



وصف المقررات

FR117 Introduction to Computer

(2,1,1,3)

This course aims to meet the requirements of beginner users of computers and students. It introduces the fundamental concepts in the field of computer science and engineering.

Prerequisite: NA

ECE118 Electronic Material

(2,0,0,2)

This course covers the structure of matter; Atomic Bonding; Energy Levels and Bonds; Crystal structure; Conductor, Semiconductors and Insulator; Properties of Conducting, Semiconductors materials and Insulator materials; Opto electrical properties; Magnetic materials; Para-and Ferro magnetism; Ferrites and Their applications; Dielectric materials; Dielectric Properties of Solids; Ionic conductivity; Dielectric Loss; Break down; Introduction to fiber optical materials.

Prerequisite: NA

CE126 Introduction to Programming (1)

(2,0,2,3)

This course covers an Introduction to Programming provides an overview of programming concepts: analysis, design, testing and code development. It includes Data types, declarations, Control structures, standard functions and creation and accessing of files. Applications for solving simple scientific and engineering problems.

Prerequisite: FR117 Introduction to Computer

EE127 Principle of Electrical Engineering

(2,0,2,3)

An electrical circuit theory and electromagnetic theory are the two fundamental theories upon which all branches of electrical engineering are built. Many branches of electrical engineering such as power, electric machines, control, electronics, communications and instrumentation, are based on electrical circuit theory.

Prerequisite: FR115 Physics (1)

FR114 Mathematics (1)

(3,1,0,3)

Algebra: Determinants – Its properties, Cramer's rule; Matrices, solution of system of linear equations; Infinite series, convergence and divergence of infinite series. Vector Algebra: Basic concepts, dot product, cross product, triple product. Complex numbers, De- Moivre's theorem. Three dimensional geometry, equation of planes and lines.

Prerequisite: NA

FR124 Mathematics (2)

(3,1,0,3)

Differential Calculus: Higher derivatives & Leibnitz theorem, Expansion of functions, Taylor's and Maclaurin's series, Indeterminate forms. Partial derivatives, curvature and evolutes. Integral Calculus: Multiple integrals; double & triple integrals. Differential equations: Ordinary differential equations, various methods of solving first order differential equations and its applications – solution of higher order differential equations and its applications.

Prerequisite: FR114 Mathematics(1)

FR116 Engineering Drawing

(2,0,2,3)

Introduction and general instruction regarding lettering instruments and line work. Free sketching. Plane geometric constructions. Projection systems-perspective orthographic, axonometric, isometric and oblique Projections. First angle, third angle projections. Orthographic and pictorial view. Projections of various objects and auxiliary planes.

Prerequisite: NA

**FR115 Physics (1)****(2,0,2,3)**

Vectors: (4h) Scalar and vector quantities, addition of vectors, component of vectors, scalar product, application acceleration of gravity, free fall, **Dynamics of Bodies:** (4h) Displacement, velocity and acceleration, laws of motion, the projectile, Newton's first law, mass and weight, force, Newton's second law, Newton's third law, linear momentum, impulse, conservation of linear momentum collisions. **Energy:** (2h) Work, work done against gravity, power, energy, KE, PE, conservation of energy. **Circular and S. H. M.:** (4h) Angular displacement, angular velocity, angular acceleration, centripetal force, centripetal acceleration. Angular momentum, Torque, rotational KE, gravitation. Elastic PE. S. H. M. velocity and acceleration in S. H. M., simple pendulum. **Fluids** (4h): Pressure, atmospheric pressure, density surface tension, fluid flow, Bernoulli's Equation. **Mechanical properties of matter:** (2h) Elasticity, stress and strain, young's modulus Shear and Bulk modulus. **Geometrical Optics:** (4h) Reflection and refraction, mirrors and lenses. **Temperature and Heat:** (4h) temp. Thermometers, mechanical equivalent of heat, specific heat capacity change of state, Boyle's law, Charlie's law, ideal gas law. K. Theory of gases, heat transfer.

