AL-AHLIYYA AMMAN UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

Short Course Description

Curriculum 2010-2011
812201 C – language programming [3] [3-3]
The course covers the fundamental concepts of programming, analyzing problem statements, designing computer solutions, as well as an introduction into the syntax and semantics of the C language. It also focuses on enumeration types, data types, variables, constant, formatted I/O, operators and expressions, control flows, functions, arrays, structures, pointers and strings.

812401 Digital Logic circuit [3] [3-3]
Digital numbering system and information representation; arithmetic operations, decimal and alphanumeric codes, binary logic, boolean algebra (identities, functions and manipulation), standard forms, simplification, logic gates, switch-level and logic CMOS implementation, integrated circuits, combinational logic design: circuits (gate level), design hierarchy and procedures, computer-aided design, combinational two-level and multi-level implementations. Arithmetic (add, subtract, multiply) and other popular (multiplexers, encoders, decoders) modules. Programmable logic design (ROMs, PLAs, PALs, FPGAs), language-directed combinational design (VHDL), Sequential logic design: latches, flip-flops, state machine design and minimization (Mealy and Moore models), design problems.

Prerequisite 312104 Computer Skills (1)

812408 Digital Logic Lab (1) [1-3]
Combinational logic circuits, storage elements, hazards (malfunctions). Circuit characteristics (loads, delays, etc.), simple combinational networks (adders, multiplexes, etc.). Simple sequential networks (counters, shift registers, etc.), synchronous and asynchronous sequential machines, processor and controller, Project using a microprocessor as a control.

Corequisite 822401 Digital Logic Circuits

81283 Object Oriented Programming [3] [3-3]
Introduction to the concepts and features of Object-Oriented Programming (OOP), encapsulation, inheritance, polymorphism, classes and objects, arrays, pointers, operators and friends. Students will write programs using the language C++.

Prerequisite 39122 Computer Skills (2)
Corequisite 812201 C – language programming

81304 Discrete Mathematics [3] [3-3]
Introduction to Discrete Mathematics: Logic, Relations, Functions, Basic Set Theory, Countability and Counting Arguments, Proof Techniques, Mathematical Induction, Graph Theory, Combinatorics, Discrete Probability, Recursion, Recurrence Relations, and Number Theory; The Fundamental Mathematical Tools Used in Computer Engineering as: Sets, Relations, and Functions; Propositional Logic: Predicate Logic, and Inductive Proofs, Summations, Recurrences, and Elementary Asymptotic; Counting and Discrete Probability; Undirected and Directed Graphs; Introductory Linear Algebra, with Applications in Computer Engineering.

Prerequisite 832005 Engineering Analysis (2)

813401 Digital Systems [3] [3-3]
Sequential logic circuits design, analysis and state reduction. Digital subsystems, basic computer organization and design. Memory units, error correction codes, algorithmic state machine (ASM) and asynchronous sequential logic (design, analysis, reduction). Language-directed sequential design (VHDL), registers and counters. Memory basics (SRAM, DRAM, basic memory systems).

Prerequisite 812401 Digital Logic Circuits

813402 Computer Design and Digital Systems Lab (1) [1-3]
Logic conventions and indicators, logic gates and logic operations, min-term representations and implementation of simple logic functions, max-term representations, multiple output networks, code translation class, Controlled circuits, memory addressing, Construction of flip-flops, registers, assembly language/computer simulator. Designing synchronous counters using EPROM, binary number detector, analysis of sequential synchronous logic circuits, complementary, memory design, RAM design, ALU design.

Prerequisite 813401 Digital Systems
813403 Microprocessors {3} [3-3]
Introduction to the microprocessor and microcomputer, the microprocessor and its architecture, addressing modes, instruction set, programming the microprocessor using assembly languages, 8086 and 8088 hardware specifications, memory interface, basic I/O interface, interrupts, keyboard and printer interface, PPI 82C55, ADC, DAC and DMA interface.
Prerequisite 812401 Digital Logic Circuits

813408 Microprocessor Lab {1} [1-3]
Explain the 8086/8088 instructions set, develops program and programming techniques using the TASM turbo assembler program, DOS function call, and the BIOS function call.
Corequisite 813403 Microprocessors

813801 Data Structure and Algorithms {3} [3-3]
Operational knowledge of the fundamental data structures and algorithms of computer engineering, design and analysis of diverse basic data structures and algorithms: lists, trees, graphs, queues, stacks, tables, string matching, sorting, searching, file manipulation, divide-and-conquer, backtracking, dynamic programming, etc.
Prerequisite 812201 C – language programming

