

**Faculty of King Abdullah II School for Information Technology**  
**Department of Computer Science**  
**Study Plan**  
**Master's in Computer Science**  
**(Non-Thesis Track)**

	Serial #	Degree	Dep #	Faculty #	Year	Track
Plan Number			1	19	2015	Non-Thesis

**First: General Rules Conditions:**

1. This plan conforms to the valid regulations of the programs of graduate studies.
2. Specialties of Admission:
  - First Priority: Bachelor of Computer Science (CS)
  - Second Priority: Bachelor of Computer Networks
  - Third Priority: Bachelor of Computer Information Systems (CIS)
  - Fourth Priority: Bachelor of Software Engineering
  - Fifth Priority: Bachelor of Business Information Systems (BIS)/Business Information Technology (BIT)
  - Sixth Priority: Bachelor of Computer Engineering
  - Seventh Priority: Bachelor of specialty within information technology.

**Second: Special Conditions:** None

**Third : Study Plan : Studying (33) Credit Hours as follows:**

**1. Obligatory Courses: (24) Credit Hours:**

Course No.	Course Title	Credit hrs.	Theory	Practical	Pre/Co-requisite
1901710	Research Methodologies in Computer Science	3	3	0	-----
1901715	Theory of Algorithms	3	3	0	-----
1901717	Theory of Computation and Complexity	3	3	0	-----
1901736	Computational Intelligence	3	3	0	-----
1901752	Parallel and Distributed Computing	3	3	0	-----
1901761	Operating Systems	3	3	0	-----
1901765	Computer Networks	3	3	0	-----
1902723	Database Systems	3	3	0	-----

**2. Elective Courses: Studying (9) Credit hours from the following:**

Course No.	Course Title	Credit hrs.	Theory	Practical	Prerequisite
1901713	Formal Compiling Methods	3	3	0	-----
1901718	Evolutionary Algorithms (EA)	3	3	0	-----
1901738	Spatial and Temporal Databases	3	3	0	-----
1901754	Parallel Architecture	3	3	0	-----
1901755	Advanced Methods in Modeling and Simulation	3	3	0	-----
1901757	Image Processing	3	3	0	-----
1901766	Wireless Networks	3	3	0	-----
1901767	Computer Network Security	3	3	0	-----
1901768	Mobile Location Based Services	3	3	0	-----
1901775	Programming Languages Design	3	3	0	-----
1901788	Selected Topics in Computer Science	3	3	0	-----

**3. A comprehensive exam (1901798).**



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**1901710 Research Methodologies in Computer Science** **3<sup>1</sup> Credit Hours**

This course focuses on research methods, research process, use of research tools and techniques, writing and presentation skills to the young researchers. This course is intended to provide the students with a broad overview of methods and concepts (both quantitative and qualitative research). Students should be confident in using the right methods and tools to analyze data. They will also be able to better design their primary research studies as well as to quickly enter and analyze this information.

**1901715 Theory of Algorithms** **3 Credit Hours**

This course provides Strategies of algorithms synthesis and analysis. Design methodologies of classical algorithm categories such as: divide-and-conquer, greedy method, dynamic programming, search and traversal, backtracking, and branch-and-bound. Computational complexity and important theoretical results from lower-and upper-bound studies, NP-hard, and NP-complete problems will be addressed.

**1901717 Theory of Computation and Complexity** **3 Credit Hours**

Finite Automata and Regular Languages, Properties of Finite Automata, Regular Expressions, The Pumping Lemma and Closure Properties; Universal Models of Computation, Encoding Instances, Choosing a Model of Computation, Model Independence, Turing Machines as Enumerators and Acceptors; Computability Theory, Primitive Recursive Functions, Partial Recursive Functions, Arithmetization: Encoding a Turing Machine, Programming Systems, Recursive and R.E. Sets, Rice's Theorem and the Recursion Theorem, Degrees of Unsolvability; Complexity Theory, Reductions, Classes of Complexity, Complete Problems; Some Important NP-Complete Problems, The Complexity of Approximation, Models of Parallel Computation, Communication and Complexity, Interactive Proofs and Probabilistic Proof Checking.

