Data Science 3 Units Prerequisite: Basic Python programming knowledge; admission to the master's program in Data Science and Analytics, or faculty permission. Typically Offered: Fall and spring

This course focuses on object-oriented methodologies in designing and implementing a variety of data structures and algorithms using the Python programming language. Coverage includes recursion, trees, search structures, hashing, heaps, sorting algorithms, and graph algorithms. Particular attention will be given to studying the relative merits of these data structures under different conditions both mathematically and through empirical measurement as they are used in the field of data science. 3 hours discussion. (022532) Grade Basis: Graduate Graded

Repeatability: You may take this course for a maximum of 3 units Course Attributes: Graduate Division; Laptop required, see department for details.

#### CSCI 608 Data Science for Graduate Studies

3 Units

**Prerequisite:** Basic programming knowledge, admission to the master's in data science and analytics, or classified standing in the master's in computer science.

#### Typically Offered: Fall only

This course covers foundational practices of data science emphasizing reproducibility and ethical practices at all stages of the data science lifecycle. Recent advances and seminal works in data science and related fields will be discussed and scientific communication best practices will be addressed. Topics include version control, scientific thinking, web scraping, intermediate data wrangling, data visualization, modeling, prediction, classification, and text analysis in either R or Python. 3 hours discussion. (022535)

#### Cross listing(s): MATH 608

#### Grade Basis: Graduate Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Graduate Division; Laptop required, see department for details.

#### CSCI 611 Applied Machine Learning

3 Units

3 Units

Prerequisite: CSCI 311 and classified graduate standing.

Typically Offered: Spring only

The course offers a practical exploration into machine learning and cutting-edge topics in neural networks, including modern techniques for deep learning. Students build deep learning models using sophisticated machine learning frameworks and scientific libraries. 3 hours lecture. (002395)

Grade Basis: Graduate Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Graduate Division

#### CSCI 612 Applied Computer Vision

Prerequisite: CSCI 311 or equivalent with C or higher.

Typically Offered: Spring only

Applied computer vision used in automation, robotics, physical security, surveillance, and inspection applications and systems. Topics covered include theory of computer vision and related algorithms for image capture and processing, filtering, thresholds, edge detection, shape analysis, shape detection, salient object detection, pattern matching, digital image enhancement, stereo ranging, and methods of sensor and information fusion. Focus is on real-time continuous image processing parallel computing systems are covered as they relate to scaling of computer vision applications. 2 hours activity, 2 hours discussion. (022279)

#### Grade Basis: Graduate Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Graduate Division; Laptop required, see department for details.

#### CSCI 620 Web Technology

#### 3 Units

**Prerequisite:** CSCI 567 with a grade of C or higher, or web programming experience, and classified graduate standing.

#### Typically Offered: Fall only

This course examines frameworks, libraries, languages, and tools for the development of full stack web applications that are progressive, responsive, and secure. Students propose, design, develop, test, and present a nontrivial full stack web application. 3 hours seminar. (002436)

#### Grade Basis: Graduate Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Graduate Division; Laptop required, see department for details.

#### CSCI 630 Software Design and Maintenance

**Prerequisite:** Classified Computer Science Graduate Standing. **Typically Offered:** Spring only

Students conduct a study of designing and maintaining complex software. The course builds upon fundamental software engineering skills with an emphasis on: object-oriented software design patterns, anti-patterns, code review and refactoring, and tools for evaluating code quality. Students practice maintaining software by collaborating on a large-scale open source project using automated development operation (DevOps) tools. 3 hours discussion. (002394)

#### Grade Basis: Graduate Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Graduate Division; Laptop required, see department for details.

#### CSCI 640 Scalable Software Systems

3 Units

3 Units

Prerequisite: CSCI 311 or CSCI 211 and CSCI 605; classified graduate standing.

Typically Offered: Fall only

This course offers a practical exploration of topics in scalable

computing. Students gain hands-on experience building things to solve a multitude of topics in scalable computing. Students learn how to solve computationally complex problems involving big data. Topics include but are not limited to single-node and multi-node parallelism, threading, and coprocessor programming. 3 hours lecture. (002430)

#### Grade Basis: Graduate Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Graduate Division; Laptop required, see department for details.

#### CSCI 644 DevOps Engineering

**Prerequisite:** CSCI 311, or CSCI 605 and MATH/CSCI 485; and classified graduate standing.

Typically Offered: Fall and spring

This course introduces students to distributed system administration skills, setting up distributed computation environments, version control, build systems, dependency management, continuous integration, testing, cloud virtualization technologies, and setting up mobile, web, machine learning, artificial intelligence, and data science pipelines. 3 hours discussion. (022536)

Grade Basis: Graduate Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Graduate Division; Laptop required, see department for details.

#### CSCI 650 Algorithms and Computability

3 Units

3 Units

Prerequisite: CSCI 311 and classified graduate standing. Typically Offered: Spring only

This course presents algorithm design techniques (such as divideand-conquer, greedy algorithms, dynamic programming, and others), mathematical and empirical analysis of algorithms, computability, Rice's theorem, P and NP classes, NP-completeness, and recent advances in algorithms. 3 hours lecture. (002417)

Grade Basis: Graduate Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Graduate Division

CSCI 651 Applied Graph Theory3 UnitsPrerequisite: CSCI 311 and classified graduate standing.Typically Offered: Fall onlyThis course covers foundational aspects of network science, the study of graph representations and the patterns they contain, along with tools and techniques for analyzing network data. Topics include random graph models, measures of structural importance, information spread in data networks, and methods for embedding graphs in real space. This is a project-based course. Students implement and apply graph algorithms on real-world network data. 3 hours lecture. (022206)Grade Basis: Graduate Graded Repeatability: You may take this course for a maximum of 3 units	CSCI 697 Independent Study1-6 UnitsPrerequisite: Classified graduate standing, faculty permission.Typically Offered: Fall and springThis 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
Course Attributes: Graduate DivisionCSCI 682 Topics in Artificial Intelligence3 UnitsPrerequisite: Classified graduate standing.Typically Offered: Inquire at departmentFurther 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	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
Course Attributes: Graduate DivisionCSCI 689 Internship1-3 UnitsTypically Offered: Fall and spring0 hours supervision. (020142)Grade Basis: Report in Progress: CR/NCRepeatability: You may take this course for a maximum of 3 unitsCourse Attributes: Graduate DivisionScourse Attributes: Graduate DivisionCSCI 693 Research Methods in Computer Science3 UnitsPrerequisite: Candidate status.Typically Offered: Fall and springThis course interweaves three distinct themes (investigation, experimentation, and technical writing), that culminate in a	CSCI 699P Master's Project3 UnitsPrerequisite: Candidate status.Typically Offered: Fall and springYou 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
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	CSCI 699T Master's Thesis1-6 UnitsPrerequisite: Candidate status.Typically Offered: Fall and springThis 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

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, see department for details. **Grade Basis:** Report in Progress: CR/NC **Repeatability:** You may take this course for a maximum of 6 units **Course Attributes:** Graduate Division

grade upon completion. 9 hours supervision. (002453)

graduate advisory committee chair. Master's Thesis courses earn a Credit

# **Computer Science Education**

#### 3 Units

CSED 500 Exploring Computer Science Typically Offered: Inquire at department

This course explores how to teach Exploring Computer Science and related curricula that introduce K-12 students to computational thinking. Through "unplugged" and computer-based instructional activities, the 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. Asynchronous, self-paced, online activity. 3 hours lecture. (022210)

Grade Basis: Report in Progress: Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division; Laptop required, see department for details.

#### CSED 501 Computing Practice and Programming 3 Units Typically Offered: Inquire at department 3

This course prepares teachers to teach AP computer science principles or similar curricula that emphasize problem solving by collaboratively designing, developing, and evaluating algorithms. The course explores pedagogy for creative development, abstraction, data representation, computer systems and networks, and the impacts of computing while learning the fundamentals of high-level programming in Python. Asynchronous, self-paced, online activity. 3 hours lecture. (022211) **Grade Basis:** Report in Progress: Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division; Laptop required, see department for details.

#### CSED 510 Technology for Computer Science Education 2 Units Typically Offered: Inquire at department

Hardware and software technologies evolve rapidly. This course provides an overview of components and integrated systems of computers and networking for teaching computer science courses by developing a plan for integrating educational technologies effectively in computer science classrooms. The project explores technology for supporting evidence-based pedagogy to foster interactive, creative, and inclusive computer science education. Asynchronous, self-paced, online lecture and supervised project. 2 hours discussion. (022212) **Grade Basis:** Report in Progress: Graded

**Repeatability:** You may take this course for a maximum of 2 units **Course Attributes:** Upper Division; Laptop required, see department for details.

#### CSED 511 Computing in Society

Typically Offered: Spring only

Computers are ubiquitous and influential in shaping society. This course discusses the impacts of computers on individuals and society. Teachers learn about issues of inclusion and equity in computer science pedagogy and relate contemporary social issues to the discipline. A supervised project guides teachers as they develop educational materials for computer science classrooms that contextualize computing in society. Asynchronous online lecture and supervised project. 2 hours discussion. (022280)

Grade Basis: Report in Progress: Graded

**Repeatability:** You may take this course for a maximum of 2 units **Course Attributes:** Upper Division; Laptop required, see department for details.

#### CSED 590 Software Design, Data Structures, and Algorithms 3 Units Typically Offered: Summer session only

Teachers learn the AP Computer Science A curriculum, emphasizing 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 multidimensional arrays, inheritance, recursion, sorting, and searching. Projects involve software engineering practices and tools, including professional integrated development environments (IDE), to create real software applications. Previous programming experience is recommended, but not required. Asynchronous, self-paced, online activity. 3 hours discussion. (022284)

Grade Basis: Report in Progress: Graded

**Repeatability:** You may take this course for a maximum of 3 units **Course Attributes:** Upper Division; Laptop required, see department for details.

## **Computer Science Department** The Faculty

Abbas Attarwala 2022 Associate Professor Doctor of Philosophy University of Waterloo

Kevin J Buffardi 2014 Professor Doctor of Philosophy Virginia Polytechnic Institute

Bryan C Dixon 2013 Professor Doctor of Philosophy Univ Of Colorado At Boulder

Todd A Gibson 2012 Professor Doctor of Philosophy Univ Of Colorado At Denver

Tyson R Henry 2001 Chair Doctor of Philosophy Univ Of Arizona

Brian D Herring 2007 Lecturer Master of Science CSU-Chico

Matthew D Hill 2024 Lecturer Master of Science CSU-Chico

2 Units

Shahid Iqbal 2010 Lecturer Bachelor of Science CSU-Chico

Ben Juliano 1998 Professor Doctor of Philosophy Florida St Univ

James R Krepelka 2013 Lecturer Bachelor of Science CSU-Chico

Michael Larson 2021 Lecturer Master of Science Liberty Univ

Bo Shen 2024

Associate Professor Doctor of Philosophy Wayne St Univ

#### Sam B Siewert 2020 Associate Professor Doctor of Philosophy Univ Of Colorado At Boulder

Kun Tian 2022 Associate Professor Doctor of Philosophy Univ Of Texas At Dallas

Richard C Tillquist 2020 Assistant Professor Doctor of Philosophy Univ Of Colorado At Boulder

Shelley M Wong 2019 Lecturer Master of Science CSU-Chico

David R Zeichick 2005 Assistant Professor Doctor of Philosophy Nova Univ

## **Emeritus Faculty**

Judith A Challinger Emeritus Doctor of Philosophy Univ Of Cal-Santa Cruz

Leonard W Fisk Emeritus Doctor of Philosophy Univ Of Cal-Irvine

Helen J Gesick Emeritus Master of Science CSU-Chico

Elena Y Harris Emeritus Doctor of Science Univ Of Cal-Riverside

Ralph C Huntsinger 1971 Emeritus Doctor of Philosophy Montana St Univ

Seung B Im Emeritus Doctor of Philosophy Southern Methodist Univ

#### Anne M Keuneke

Emeritus Doctor of Philosophy

Clement H Luk 1972 Emeritus Master of Science SUNY AT BUFFALO

Orlando S Madrigal 1970

Emeritus Doctor of Philosophy Texas A & M Univ At Galveston

William J Mcnelley

Emeritus Doctor of Philosophy Oregon St Univ

Jim Murphy Emeritus Doctor of Philosophy Michigan St Univ

Renee S Renner Emeritus Doctor of Philosophy Florida St Univ

## Melody J Stapleton

Emeritus Doctor of Philosophy Univ Of Cal-Riverside