814404 Embedded Systems {3} [3-3]
Introduction to embedded system, understanding the requirements, constraints and tools associated with the design and implementation of software systems that govern the operation of physical hardware since such systems are often combinations of electrical, mechanical and software components. Specific topics will include microcontrollers and embedded development, communication protocols, data acquisition, actuators, sensors, signal processing, basic control theory and real-time embedded operating systems.
Prerequisite 813403 Microprocessors

814405 Computer Architecture and Organization{3} [3-3]
Principles of computer organization and basic architecture concepts. Detailed design and implementation of the data/control path and arithmetic of CPU, emphasis on performance and cost analysis, register transfer and microoperation, digital logic circuits, digital components, data representative and assembly language. Memory technology, memory hierarchy, memory caching, I/O systems, pipelining technique and introduction to parallel processing.
Prerequisite 813403 Microprocessors

814408 Embedded Systems Lab {1} [1-3]
Basic introduction to microcontroller-based embedded systems development. It includes structured laboratory exercises in the following areas: PIC microcontroller assembly programming, C language programming, peripheral interfacing, interrupt management, structured programming and task scheduling. It also includes simple applications on digital signal processing (DSP), mechanical and electrical sensors and other related topics.
Corequisite 814404 Embedded Systems

814802 Intelligent Systems and Neural Networks {3} [3-3]
Models of artificial neural networks and biological information processing, Feedforward Neural Networks, Feedback Neural Networks, Learning methods, Classification methods, Cellular Neural Networks. Design principles of autonomous agents, agent architectures, machine learning, genetic algorithms, and multi-agent collaboration.
Prerequisite 813801 Data Structures and Algorithms

814803 Data Communication Systems{3} [3-3]
Principles of Data Communications: the Fundamentals of Signaling, Basic Transmission Concepts, Transmission Media, Circuit Control, Line Sharing Techniques; Physical and Data Link Layer Protocols: Error Detection and Correction, Data Compression, Common Carrier Services and Data Networks, and the Mathematical Techniques Used for Network Design and Performance Analysis; Analog and Digital Signaling: Data Encoding and Modulation, Shannon Channel Capacity, Synchronous and Asynchronous Transmission, RS232 physical layer interface standards, FDM, TDM, and STDMP Multiplexing Techniques, Inverse Multiplexing; Analog and
Digital Transmission; V Series Modem Standards: PCM Encoding and T1 Transmission Circuits, data compression algorithms; circuit, message, packet and cell switching techniques; ISDN, Frame Relay, SMDS and ATM Networks, Minimum Spanning Tree, Reliability and Availability. Queuing Analysis Topology Optimization Techniques.

**Prerequisite 813401 Digital Systems**

814601 Computer Networks (1) {3} [3-3]
Definition, uses and classification of computer networks, multiple access methods, layered network structure, OSI and TCP/IP Reference models, network standardization, physical layer, basic definitions related to digital data transmission, RS-232 C interface Functions of data link layer, framing, flow control, error control; HDLC, SLIP and PPP protocols. MAC sub layer, repeaters, bridges, routers, gateways and routing algorithms.

**Prerequisite 814803 Data Communication Systems**

814804 Database Systems {3} [3-3]
Theory and practice of database systems, efficient file access techniques, the relational data model as well as other data models, query languages, database design using entity-relationship diagrams and normalization theory, query optimization, and transaction processing.

**Prerequisite 813801 Data Structure and Computer Algorithms**

815805 Digital Image Processing {3} [3-3]
Image representation, restoration, transformation, classification, compression, enhancement, segmentation, image filters, design, histogram techniques, sampling and quantization, fast fourier transform, image data structures, parallel/distributed processing, illumination models and surface-rendering methods. A number of applications will be presented as case studies.

**Prerequisite 823007**

815406 Microprocessor Systems {3} [3-3]
To continue the study of microprocessor systems with particular emphasis on: Current approaches to hardware and software organization. Real-time systems, design and application. An introduction to signal theory, filtering techniques and control.

**Prerequisite 813403 Microprocessor**

815204 Fuzzy Logic {3} [3-3]
Fuzzy Set Theory and Fuzzy Logics, basic concepts of fuzzy set theory (membership, cardinality, entropy) and set operations (union, intersection, complementation) are described. Fuzzy sets are interpreted in the frame of possibility theory. A brief review of boolean logic and multivalued logic is given. Fuzzy logic operations (and, or, not, implication), fuzzy relations and compositions are then described. Triangular T-norms, conorms, and generalized aggregation operators are also covered.

**Prerequisite 814802 Intelligent Systems and Neural Networks**

815806 Expert System {3} [3-3]
Introduction to knowledge based intelligent systwms, rule based expert systems, uncertainty management in rule based expert systems, fuzzy logic, fuzzy inference. Genetic algorithms, evolution strategies and genetic programming, machine learning, classification, input concepts and output representation, classification, decision tree, rules and regression, types of agents, multi agent interaction/ reaching agreement, MAP applications, semantic web, supervised learning, unsupervised learning.

