COMPUTER SCIENCE (CS)

CS 1308. Computer Literacy and the Internet.
A study of the uses of computers and their effects on society. Text
processing, spreadsheets, databases, and Web programming. Does
not count for computer science credit towards a minor, a BS, or a BA in
computer science.
about Computer Literacy and the Internet
3 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
TCCN: COSC 1300

CS 1319. Fundamentals of Computer Science.
Provides fundamental knowledge of the six layers of computer science
as per the ACM CS0 curriculum. The information, hardware, programming,
operating system, applications, and communications layers are
presented plus appropriate open computer laboratory exercises. Does not
count for computer science credit towards a minor, BS, or BA in computer
science.
about Fundamentals of Computer Science
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
TCCN: COSC 1315

CS 1428. Foundations of Computer Science I.
Introductory course for computer science majors, minors and others
desiring technical introduction to computer science. Contains overview
of history and structure of the digital computer, including binary data
representation. Problem solving, algorithm development, structured
programming, good coding style, and control structures of C++ are
emphasized. Prerequisite or co-requisite: MATH 1315.
about Foundations of Computer Science I
4 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
TCCN: COSC 1420

CS 2308. Foundations of Computer Science II.
Fundamentals of object-oriented programming. Introduction to abstract
data types (ADTs) including lists, stacks, and queues. Searching and
sorting. Pointers and dynamic memory allocation. A continuation of CS
1428. Prerequisite: CS 1428 with a grade of C or higher.
about Foundations of Computer Science II
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
TCCN: COSC 2315

CS 2315. Computer Ethics.
This course is primarily for computer science majors, focusing on the
ethical codes of the professional societies, the philosophical bases of
ethical decision-making, and the examination of several contemporary
case studies. Prerequisites: CS 1428, ENG 1310, COMM 1310, and PHIL
1305 or PHIL 1320 with grades of C or higher. (WI).
about Computer Ethics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter
about Computer Ethics

CS 2318. Assembly Language.
A course covering assembly language programming, including instruction
sets, addressing modes, instruction formats, looping, logic, data
representation, subroutines and recursion; and the interface between
hardware and software. Prerequisites: MATH 2358 and CS 2308 with
grades of C or higher.
about Assembly Language
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
TCCN: COSC 2325

CS 2420. Digital Logic.
An introduction to fundamental computer technologies, including
Boolean logic design, logic circuits and devices, and basic computer
hardware. A laboratory providing hands-on experience with electricity,
combinational and sequential digital circuits, and computer hardware.
Prerequisite: CS 1428 with a grade of C or higher.
about Digital Logic
4 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Digital Logic

CS 3320. Internet Software Development.
A course providing foundations for the construction and design of static
and dynamic Web pages with database applications. This will include
server-side and client-side software development. Prerequisite: CS 2308
with a grade of C or higher, or consent of instructor.
about Internet Software Development
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Internet Software Development

Use of fundamental hardware components. Topics include ALU’s,
single and multiple cycle datapath and control, RISC vs. CISC,
pipelining, caches, I/O, virtual memory and related performance issues.
Prerequisites: (CS 2420 or EE 2420), (CS 2315 or EE 2400), and (CS 2318
or EE 3420) with grades of C or higher.
about Computer Architecture
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Computer Architecture
CS 3358. Data Structures.
A course covering classic data structures and an introduction to object-oriented development. Prerequisites: CS 2308 and MATH 2358 with grades of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 3369. Embedded Computer Systems.
This course studies the architecture of embedded systems, micro-controllers, their peripherals, languages, and operating systems and the special techniques required to use them. Prerequisites: CS 2318 and CS 2420 with grades of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 3378. Theory of Automata.
An introduction to automata theory, computability, and formal languages. Prerequisite: CS 3358 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 3398. Software Engineering.
The study of software design, implementation, and validation techniques through team projects. Structured analysis, programming style, and project documentation are emphasized in large software projects. Prerequisites: (CS 2315 or EE 2400) and CS 3358 with grades of C or higher. (WI).

