

Bachelor of Science in Computer Engineering

Course Catalog

3121120 Computer Programming

This course provides knowledge and skill of problem solving and programming concepts using pseudo code and a computer programming language. Topics cover: the problem-solving process; data types; variables, constants, and memory locations; simple sequential programs; basic input/output; selection and repetition control structures; arrays and strings; and user-defined methods.

3122110 Programming for Engineers

This course extends the programming concepts developed in the earlier courses and provides the students an opportunity to learn the advanced concepts that are used in engineering applications including digital design. The course also offers an in-depth exposure to advanced programming techniques in JAVA and the MATLAB programming environment.

3122150 Circuit Analysis

This course covers the topics of DC and AC circuit analysis. It includes the topics impedance and admittance, mesh, nodal, superposition, Thevenin's and Norton's theorem, transient response of RC and RLC circuits, sinusoidal steady state response, resonance, phasor representation, and two-port networks.

3122420 Digital Logic Design

One of the main goals of this course is to teach students the fundamental concepts in classical digital design and to demonstrate clearly the way in which digital circuits are designed and analyzed today. The purpose is to make students familiar with modern hierarchy of digital hardware and enlighten them the state-of-the-art computer hardware design methodologies. Moreover, the contents of the course provide students the basic idea of how to design and simulate logic circuits.

3122460 Computer Organization & Architecture

Introduction to computer organization, the major components of a computer system and the interaction between them, including CPU, memory, I/O devices and buses. Machine instructions, assembly language programming, CPU performance and metrics, non-pipelined and pipelined processor design, datapath and control unit, pipeline hazards, memory system and cache memory.

3122510 Electronics I

Basic properties of semiconductor materials. Theory of operation and applications of p-n junction diodes, Zener diodes and photodiodes. Theory of operation, biasing circuits, and small signal analysis of Bipolar Junction Transistor and Junction Field Effect Transistor. Transistor configurations and two-port network representation of transistor, a.c. equivalent circuits. Analysis and design of transistor amplifier circuits.

3123006 Computer Engineering Internship

Internship familiarizes students with actual working environments. It gives students the opportunity to integrate their knowledge and skills acquired in various courses. Internship also gives the student a feeling of what is involved in working in a practical environment. It also provides an opportunity to develop communication and team-work skills as well as ethical issues relating to the profession.

3123030 Electronics II

This course covers design and analysis of BJT and FET amplifier circuits, operational amplifiers and their applications in wave shaping, signal generation, filters, A/D and D/A converters. It also covers design of oscillator circuits and signal/waveform generators.

3123210 Digital System Design

This course introduces design methodologies for implementing digital systems in programmable logic. The course will build on the basics of digital logic from 2nd year. The students will learn how a Hardware Description Language (HDL) is used to describe and implement hardware. The topics will include (behavioral modeling, dataflow modeling and structural modeling and writing test benches for design verification). The students also will learn about computer-aided synthesis and implementation for PLDs and FPGAs design with a focus on FPGA design flow. Laboratory exercises lead the students through the complete programmable logic design cycle. Each student will prototype a digital system starting with VHDL entry, functional and timing simulations, logic synthesis, device programming, and verification.

3123221 Instrumentation and Measurements

Basic measurement concepts, sources and types of measurement errors, sources of noise and interference. DC and AC Bridges and their applications. Analog DC and AC meters. Oscilloscopes: types, specifications, operation, measurements with oscilloscopes. Electronic voltmeters, digital multi-meters, electronic counters. Logic Analyzers, Data Generators, Data acquisition and control using plug-in cards. Development of virtual instruments using software.

3123480 Microprocessor Systems

This course covers microprocessor architecture, system design and development, instruction set and buses. The Intel 80x86 family, real and protected mode, interrupts and interfacing techniques are explained. Advanced microprocessor system architectures such as the Intel Pentium will be discussed.

