

Computer Science (CS)

CS 100. Discovering Computer Science. 3 hours.

Fundamentals of computing; history of computation; computer organization; program design, testing and debugging; web design; computer animation; software tools; societal and legal issues in computing. Course Information: Credit is not given for CS 100 if the student has credit in CS 111 or CS 112 or CS 113 or CS 107 or CS 109 or MCS 260. No graduation credit given to students enrolled in Engineering. No graduation credit for students enrolled in a major offered by the Departments of Biomedical Engineering, Chemical Engineering, Civil Materials and Environmental Engineering, Computer Science, Electrical and Computer Engineering, or Mechanical and Industrial Engineering. Extensive computer use required. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture-Discussion. *Natural World - No Lab course.*

CS 107. Introduction to Computing and Programming. 4 hours.

Access and use of computing resources. Programming and program design. Problem solving. Data types, control structures, modularity, information hiding. Course Information: Credit is not given for CS 107 if the student has credit for CS 141. Previously listed as EECS 171. Prerequisite(s): Credit or concurrent registration in MATH 180. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture.

CS 109. Programming for Engineers with MatLab. 3 hours.

Develop an understanding of program design using data types, operators, control structures, functions, file I/O, arrays and structures. Demonstrate the understanding through computer projects with engineering applications. Course Information: Credit is not given for CS 109 if the student has credit for CS 111 or CS 112 or CS 113. Extensive computer use required. Prerequisite(s): Credit or concurrent registration in MATH 180. Class Schedule Information: To be properly registered, students must enroll in one Laboratory-Discussion and one Lecture-Discussion.

CS 111. Program Design I. 3 hours.

Introduction to programming: control structures; variables and data types; problem decomposition and procedural programming; input and output; aggregate data structures including arrays; programming exercises. Course Information: 3 hours. Extensive computer use required. Credit is not given for CS 111 if student has credit in CS 107 or CS 109 or CS 112 or CS 113. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture-Discussion.

CS 112. Program Design I in the Context of Biological Problems. 3 hours.

Introduction to programming using Biology as the context for programming in a high-level language; control structures, variables, simple and aggregate data types; problem-solving techniques; biology topics include central dogma and genetics. Course Information: Same as BIOS 112. Credits is not given for CS 112, if student has credit in CS 111 or CS 113. Course Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture-Discussion.

CS 113. Program Design I in the Context of Law and Public Policy. 3 hours.

Introduction to programming using law and public policy as the context for programming; control structures, variables, simple and aggregate data types; problem-solving techniques; legal topics: security, privacy, encryption, and predictive policing. Course Information: Credit is not given for CS 113 if the student has credit in CS 107 or CS 109 or CS 111 or CS 112. Class Schedule Information: To be properly registered, students must enroll in on Laboratory and one Lecture-Discussion.

CS 141. Program Design II. 3 hours.

Data abstraction and modular design; recursion; lists and stacks; dynamic memory allocation; file manipulation; programming exercises. Course Information: 3 hours. Previously listed as CS 102. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 111 or Grade of C or better in CS 112 or Grade of C or better in CS 113 or Grade of C or better in CS 107 or Grade of C or better in CS 109; and Credit or concurrent registration in MATH 180. Class Schedule Information: To be properly registered, students must enroll in one Laboratory-Discussion and one Lecture-Discussion.

CS 151. Mathematical Foundations of Computing. 3 hours.

Discrete mathematics concepts fundamental to computing: propositional logic, predicates and quantifiers; proofs; sets; recursive definitions and induction; functions, relations and graphs; combinatorics and discrete probability; applications. Course Information: 3 hours. Credit is not given for CS 151 if the student has credit in MCS 361. Prerequisite(s): Grade of C or better in CS 111 or Grade of C or better in CS 112 or Grade of C or better in CS 113 or Grade of C or better in CS 107 or Grade of C or better in CS 109; and Credit or concurrent registration in MATH 180; or appropriate score on the department placement test. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Discussion.

CS 194. Special Topics in Computer Science. 1-3 hours.

Multidisciplinary computer science topics at first-year level that vary from term to term depending on current student and instructor interests.

CS 211. Programming Practicum. 3 hours.

Software development tools and practices; debugging and testing; advanced language features; standard libraries; code management. Course Information: 2 hours. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 141; or Grade of C or better in CS 107. The option to use CS 107 as a prerequisite (in place of CS 141) is only for Computer Engineering majors or students doing a Computer Engineering minor. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory-Discussion.

CS 251. Data Structures. 4 hours.

