

## Courses Description

**College:** Engineering

**Department:** Computer Engineering

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**Course ID:** 2204081701      **Description:** Advanced Computer Architecture

**Full Course Description:** This course discusses principles of modern high performance computer architecture. It covers  
□ topics such as advanced pipelining, static and dynamic multiple issue, VLIW and superscalar  
□ processing, multithreading, graphic processors, multi-core chips, cache design, and optimized  
□ memory hierarchies. The course also discusses hardware security issues such as information  
□ leakage, side-channel attacks and trusted computer architectures.

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**Course ID:** 2204081702      **Description:** Artificial Intelligence and Machine Learning

**Full Course Description:** This course covers the fundamentals of artificial intelligence and machine learning including supervised learning, unsupervised learning, reinforcement learning and adaptive control. The  
□ course discusses examples including: support vector machines, generative/discriminative learning, parametric/non-parametric learning, clustering, dimensionality reduction, kernel  
□ methods, learning theory, and neural networks. Also, the course presents recent machine  
□ learning applications such as data mining and bioinformatics.

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**Course ID:** 2204081703      **Description:** Advanced Computer Security

**Full Course Description:** This course reviews the basic concepts of computer security. Lectures cover threat modeling  
□ and risk assessment, systems and protocols vulnerabilities, attacks on systems and protocols,  
□ defense and protection techniques (e.g. IDS and IPS), design of secure systems and security  
□ protocols (e.g. IPSec), penetration testing techniques and hardware security. Lectures also cover topics like cyber-physical security and discussion of the most recent high-impact  
□ cyber-attacks.

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**Course ID:** 2204081704      **Description:** Advanced Computer Networks

**Full Course Description:** This course reviews the basic topics of computer networks including layering, OSI model,  
□ routing and switching. Lectures cover Internet routing and Autonomous Systems (AS),  
□ Border Gateway Protocol (BGP), Domain Name System (DNS), error detection and recovery,  
□ congestion management and Quality of Service (QoS), Software Defined Networks (SDN),  
□ networks performance evaluation, wireless networks and wireless sensor networks,  
□ applications like email and HTTPS.

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**Course ID:** 2204081705      **Description:** Programming and Algorithms

**Full Course Description:** This course introduces advanced concepts for the design and analysis of algorithms, and  
□ explores a variety of applications. Several computation models and techniques for the  
□ analysis of algorithm complexity are presented. The topics to be covered are: the design and  
□ complexity analysis of recursive and non-recursive algorithms for searching, sorting, set  
□ operations, randomization in algorithm design, graph algorithms, matrix multiplication, NP-  
□ complete problems, and Approximation Algorithms. The discussed course topics are  
□ reinforced through several programming projects.

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**Course ID:** 2204081706      **Description:** Seminar in Computer Engineering

**Full Course Description:** This course covers the ethics of graduate research as well as the necessary skills and  
□ background required to conduct basic and advanced research in Computer Engineering.  
□ Students will learn how to write and present various types of research documents including  
□ proposals and technical reports.

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**Course ID:** 2204081707      **Description:** Special Topics in Artificial Intelligence

**Full Course Description:** The course covers recent and advanced topics in Artificial Intelligence such as symbolic approaches to AI, statistical approaches to AI, and the combinations of statistical and symbolic approaches to AI. Additionally, the course emphasizes one or more of the following topics: data science, data mining, natural language processing, deep learning, big data, robotics, neural networks, and fuzzy logic.

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**Course ID:** 2204081708      **Description:** Computer Vision and Robotics

**Full Course Description:** This course introduces fundamental concepts and techniques for computer vision and robotics with an emphasis on vision and how to use it in robotic applications. The course focuses on multi-view geometry, where various possible sensors and sensory configurations on robotic platforms will be discussed and presented. Some of the important topics to be covered are: image formation and analysis, rigid body and coordinate frame transformations, edge detection, camera models and calibration, epipolar geometry and fundamental matrix, 3-D stereo reconstruction, planning and robot control, Object recognition, and template matching.

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**Course ID:** 2204081709      **Description:** Big Data Analytics

**Full Course Description:** The course covers the following topics: the fundamental platforms to deal with big data (e.g. Hadoop), data storage methods (e.g. HDFS), analytics algorithms, visualization methods, large-scale machine learning methods, optimization methods for different hardware platforms, and future challenges of big data.

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**Course ID:** 2204081710      **Description:** Optimization Methods

**Full Course Description:** This course provides an introduction to optimization theory and methods, with various engineering applications in systems and control. Topics to be covered are: linear programming, nonlinear unconstrained optimization, nonlinear constrained optimization, various algorithms and search methods for optimization, and their analysis.

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**Course ID:** 2204081711      **Description:** Advanced Cryptography

**Full Course Description:** This course covers the basics of cryptography theory including perfect secrecy and computational secrecy. Lectures cover number theory, factoring and discrete logarithms, private key cryptography, public key cryptography, block cipher and modes of operation, stream cipher, key distribution and key management, cryptanalysis, hashing, Message Authentication Code (MAC), digital signature and cryptographic applications like SSL/TLS.

