

1.	School	<b>Engineering</b>
2.	Department	<b>Computer</b>
3.	Program title (Arabic)	ماجستير في هندسة الحاسوب والشبكات
4.	Program title (English)	<b>Master in Computer Engineering and Networks</b>
5.	Track	<b>Thesis Track</b>

	Specialization #	Degree	Dep #	Faculty #	Year	Track
Plan Number	0907	Ms.c	07	09	2019	Thesis

### First: General Rules & Conditions:

1. This plan conforms to the valid regulations of the programs of graduate studies.
2. Specialties of Admission:
  - The First Priority: Bachelor's in Computer Engineering
  - The Second Priority: Bachelor's in Electrical Engineering
  - The Third Priority: Bachelor's in Networks Engineering
  - The Fourth Priority: Bachelor's in Communications Engineering
  - The Fifth Priority: Bachelor's in Electronics Engineering
  - The Sixth Priority: Bachelor's in Mechatronics Engineering
  - The Seventh Priority: Bachelor's in Electrical Power Engineering
  - The Eighth Priority: Bachelor's in Biomedical Engineering
  - The Ninth Priority: Bachelor's in Intelligent Systems Engineering
  - The Tenth Priority: Bachelor's in Networks Security and Engineering
  - The Eleventh Priority: Bachelor's Degrees in Electrical Engineering and Computer Engineering or any Similar/equivalent Degrees

**Second: Special Conditions:** None.

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

1. Obligatory Courses (15) Credit Hours:

Course No.	Course Title	Credit hrs.	Pre-requisite
0907703	Research Methodology	3	-
0907720	Probability and Queuing Theory	3	-
0907721	Network Systems Design	3	-
0907743	Applied Machine Learning	3	-
0907731	Advanced Computer Architecture	3	-

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

Course No.	Course Title	Credit hrs.	Pre-requisite
0907749	Advanced Wireless Networks	3	0907721
0907724	Multimedia Engineering	3	-
0907734	Advanced Parallel Processing	3	0907731
0907735	Advanced Digital System Design	3	-
0907750	Advanced Distributed Systems	3	-
0907748	Advanced Networks and Systems Security	3	-
0907744	Advanced Algorithms	3	-
0907761	Applied Data Science	3	0907743
0907746	Advanced Cloud Computing	3	0907721
0907747	Advanced Digital Image Processing	3	-
0907751	Advanced Topics in Computer Engineering and Networks	3	-
0907752	Computer Vision	3	0907743
0907756	Computational Intelligence	3	0907743

Masters Thesis, 0907799; (9) Credit Hours.

3. Thesis: 0907799 Credit hours (9).

**Advisory Study Plan  
First Year**

First Semester			Second Semester		
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
0907720	Probability and Queuing Theory	3	0907743	Applied Machine Learning	3
0907721	Network Systems Design	3	0907731	Advanced Computer Architecture	3
0907703	Research Methodology	3	0907799	Thesis	3
<b>Total</b>		<b>9</b>	<b>Total</b>		<b>9</b>

**Second Year**

First Semester			Second Semester		
Course Number	Course Title	Credit Hours	Course Number	Course Title	Credit Hours
	Elective course			Elective course	3
	Elective course	3	0907799	Thesis	3
0907799	Thesis	3			3
<b>Total</b>		<b>9</b>	<b>Total</b>		<b>6</b>