Design, usage and analysis of data structures: review of lists, stacks and queues; hash tables, priority queues, search trees, introduction to graphs; searching and sorting; runtime analysis; programming projects and lab exercises. Course Information: 4 hours. Prerequisite (s): Grade of C or better in CS 141 or Grade of C or better in CS 107; and Grade of C or better in CS 151; and Credit or concurrent registration in CS 211 or Credit or concurrent registration in ECE 266. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory.

CS 261. Machine Organization. 4 hours.

Data representation and computer arithmetic; machine language; addressing; memory hierarchy; subroutines; data structures; processor architecture: hardware components, pipelining. Course Information: Credit is not given for CS 261 if the student has credit for ECE 267 or ECE 366. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 141; and Credit or concurrent registration in CS 211. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory.

CS 277. Technical and Professional Communication in Computer Science. 3 hours.

Communication skills for computing students and professionals in various contexts: technical writing, portfolios, job interviews, demos, sales, with speech organization, visuals, and delivery. Attendance, participation, and presentations required. Course Information: Prerequisite(s): CS 141. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Discussion.

CS 294. Special Topics in Computer Science. 1-3 hours.

Multidisciplinary computer science topics at sophomore level that vary from term to term depending on current student and instructor interests. Course Information: Prerequisite(s): Consent of the instructor.

CS 301. Languages and Automata. 3 hours.

Regular sets and finite automata. Context-free languages and push-down automata. Parsing. Computability theory including Turing machines and decidability. Course Information: Previously listed as EECS 361. Prerequisite(s): Grade of C or better in CS 151; and Credit or concurrent registration in CS 251. Class Schedule Information: To be properly registered, students must enroll in one Discussion/Recitation and one Lecture.

CS 341. Programming Language Design and Implementation. 3 hours.

Programming language paradigms, design and implementation: syntax and semantics; parsing; runtime systems; control; data types; subroutines and exceptions; data and procedural abstraction; functional programming. Course Information: Extensive computer use required. Prerequisite(s): Grade of C or better in CS 211 and Grade of C or better in CS 251.

CS 342. Software Design. 3 hours.

Software design principles and practices: Object-oriented design; design patterns; software reuse; testing; event driven programming and concurrency; graphical user interface design and development; Team development. Course Information: Extensive computer use required. Credit is not given for CS 342 if the student has credit for CS 340. Prerequisite(s): Grade of C or better in CS 251 and Grade of C or better in CS 211.

CS 351. Advanced Data Structure Practicum. 3 hours.

Design and implementation details of advanced data structure and non-trivial algorithms with an emphasis on amortized analysis. Course Information: Prerequisite(s): CS 251.

CS 361. Systems Programming. 4 hours.

Study of computer systems emphasizing impact on application level programming. Virtual memory and memory management; code optimization; system-level I/O; concurrency: processes, threads, synchronization; introduction to network programming. Course Information: Extensive computer use required. Prerequisite(s): Grade of C or better in CS 251 and Grade of C or better in CS 211; and CS 261. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory.

CS 362. Computer Design. 4 hours.

Computer hardware building blocks. logic gates; combinational circuits; arithmetic circuits; flip flops and sequential circuits; registers and memory; CPU design; I/O design. Course Information: 3 hours. Extensive computer use required. Credit is not given for CS 362 if the student has credit in ECE 265. Prerequisite(s): Grade of C or better in CS 211; and CS 261. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Laboratory.

CS 377. Ethical Issues in Computing. 3 hours.

Communication skills for computing professionals: presentation organization, visual aides, delivery techniques, argument support. Ethical and societal issues in computing: privacy, intellectual property and ownership, crime. Course Information: 3 hours. Extensive computer use required. Prerequisite(s): Credit or concurrent registration in CS 251. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion and one Discussion.

CS 378. Framework-based Software Development for Hand-held Devices. 3 hours.

Multi-platform app development using software frameworks; the integration of framework-generated code with native code of mobile operating systems; numerous programming assignments in multiple programming languages. Course Information: Prerequisite(s): CS 342.

CS 391. Computer Science Practicum. 1 hour.

Provides students with the opportunity to apply the skills and knowledge gained in previous engineering courses within a professional, working environment. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. A maximum of 3 hour awarded toward degree requirements. Prerequisite(s): Approval of the Department.

CS 394. Special Topics in Computer Science. 1-3 hours.

Multidisciplinary computer science topics at junior-senior level that vary from term to term depending on current student and instructor interests. Course Information: Prerequisite(s): Consent of the instructor.

CS 398. Undergraduate Design/Research. 1-3 hours.

Design and/or research experience for undergraduate Computer Science majors under close supervision of a CS faculty member. Course Information: Previously listed as EECS 398. Prerequisite(s): Consent of the instructor.

CS 401. Computer Algorithms I. 3 or 4 hours.

Design and analysis of computer algorithms. Divide-and-conquer, dynamic programming, greedy method, backtracking. Algorithms for sorting, searching, graph computations, pattern matching, NP-complete problems. Course Information: Same as MCS 401. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in MCS 360; or Grade of C or better in CS 251.

CS 402. Algorithms in Practice. 3 or 4 hours.

Design, implementation and presentation of algorithms and data structures emphasizing dynamic programming and both exact and heuristic approaches to NP-hard problems; problem solving sessions, programming projects and presentations. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 401; and consent of the instructor.

CS 407. Economics and Computation. 3 or 4 hours.

Techniques for analysis of markets, making decisions with other strategic agents, and understanding how algorithms affect the incentives of market participants. These include game theory, mechanism design, auction theory, and social choice theory. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in CS 251.

CS 411. Artificial Intelligence I. 3 or 4 hours.

Problem representation; rule-based problem-solving methods; heuristic search techniques. Application to expert systems, theorem proving, language understanding. Individual projects. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in CS 251.

CS 412. Introduction to Machine Learning. 3 or 4 hours.

Mechanism, implementation, and application of systems that improve automatically based on past experience, including classification, density estimation, clustering, and online learning tasks and solutions. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. MATLAB will be used for some of the homework assignments, but prior experience with it is not required. Prerequisite(s): Grade of C or better in CS 251; and IE 342 or STAT 381 or ECE 341.

CS 415. Computer Vision I. 3 or 4 hours.

Computer vision system design. Segmentation and representation of regions and boundaries; image filtering; object recognition; advanced topics (examples: texture, stereo, color); applications. Programming assignments. Course Information: 3 undergraduate hours. 4 graduate hours. Previously listed as EECS 487. Prerequisite(s): CS 202 or MCS 360; or consent of the instructor.

CS 418. Introduction to Data Science. 3 or 4 hours.

Provides an in-depth overview of data science in engineering. Topics include modeling, storage, manipulation, integration, classification, analysis, visualization, information extraction, and big data in the engineering domain. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 251; and STAT 381 or IE 342 or ECE 341.

CS 421. Natural Language Processing. 3 or 4 hours.

Design of natural language processing systems; part-of-speech tagging, statistical and symbolic parsers; semantic interpretation; discourse and dialogue processing; natural language generation; applications. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 301 or MCS 441.

CS 422. User Interface Design and Programming. 3 or 4 hours.

User interface design, implementation, and evaluation: user-centered design methodologies, windowing systems, I/O devices and techniques, event-loop programming, user studies. Programming projects. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 342.

CS 423. Natural User Interactions. 3 or 4 hours.

Introduces students to the field of natural user interactions, including topics such as design principles, hardware-to-software development pipeline (including various existing platforms, toolkits and APIs), as well as effective evaluation techniques. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 342. Recommended background: CS 422 or CS 522.

CS 424. Visualization and Visual Analytics. 3 or 4 hours.

Geospatial visualization, scientific visualization, medical visualization, information visualization, and social network visualization, interaction, data analysis, human factors, dynamic data, privacy, uncertainty, data transforms. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 251.

CS 425. Computer Graphics I. 0-4 hours.

Principles of interactive computer graphics. Raster and vector display, techniques and hardware considerations. Introduction to two-dimensional and three dimensional rendering. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 251. Class Schedule Information: To be properly registered, students must enroll in one Laboratory-Discussion and one Lecture-Discussion.

CS 426. Video Game Design and Development. 3 or 4 hours.

Theory and practice of video game design and programming. Students will form interdisciplinary teams, to design, build and demonstrate video games or related interactive simulation environments. Course Information: Same as DES 426. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in CS 251.

CS 427. Creative Coding. 3 or 4 hours.

Creative Coding investigates how contemporary computational techniques can inspire novel forms of art making, providing students with the skills to make use of technology for expressive purposes. Course Information: Same as DES 427. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in CS 251.

CS 428. Virtual, Augmented and Mixed Reality. 3 or 4 hours.

Virtual reality, augmented reality, and mixed reality environments, display devices, input devices, tracking, navigation, interaction, collaboration, generating visuals and sounds, software tools, applications, evaluation, safety. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): CS 342; or consent of the instructor.

CS 440. Software Engineering I. 3 or 4 hours.