3123490 Embedded Systems

This course introduces the hardware and software design of embedded systems using microcontrollers. Students are introduced to microcontroller programming in both assembly and C. Important subsystems of the microcontroller are covered such as timers, interrupts, serial transmission of data, analog to digital and digital to analog converters. There are a series of exercises introduced into the lectures and labs which give students hands-on experience with working with microcontroller. At the end of the course, each student will choose a design project to work on during the last few weeks.

3124300 Selected Topics in computer Engineering

This course covers some advanced topics related to computer engineering, computer science and its related areas that are not covered in the curriculum, and are considered useful and additional learning material for students majoring in computer engineering. Course contents are subject to the approval of the department.

3124310 Project I

The course aims to give students the opportunity to work in a guided but independent fashion to develop a solution to a problem by making use of knowledge, techniques, and methodologies acquired in the previous semesters. The course also aims to enhance team work and communication skills, both oral and written.

3124320 Project II

The course aims to give students the opportunity to work in a guided but independent fashion to develop a solution to a problem by making use of knowledge, techniques, and methodologies acquired in the previous semesters. The course also aims to enhance team work and communication skills, both oral and written. Student may continue the work on project-1 subject to the approval of the advisor or define a new project.

3124400 Digital Integrated Circuits

This course covers the, design, operation, and analysis of various digital integrated circuit families, MSI digital circuits, and memories.

3124460 Engineering Ethics

This course is designed to introduce undergraduate Computer Engineering students to the concepts, theory and practice of engineering ethics. Topics include professionalism, code of ethics, moral framework, safety & risk, honesty, intellectual properties, privacy, computer crimes, economic and global issues.

3152020 Discrete Mathematics

This course covers fundamental mathematical concepts and reasoning along with problem solving techniques. Topics covered include propositional logic, predicate logic, inference, proof methods including induction, set operations, recursion, binary relations including order relations, and equivalence relations, graphs, trees, and functions.

3152040 Data Structures and Algorithms

The course covers concepts of program performance (time and space complexity); abstract data types; recursion; abstract data structures: lists, stacks, queues, graphs, trees, binary search trees, priority queues, heaps, and operations on them and their applications; sorting; searching and hashing.

3152060 Human Computer Interaction

Concepts, human information processing (cognition, perception, movement, culture, communication, human diversity, motivation for computer interaction, human performance models, etc.), user interface design principles, information presentation, visual, auditory and tactile displays, speech communication, data entry, controls, tools and feedback, human factors in computer programming, workspace design, environmental and legal considerations. We will study the modeling, the building and the evaluation aspects.

3152050 Fundamental of Data Communications and Networking

Introduction to computer networks and the Internet. Protocol layers and the OSI model. Application layer: HTTP, FTP, SMTP, POP3, DNS and peer-to-peer applications. Transport layer: UDP, TCP and congestion control. Network layer: virtual circuits, routers, IP protocols and routing algorithms. Link layer: error detection and correction, multiple access, MAC addressing, switches, ARP, Ethernet, local area networks and wide area networks. Wireless and mobile networks.

3153010 Operating Systems

This course covers the principles and concepts of modern operating systems. Operating system services: processes and process management, memory management, file systems, Input/Output and device control, deadlocks, distributed systems, case studies. To introduce the learner to the principles and practice of operating systems with respect to effective and convenient management and operation of a computer system.

3153020 Database Management Systems

This course is designed to give a theoretical and practical background in database techniques. It covers: database concepts, data models, data dictionary, entity relationship diagrams, and relational data model, converting E-R models to relational model, SQL language, and normalization. Oracle software is used in the Lab.

3153030 Fundamental of Information Security

This course aims at introducing fundamental security concepts to students. Main security threats and related countermeasures are presented. Students will learn the importance of protecting information stored on computer systems from unauthorized access. The students will also learn how to encrypt and decrypt information, control access to objects and recommend a secure system implementation.

3153040 Fundamentals of Web Systems

This course introduces the basics of Web systems and how it differs from desktop systems. Students will learn client-server architecture, and how it evolves to multitier system. The course will allow student to learn and use essential Web languages and technologies including XHTML, CSS, and XML. Students will apply this knowledge to generate essential web components like basic browser controls (buttons, links, and menus), forms and frames. They will also understand how these components are managed on the server side.

3153050 Fundamentals of Software Engineering

The course emphasizes object-oriented techniques and the use of UML. Topics covered in this course include: overview of the software engineering process, software process models, UML syntax and semantics, software requirement analysis, software design principles and models, component-level design, and software testing. Student will work in teams on software projects.

3153070 Information Technology Project Management

This course aims cover: characteristics of IT Project management, initiating an IT project; project planning; defining and managing project scope, structuring a project, project schedule and budget, managing project risk, project communication, tracking, and reporting, IT project quality management, ethics and professional practices, and project implementation.

3153090 Cloud Computing

This course aims to introduce students to theory and practice of cloud computing. Topics include: introduction to cloud computing; parallel and distributed systems; cloud infrastructure; applications and paradigms; resource virtualization; resource management and scheduling; networking support; cloud storage systems; cloud security.

3153110 Advanced Computer Networks

This course will cover the principles of networking with a focus on algorithms, protocols, and implementations for advanced networking services. We will examine a variety of ideas that were proposed to enhance the Internet, why some of these enhancements were successful while others were not. The emphasis in this course is on topics such as routing protocols, advanced routing and switching. It covers Internet architecture, congestion control, QoS, IPv6, and voice over IP. The student will use network simulators for some network models.

3153120 Network Security

This course introduces students to main security concepts related to the protection of a network from known threats and attacks. This includes digital signatures, authentication protocols, IP & Web

security and e-mail security. It also emphasizes the importance of using firewalls in order to secure a network. Packet-filtering routers, application and circuit-level gateways are presented. Advanced cryptographic algorithms are also discussed in details such AES, MAC & hash operations and cipher modes.

3154060 Computer Modeling and Simulation

This course aims to introduce students to elements and methodology of simulation. Topics include: basic concepts and types of simulation, discrete-event simulation, a review of probability and statistics relating to simulation, selecting input probability distributions, generation of random variates, design of simulation experiments and output analysis, verification and validation of simulation models. Students are expected to submit a simulation project.

3154110 Network Design & Implementation

The aim of the course is for the student to design a LAN solution detailing structured cabling components, desktop and server hardware, network operating systems, and network administration tools. He can document the design solution with materials and equipment lists, cable installation drawings, telecommunications and server room layouts, software versions and compatibility lists, and budget requirements. Also he demonstrates design feasibility by implementing a LAN prototype with all required functionality including servers, workstations and network infrastructure. This course defines a technical project plan and timeline for implementation, and discussing overall project benefits, possible technical issues and required resources to complete the project.

3154120 Wireless and Mobile Computing

This course presents the student with the latest in wireless technologies. The first part includes wireless networks such as, cellular and short range wireless technologies, protocols for wireless and wireless resources management. The second part includes mobile computing such as, VoIP on wireless, computing & programming over wireless. The student will study the legal and the private issues associated with wireless.

3154130 Network Operating Systems

This course introduces network operating system NOS, which is the software that allows multiple computers to communicate, share files and hardware devices with one another. The course aims to provide the student with theoretical and practical knowledge of network operating systems. The student is exposed to some of the most commonly used network operating systems. The student will reinforce their theoretical knowledge in practical sessions where they will install configure, manage and trouble-shoot network operating systems.

3154140 Enterprise Security

This course aims at introducing students to enterprise security concepts, related risks and cost. It mainly presents a deep coverage of intrusion detection and prevention concepts, including architectures and a survey of most popular IDS implementations and deployments. Students are also introduced to the need of having proper security policies and procedures in order to handle threats properly in addition to forensics techniques to thwart computer attacks.

3154150 Network Management

The course discusses typical architectures for network management including the management console, aggregators and device agents. This course introduces management paradigms and protocols (SNMP). Remote Monitoring (RMON), Network Management Tools and Systems are examined. The Web-Based Management and Network Management Applications are covered.

Configuration of basic network resources and management of multiple servers' network and troubleshooting.