Prerequisite: NA**FR125 Physics (2)****(2,0,2,3)**

Waves: Wave motion, pulses in string, principle of super position, periodic waves, equation of wave, Beats, Doppler effect, sound intensity, frequency types of waves, standing waves, resonance sound, response. **Electromagnetic waves.** Electricity: electric charge, coulombs law, electricity and matter, electrical conduction, electric field, lines of force, gauss's law, electric pot. Energy. Potential diff, electron volts, electric current, ohm's law, resistivity, conductivity, electric power. Resistors, E. M. F. Kirchoff's rules. Capacitances, magnetic forces. Electromagnetic induction, Faraday's law, Amp. And voltmeter, heat effect of an electric current. Atomic structure: bohr model of hydrogen atom, energy levels, atomic spectra, excitation and ionization energy, Conductors and free electrons solids and liquids. Crystalline and non crystalline material, crystal bonds, energy bands, conduction, semiconductors and insulators, crystal defects, Physics of semiconductors: Electron emission, cathode ray tube, properties of C. R. electron motion in elec. And mag. Fields, photo-electric effect, semiconductors, intrinsic and extrinsic semiconductors, P.N junction diode, rectification circuits, transistors.

Prerequisite: FR115 Physics (1)**ECE 214 Electronic Device****(2,0,2,3)**

This course covers an introduction to physics of semiconductors; Bipolar Devices; PN junction theory; PN junction diode; bipolar junction transistor (MIS) diode; Coupled Devices (CDD); Metal Oxide semiconductor FET(MOSFET). Photonic Devices; Light emitting diode(LED); Semiconductor lasers, and photo-detectors.

Prerequisite: ECE118 Electronic Material / EE127 Principle of Electrical Engineering**CE212 Introduction to Programming (2)****(2,0,2,3)**

This course introduces the fundamental programming concepts and techniques: analysis, design, testing and code development. Topics such as functions, recursion, arrays and pointers will be studied. Then data structures, files and structured program design will be covered. Finally, elements of object-oriented design and programming will be introduced.

Prerequisite: CE126 Introduction to Programming (1)

***CE213 Discrete Mathematics*****(3,0,0,3)**

This course covers the mathematical topics most directly related to computer science and engineering such as logic, proofs and sets. Then, functions, algorithms and recursion will be introduced. After that, the counting, discrete Probability and relations will be studied. Finally, graph and trees will be covered.

Prerequisite: *FR114 Mathematics (1) / FR117 Introduction to Computer*

ECE215 Signals and Systems**(2,1,0,2)**

The course presents and integrates the basic concepts for both continuous-time and discrete-time signals and systems. It is an introduction to analog and digital signal processing, control systems and communication systems and some other subjects. Signal and system representations are developed for both time and frequency domains. It covers linear time-invariant (LTI) systems: system properties, convolution sum and the convolution integral representation. These representations are related through the Fourier series, Fourier transform and Laplace Transform with their properties.

Prerequisite: *FR124 Mathematics (2)*

CE216 Technical English**(2,0,0,2)**

Technical English is a reading speaking listening and writing course designed to combine students' knowledge of English and their ability to express the concepts of computer engineering in English. It gives the student the language, information, and skills. Student needs to start his / her career and learns the English and needs to do the job, practices language in real work situations, and learns specialist vocabulary (ESP) English for Specific Purposes. It is essential and compulsory for all students of second year of computer Engineering.

Prerequisite: *UR123 English Language (2)*

CE223 Digital Logic Design**(3,0,2,4)**

This course introduces the fundamental digital logic design is concerned with the design of digital electronic circuits. Topics such as expressions, minimization methods will be studied. Then Gates, Truth tables. Combinational Circuits will be covered. Finally, Karnaugh map, will be introduced.

Prerequisite: *FR117 Introduction to Computer / CE213 Discrete Mathematics*

ECE 222 Electronic Circuits**(2,1,2,3)**

Diode circuits, small signal bipolar and FET amplifiers, transistor biasing and bias stabilization. Feedback amplifiers, frequency response of amplifiers. Introduction to differential and operational amplifiers. Tuned amplifiers, power amplifiers; Oscillators.

Prerequisite: *ECE 214 Electronic Device*

CE224 Web-Site Design**(2,0,2,3)**

This course is an introduction to the design, creation, and maintenance of web pages and websites. The course addresses the specific needs and concerns of beginners how to design web sites. The course involves three phases as follows. Firstly, the course begins with an overview of using hypertext markup language (HTML) to describe the content in a web page. Next, cascading style sheet (CSS) is addressed to describe how the content of pages looks. That is, CSS is considered the official and standard mechanism for formatting text and page layouts. Finally, the course aims to teach students the basic concepts of adobe Dreamweaver as a web-authoring tool to publish and manage web sites.

