

# Computer Science (CSEN)

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## **CSEN 5303 Adv Topics in Computer Sci 1-3 SCH (1-3)**

One or more advanced topics. May be repeated when topic changes. (Credit may not be obtained for both CSEN 5303 and EEEN 5303 courses if the topic is the same.)

## **CSEN 5304 Adv Computer Architecture 3 SCH (3-0)**

Introduces the design principles of modern computers. The topics include RISC and CISC architecture, interconnection networks, multiprocessors and multicomputer systems, dataflow and systolic arrays, future outlook for architectures and the basics of parallel algorithms. (Credit may not be obtained in both CSEN 5304 and EEEN 5304.)

## **CSEN 5305 Graduate Research Project 3 SCH (3)**

Designed for project option students and requires completion of research project. Prerequisite: departmental approval. May be repeated for a maximum of 6 semester hours.

## **CSEN 5306 Thesis 3 SCH (1-3)**

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 10 semester credit hours.

## **CSEN 5313 Compiler Design 3 SCH (3-0)**

This course introduces the structure of a compiler and the various techniques used for designing a compiler. Topics include grammars, parsing methods, implementation details and translator writing systems.

## **CSEN 5314 Database Systems 3 SCH (3-0)**

Basic concepts and architecture of database systems, ER model, relational model, relational algebra, SQL, ER-to-rational mapping, functional dependencies normalization, database design process, object-oriented database. Distributed database. Prerequisite: graduate standing in computer science or another engineering discipline.

## **CSEN 5320 Artificial Intelligence 3 SCH (3-0)**

Fundamental concepts of intelligent computer systems, knowledge representation, logical reasoning, search strategies, game theory, Bayesian networks, neural networks, reinforcement learning, natural language processing, and current research in AI area.

## **CSEN 5321 The Ethics of AI 3 SCH (3-0)**

Explores ethical issues that arise with the development of AI technologies; traditional ethical theories; the moral status of AI: thinking machines, moral agents and moral patients; AI consciousness; algorithmic bias; accountability; transparency; AI bias and opinion manipulation; the ethical use of generative AI in art and research; AI friendship; policies and regulations; AI creativity, authorship, and intellectual property.

## **CSEN 5322 Operating systems 3 SCH (3-0)**

Operating systems principles; procedures and their implementation; protection, concurrent, cooperating and communicating processes; storage management; resource allocation; scheduling; file systems; and system design issues.

## **CSEN 5323 Computer Comm Networks 3 SCH (3-0)**

The International Standards Organization (ISO) Open Systems Interconnection (OSI) model as a framework for the study of computer communication networks. Data communication. Functions and protocols of physical layer, medium access sublayer, link layer, network layer and transport layer. Case studies. ISDN. Prerequisite: graduate standing in computer science or electrical engineering.

## **CSEN 5325 Software Engineering 3 SCH (3-0)**

Covers development life-cycle models, inspection process, software quality metrics, testing, validation metrics, estimation and scheduling. Prerequisite: graduate standing in engineering.

## **CSEN 5330 Data Mining 3 SCH (3-0)**

Types of data, similarity and distance functions, data preprocessing, sampling, feature selection, discretization, attribute transformation, classification and prediction methods, decision trees, support vector machines, regressions, classification rules, Bayesian learning, neural networks, association rule mining, sequential pattern mining, cluster analysis, anomaly detection.

## **CSEN 5332 Machine Learning 3 SCH (3-0)**

Fundamental concepts of machine learning including supervised and unsupervised learning, deep learning, probabilistic models, and reinforcement learning; covers key algorithms such as decision trees, neural networks, support vector machines, prototype methods and nearest neighbors, ensemble learning, and undirected graphical models; algorithm design, model evaluation, and optimization techniques.

## **CSEN 5333 Real Time Systems 3 SCH (3-0)**

Characteristics of systems and techniques used in real time computer applications. Scheduling theory, verification and design techniques including simulation and probabilistic models. Prerequisite: graduate standing.

## **CSEN 5336 Analysis of Algorithms 3 SCH (3-0)**

Introduction of the design and analysis of computer algorithms. Topics include asymptotic efficiency; a survey of useful algorithms for sorting, information retrieval, and graphs; paradigms for algorithm design; and a brief introduction to complexity classes including NP. Prerequisite: graduate standing.