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter

CS 4100. Computer Science Internship.
Provides on-the-job training supervised by computer scientists in industry internship programs approved by the department. Prerequisite: CS majors and minors only.

1 Credit Hour. 0 Lecture Contact Hours. 20 Lab Contact Hours.
Grade Mode: Credit/No Credit

CS 4298. Undergraduate Research I.
Supervised individual research project in a mentor-student relationship with a computer science faculty member. Cannot be given degree credit until the satisfactory completion of CS 4299. Prerequisites: Junior standing; major GPA of 3.00; departmental approval.

2 Credit Hours. 1 Lecture Contact Hour. 2 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CS 4299. Undergraduate Research II.
Supervised individual research projects in a mentor-student relationship with a computer science faculty member. Prerequisites: CS 4298 and departmental approval.

2 Credit Hours. 1 Lecture Contact Hour. 2 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

CS 4310. Computer Networks.
A survey of network architectures and their components. Emphasis will be on media access, network and transport layer protocols. Prerequisite: CS 3358 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 4315. Introduction to Data Mining.
This course covers fundamental concepts and techniques in data mining and information retrieval. Data mining topics include classification, cluster analysis and pattern mining. Information retrieval topics include Boolean retrieval, vector space model, and Web search. Prerequisite: CS 3358 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 4318. Program Translators.
a study of computer languages, data structures, algorithms, and theory used in constructing compilers and other program translators. Prerequisite: CS 3358 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

Principles and methods in human factors and ergonomics applied to the design and use of computer systems. Prerequisite: CS 3358 with a grade of C or higher. (WI).

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter

Principles of operating systems. Algorithms for CPU scheduling, memory management, cooperating sequential processes and device management. Prerequisites: (CS 2318 or EE 3420) and CS 3358 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
CS 4332. Introduction to Database Systems.
Introduction to database concepts, data models, file structures, query languages, database management systems. Prerequisite: CS 3358 with a grade of C or higher.
about Introduction to Database Systems
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Introduction to Database Systems

CS 4346. Introduction to Artificial Intelligence.
An introduction to the basic concepts of artificial intelligence; search techniques, knowledge representation, problem solving. Prerequisite: CS 3358 with a grade of C or higher.
about Introduction to Artificial Intelligence
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Introduction to Artificial Intelligence

CS 4350. Unix Systems Programming.
Fundamentals of Unix operating systems, Unix file system and environment, C memory allocation, development tools, processes and signals, threads, device drivers, and programming for security. Prerequisite: CS 3358 with a grade of C or higher.
about Unix Systems Programming
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Unix Systems Programming

CS 4354. Object-Oriented Design and Implementation.
An in-depth study of object-oriented design and implementation issues with emphasis on understanding the life cycle of object-oriented software, Unified Modeling Language, inheritance and polymorphism, designing remote and persistent objects, and exception handling. In-depth study of Java object-oriented language. Java will be used for implementing the exercises. Prerequisite: CS 3398.
about Object-Oriented Design and Implementation
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Object-Oriented Design and Implementation

CS 4356. Survey of Computer Languages.
A survey of computer languages. Criteria for choosing languages to be covered include history, important development paradigms and environments, and language implementations. Prerequisite: CS 3358 with a grade of C or higher.
about Survey of Computer Languages
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Survey of Computer Languages

Course covers practical aspects of computer system security including managing and producing code for secure systems. Theory, such as cryptography, is introduced as needed. Prerequisite: CS 3358 with a grade of C or higher.
about Computer System Security
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Computer System Security

CS 4378A. Introduction to Digital Forensics.
This course is an introduction to digital forensics that describes the techniques and tools used in criminal and civil investigations that involve computing systems, digital devices, and networks. Hands-on experience will be acquired through projects. Prerequisite: CS 4350 or consent of instructor.
about Introduction to Digital Forensics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Topics
Grade Mode: Standard Letter
about Introduction to Digital Forensics