Prerequisite: *CE212 Introduction to Programming (2)*

**CE225 Data Structure** (2,0,2,3)

This Course covers data structure concepts such as linked list and stacks. Then queues and double ended queues will be introduced. After that, searching will be studied. Finally, trees and binary trees will be covered.

Prerequisite: CE212 Introduction to Programming (2)

FR226 Numerical Computation (2,0,2,3)

This course covers errors and approximations in numerical calculations. Solution of algebraic and transcendental equations. Solution of linear system of equations (direct and iterative methods). Solution of non-linear system of equations. Solution techniques for Eigen value problems. Interpolation. Numerical differentiation. Numerical integration. Approximations. Ordinary differential equations. Numerical solution of partial differential equations. (Computer implementation of the methods).

Prerequisite: FR124 Mathematics (2)

FR211 Mathematics (3) (2,2,0,3)

Laplace Transforms: Laplace transforms of standard functions, inverse transforms, convolutes, solution of differential equations, Laplace transform of periodic functions. Partial Differential Equations: Formation, solution of linear equation of first order, homogeneous linear equations with constant coefficients, solution of Laplace equation. Probability: Basic concepts of probability theory, random variables, and discrete and continuous distribution. Bay's theorem, moments and moments generating functions, joint probability distribution, and correlation

Prerequisite: FR124 Mathematics (2)

FR221 Mathematics (4) (2,2,0,3)

Complex variables: Functions of complex variables, differentiation, analytical functions, harmonic functions, complex integration, Cauchy's theorem, Cauchy's integral formula, Taylor's series, Laurent's theorem, residue theorem, contour integration of real functions. Fourier Series: Fourier expansions of various functions in given intervals, Euler's formulae, odd and even functions, Half range series, typical waveforms, and harmonic analysis. Vector Calculus: Vector differentiation, scalar and vector point functions, Del applied to point functions, gradient, divergence and curl, vector integration; Green's theorem in a plane, Stokes's theorem and divergence theorem, orthogonal curvilinear coordinates, spherical and cylindrical polar coordinates. Special Functions: Gamma and Beta functions, solution of differential equations in series, solution of Bessel's function, recurrence formula for $J_n(x)$, solution of Legendre's equation. Statistics: Functions of random variables, calculus of probability, regression analyses. Random sampling, random numbers, estimation of parameters, confidence intervals.

Prerequisite: FR211 Mathematics (3)

ECE311 Principle of Communication (2,0,2,3)

A communication system convey information from its source to destination some distance away, there are so many different applications of communication system that we cannot attempt to cover every type, so we discuss in details all the individual parts that make up a specific system.

Prerequisite: ECE215 Signals and Systems

***ECE312 Digital Electronics*** (2,1,2,3)

This course will cover various IC. logic families, including diode logic (DL), resistor-transistor logic (RTL), diode-transistor logic (DTL), diode transistor-transistor logic (TTL), emitter-coupled logic (ECL), NMOS, PMOS, and CMOS logic. In addition, various other circuits used in digital world will be covered. These include analog to digital and digital to analog converters, Schmitt-triggers, mutivibrators, and A 555 timer and its applications in timing circuits.

Prerequisite: ECE 222 Electronic Circuits

CE313 Object Oriented Programming (OOP) (2,0,2,3)

This Course covers Object-Oriented (OO) Programming Environment to develop Java applications such as Classes Objects and methods and the fundamental features of OOP. For the beginners gives Java Overview and an architecture-neutral of java language help the student to understand the basic to advanced concepts related to Java Programming language. After that, objects and classes, encapsulation, Inheritance, Polymorphism and streams will be studied. Finally, applications with Java fundamentals of object windows library classes will be covered.

Prerequisite: CE225 Data Structure

EE314 Control Systems (3,0,0,3)

Control system has achieved a very important position in the modern technology, optimization and automation principles are improving the static and transient behavior of control systems, the stability analysis and the design of such control systems is the challenge before today's engineer. The control system find applications in the wide variety of engineering branches.

Prerequisite: EE127 Principle of Electrical Engineering / FR221 Mathematics (4)

CE315 Software Engineering (2,0,2,3)

This course covers the fundamental material on software engineering such as software process, and agile software development. Then, requirements engineering and system modeling will be introduced. After that, the design and implementation will be studied. Finally, software testing & evolution will be covered.