**CSEN 5340 Parallel Computing 3 SCH (3-0)**

Principles of parallel algorithm design: task decomposition, synchronization, load balancing, computational dependencies; parallel computing architectures; collective communications; analyzing parallel algorithms; scalability, efficiency, speedup; parallel algorithms for fundamental problems such as sorting; shared-memory programming; distributed-memory programming; hybrid programming; message passing interface; GPU architecture and programming; transactional memory.

**CSEN 5344 Cloud Computing 3 SCH (3-0)**

Cloud computing, services, and technologies for hosting, storing, and processing data on the cloud. Fundamentals of cloud computing using cloud services, such as cloud servers, databases, and data warehouses, along with principles and architectural foundations upon which cloud computing is based. Software design and implementation strategies that support the integration and exploitation of cloud-based resources, integration of cloud infrastructure into the design of software systems, security considerations associated with cloud computing, such as the use of public, private, and hybrid cloud resources.

**CSEN 5346 Data Science I 3 SCH (3-0)**

Introduction to data science and data analytics programming in Python using libraries such as NumPy for computational array operations, SciPY for scientific and numerical computing, Pandas for data analysis and manipulation; an overview of techniques and methods for loading datasets, formatting data, feature analysis, and processing large amounts of data; collecting, pruning, munging, analyzing, visualizing, and processing data; building machine learning models, training them with data, testing the models to evaluate their performance, and using the models to make decisions or predictions.

**CSEN 5347 Data Science II 3 SCH (3-0)**

Methods and tools used to analyze, visualize, and derive insights from complex data; data wrangling, statistical analysis, predictive modeling, data-driven decision making; applications in machine learning, natural language processing, and big data analytics; data analysis lifecycle, data acquisition and cleaning, model deployment, and result interpretation.

**CSEN 5350 Neural Networks Application 3 SCH (3-0)**

Includes a review of network architectures, perceptron, linear networks, back-propagation and radial basis networks. A real-time laboratory experience in seeing the application of neural networks. Prerequisite: graduate standing in Computer Science. (Credit may not be obtained in both CSEN 5350 and EEEN 5350.)

**CSEN 5352 Bioinformatic Computing 3 SCH (3-0)**

Computational and statistical algorithms in Python and Biopython for bioinformatics and biological applications. Computational tools for analyzing and modeling biological sequences of genes and proteins stored in databases in the GenBank, FASTA, and PDB formats. Gene and protein modeling, design, visualization, optimization, structure prediction, sequence analysis, sequence similarity search using BLAST, parsing, analyzing, transcribing and translating gene or protein sequences.

**CSEN 5356 Mobile Application Development 3 SCH (3-0)**

Design and development of software for mobile platforms including: user interface design, user experience factors, processes, threading, multitasking, database integration, application lifecycles, resource constraints in mobile environments, app security, cloud and network integration.

**CSEN 5362 Cyber Intelligence 3 SCH (3-0)**

Challenges and opportunities, static malware analysis, anomaly detection in communication networks, ransomware network traffic detection, detection of crypto-ransomware, botnet traffic detection, investigation of OpenFlow-Based SDN platforms, mobile forensics, and model probing attack. Prerequisites: CSEN 5320, CSEN 5330, CSEN 5332, CSEN 5346, or CSEN 5347.

**CSEN 5364 Advanced Cybersecurity 3 SCH (3-0)**

This course explores advanced concepts, techniques, and tools used in modern cybersecurity defense and threat detection. Topics include advanced malware analysis, intrusion detection systems, network security monitoring, threat intelligence, digital forensics, adversarial tactics, cyber threat modeling, security analytics, and emerging security challenges in cloud systems, Internet of Things (IoT), and AI-driven environments.

**CSEN 5401 Adv Probs in Computer Sci 1-4 SCH (1-4)**

Individual or group research on advanced problems conducted under the supervision of a faculty member. Maximum credit 8 semester hours.

**CSEN 6303 Special Topics in Computer Science 3 SCH (3-0)**

Courses offered under this Special Topics denomination concentrate on themes not present in the current EECS curriculum, or can also be offered to strengthen and provide further depth of study in important areas of computer science. Topics vary to reflect new developments and interests on emerging areas of computer science, such as cryptography, the Internet of Things, and wireless sensor networks, to name a few. May be repeated when topic changes.