CS 4378P. Introduction to Digital Multimedia.
Concepts, problems and techniques in digital multimedia. Topics include digital representation of video and data compression. Applications, primarily in education and business presentations, and new and potential capabilities, such as video on demand and virtual reality. Prerequisite: CS 3358 with a grade of C or higher.
about Introduction to Digital Multimedia
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Introduction to Digital Multimedia

CS 4378V. Introduction to Machine Learning.
Provides systematic introduction to machine learning, covering basic theoretical as well as practical aspects of the use of machine learning methods. Topics include learning theory, learning methods, recent learning models, etc. Application examples include multimedia information retrieval, text recognition, computer vision, etc. Prerequisite: CS 3358 grade of C or higher.
about Introduction to Machine Learning
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Introduction to Machine Learning

CS 4378W. Introduction to Human Computer Interaction.
Introduces HCI topics specifically highlighted by new input modalities such as eye-tracking. Considers new input modalities as new channels for data gathering including multimedia compression, interface design, usability evaluation, biometrics. Application of HCI as an interdisciplinary research tool will also be discussed. Prerequisite: CS 3358 with grade of C or higher.
about Introduction to Human Computer Interaction
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Introduction to Human Computer Interaction

CS 4378Z. Practical Game Development.
Course teaches practical aspects of computer game design and implementation. Topics include graphics game engines, game physics, AI methods applied to games, and software architectures for computer games. Students will gain knowledge and skills needed for game development via student projects.
about Practical Game Development
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Practical Game Development
CS 4379A. Software Testing.
The concepts used in a formal testing of safety critical and high-quality software applications are investigated. Topics include, but are not limited to, test design, static and dynamic testing tools, and formal testing documentation. Prerequisite: CS 3398 with a grade of C or higher.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Software Testing

CS 4379B. Introduction to Graphical User Interfaces.
This course covers abstract and practical foundations of graphical user interface design, evaluation, and implementation. It discusses the fundamentals of computer graphics and interactive computer/human interfaces. The course includes a survey of usability measures, the major GUI standards, and GUI tools. Prerequisite: CS 3358 with a grade of C or higher.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Introduction to Graphical User Interfaces

CS 4379Q. Introduction to Recommender Systems.
This course covers the basic concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences. We will discuss how recommender systems are deployed in e-commerce sites, social networks, and many other online systems. Additionally, we will review current research in the field. Prerequisite: CS 3358 with a grade of “C” or higher, or consent of instructor.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Introduction to Recommender Systems

CS 4379Y. Introduction to Green Computing.
Reducing energy consumption of mobile devices, cloud computing platforms, and supercomputers is a paramount but daunting problem. This course covers fundamental concepts and techniques in green computing, including a hardware energy efficiency roadmap, energy efficient software design, resource management, and storage solutions; and green data centers and mobile computing. Prerequisites: CS 3339 and CS 3358 with grades of C or higher.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Introduction to Green Computing

CS 4380. Parallel Programming.
This course teaches practical aspects of parallel programming. The covered topics include multi-core processors and shared-memory programming, hardware accelerator programming, and distributed-memory machines and message-passing programming. The students will gain the knowledge and skills needed for developing parallel software by writing programs for a variety of parallel computers. Prerequisite: CS 3358 with a grade of “D” or higher; or instructor consent.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Parallel Programming

A study of the hardware and software used in graphic representation and interpretation of data. Prerequisites: CS 3358 with a grade of C or higher and familiarity with trigonometric functions.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Computer Graphics

CS 4395. Independent Study in Computer Science.
Open to undergraduate students on an independent basis by arrangement with the faculty member concerned. Requires department chair approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Independent Study in Computer Science

CS 4398. Software Engineering Project.
Students undertake a software development project. They work in teams, developing requirements and designs which they will implement and test. Prerequisite: CS 3398 with a grade of C or higher.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Software Engineering Project

CS 5100. Advanced Computer Science Internship.
This course provides advanced training supervised by computer scientists in internship programs approved by the department. Course cannot be counted toward any graduate degree, is open only to majors in the Department of Computer Science. May be repeated once but not for credit and requires approval of the department chair.
1 Credit Hour. 0 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Leveling/Assistantships
about Advanced Computer Science Internship

CS 5199B. Thesis.
This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Thesis
CS 5299B. Thesis.
This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.
Grade Mode: Credit/No Credit
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.

