Department Requirements:

A- Compulsory Courses:

110408213   Data Structure   (3,0,3)
           Prereq. 110108112

Basics of object oriented programming including: Types of programming. Classes and subclasses, class hierarchies, data and program abstraction, decomposition of large systems into reusable objects, encapsulation, inheritance, polymorphism, and modularity in programming. Basic concepts of representations of data, including stacks and queues, arrays and graphs, contiguous list, linked list, tree and binary tree. Programming projects will be implemented in an object-oriented language using C++.

110408220   Digital Logic   (3,0,3)
           Prereq. 110101102 or
           ~~111001141~~ 110101152

Number systems and arithmetic, two's-complement arithmetic, binary addition/subtraction circuits, Boolean algebra, mapping techniques and function minimization, Logic gates, Logic equivalent circuits, structured system design procedures, synthesis of combinatorial circuits, analysis and synthesis of sequential circuits, and flip-flops. Clock generation circuits. Mealy and Moore models. Registers, counters, memory units.

110408221   Digital Logic Lab   (0,3,1)
           Prereq. 110408220

Logic gates, Boolean Algebra, multiplexers, decoders and 7-segments display, adders and comparators, design of sequential circuits, synchronous counters, asynchronous counters, registers, ADC / DAC, PLD, project.

110408300   Algorithms   (3,0,3)
           Prereq. 110101152 &
           110408213

This course is an introductory course to the design, implementation and analysis of computer algorithms. Topics covered include the growth of functions, the time complexity of algorithms, recurrence relations and their solutions, the design and analysis of various sorting algorithms (insertion, merge, quick, and heap sort), graph searching algorithms (breadth-first and depth-first search), and spanning trees. Programming projects.

110408303   Fundamentals of Communications   (3,0,3)
             Prereq. 110409322 &
             110403242

Analog and digital transmission, modulation and demodulation, transmission media, data encoding, synchronous and asynchronous transmission, digital carriers, error control, multiplexing. Basics of wireless communication.

110408326   Digital Integrated Circuits and Embedded   (0,3,1)
             Systems Lab
             Prereq. 110408362
             Concurrent

CAD tools, schematic editor, circuit simulator (Spice), DC analysis, transient analysis, Spice Models, HDL language, FPGA tools, analyzing tool reports, design synthesis, programming FPGA boards.

110408327   Digital Electronics and Integrated Circuits   (3,0,3)
             Prereq. 110409240 &
             110408220

Diode and transistor models (Ebers-Moll model), resistor-transistor logic (RTL), diode-transistor logic (DTL), transistor-transistor logic (TTL), Schottky TTL, emitter-coupled logic (ECL), MOSFET digital circuits, resistor-loaded NMOS logic. Static and dynamic behavior of diodes and MOSFET devices, Spice models for diodes and MOSFET devices. Emphasis on Spice simulations for circuits composed of diodes and MOS devices. Analysis of static and dynamic behavior of MOSFET device; spice model of MOS device. Analysis of the static behavior of MOS inverter, including noise margin and power dissipation. Design combinational circuits using static and dynamic CMOS. Designing sequential logic circuits. Modeling of wire interconnects. Examining various implementation strategies for digital ICs. Addressing timing issues in digital circuits. Designing arithmetic building blocks.

110408332   Assembly Language and Microprocessor Systems   (3,0,3)
             Prereq. 110409240 &
             110408220

Introduction to μ-processors and μ-computers, software/hardware architecture of 8088-based μ-computer systems, assembly language and programming techniques for 8088/8086 μ-processor; Instruction set and addressing modes; Operating systems issues, memory address space, program development with MASM. Hardware architecture of 8088/86 μ-processors, memory subsystems, buses, registers, I/O subsystems, advances on the Pentium processor families.

110408333   Microprocessors Lab   (0,3,1)
             Prereq: 110408332   &
             110408221

Introduction to BGC 8088, debug commands, addressing modes and control flags, data transfer, 8284-clock generator, design of linear-select RAM-memory, 8-bit input / output ports, dynamic display, project.