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<sup>1</sup> Theory

### **1901736 Computational Intelligence**

**3 Credit Hours**

This course focuses on artificial intelligence from an agent perspective, and explores issues of knowledge representation and reasoning including heuristic and stochastic search, logical and probabilistic reasoning, planning, learning, and perception. Advanced topics will be selected from areas such as robotics, vision, natural language processing, and philosophy of mind.

### **1901752 Parallel and Distributed Computing**

**3<sup>1</sup> Credit Hours**

The course is centered in three concepts: Architectures, Algorithms and programming. Parallel and Distributed Architectures: Parallel and Distributed computer taxonomy, example of Parallel and Distributed computers, fundamental communication operations, and performance metrics. Parallel algorithms: design and analysis of parallel algorithms with emphasis on sorting, matrix problems, and graph problems. Parallel programming: types of parallelism, parallel programming paradigms, message passing programming, data and parallel programming.

### **1901761 Operating Systems**

**3Credit Hours**

This course provides Distributed operating systems; Synchronization in distributed operating systems; Process Management in distributed operating systems; Distributed file systems; Distributed shared memory; Real-time operating systems; Scheduling in real-time operating systems.

### **1901765 Computer Networks**

**3 Credit Hours**

This course discusses Computer Networks and the Internet, Data Link Layer, Network Layer, Transport Layer Options (Silly Window Syndrome, Delayed ACK , Selective Acknowledgments, Selective Retransmission Request (SRR), Time Stamp, Window Scale); VLANs (Virtual Local Area Networks);Advanced Multimedia-Networking Protocols: Real-time Transmission Protocol (RTP), Real-time Transmission Control Protocol (RTCP), Session Initiation Protocol (SIP); Network-Management Protocols: Simple Network Management protocol (SNMP), Structure of Management Information (SMI), Management Information Base (MIB); Quality of Service (QoS): Integrated Services (Intserv), Resource Reservation protocol (RSVP), Differentiated Service (Diffserv); Asynchronous Transfer Mode (ATM).

### **1902723 Database Systems**

**3 Credit Hours**

Advance data modeling concepts: advance relational data modeling, object oriented data modeling, database design theory, advance relational algebra, database normalization, object oriented database design, advance query languages, advance relational SQL constructs, object oriented query languages, database integrity, concurrency control, concurrency problems, concurrency approaches, database recovery, recovery solutions and approaches, database security.

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<sup>1</sup> Theory

### **1901713 Formal Compiling Methods**

**3 Credit Hours**

This course explores foundation of Compiler design, principles, techniques & tools. Topics include Compilation Phases, Run-time environments, Machine-Independent Optimization, Instruction-Level Parallelism, Optimizing for Parallelism as Locality, Interprocedural analysis.

### **1901718 Evolutionary Algorithms (EA)**

**3<sup>1</sup> Credit Hours**

Evolutionary Algorithms (EA) are stochastic searching algorithms whose search methods are based on natural evolution, Darwinian theories of fighting for survival, genetic inheritance, natural selection and reproduction of best individuals . They provide robust search in complex space, and are computationally simple but powerful for finding optimal solutions in general search spaces. EA consider simultaneously several potential solutions that are treated as individuals to form a population. The individuals interact with each other and create new individuals to form a new generation. The course, introduce the theoretical background of EA, Where the student should be able to build efficient algorithms, and avoiding problems often encountered by EA. The course should enable the students to have several goals: Identify optimization problem the student is dealing with, to decided if the problem can be solved with an EA, To select an appropriate EA,, To make a rough estimation of the effort needed to solve the problem using an EA, And finally, to solve the problem with an EA. Evolutionary algorithms includes: genetic algorithms, genetic programming, grammar evolution...