CS 5300. Professional Development of Graduate Assistants.
This course is designed to develop and enhance the professional and technical skills of graduate teaching and instructional assistants. Topics covered may include, but are not limited to, teaching skills, technical skills, ethical and legal issues, and laboratory management. This course does not earn graduate degree credit. Graded on a credit (CR), no-credit (F) basis.
Grade Mode: Leveling/Assistantships
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Leveling/Assistantships

CS 5301. Programming Practicum.
Intensive review of programming through data structures. Includes syntax, semantics, problem solving, algorithm development, and in-class exercises. May be repeated once. Does not count for credit toward any graduate degree. Prerequisite: CS 3358 with a grade of C or higher, or consent of instructor.
Grade Mode: Leveling/Assistantships
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Leveling/Assistantships

A study of modern operating systems including network, distributed, or real-time systems. Prerequisites: CS 3358 and CS 4328.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

A study of network and communication systems. Verification and/or implementation of protocols will be required. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

CS 5316. Data Mining.
This course covers fundamental concepts and techniques plus recent developments in data mining and information retrieval. It provides relevant research training and practice opportunities. May not be taken for credit if student received credit for CS 4315. Prerequisite: CS 3358 with a grade of C or higher.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

CS 5318. Design of Programming Languages.
Covers various aspect of the design of programming languages including principles, methodologies, and a panorama of techniques in formal syntax and formal semantics. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Professional level presentation of techniques and research findings related to human-computer interactions. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

CS 5329. Algorithm Design and Analysis.
Introduction to algorithm design and analysis, computational complexity, NP – completeness theory. Prerequisites: CS 3358, MATH 2472, and MATH 3398 or MATH 5358 with a grade of “C” or higher.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

CS 5331. Crafting Compilers.
Overview of the internal structure of modern compilers. Research on compilation techniques. Topics include lexical scanning, parsing techniques, static type checking, code generation, dataflow analysis, storage management, and execution environments. Prerequisite: CS 3358 with a grade of “C” or higher.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

CS 5332. Data Base Theory and Design.
Computer system organization for the management of data; data models, data model theory, optimization and normalization; integrity constraints; query languages; intelligent database systems. Prerequisites: CS 3358 and CS 4328.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

Database related topics will be covered including object-oriented database, intelligent database, distributed database, CASE tools, and DBMS. The design of databases will be covered with an emphasis on the design of the conceptual, logical, and internal models. Prerequisite: CS 4332 or CS 5332, with a grade of C or higher.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
CS 5334. Advanced Internet Information Processing.
Integration of popular scripting languages (Perl, JavaScript, PHP, and other CGI capable languages) and database programming languages (embedded database programming languages, JavaServlets, and PHP) to provide advanced information processing for Internet applications that demand both database support and sophisticated, application specific information processing. Prerequisite: CS 4332 or CS 5332 with a grade of "C" or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Advanced Internet Information Processing

CS 5335. Research in Object-Oriented System Development.
The course covers the object-oriented methodologies for system analysis, design, implementation, testing, and other aspects of system development. Emphasis will be on using OO methodologies to manage the complexity of complicated software. Other topics like modeling, OODB, and OO languages will also be covered. Prerequisites: CS 3358, and either CS 4332 or CS 5332 with grades of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Research in Object-Oriented System Development

CS 5338. Formal Languages.
Advanced topics in automata theory, grammars, Turing machines, decidability, and algorithmic complexity. Prerequisites: CS 3358 and MATH 3398.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Formal Languages

Study of advanced concepts and programming skills in computer networks such as advanced TCP/IP, API, multicasting and broadcasting, reliable communications, advanced I/O functions and options. Prerequisite: CS 5310 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Advanced Network Programming