Prerequisite: CE225 Data Structure

CE316 Computer Organization (2,0,2,3)

Computer organization explores the computer hardware and software structure. This course covers basic hardware and software structure, addressing methods, programs control, processing units, I-O organization, arithmetic, main-memory organization, peripherals and microprocessor.

Prerequisite: CE223 Digital Logic Design

CE321 Computer Architecture (2,1,2,3)

This course covers different hardware architectures concerned with the structure and behavior of the various functional modules of the computer, and the development of the hardware for the computer taking into consideration a given set of specifications.

Prerequisite: CE316 Computer Organization

CE322 Principles of Data Base (2,1,2,3)

This course is about of database concepts. It covers relational data model, SQL language, design models for database, query processing and optimization, and advanced topics in database systems.

Prerequisite: CE225 Data Structure

**FR323 Probability & Statistics** (3,0,0,3)

This course covers the concept of probability and statistics. Discrete probability, Continuous probability and Expectation will be introduced. Then, Stochastic Processes, Sampling distributions, Estimation and Hypothesis tests will be studied. Finally, Correlation and regression will be covered.

Prerequisite: FR124 Mathematics (2)

CE324 Microprocessors (2,1,2,3)

This course covers the internal architecture of 8086, 80286, 80386, 80486 and Pentium microprocessors, their addressing modes, instruction sets, and interfacing.

Prerequisite: CE316 Computer Organization

ECE325 Electronic Instrumentation (2,1,2,3)

This course will introduce industrial instrumentation as used for troubleshooting, process measurements and process control. Specifically, the course will discuss measurement terminology, differentiating between analog and digital, describe the instrumentation used for electronic testing and develop the principles of operation of transducers used for industrial process measurement and control.

Prerequisite: EE127 Principle of Electrical Engineering

CE326 Operating System (2,0,2,3)

This course covers an introduction to operating system such as design and implementation. Then Operating System Structures, Process Management and Threads will be introduced. After that, Process Synchronization, CPU Scheduling and Main Memory will be studied. Finally, Storage Management, File –System Interface and I/O Systems will be covered.

Prerequisite: CE316 Computer Organization

CE411 Computer Networks (1) (2,1,2,3)

This course covers the fundamental material on computer networks such as introduction Computer Networks and the Internet, circuit switching vs. packet switching, types of network delays, Protocol layers, ISO and TCP/IP network models. Application layer function and protocols such as HTTP, DNS, FTP, etc. Transport layer function and protocols, connection and connectionless communication, TCP and UDP, multiplexing and de-multiplexing, socket concepts, reliability and congestion control in TCP. Network layer function, IP protocol, logical addressing, routing protocols, multicasting concepts.

Prerequisite: ECE311 Principle of Communication

ECE412 Digital Signal Processing (DSP) (2,0,0,2)

Digital Signal Processing (DSP) is one important in computer and communication fields, spectral analysis using transforms is one of the fundamental methods of communication and computer engineering, it allows us to treat entire classes of signals that have many properties and computation it by many mathematical computation methods and by using z-transform and Fast Fourier Transform (FFT).

Prerequisite: ECE312 Digital Electronics

FR413 Engineering Economics & Management (2,0,0,2)

This course covers Basic principles of engineering economy: such as production and markets. Then, Basic economic problems and money will be introduced. After that, Introduction to Management will be studied. Finally, Functions of Management; Marketing management and Production Management will be covered.

Prerequisite: Fourth-year standing

**CE414 Computer Graphics (2,0,2,3)**

This course covers the fundamental material on computer graphics such as introduction to computer graphics systems, coordinate systems, output primitives such as pixel, line, circle. Then, algorithms to draw output primitives such as DDA, Bresenham algorithms for line and circles will be introduced. Finally, Transformations in 2-d and 3-D dimensions, Coloring system, filling algorithms, and introduction to computer animations will be studied..

Prerequisite: FR323 Probability & Statistics

CE415 Microprocessor Interfacing (2,1,2,3)

This course covers basis I/O components and their interface to the microprocessor. Detail on I/O techniques that include interrupts will be introduced. Finally, I/O techniques that include direct memory access (DMA) will be covered.