## Courses Description

- 0907703 Research Methodology (3 Credit Hours)**  
**Pre-requisite: -**  
Issues in Research Mythologies, Performance Evaluation and Benchmarking. Measurement Tools and techniques, Trace Driven and Execution Driven Simulation. Choice of metrics. Benchmarks. Statistical techniques for Performance Evaluation. Trace Generation and Validation, Synthetic Traces, Verification of Simulators. Design of Experiments. Analytical Modeling of Processors, Statistical modeling, Hybrid Techniques. Workload Characterization. Literature Surveys and Writing Research Papers and Reports.
- 0907720 Probability and Queuing Theory (3 Credit Hours)**  
**Pre-requisite: -**  
Probability and random variables, distributions and density functions, stochastic processes, Markov chains, modeling and analysis of queuing systems with applications in computers and networking where topics include birth-death processes and simple Markovian queues, networks of queues and product form networks, single and multi-server queues, multi-class queuing networks, fluid models, adversarial queuing networks, as well as heavy-traffic theory and diffusion approximations.
- 0907721 Network Systems Design (3 Credit Hours)**  
**Pre-requisite: -**  
This course gives a broad view of the current state of computer networking research. Topics include: Internet architecture; Internet routing: the Border Gateway Protocol (BGP), routing characterization, routing security, Internet AS relationships, traffic engineering, end host congestion control; quality-of-service, network security: intrusion detection systems, worms, and honey pots; mobile and wireless networking; peer to peer and overlay networking; content distribution networks; sensor networks; critical network infrastructure services: Domain Name Server (DNS), mail servers, etc.; network measurement: distance estimation, bandwidth measurement, trouble shooting tools; network management.
- 0907722 Advanced Networks and Systems Security (3 Credit Hours)**  
**Pre-requisite: -**  
Review of Computer Networks. Number Theory and Field Arithmetic. Sources of Network Threats. Data Encryption: Cryptography and

Ciphering. Risk Management. Key Management. Protocols and Algorithms of Security Systems. Email and Web Security and Firewalls. Performance Evaluation of Security Systems.

**0907749 Advanced Wireless Networks (3 Credit Hours)**

**Pre-requisite: 0907721**

Introduction to wireless networks: physical layer, MAC and IEEE 802.11, HIPERLAN, Bluetooth, channel assignment and channel hopping, power control and rate control, multi-radio, network layer, mobile IP, and naming, routing in mobile networks, transport protocol in wireless networks; types of wireless networks: wireless mesh networks, sensor networks, cellular networks, delay tolerant networks, RFID and WiMax; wireless network management and security: localization, network usage studies, network diagnosis, network security.

**0907724 Multimedia Engineering (3 Credit Hours)**

**Pre-requisite: -**

Signal processing concepts exploited in the field of multimedia applications, issues in multimedia applications design, multimedia data processing and representations, multimedia compression standards (text, image, video and audio), multimedia content representation, content-based multimedia retrieval, watermarking techniques and security, multimedia network communications.

**0907731 Advanced Computer Architecture (3 Credit Hours)**

**Pre-requisite: -**

Review of computer design principles, processor design, RISC processors, pipelining, and memory hierarchy. Instruction level parallelism (ILP), dynamic scheduling, multiple issue, speculative execution, and branch prediction. Limits on ILP and software approaches to exploit more ILP. VLIW and EPIC approaches. Thread-level parallelism, multiprocessors, chip multiprocessors, and multi-threading. Cache coherence and memory consistency. Advanced memory hierarchy design, cache and memory optimizations, and memory technologies. Advanced topics in storage systems. Designing and evaluating I/O systems.

**0907734 Advanced Parallel Processing (3 Credit Hours)**

**Pre-requisite: 0907731**

Architectures for explicit parallelism. Multithreaded processors, small- and large-scale multiprocessor systems. Shared-memory

coherence and consistency. Graphics processing units. Effect of architecture on communication latency, bandwidth, and overhead. Latency tolerance techniques. Interconnection networks. The development of programs for parallel computers. Basic concepts such as speedup, load balancing, latency, system taxonomies. Design of algorithms for idealized models. Programming on parallel systems such as shared or distributed memory machines, networks. Grid Computing. Performance analysis. Case studies.