### **1901738 Spatial and Temporal Databases**

**3 Credit Hours**

This course considers models of spatial databases, how data is structured, stored, indexed, retrieved, and displayed. Other topics include fuzzy spatial databases, temporal databases, multidimensional access methods, query processing, spatio-temporal data management, remotely-sensed data, and spatial data mining.

### **1901754 Parallel Architecture**

**3 Credit Hours**

Study of parallel processing hardware, memory, buses, multi-stage networks. Pipeline, array and associate processor, bus based systems, cross-bar systems, grids, systolic arrays, trees, and data-flow architecture. Processors for parallel architectures, memory structures, cache memory, bus structures. Arbitration and synchronization. Dynamically reconfigurable architecture.

### **1901755 Advanced Methods in Modeling and Simulation**

**3Credit Hours**

Advanced concepts of computer simulation; models for computer simulation; random numbers: Pseudorandom number generation and testing, Monte Carlo methods. distribution functions. Simulation modeling: discrete-event simulation, continuous simulation; verification and validation of simulation models: input analysis, output

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<sup>1</sup> Theory

analysis. Queuing theory models; design codes, test and debug simulation programs. Sample applications.

### **1901757 Image Processing**

**3<sup>1</sup> Credit Hours**

The course provides mathematical foundations and practical techniques for digital manipulation of images, image acquisition, representation, preprocessing, segmentation, and compression. Other topics include multi-resolution image processing, wavelets, morphological image processing, noise reduction and restoration, simple feature extraction and recognition tasks, image registration.

### **1901766 Wireless Networks**

**3<sup>1</sup> Credit Hours**

Wireless Networks: IEEE 802.11(Point Coordination Function and Distributed Coordination Function), WiMAX, Mobile IP; Routing Protocols for Wired and Wireless Networks: Distance Vector Routing Protocol (D.V.), Link State Routing Protocols (L.S.), Ad hoc On demand Distance Vector (AODV), Dynamic Source Routing (DSR); Advanced TCP Protocols: TCP Adaptive Timeout, TCP Adaptively for Wireless Networks: I-TCP, MTCP, Split TCP; Cellular Networks and General Packet Radio Service (GPRS); QoS and Real time applications for wireless networks.

### **1901767 Computer Network Security**

**3 Credit Hours**

Advance topics in Cryptography; Authentication; Integrity; Key Distribution and Certification; Access Control: Firewalls; Attacks and Countermeasures: Mapping, Packet Sniffing, IP Spoofing, Denial-of-Service and Distributed Denial-of-Service Attacks, Hijacking; Security in Many Layers: HTTPS, Secure E-mail, Secure Sockets Layer (SSL) and Transport Layer Security (TLS), IPsec, Security in wireless networks such as IEEE 802.11, Mobile agents security.

### **1901768 Mobile Location Based Services (MLBS)**

**3 Credit Hours**

MLBS applications: usage area, taxonomy, privacy, marketing; The development of MLBS: performance considerations; Navigation systems: spatial database, gateway services, route determination location utility services,...; MLBS and data management: middleware for MLBS protocol, content modeling, update management, linear referencing; MLBS interoperability and standards; MLBS data collection: satellite positioning systems, indoor positioning systems, network-based positioning; MLBS data transmission in Mobile communication systems: cellular-based mobile, wireless local area networks, ad-hoc networking, and service discovery.

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<sup>1</sup> Theory

### **1901775 Programming Languages Design**

**3<sup>1</sup>Credit Hours**

This course discusses advanced principles underlying current programming languages and models. Topics include control and data abstractions, language processing and binding, indeterminacy and delayed evaluation, and languages and models for parallel and distributed processing. A variety of computational paradigms are discussed: functional programming, logic programming, object-oriented programming and data flow programming.

### **1901788 Selected Topics in Computer Science**

**3<sup>1</sup> Credit Hours**

Lectures on and study of selected topics in current research and recent developments in computer science.

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<sup>1</sup> Theory