3154160 Data Compression

The aim of this course is to introduce the theoretical underpinnings of data compression and cover many fundamental algorithms. Topics covered include: fundamentals of digital communication, communication channel, measure of information, encoding of source output, shannon's algorithms. Discrete and continuous channel entropy coding, variable length code, channel noise, compression & codes, lossless compression algorithms, lossy compression algorithms, audio compression, image and video compression.

3154170 Distributed Systems

The aims of this course are to study the fundamental characteristics of distributed systems. Topics covered will include: low-level basics including sockets, internet-based inter-process communications, and threading; remote-procedure-calls and remote-method-invocations; modern synchronous and asynchronous style client server systems and supporting processes; messaging and transactional systems; peer-to-peer and grid technologies; supporting systems such as naming and directory services.

3154180 Wireless Network Security

This course introduces students to modern wireless technologies (802.11, Bluetooth, RFID, ZIGBEE, and Infrared). It covers most aspects related to radio communication and various physical phenomena in a wireless environment. It also surveys most wireless security issues across the OSI layers and technologies (1G, 2G, 2.5G and 3G). Students will also be introduced to basic and advanced security implementations (filtering by MAC, WAP, WAP2, VPN, RADIUS), including setting proper security procedures and policies.

3154210 Web Application Design and Development

This course prepares students to apply different web technologies and integrate them into a web application. Topics covered include: Web applications and Rich Internet Applications (RIA), programmable Web applications, working with proxies, Yahoo and Google mash up services, Creating a Web application, model view controller pattern, from design, validation and usability, User Interaction Effects and Animation, and Tagging and Rating the Web Application.

3154220 Information Architecture

Information is the heart of knowledge and one of the main pillars of information systems. This course introduces fundamental concepts and methods of understanding and modeling data as well as extracting information out of it. It also shows how to represent large volume of information and allow users to comprehend and interact with it in an effective way. The course focuses on data modeling and architecture approaches allowing student to build effective information architecture. Then the student will learn how to interact with information using different labeling, navigation, and search strategies. Students will finally learn about information architecture in practice and its applications in large organizations.

3154230 Advanced Database Design & Implementation

This course builds on top of the first DBMS course by introducing advanced database concepts to allow students to effectively design and implement industrial quality database. The course revisits SQL in a deeper, more practical approach, with a focus on its PL/SQL extension. The student will learn database in a client-server setting, and see how to manage multi-user databases. Students will

be able to design and implement functional databases that include major components of an industrial database.

3154250 Distributed and Object Databases

This course discusses new and emerging issues in the field of distributed database. It focuses on principles of db distribution from both data distribution approach and network technologies role in distribution. Students will have in depth coverage of advanced transaction model and workflow as well as parallel databases, distributed object DBMS, push-based technology, and mobile DBMS; all of which are pillars of enterprise information technology of today.

3154260 Knowledge Management

This aim of this course is to introduce basic concepts, terminology, and techniques of Knowledge Management (KM). Topics covered include: the origins and units of organizational knowledge; evolution of knowledge management; implementation and utilization of knowledge management systems, and how to measure their impact, outputs, and benefits.

3154270 Advanced Web Topics

This course introduces students to the latest trends and technologies as used by today's information technology industry. The course focuses on advanced Web technologies that are strongly adapted as the next generation IT. Students will learn the role of Web 2.0 and Web 3.0 with special focus on Web services and Service-Oriented Architecture. The course will allow students to understand the current evolution from Personal Computing (1980s) to Network Computing (1990s) to Internet and Windows (2000s) to today's trends of cloud computing, Web tool kits, mashups, and social networking.

3154280 Data Warehousing and Data Mining

Today's IT deals with gigantic amount of information. The success of any organization greatly depends on its ability to process and understand its information and extract essential knowledge to help managers take well informed decisions. This course aims to introduce students to concepts and techniques of Data Warehousing and Data Mining. Topics covered include: data warehouse architecture, development life cycle, logical data modeling for a data warehouse, physical data design; Data mining concepts and tasks, data preprocessing and reduction, classification techniques, association analysis and algorithms, clustering analysis and algorithms, anomaly detection methods, and web mining.