**0907735 Advanced Digital System Design (3 Credit Hours)**

**Pre-requisite: -**

Multi-Level Combinational Design, Programmable Logic Synthesis, Arithmetic Circuits, Sequential System Design, Finite State Machine Optimization, Analysis of Asynchronous Sequential Systems, Asynchronous Sequential System Design, Multi-Valued Logic Synthesis, Multi-Valued System Optimization, Regular Digital System Design, Static and Dynamic Hazards, Testing Techniques for Modern Digital Systems, Design-For-Testability

**0907741 Advanced Distributed Systems (3 Credit Hours)**

**Pre-requisite: -**

Introduction to Distributed Systems, Distributed Operating Systems, Processes and Inter-process Communication (IPC), Distributed File Systems, Remote Procedure Calls (RPC), Security Models, Distributed Architectures and Technologies, Middleware, Object Based Distributed Systems, Messaging and Message Oriented Systems, Agent-Based Systems, Distributed Application Project.

**0907743 Applied Machine Learning (3 Credit Hours)**

**Pre-requisite: -**

This graduate course concentrates on the application of state-of-the-art machine learning (ML) algorithms for solving real-world problems. This course starts with reviewing the Python programming language and its important related packages. The covered topics include data preparation, training, evaluation, various evaluation metrics, supervised learning (regression, classification, neural networks, deep learning, convolutional neural networks, and recurrent neural networks), basics of unsupervised and reinforcement learning, and recommender systems. This course has practical assignments and term project.

- 0907744**      **Advanced Algorithms**      **(3 Credit Hours)**  
**Pre-requisite: -**  
Emphasis will be placed on fundamental algorithms and advanced methods of algorithmic design, analysis, and implementation. Techniques to be covered include network flows, linear programming, Integer linear programming, NP-completeness, solving NP-complete problems using approximate and heuristic approaches, and dynamic programming.
- 0907745**      **Applied Data Science**      **(3 Credit Hours)**  
**Pre-requisite: 0907743**  
Definitions and applications; Market trends; Data analytics lifecycle; Data exploration and pre-processing; Data visualization; Theory, tools and methods; Introduction to Big data management, warehousing and processing. This course has practical assignments and term project.
- 0907746**      **Advanced Cloud Computing**      **(3 Credit Hours)**  
**Pre-requisite: 0907721**  
Cloud computing models, techniques, and architectures, distributed computing models and technologies, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), virtualization, security and privacy issues, performance and systems issues, capacity planning, disaster recovery, Cloud OS, federated clouds, challenges in implementing clouds, data centers, cloud hosted applications, and other advanced and research topics in cloud computing.
- 0907747**      **Advanced Digital Image Processing**      **(3 Credit Hours)**  
**Pre-requisite: -**  
Introduction to digital image processing techniques for enhancement, compression, restoration, reconstruction, and analysis, 2-D signals and systems, image analysis, image segmentation, achromatic vision, color image processing, color imaging systems, medical imaging, image sharpening, interpolation, decimation, linear and nonlinear filtering, camera modeling, stereo vision, pose calculation, object recognition, optical flows, visual tracking, color vision, and beginning concepts of computational geometry.

**0907751 Advanced Topics in Computer Engineering and Networks (3 Credit Hours)**

**Pre-requisite: -**

Topics of special interest in current computer engineering and networks issues. The course description is specified by the department at every course offering.

**0907756 Computational Intelligence (3 Credit Hours)**

**Pre-requisite: 0907743**

The course discusses the fundamentals and advances of soft computing-based design approaches using tools such as fuzzy logic, neural networks, evolutionary computing, and swarm intelligence. These tools could be useful in many areas such as information retrieval, smart grid control, driverless cars, intelligent transportation, intelligent mechatronics, optimization, communication, robotics, and manufacturing. The course involves tutorials on implementation of the major algorithms taught in class as applied to examples of real-world systems

**0907752 Computer Vision (3 Credit Hours)**

**Pre-requisite: 0907743**

Introduction to computer vision including fundamentals of computer vision at the low, medium and high levels. Topics include image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, video processing, deep-learning algorithms for image classification, object recognition, object detection and scene understanding. The course focuses on the practical aspects and implementation of these topics through homework assignments and term project.