110408340   Computer Organization   (3,0,3)
             Prereq. 110408332

Basic computer organization; Instruction set architecture, control and microcode, computer arithmetic, addressing modes; basic hardware and software structure, addressing methods, data and Instruction formats, programs control, design of a simple computer, processing unit organization and design, input/output organization, main-memory organization, peripherals, microprocessor families, machine instructions and programs, basic pipelining. Course project.

110408362   Embedded Systems   (2,2,3)
             Prereq. 110408332 &
             110408327

Overview of embedded system hardware and software, hardware/software partitioning, interfacing, bus protocols, device drivers, interrupts, concurrent processes, reliability, low-power design, testing, real time embedded systems, embedded systems software.

110408423   VLSI Design   (2,2,3)
             Prereq. 110408327

Review CMOS transistor operation and manufacturing, design CMOS logic gates, examine circuit families, study sequential circuits including latches and flip-flops, examine data-path designs and memory arrays, optimize timing and power at the circuit level, and survey advanced circuit design techniques, verification and design for test.

110408442   Computer Maintenance Lab   (0,3,1)
             Prereq. 110409240 &
             110408340

Overview of PCs and their peripherals like mouse, keyboard, digital pads, and other pointing devices; computer anatomy; motherboards and processors, memories, computer assembly; hardware compatibility and connectivity issues, computer faults troubleshooting, and diagnosing.

110408443   Computer Architecture   (3,0,3)
             Prereq. 110408340

Memory hierarchy, cache, virtual memory organization for high performance machines; I/O architecture and interfacing. Control & microprogramming techniques. Processor architecture, controllers, buses, DMA. Performance and cost measurement considerations, distributed system models. Advanced pipelining techniques, processor implementation strategies, CISC and RISC, vector processors, single and multiple issue processors, VLIW, superscalar processors, special purpose components and devices; I/O and bus subsystems. Multiprocessor systems hardware description languages. Course project.

110408450   Computer Networks   (3,0,3)
          Prereq. 110408303

Definitions, network architectures, OSI model, communication protocols, media access control protocols for shared channels. Routing algorithms. TCP/IP and client/server model, network topologies, local area networks, internetworking devices, high-speed bridged networks, wide area networks, introduction to Internet and TCP/IP, introduction to ISDN, DSL, and ATM networks. Switched networks, mobile/wireless networks. Performance analysis of computer networks: Queuing systems, throughput-delay analysis.

110408454   Computer Networking Lab   (0,3,1)
          Prereq. 110408450

An introduction to basic router configuration for local area networks, IP addressing techniques, cabling and routers, configuration of switches, VLANs.

110408455   Operating Systems   (2,2,3)
          Prereq.   110408340

Introduction to organization of operating systems, computer-system structures, operating-system structures, processes, process interaction and communication, threads and pthreads, CPU scheduling, process synchronization, deadlock problems and avoidance, memory management, virtual memory, buffering, sockets, distributed systems structures, file-system interface, file-system implementation, distributed file systems, sharing and protection of processes and data. Data space management. Examples of operating systems (UNIX and Windows XP). Course project.

110408456   Computer Security   (3,0,3)
          Prereq. 110408450 &
          110408300

Fundamental issues and first principles of security and information assurance (confidentiality/privacy, integrity, authentication, identification, authorization, availability, access control). Introduction to both symmetric and asymmetric cryptography. Business issues of risk analysis and management of resources. Issues in information systems security; analysis, design, and coding of information systems/ networks for security; Introduces firewalls, network intrusion detection, Viruses, Worms, Trojan horses, and other forms of malicious code; techniques for building secure organizational systems; e-commerce related security issues; policy, legal and ethical issues in security.

110408457   Wireless Networks   (2,2,3)
          Prereq.110408450

This course covers cellular and wireless networks and their components. The topics include: first generation analog cellular phone systems; traffic engineering; mobility management; intersystem operation; second generation digital cellular standards: GSM, IS-95 (cellular CDMA); short message service (SMS); 2.5G data services (e.g., GPRS); third generation cellular standards (cdma 2000 and WCDMA/UMTS); location technology, wireless local area networks (802.11), wireless personal area networks (e.g., Bluetooth, Zigbee), wireless metropolitan networks (WiMax), and satellite systems

110408480   Practical Training   (0,0,0)
                Prereq. Passing 112 Credit hrs.
The BSc degree in Computer Engineering requires 8 weeks of continuous training inside Jordan or outside Jordan. The training must be conducted within private or public sectors working in the ECE fields, which requires the approval of the department. A final report is required.