**Prerequisite 814802 Intelligent Systems and Neural Networks**

813808 Software lab {1} [1-3]
This Lab. introduces the students a software tools and packages to perform certain computer engineering tasks and to improve their skills, such as MATLAB, OPNET, visual programming , ....etc

**Prerequisite 812201 C – language programming**

815203 Operating Systems {3} [3-3]
General Introduction to the Techniques used to Implement Operating Systems and Related Kinds of Systems Software; Process Management: Creation, Synchronization, and Communication;
Processor Scheduling; Deadlock: Prevention, Avoidance, and Recovery; Main Memory Management; Virtual Memory Management: Swapping, Paging, Segmentation and Page- Replacement Algorithms; Control of Disks and other Input/Output Devices; File System Structure and Implementation; Protection and Security; Distributed Systems.

Prerequisite 814405 Computer Architecture and Organization

815604 Computer Networks (2) [3] [3-3]
Prerequisite 814601 Computer Networks (1)

815605 Computer and Network Security (3) [3-3]
Recent advances in computer networks and system security. Fast and secure network systems, secure storage systems, high performance intrusion detection systems, and efficient anti-abuse systems. Basic concepts of computer security and the theory and current practices of authentication, authorization and privacy mechanisms in modern operating systems and networks
Prerequisite 815604 Computer Networks (2)

815608 Computer and Network Security Lab. {1} [1-3]
Contemporary network protocols and experience in using automated tools or other techniques to analyze and evaluate security mechanisms. To understand security properties and requirements, authentication, key establishment, and fairness. Several models and tools used in security analysis and examine their advantages and limitations. Constraint solving, process algebras, protocol logics, probabilistic model checking, game theory, and executable models based on logic programming. Individually or in small teams, students will select a protocol or system to analyze, identify the system and its desired properties in a precise way and use one of the tools or methods covered in the course to perform a security analysis. A set of candidate systems will be given, but students may propose their own. Projects may look at network protocols, or other kinds of systems, such as privacy systems, web security, and trusted computing architectures.
Prerequisite 815604 Computer Networks (2)
Corequisite. 815605 Computer and Network Security

815602 Distributed Sys. and Parallel Processing [3] [3-3]
How to distribute the processing across platforms using remote library services, distribute data and programs to remote machines, take advantage of multiple processors on a single machine and manage remote tasks.
Prerequisite 813403 Microprocessors
Corequisite 815203 Operating Systems

815807 Robotic Engineering (3) [3-3]
Sensor performance and integration, electric and pneumatic actuators, power transmission, materials and static force analysis, controls and programmable embedded computer systems, system integration and robotic applications.
Prerequisite 824702 Control Systems

815205 Computer Graphics [3] [3-3]
Principles of two-dimensional and three-dimensional interactive raster graphics. Principles of scan conversion algorithms for two-dimensional and three-dimensional graphics primitives; data structures and modeling techniques for raster graphics; interaction, visual realism, animation and user interface design; ray tracing, illumination, shading, data storage/retrieval, software engineering and parallel computing for graphics
Prerequisite 813801 Data Structure and Computer Algorithms

815206 Software Engineering {3} [3-3]
Full Cycle of a Software System Development Effort: Including Requirements Definition, System Analysis, Design, Implementation, and Testing; Special Emphasis is Placed on System Analysis
and Design; The Design Phase Includes Development of a User Interface: A Large Term Project Incorporates the Full Software Life Cycle.

**Prerequisite 812201 C – language programming**

**815206 Selected Topics in Computer Engineering {3} [3-3]**

Some Important Skills Necessary to Develop Large Software Products; The Course Would Address Requirements Specification: Process Models, Design, Testing, and a Few Current Topics, with a Special Emphasis on the Roles of Abstraction and Decomposition and their Use through out the Software Life Cycle; Large Modern Software Products: Architectural and Detailed design. Both procedural and object-oriented design would be discussed. UML and Unified process, that have gained wide acceptance would be given due importance with exposure to usage of CASE tools. Testing, quality assurance, and software reliability would be discussed with adequate emphasis.

**815901 Graduation Project (1){1}[1-3]**

Students work in groups to conduct a graduation project in two phases, graduation project I is the first phase which include developing proposal, literature review, problem identification, and data collection.

**Prerequisite: 120 credit hours**

**815903 Graduation Project (2)**

This project completes and implements the work undertaken in project I. After full implementation of the graduation project’s goals, the student must present a comprehensive report he must Presentation his findings to an examination panel.

**Prerequisite 82591 Graduation Project (1)**

**815908 Practical Engineering Training**

A practical experience to be gained through working for eight continuous weeks in accredited establishments.

**Prerequisite Completion of 110 credit hours**