CS 5343. Wireless Communications and Networks.
Study of the fundamental aspects of wireless communications and wireless/mobile networking APIs. Prerequisites: CS 3358 with a grade of B or higher and CS 5310 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Wireless Communications and Networks

CS 5346. Advanced Artificial Intelligence.
Knowledge representation; knowledge engineering; parallel and distributed AI; heuristic searches; machine learning and intelligent databases; implementation of systems in high-level AI languages. Prerequisite: CS 3358.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Advanced Artificial Intelligence

CS 5348. Computer Organization and Design.
This course covers the dynamic interaction of the computer system building blocks and their management. Course topics include the design of the instruction set, high speed arithmetic, memory hierarchy, and control units. Computer system performance evaluation methodology and techniques are also covered. Prerequisites: CS 3339 and CS 3358.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Computer Organization and Design

CS 5351. Parallel Processing.
Introduction to the design and analysis of parallel algorithms, parallel architectures, and computers. Prerequisites: CS 3358, CS 3409, and CS 4328.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Parallel Processing

CS 5352. Distributed Computing.
Study of advanced topics in distributed systems: concurrency control and failure recovery, management of replicated data, distributed consensus and fault tolerance, remote procedure calls, naming and security. Prerequisites: CS 3358 and CS 4328.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Distributed Computing

CS 5369D. Advanced Digital Forensics.
This course provides a comprehensive understanding of the techniques and tools used in criminal and civil investigations that involve computing systems, digital devices and media, and communication networks. The course covers recent research material published in the field. Hands-on experience will be acquired through case studies and projects.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Advanced Digital Forensics
CS 5369E. Advanced Embedded Computer Systems.
Research in the architecture of embedded systems, micro-controllers, their peripherals, languages, and operating systems and the special techniques required to use them. Course will provide in-depth knowledge of implementation of individual projects. Course cannot be taken for credit if student received credit for CS 3468. Prerequisite: CS 3339 or the equivalent.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Advanced Embedded Computer Systems

CS 5369G. Web Service Engineering.
Advanced concepts and techniques for enabling Web application integration and interaction using Semantic Web and Web services. Concepts and techniques include service discovery ontology (RDF, DAMLS), XML-based interactions standards (ebXML, RossettaNet) and Web Services (WSDL, SOAP, UDDI, BPEL). Prerequisite: CS 3358 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Web Service Engineering

CS 5369H. Designing, Implementing and Evaluating E-Commerce Applications.
Design, implement, evaluate working E-commerce website using Microsoft ASP.NET Framework and C#. Organization, purpose, operation allowing themes, membership and content management systems, mailing list, and E-commerce store with support for real-time credit card processing, home page personalization, and localization. Prerequisite: CS 5326 with C or higher or instructor’s permission.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Designing, Implementing and Evaluating E-Commerce Applications

CS 5369J. Advanced Human Computer Interaction.
This course will cover state of the art human computer interaction topics such as perceptual compression, eye-gaze, and brain computer interfaces with emphasis on the human visual system, eye-tracking, and electroencephalography. Prerequisite: CS 3358.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Advanced Human Computer Interaction

CS 5369L. Machine Learning and Applications.
Provides broad introduction to machine learning, including learning theory, and recent topics like support vector machines and feature selection. Covers basic ideas, intuition, and understanding behind modern machine learning methods. Discusses applications like face recognition, text recognition, biometrics, bioinformatics, and multimedia retrieval. Prerequisite: CS 3358 grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Machine Learning and Applications

CS 5369P. Principles of Programming Languages.
Overview of principles of programming languages including type checking algorithms. Emphasis is on type systems’ theoretical aspects and pragmatics of their use in imperative and functional languages including peculiarities of object-oriented systems. Prerequisites: CS 3358 and MATH 3398 with grades of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Principles of Programming Languages

CS 5369Q. Recommender Systems.
This course covers various concepts of recommender systems, including personalization algorithms, evaluation tools, and user experiences. Discussion of how recommender systems are deployed in business applications, design of new recommender experiences, and how to conduct and evaluate research in recommender systems. Cannot take for credit if already took CS 4379Q. Prerequisite: CS 3358 with a grade of C or higher or consent of instructor.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing Topics
Grade Mode: Standard Letter
about Recommender Systems