110408591   Graduation Project (1)   (0,3,1)
                Prereq. Passing 120 Credit hrs.
A group of students apply their theoretical knowledge gained throughout their study to design or build a certain circuit/device/system to perform specific function(s) under the supervision of one or more of the instructors.

110408592   Graduation Project (2)   (0,6,2)
                Prereq. 110408591
Continuation of Project 1. The actual design and implementation may take place during the course of project 2.

B- Elective Courses:

110408510   Systems Programming   (3,0,3)
                Prereq. 110408213 &
                110408332
Design and implementation of various system software components including assembler, macro processor, compiler, and loader; analysis of modern software engineering practice, methods for requirements specification, design, implementation, verification, and maintenance of large software systems; advanced software development techniques and large project management approaches; project planning, scheduling, resource management, accounting, configuration control, and documentation; special emphasis on technical writing.

110408520   Analog Integrated Circuits   (3,0,3)
                Prereq. 110408327
Overview of analog and mixed-signal CMOS integrated circuits, op amp, current mirror, differential, low-noise and feedback amplifiers, mixers and oscillators and comparator design. The basics of sample-and-hold circuits, A/D and D/A.

110408522   Digital System design   (3,0,3)
          Prereq. 110408327
Hardwired and stored logic paradigms for digital system implementation; the hardware description language (VHDL), configurable logic devices such as PLDs and FPGAs; system interconnection structures, bus arbitration schemes and data-link level bus communication protocols; architectural and operational aspects of general purpose central processing units (CPUs); an introduction to the use of programming languages (assembly and high-level) in the design of stored logic systems and related low-level issues such as the binding of program and data to memory; and memory and input/output organizations and interrupt mechanisms, power, area and delay optimizations; clocking schemes; power distribution and dissipation; I/O and packaging.

110408530   Microprocessors based Systems   (3,0,3)
          Prereq. 110408332
Architecture of a microcomputer, software model of 8088/86 Microprocessor, the hardware architecture of 8088/86 microcomputer system, memory interface, Input/output interface circuits for 8088/86-based microcomputer, interrupt interface of the 8088/86 microprocessor, hardware of the original/IBM PC microcomputer, real-time software and hardware architecture of the 80286 microprocessor, interfacing to the external devices.

110408553   Wireless Networks Security and Protocols   (3,0,3)
          Prereq. 110408457 &
          110408456
Wireless networks have special characteristics and requirements which makes them different from wired networks. The goal of this course is to study the different wireless networks routing protocols. The focus will be on the different routing protocols (energy-efficient routing, QoS routing, geographical-based routing …..) designed for the MANET and sensor networks. The course will cover MAC and Network layers such as CSMA, CSMA/CA, TDMA, TDMA/CSMA, AODV, DSR, WRP, TORA and LEACH. This course has a term project and/or assignments. Also, this course Focuses on fundamental security issues in wireless networks security topics includes: confidentiality, Privacy, Integrity, Spoofing signal Intercept, Key management and distribution and control of fraudulent usage of wireless networks. It also introduces the security mechanisms for the most common wireless networks including: WLAN, Bluetooth, GSM, 3G networks, WiMax, and sensor networks.

110408557   Internet Protocols   (3,0,3)
          Prereq. 110408450
This course provides a detailed understanding of essential Internet protocols. It includes ARP, IP, ICMP, IGMP, UDP, TCP, routing protocols such as RIP, OSPF and BGP, multicasting and multicast routing protocols such as DVMRP, MOSPF and PIM, application protocols such as DNS, DHCP, FTP and HTTP.

110408560 Networks Modeling and Simulation   (3,0,3)
        Prereq. 110408450
Introduction to simulation concepts, discrete event simulation, random number generation, 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). Well-known network simulation packages such as ns2 and/or OPNET, are considered.

110408561 Information Systems and Network   (3,0,3)
        Infrastructure Protection
        Prereq. 110408456
Techniques for the protection and survivability of information systems and networks. Critical infrastructure definition, risk management, vulnerability and risk analysis, fault and attack trees, availability analysis, traffic restoration schemes and survivable network design and management techniques; critical infrastructure simulation, CIP policy and legal issues, SCADA systems.