Prerequisite: CE324 Microprocessors

CE421 Computer Networks (2) (2,1,2,3)

This course covers the advanced material on computer networks such as: Data link layer services, Error detection and correction, Parity checksum, CRC, Multi-access link protocols, Channel Partitioning, Random Access Protocols, Switched Local Area Networks, Physical Addressing,, ARP protocol, Ethernet, Link layer Switches, and VLANs.

Prerequisite: CE411 Computer Networks (1)

CE422 VLSI Circuit Design (2,0,2,3)

VLSI fabrication technology is still in the process of evolution which is leading to smaller line widths and feature size and to higher packing density of circuitry on a chip which lead to improved performance and it is important to study how can design VLSI.

Prerequisite: ECE 214 Electronic Device

CE423 Artificial Intelligence (2,0,2,3)

Artificial Intelligence (AI) is a combination of computer science, physiology, and philosophy. It aims to create machines that can "think". This course covers a broad technical introduction to the techniques that enable computers to behave intelligently. This includes problem solving methods, representing knowledge, reasoning, learning, perceiving, and interpreting.

Prerequisite: CE213 Discrete Mathematics / CE225 Data Structure

CE424 Data Security (2,0,2,3)

This course covers the fundamental concepts of cryptography such as: security goals, types of attacks, security services, mechanisms and techniques. Traditional symmetric-key cryptography: substitution and transposition techniques, Modern symmetric-key cryptography: stream cipher concepts and techniques, RC4. Block cipher concepts and techniques: Simplified DES/DES/AES, 3-DES. Asymmetric-key cryptography: concepts and techniques, RSA cryptography. Hash functions, Message Digest Algorithm, SHA-512 hash function, digital signature, message authentication functions.

Prerequisite: CE411 Computer Networks (1)

CE425 Real Time Computer & PLC (2,0,2,3)

Real time computer control satisfy time constraints and it is the system that response stimulate events within a specific time, the two types offline when the work depends on computer without monitoring and online real time when the work depends on computer with monitoring, this technology is still in the development and lead to improved performance and it is important to study how can system work in real time and how can use PLC with programming it.

Prerequisite: EE314 Control Systems

**CE416 Course Project (1) (3,0,0,3)**

To train students in carrying out hardware/software design and development exercises under the supervision of a faculty member in the department.

Prerequisite: *Fourth-year standing*

CE426 Course Project (2) (3,0,0,3)

To train students in carrying out hardware/software design and development exercises under the supervision of a faculty member in the department.

Prerequisite: *CE416 Course Project (1)*

CE511 Hardware Design Language & Modeling VHDL (2,0,2,3)

VHDL is describing the structure and function of any digital circuits and enables a precise, formal description of an electronic circuits that allowed for the automated analysis by VHDL simulation and it is an integral part of Electronic Design Automation(EDA)systems especially for complex circuits.

Prerequisite: *CE223 Digital Logic Design*

CE512 Computer and Internet Security (2,0,2,3)

This course covers the fundamental concepts of cryptography such as: Email security protocols PGP and S/MIME and security services for e-mail, security services at the transport layer SSL and TLS, security services at the network layer IPsec and tunneling, confidentiality and authentication security services in IPsec protocol, overview of firewall, it's limitations, types of firewall: packet-filter and circuit level, stateful inspection, basing, location and configuration, intrusion problems: behavior and techniques, intrusion detection (statistical and rule-based), and password management.

Prerequisite: *CE411 Computer Networks (1)*

CE521 Parallel Processing Techniques (3,0,0,3)

Parallel processing increase performance of computers, in this direction capabilities for development I/O coprocessor, cache and memories, and application of pipelining, time sharing, multiprogramming and multiprocessing all these to achieve optimal performance from a computer exploiting parallelism.

Prerequisite: *CE321 Computer Architecture / CE324 Microprocessors*

CE514 Final Project (1) (3,0,0,3)

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters. At the end of the semester the student submits a report describing his projects and the parts he completed in the first semester and proposed parts in the 2nd semester and present the work to a committee constituted by the department. The projects are oriented toward providing experience in the establishment of objectives, criteria, synthesis, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

Prerequisite: *Fifth-year standing*

CE523 Final Project (2) (6,0,0,6)

The student should take a B.Sc. project in related area to his specialization and with technical merit. This project is for two semesters. At the end of the semester the student submits a report describing his projects and the parts he completed in the first semester and proposed parts in the 2nd semester and present the work to a committee constituted by the department. The projects are oriented toward providing experience in the establishment of objectives, criteria, synthesis, analysis, construction, testing, and evaluation; solution of open-ended problems; design methodology.