Software life-cycle model, requirement specification techniques, large-scale software design techniques and tools, implementation issues, testing and debugging techniques, software maintenance. Course Information: 3 undergraduate hours. 4 graduate hours. Previously listed as EECS 470. Prerequisite(s): CS 342.

CS 441. Engineering Distributed Objects For Cloud Computing. 3 or 4 hours.

Provides a broad but solid overview of engineering distributed object for cloud computing. Students will learn the theory and principles of engineering distributed objects for cloud environments. Programming assignments required. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 341 or Grade of C or better in CS 342; and Grade of C or better in CS 361.

CS 442. Software Engineering II. 3 or 4 hours.

Advanced concepts in software development: requirements engineering, cost estimation, risk analysis, extreme programming, regression test case selection, and design patterns. Software lab assignments required. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): CS 440.

CS 450. Introduction to Networking. 3 or 4 hours.

Network protocols, algorithms, and software issues. Topics include the Open Systems Interconnect model, data link, network and transport layers, TCP/IP, ATM, mobile networks. Course Information: 3 undergraduate hours. 4 graduate hours. Credit is not given for CS 450 if the student has credit for ECE 433. Prerequisite(s): CS 361.

CS 453. Introduction to Parallel and Distributed Processing. 3 or 4 hours.

Foundations of parallel and distributed processing; clusters and parallel systems; communication primitives; programming with MPI; scalability; distributed graph algorithms; distributed mutual exclusion, deadlock detection, peer-to-peer systems. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in CS 251. Recommended background: CS 401.

CS 454. Principles of Concurrent Programming. 3 or 4 hours.

Focuses on the foundations and basic principles of concurrent programming, covering high-level notions of concurrent correctness and connecting those abstract concepts to real-world programming constructs and algorithms used in practice. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 361.

CS 455. Design and Implementation of Network Protocols. 3 or 4 hours.

Network protocols and their software, Examines OS network interface through network layers. Topics include routing, congestion control, fault tolerance, security, name servers, multicast, and performance. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 340 and CS 450.

CS 461. Operating Systems Design and Implementation. 3 or 4 hours.

Kernel design and implementation; process management; effective management of machine resources: resource allocation and scheduling, mutual exclusion, deadlock avoidance, memory management policies, devices and file systems, and client-server systems. Course Information: 3 undergraduate hours; 4 graduate hours. Previously listed as CS 385. Extensive computer use required. Prerequisite(s): CS 361.

CS 463. Systems Performance and Concurrent Computing. 3 or 4 hours.

Understanding the many systems factors that affect program performance, including program design for concurrent computing, profiling and program optimization. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 361. Recommended Background: CS 461.

CS 466. Computer Architecture. 3 or 4 hours.

Design principles of computer architecture. Topics include: instruction set architecture, pipelining, instruction-level parallelism, caches, main memory, and thread-level parallelism. Course Information: Same as ECE 466. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ECE 366 or CS 261.

CS 468. Network Security. 3 or 4 hours.

Introduces basic concepts of security and privacy, and covers the principles and practice of network security. Given the ubiquitousness of network communications, this course explores a range of systems and applications, and the threats they face. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 361.

CS 472. Provably Correct Programming. 3 or 4 hours.

Introduction to interactive theorem proving and program logics, with the goal of specifying and proving the correctness of programs. Learn to develop machine-assisted formal mathematical proofs and prove that programs satisfy their specifications. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): CS 341. Recommended background: CS 341 or experience with functional programming.

CS 473. Compiler Design. 3 or 4 hours.

Language translation: lexical analysis, parsing schemes, symbol table management, syntax and semantic error detection, and code generation. Development of fully-functional compiler. Course Information: Same as MCS 411. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in CS 301 or Grade of C or better in MCS 441; and Grade of C or better in CS 251 or Grade of C or better in MCS 360; and Grade of C or better in CS 261.

CS 474. Object-Oriented Languages and Environments. 3 or 4 hours.

Data abstraction, classes and objects, messages and methods, polymorphism and dynamic binding, inheritance. Object-oriented design. Pure and hybrid object-oriented languages. Course Information: 3 undergraduate hours. 4 graduate hours. Previously listed as EECS 474. Prerequisite(s): CS 342.

CS 475. Object-Oriented Programming. 3 or 4 hours.

OO Paradigm: classes, messages, methods, variables, inheritance, polymorphism; the C++ and Java languages; programming labs required. Course Information: 3 undergraduate hours. 4 graduate hours. Credit is not given for CS 475 if the student has credit for CS 340 or CS 474. Extensive computer use required. Prerequisite(s): CS 202; and consent of the instructor.