110408565 Real Time Systems   (3,0,3)
        Prereq. 110408362 &
        110408455
Overview of real-time systems; design issues of real-time systems; programming language support; use of unified modeling language (UML), reliability and fault tolerance; time handling; exceptions and exception handling; concurrent programming; real time operating systems; scheduling; synchronization; real time communication; resource control; distributed systems; real-time engineering applications of computers to on-line control, communication systems and data acquisition. Course project.

110408572 Cryptographic Systems   (3,0,3)
        Prereq. 110408456
Principles of number theory, cryptographic algorithms and cryptanalysis. Steganography, block and stream ciphers, secret key encryption (DES, RES, RE-N), primes, random numbers, factoring, and discrete logarithms. Public key encryption (RSA, Diffie-Helman, elliptical curve cryptography, N'TRU); key management, hash functions (MD5, SHA-1, RIPEMD-160, HMAC).

110408573 Networks and Internet Security   (3,0,3)
        Prereq. 110408456
Principles of network security and management. Review of network vulnerabilities, security at the link, network and transport layers; dial-up security (PAP, CHAP, Radius, Diameter), IPSEC, SSL, and VPNS. Email security (PGP, S/MIME); Kerberos; X.509 certificates; AAA and mobile IP; SNMP security; firewalls; filters and gateways; policies and implementation of firewall policies; stateful firewalls; firewall appliances.

110408576 Design of Testability   (3,0,3)

Prereq. 110408327

Stuck-At faults, observability, controllability, fault coverage, test vectors, automatic test pattern generation (ATPG), statistical fault analysis, ad-hoc testing, level sensitive scan design (LSSD), serial scan, parallel scan, signature analysis and BILBO, boundary scan, built-in-self-test (BIST), IDDQ testing.

110408577   VLSI Systems   (3,0,3)
Prereq. 110408423

Integrated system design, memory cells and systems, logic arrays, design methodologies, planning, power estimation, area estimation, timing analysis, low-power design, low-voltage design, testing, FPGA design and implementation.

110408578   Implementation of Digital Signals Processing   (3,0,3)
Systems
Prereq. 110409322 &
110408327

Review DSP systems and fundamental elements, adder and multiplier designs, register minimization, folding/unfolding, pipelining, retiming, parallelism, power issues, filter designs, FFT processor design.

110408593   Special Topics in Computer Engineering   (3,0,3)
Prereq. Department Consent.

Recent topics in Computer Engineering taught by a visiting professor or a department faculty member.

C- Offered Courses for non CPE students:

110408240   Computer Design and Organization   (3,0,3)
Prereq. 110408220 or
111001123

History and evolution of computer system architecture ; instruction set architecture, control and microcode, computer arithmetic, addressing modes; basic hardware and software structure, addressing methods, data and Instruction formats, programs control, description of the components of the computer and its different levels, CPU design, basic pipelining, control unit design, microprogrammed & hardwired control unit, RISC & CISC, operating system support.

110408343   Fundamentals of Computer Architecture   (3,0,3)
Prereq. 110408240

Performance and cost measurement considerations. Advanced pipelining techniques, processor implementation strategies, CISC and RISC, vector processors, single and multiple issue processors, VLIW, superscalar processors. Memory hierarchy, cache, virtual memory organization for high performance machines. Course project.

110408433   Microprocessors and Embedded Systems   (3,0,3)
            Prereq. 110409343
Overview of embedded system hardware and software, hardware/software partitioning, Introduction to Microprocessors, software/hardware architecture of 8088-based. Assembly language for 8088/8086 Microprocessor; Instruction set and addressing modes. Hardware architecture of 8088/86 Microprocessor, memory interface, Input/output interface circuits for 8088/86-based microcomputer, interrupt interface of the 8088/86 microprocessor.

110408434   Digital Logic and Microprocessors Lab   (3,0,3)
            Prereq. 110408433
Logic gates, decoder/multiplexer, JK-FF, Counters/shifter. Introduction to BGC 8088, addressing modes and data transfer, 8284-clock generator, 8-bit input / output ports, dynamic display, project.