Prerequisite: *CE514 Final Project (1)*



Elective Course Descriptions 1 & 2

(2,0,2,3)

- **PLC Controllers**

Topics in the general field of PLC controllers:

Fundamental concepts of programmable logic controllers, principles of operation, and numbering as applied to electrical controls. The student will identify and describe digital logic circuits and explain numbering systems; explain the operation of programmable logic controllers; convert ladder diagrams into programs; incorporate timers and counters utilizing programmable logic controllers; and execute and evaluate programs. Relay Logic. Uses of PLCs. PLC components. **Number systems:** Binary counting. Octal and hexadecimal number systems. Converting numbers from one system to another. **Programming PLCs:** Ladder Logic Programming. Experiments with Ladder Logic. Troubleshooting Ladder Logic. **Wiring PLCs:** Controlling motors. Interfacing with sensors. Troubleshooting. **PLC Systems:** The computer. Microprocessors. Microcontrollers.

- **Simulation & Modeling of Computers**

Discrete-event simulation approaches, Simulation cycle, Probability and statistics in simulation, Mathematical and statistical models, Validation and verification of simulation models, Random number generation, Building valid and credible simulation models, Modeling of simulation data, Output data analysis, Simulation software, Distributed and parallel simulation, Simulation techniques of some well-known systems such as Queues, Applications to computer systems, Case studies.

- **Data Storage Technology**

Modern enterprise data storage technologies and architectures. Storage devices, file systems, storage networks, virtual storage, RAID, NAS, SAN, and other current enterprise-level storage models. Storage management, replication, deduplication, storage tiers, backups. Fundamentals of business continuity, application workload, system integration, and storage/system administration. Specific knowledge and skills required to configure networked storage to include archive, backup, and restoration technologies.

- **Digital Image Processing**

Quantitative models of imaging systems, spatial domain and frequency domain methods, digital filter design for image enhancement and restoration, edge detection, image denoising, image segmentation, image enhancement, image restoration, image compression, and image representation and description.

- **Multimedia Techniques**

Definition of multimedia, abstract and digital media, Multimedia environment; operating systems, data bases, network characteristics ‘Multimedia authoring tools; text, graphics, audio, analog and digital video, animation manipulations – storage, concurrency and delays ‘Multimedia platforms; development platforms, delivery platforms. Multimedia document management. Multimedia information distribution ‘Computer network architecture and protocols for multimedia applications ‘Case studies.



- **Knowledge Engineering & Expert Systems**

Introduction to Knowledge engineering and expert systems. Representation of knowledge. Knowledge extraction methods. Methods of inference Reasoning under uncertainty. Inexact reasoning. Design of expert systems. Implementation of expert systems. Applications of expert systems.

- **Neural Networks**

Foundations of neural network (NN) theory such as activation, signals architectures and learning algorithms. Neural network applications. Hopfield NNs. Bi-directional associative memory (BAM). Adaptive fuzzy systems; fuzzy sets and systems; fuzzy associative memory (FAM), examples of fuzzy and neural control systems.

- **Real-Time Computing**

Real-time computing definition and applications. Hard vs. soft real time computing. Synchronization in multiprocessors and distributed systems. Global multiprocessor schedulability analysis. Beyond Uniprocessor Independent Task Models. Preemptive systems. Dynamic-priority systems. Static-priority systems. Nonpreemptive systems. Classic uniprocessor scheduling results Uniprocessor Scheduling of Independent Tasks

- **Advanced Operating Systems**

Introduction to advanced modern operating system design and implementation. Protection and Security. Distributed System Structures and Distributed File Systems. Case Study :The Linux System and Windows 2000.

- **Advanced Computer Architecture**

Instruction set principles, Pipelining, pipelining hurdles. Instruction level parallelism, Data hazards avoidance, Dynamic Scheduling, Dynamic Hardware prediction. Memory Hierarchy Design, Cache design, Storage systems, Busses, I/O performance measures. Interconnection Networks, Introduction Multiprocessors architectures.

- **Selected Topics in Computer Engineering (1)**

The content is designed by a member of staff and approved by the department council.

- **Selected Topics in Computer Engineering (2)**

The content is designed by a member of staff and approved by the department council.