CS 5369R. Research in Digital Forensics.
Students will design and implement computer-based forensic tools applicable to an instructor chosen domain.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter
about Research in Digital Forensics

CS 5369Y. Green Computing.
Reducing mobile device, cloud computing platform, and supercomputer energy consumption is a paramount, daunting problem. This course covers state-of-the-art green computing research, including energy-efficient hardware and software design, power-aware resource management and storage solutions, green data centers and mobile computing. Cannot be taken for credit if received CS 4379Y credit. Prerequisite: CS 3358 with a grade of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing Topics
Grade Mode: Standard Letter
about Green Computing
CS 5374. Neural Networks.
A study of neural computing, including basic concepts, algorithms, and applications; back propagation and counter propagation networks; Hopfield networks; associative memories; massively parallel neural architectures; adaptive resonance theory; optical neural networks; connectionist approaches. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Neural Networks

A study of the digital representation and processing of major multimedia data types: image, audio, and video. Compression techniques for the three data types, standards, and storage media. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Multimedia Computing

CS 5376. Enterprise Application Integration.
Introduction to the integration of all services available on the Web. It emphasizes component-based integration frameworks based on J2EE specification (EJB, Servlets, JMS), inter-organization workflow integration frameworks, and XML framework. Students must have knowledge of object-oriented design, object-oriented programming language, databases, and networking. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Enterprise Application Integration

This course covers various aspects of producing secure computer information systems that provide guaranteed controlled sharing. Emphasis is on software models and design, including discovery and prevention of computing systems security vulnerabilities. Current systems and methods are examined and critiqued. Prerequisite: CS 3358 with a grade of C or higher.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Advanced Computer Security

A study of the algorithms and data structures used in representing and processing visual data. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Advanced Computer Graphics

CS 5379. Graphical User Interfaces.
Covers both abstract and practical treatments of using graphics to implement interactive computer/human interfaces. Includes a survey of the major GUI standards and tools. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Graphical User Interfaces

CS 5391. Survey of Software Engineering.
A study of the software life cycle with emphasis on system analysis and design. Methodologies based on data flows and on objects will be surveyed. A component on professional ethics is included. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Survey of Software Engineering

The use of design and specification languages in producing software systems. Emphasis is placed on proving correctness of designs and implementations. Prerequisites: CS 3358 and CS 5391.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Formal Methods in Software Engineering

CS 5393. Software Quality.
The latter half of the software life cycle is discussed. Topics include testing, performance evaluation, and software metrics. Appropriate software tools are studied and used. Prerequisite: CS 5391.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Software Quality

CS 5394. Advanced Software Engineering Project.
Students produce a software project of significant size in a team environment. All aspects of the software engineering course sequence are integrated and put into practice. Prerequisite: CS 5391.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Advanced Software Engineering Project

Open to graduate students on an independent basis by arrangement with the faculty member concerned. Course is not repeatable for credit. Prerequisite: CS 3358.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Independent Study in Advanced Computer Science

The essentials of software engineering processes, methods, and tools for the evolutionary design of complex interactive software are discussed. Overviews of other topics like quality concepts, SEI CMM, information technology, and network technology are covered. Student completes a literature survey of the latest software engineering analysis and design processes, methods, and tools. Prerequisite: CS 5391.
Grade Mode: Standard Letter
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
about Advanced Software Engineering Processes and Methods
CS 5399A. Thesis.
This course represents a student’s initial thesis enrollment. No thesis credit is awarded until the student has completed the thesis in CS 5399B. Graded on a credit (CR), progress (PR), no-credit (F) basis.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

CS 5399B. Thesis.
This course represents a student’s continuing thesis enrollment. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

CS 5599B. Thesis.
This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.

5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

CS 5999B. Thesis.
This course represents a student’s continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.

9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit