

# COMPUTER SCIENCE (CS)

- CS 502 Computer Architecture** **3 Credit hours**  
Design and analyze structure of major hardware components of computers including: ALU, instruction sets, memory hierarchy and caching, parallelism through multicore and many core, GPGPUs, storage systems and interfaces.  
**Grade Mode:** Normal Grading Mode
- CS 504 High Performance Computing** **3 Credit hours**  
Learn how to develop highly optimized applications for multi-core processors and clusters using software tools, parallel algorithms, performance profilers, and programming constructs in MPI, OpenMP, MapReduce, CUDA, and OpenCL.  
**Grade Mode:** Normal Grading Mode
- CS 505 Computing for Bioinformatics** **3 Credit hours**  
Study of computational algorithms and programming techniques for various bioinformatics tasks including parsing DNA files, sequence alignments, tree construction, clustering, species identification, principal component analysis, correlations, and gene expression arrays.  
**Grade Mode:** Normal Grading Mode
- CS 510 Advanced Database Systems** **3 Credit hours**  
This course introduces advanced topics in database systems including distributed systems, distributed databases, Big Data, cloud service, semantic web, web services, information security & privacy, and electronic commerce.  
**Grade Mode:** Normal Grading Mode
- CS 511 Advanced Programming** **3 Credit hours**  
The course covers advanced topics in Python programming including the use of parallel computation and GPU acceleration and investigate how to exploit frameworks such as Hadoop and Spark.  
**Grade Mode:** Normal Grading Mode
- CS 512 Embedded Systems** **3 Credit hours**  
The design of systems containing embedded computers. Micro-controller technology, assembly language and C programming, input/output interfacing, data acquisition hardware, interrupts, and timing. Real-time operating systems and application programming. Application examples.  
**Grade Mode:** Normal Grading Mode
- CS 515 Data Mining** **3 Credit hours**  
Covers (1) the process of knowledge discovery, (2) algorithms (association rules, classification, and clustering), and (3) real-world applications. Focuses on efficient data mining algorithms and scaling up data mining methods.  
**Grade Mode:** Normal Grading Mode
- CS 540 Digital Image Processing** **3 Credit hours**  
Study of mathematical techniques and algorithms for image sampling, quantization, intensity transformations, spatial filtering, Fourier transforms, frequency domain filtering, restoration and reconstruction, color imaging, wavelets, morphological image processing, and segmentation.  
**Grade Mode:** Normal Grading Mode
- CS 550 Information Retrieval** **3 Credit hours**  
Study of theory and algorithms for modeling and retrieving text. Text representation, IR models, query operations, retrieval evaluation, information extraction, text classification and clustering, enterprise and Web search, recommender systems.  
**Grade Mode:** Normal Grading Mode
- CS 552 Natural Lang Processing** **3 Credit hours**  
Fundamental algorithms and computational models for core tasks in natural language processing: word and sentence tokenization, parsing, information and meaning extraction, spelling correction, text summarization, question answering, and sentiment analysis.  
**Grade Mode:** Normal Grading Mode
- CS 580 Special Topics** **1-4 Credit hours**  
Study of emerging and advanced topics in Computer Science. Topics vary with instructor and change from one semester to another.  
**Grade Mode:** Normal Grading Mode
- CS 581 Special Topics** **1-4 Credit hours**  
Study of emerging and advanced topics in Computer Science. Topics vary with instructor and change from one semester to another.  
**Grade Mode:** Normal Grading Mode
- CS 582 Special Topics** **1-4 Credit hours**  
Study of emerging and advanced topics in Computer Science. Topics vary with instructor and change from one semester to another.  
**Grade Mode:** Normal Grading Mode
- CS 583 Special Topics** **1-4 Credit hours**  
Study of emerging and advanced topics in Computer Science. Topics vary with instructor and change from one semester to another.  
**Grade Mode:** Normal Grading Mode
- CS 600 Advanced Web Technology** **3 Credit hours**  
This course introduces modern web technologies and covers the concepts, practices, and technologies to design, develop, and manage scalable, reliable and secure web applications using client side and server side programming, mobile technology, web services, rest services, and cloud services that are accessible to a large number of users.  
**Grade Mode:** Normal Grading Mode
- CS 601 The Internet of Things** **3 Credit hours**  
This course covers the Internet of Things (IoT) Technologies. The course includes advanced topics in wireless networking technologies, mobile networks, software and hardware design for IoT applications and systems. In addition, this course offers advanced topics in cybersecurity.  
**Grade Mode:** Normal Grading Mode
- CS 602 Cloud Computing** **3 Credit hours**  
Study of emerging and advanced topics in Cloud Computing including theory and application development in cloud and understand the ways of increasing quality of services for hosted applications.  
**Grade Mode:** Normal Grading Mode
- CS 605 Software Specifications** **3 Credit hours**  
Study of software specification and verification technologies that facilitate: semantic reasoning; and verification of development artifacts including functional models, architecture, and source-code implementations.  
**Grade Mode:** Normal Grading Mode

<b>CS 610 Software Design</b>	<b>3 Credit hours</b>	<b>CS 670 Visual Analytics</b>	<b>3 Credit hours</b>
Study of approaches to software design that meet availability, manageability, maintainability, performance, reliability, scalability, and securability goals. Emphasis is on object-oriented analysis and design, design patterns and metrics.		Study of approaches, algorithms, and tools for Big Data exploration, analysis, and interpretation to enable novel discoveries and innovation. Integrating analytic capabilities of computers and domain knowledge of human analysts.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>CS 615 Software Testing</b>	<b>3 Credit hours</b>	<b>CS 681 Thesis</b>	<b>1-6 Credit hours</b>
Study of methods and tools to design high quality tests during all phases of software development. Topics include test design, test automation, test coverage criteria, and how to test software.		Investigate a research problem of theoretical interest and practical value under mentorship of a computer science faculty.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Attributes:</b> No Textbook Required, Thesis	
		<b>Grade Mode:</b> Credit/No Credit Grade Only	
<b>CS 620 Applied Algorithms</b>	<b>3 Credit hours</b>	<b>CS 685 Independent Study</b>	<b>1-4 Credit hours</b>
Study of clustering, graph-theoretic, genetic, probabilistic and randomized algorithms and their application to machine learning, data streams, data mining, computer vision, natural language processing, information retrieval, and bioinformatics.		Pursue faculty supervised, individualized course of study of a topic which is not currently a part of the Computer Science graduate curriculum.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>CS 625 AI Principles and Methods</b>	<b>3 Credit hours</b>	<b>CS 686 Independent Study</b>	<b>1-4 Credit hours</b>
Study of machine learning and statistical pattern recognition algorithms and their application to data mining, bioinformatics, speech recognition, natural language processing, robotic control, autonomous navigation, text and web data processing.		Pursue faculty supervised, individualized course of study of a topic which is not currently a part of the Computer Science graduate curriculum.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>CS 630 Machine Learning</b>	<b>3 Credit hours</b>	<b>CS 687 Independent Study</b>	<b>1-4 Credit hours</b>
Study of machine learning and statistical pattern recognition algorithms and their application to data mining, bioinformatics, speech recognition, natural language processing, robotic control, autonomous navigation, text and web processing.		Pursue faculty supervised, individualized course of study of a topic which is not currently a part of the Computer Science graduate curriculum.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>CS 645 Advanced Topics Bioinformatics</b>	<b>3 Credit hours</b>	<b>CS 688 Independent Study</b>	<b>1-4 Credit hours</b>
Study of advanced algorithms, data structures, and architectures required for solving complex problems in Bioinformatics. Focus is on analysis of patterns in sequences and 3D-structures. Team taught seminar course.		Pursue faculty supervised, individualized course of study of a topic which is not currently a part of the Computer Science graduate curriculum.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Grade Mode:</b> Normal Grading Mode	
<b>CS 650 Special Topics</b>	<b>1-4 Credit hours</b>	<b>CS 690 Comprehensive Project</b>	<b>3 Credit hours</b>
Study of emerging and advanced topics in Computer Science. Topics vary with instructor and change from one semester to another.		Develop expertise in an emerging area of computer science through guided study under faculty mentorship.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Attributes:</b> No Textbook Required	
		<b>Grade Mode:</b> Credit/No Credit Grade Only	
<b>CS 651 Special Topics</b>	<b>1-4 Credit hours</b>	<b>CS 698 Internship</b>	<b>1-3 Credit hours</b>
Study of emerging and advanced topics in Computer Science. Topics vary with instructor and change from one semester to another.		Supervised work experience in computer science or related fields.	
<b>Grade Mode:</b> Normal Grading Mode		<b>Attributes:</b> No Textbook Required	
		<b>Grade Mode:</b> Credit/No Credit Grade Only	
<b>CS 652 Special Topics</b>	<b>1-4 Credit hours</b>		
Study of emerging and advanced topics in Computer Science. Topics vary with instructor and change from one semester to another.			
<b>Grade Mode:</b> Normal Grading Mode			
<b>CS 653 Special Topics</b>	<b>1-4 Credit hours</b>		
Study of emerging and advanced topics in Computer Science. Topics vary with instructor and change from one semester to another.			
<b>Grade Mode:</b> Normal Grading Mode			
<b>CS 660 Big Data Systems</b>	<b>3 Credit hours</b>		
Learn high performance computing architectures and methods for developing and querying databases for Big Data.			
<b>Grade Mode:</b> Normal Grading Mode			