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**Course ID:** 2204081712      **Description:** Modeling and Simulation

**Full Course Description:** The course aims to provide students with a thorough understanding of simulation concepts, discrete event simulation, random number generation, discrete and continuous random variables, input modeling, statistical analysis of simulation, computer networks simulation, Discrete Time Markov Chains (DTMC), Continuous Time Markov Chains (CTMC), queuing models (M/M/1, M/M/c/k, M/G/1) and queuing theory. Network simulation packages such as ns2 are considered and programming assignments are required.

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**Course ID:** 2204081713      **Description:** Digital Forensics

**Full Course Description:** The course aims to demonstrate the fundamental techniques and legal concepts that are required to perform digital and computer forensics. Lectures cover introduction to digital forensics, storage media structure and analysis, operating systems (e.g. Windows) basics and analysis, filesystems, signature and file hash analysis, steganographic evidence analysis, user activity, Internet and email analysis, searching techniques and forensic report preparation.

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**Course ID:** 2204081714      **Description:** Software Security

**Full Course Description:** This course covers the fundamentals of software security. Lectures cover memory attacks like buffer overflow, stack smashing and code injection, memory protection, secure software design and implementation to avoid flaws and bugs, best coding practices, web security including client and server side techniques, SQL injection, Cross Site Scripting (XSS), Cross Site Request Forgery (CSRF), penetration testing, defense and protection techniques, code testing and analysis.

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**Course ID:** 2204081715      **Description:** Advanced Wireless Networks

**Full Course Description:** This course covers the advanced topics of wireless networks, with emphasis on current and next-generation wireless networks. Different types of wireless networking are covered including: state-of-the-art wireless network protocols and architectures of wireless mesh network, wireless sensor network, multimedia network, cognitive radio network, mobile ad-hoc network, mobile IPv6, and emerging wireless technologies (e.g. SDR, WRAN, SDN). The course also discusses quality of service, energy conservation, reliability and mobility management, cross-layer Routing-MAC-Phy interaction design. The course introduces the students to industry trends and research direction through course projects

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**Course ID:** 2204081716      **Description:** Cloud Computing and Datacenter Networks' Technologies

**Full Course Description:** This course provides an introduction to Cloud Computing fundamentals, cloud-enabling technologies, the different cloud service and delivery models, cloud architectures, cloud security, and the business perspective of cloud usage. In addition, this course introduces the technology of Datacenter Networks, their services, architectures, resource management models, and related optimization techniques enabling technologies, the different cloud service and delivery models, cloud architectures, cloud security, and the business perspective of cloud usage. In addition, this course introduces the technology of Datacenter Networks, their services, architectures, resource management models, and related optimization techniques.

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**Course ID:** 2204081717      **Description:** VLSI Design

**Full Course Description:** The course covers the following topics: CMOS circuits, data path units (e.g. adders, multipliers, comparators, counters, shifters), CMOS memory arrays (e.g. SRAM, DRAM, ROMs, Flash, CAMs), packaging and cooling, power distribution, clocking strategies, I/Os, design methodology, testing, debugging and design for testability.

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**Course ID:** 2204081718      **Description:** Embedded Systems and the Internet of Things (IoT)

**Full Course Description:** The course focuses on the design and analysis of computational systems that interact with physical processes. The objective is to design correct embedded systems with real-time and concurrent behavior. The course covers topics such as models of computations (e.g. finite state machine and data flow), system analysis and simulation, interfacing with sensors/actuators, real-time operating systems, scheduling, concurrency and distributed embedded systems. Covered topics are emphasized in the context of Internet of things.

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**Course ID:** 2204081719      **Description:** Parallel Computing

**Full Course Description:** This course discusses the basics of parallel computing including: parallel architectures, parallel programming techniques, parallel algorithm designs and parallel performance analysis. Parallel architecture topics include distributed and shared memory, cache coherence, distributed memory, distributed file systems, cluster-based systems and GPUs. Parallel algorithm topics cover parallel algorithm models, decomposition techniques and load balancing and scheduling. Parallel programming includes multi-processor, multi-core programming and thread programming. Also, the course discusses modern parallel computing examples, such as MPI, UPC, OpenMP, CUDA and OpenCL, OpenACC.

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**Course ID:** 2204081720      **Description:** Hardware Security

**Full Course Description:** This course focuses on basic concepts in the security of hardware systems including: active and passive attacks, counter measurements and design-for-trust. Topics covered include: side-channel attacks, hardware Trojans, hardware DoS attacks, IP piracy, reverse engineering; pre-silicon and post-silicon detection techniques; design for trust, runtime monitoring; secure systems, trust modules, hardware watermarking, FPGA security, hardware security primitives (e.g., random number generators, physical unclonable functions, crypto-processors).

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**Course ID:** 2204081721      **Description:** Advanced Topics in Computer Engineering

**Full Course Description:** The course covers recent and advanced topics in Computer Engineering.

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**Course ID:** 2204081799      **Description:** thesis

**Full Course Description:** Research master thesis must be defended in Computer Engineering fields.

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**Course ID:** 2204083799      **Description:** thesis

**Full Course Description:**

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**Course ID:** 2204086799      **Description:** thesis

**Full Course Description:**

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**Course ID:** 2204089799      **Description:** thesis

**Full Course Description:**