CS 476. Programming Language Design. 3 or 4 hours.

Definition, design, and implementation of programming languages. Syntactic and semantic description; variable bindings, control and data structures, parsing, code generation, optimization; exception handling; data abstraction. Course Information: Same as MCS 415. 3 undergraduate hours. 4 graduate hours. Previously listed as EECS 476. Prerequisite(s): MCS 360; or CS 341.

CS 477. Public Policy, Legal, and Ethical Issues in Computing, Privacy, and Security. 3 or 4 hours.

Contemporary topics involving legal, public policy, and/or ethical issues in computing, especially privacy, security, and surveillance. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Consent of the instructor.

CS 478. Software Development for Mobile Platforms. 3 or 4 hours.

Design and implementation of mobile applications; operating systems, object-oriented languages and programming environments for mobile platforms; integration with hardware components; and location-aware applications. Programming assignments required. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): CS 342.

CS 479. Wearables and Nearables Technology Laboratory. 3 or 4 hours.

Practical experience in design and development of wearable and nearable devices. Acquisition and processing of sensors data. Design and development of user-friendly user interface. Course Information: Same as BME 479. 3 undergraduate hours; 4 graduate hours. Extensive computer use required. Prerequisite(s): BME 240; or CS 251; or consent of the instructor. Recommended background: ECE 210 and CS 109.

CS 480. Database Systems. 3 or 4 hours.

Database design, logical design, physical design. Relational databases. Recovery, concurrency control. Normalization. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Grade of C or better in CS 251.

CS 483. Big Data Mining. 3 or 4 hours.

Data mining for very large datasets from a foundational and practical standpoint including similarity search, data-stream processing, advanced technology for search engines, recommendation systems, and graph analytics. Course Information: 3 undergraduate hours; 4 graduate hours. Credit is not given for CS 483 if the student has credit in CS 583. Prerequisite(s): Grade of C or better in CS 251; and ECE 341 or IE 342 or STAT 381. Recommended background: CS 401 and CS 480.

CS 484. Secure Web Application Development. 3 or 4 hours.

Web applications integrate concepts from software engineering, systems programming, and computer security. Teaches security through web development, enabling students to design, deploy, scale, attack, and defend modern web applications. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Credit or concurrent registration in CS 341.

CS 485. Networked Operating Systems Programming. 4 or 5 hours.

Concepts, design, and programming of multi-process and distributed systems; inter-process communications; fault tolerance; distributed programming semantics. Programming assignments and project required. Course Information: 4 undergraduate hours. 5 graduate hours. Previously listed as EECS 471. Prerequisite(s): CS 385.

CS 487. Building Secure Computer Systems. 3 or 4 hours.

Building and programming secure systems; protecting systems from threats and reduction of vulnerabilities; Includes application, host and network security. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 385; and senior standing or above; or consent of the instructor.

CS 488. Introduction to Cryptography. 3 or 4 hours.

Foundational concepts: encryption schemes, hash functions, message authentication codes, digital signatures. Practical systems: stream and block ciphers, SHA. Advanced topics: secure computation, zero-knowledge proofs, blockchain. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Prerequisite(s): Grade of C or better in CS 251; and IE 342 or STAT 381 or STAT 401.

CS 489. Human Augmentics. 3 or 4 hours.

Study of technologies for augmentation of human capabilities; human limitations; implants and wearable technologies; implants; brain-computer interfaces; exoskeletons; sensors and networks. Includes project work. Course Information: Same as BME 489. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Grade of C or better in CS 251; or consent of the instructor.

CS 491. Seminar. 1-4 hours.

Topics of mutual interest to a faculty member and a group of students. Offered as announced by department bulletin or the Timetable. Course Information: May be repeated. Previously listed as EECS 491. Prerequisite(s): Consent of the instructor.

CS 494. Special Topics in Computer Science. 1-4 hours.

Multidisciplinary computer science topics for undergrad seniors and graduate student that vary from term to term depending on current student and instructor interests. Course Information: 1 to 3 undergraduate hours; 2 to 4 graduate hours. Prerequisite(s): Consent of the instructor.

CS 499. Professional Development Seminar. 0 hours.

Graduating seniors will be provided with information regarding future career paths and will provide information regarding the program to be used for assessment purposes. Students take the CS Major Field Exam as part of this course. Course Information: Satisfactory/Unsatisfactory grading only. Prerequisite(s): Open only to seniors; and approval of the department. Must be taken in the student's last semester of study.