Faculty of Computer Science and Informatics

Computer Science Department

Study Plan of MSc Degree in

Computer Science - Thesis Track

Academic Year: 2021/2022

Department Vision

Distinction in teaching, learning, scientific research and community service in the field of computer science.

Department Mission

Providing quality and advanced research program in the field of computer science and its applications to prepare graduates equipped with knowledge and research skills necessary to meet the growing market requirements and lifelong learning.

Department Objectives

1. Providing students with diverse knowledge in the light of the rapid change in the software industry and computing.
2. Providing students with in-depth research competencies in the subject of computer science as a basis for postgraduate studies.
3. Providing students with analytical knowledge and skills to find effective and creative solutions for practical and research problems.
4. Honing specialists equipped with necessary knowledge to make changes, innovation and enhancement in the fields of computer science.

Learning Outcomes

The expected outcomes of this program are preparing graduates competent in:

1. Applying knowledge, mathematical methods and algorithm in computer aspects.
2. Analyzing, designing, implementing and evaluating computing and simulation systems.
3. Realizing computing impacts and technological development on individuals, organizations and societies.
4. Using methods of analysis and problem solving.
5. Using the appropriate techniques and tools in conducting researches.

Contents of the Study Plan

The MSc's degree program in Computer Science consists of (33) credit hours with two tracks distributed as follows:

Track	Requirement Type	Credited Hours
Thesis	Core Requirements	15
	Elective Requirements	9
	Thesis	9
Total		**33**

University Coding System

4						
College Code	**Department Code**	**Knowledg Area**	**Course Level**		**Course Sequance**	
			Year	**Term**		
Faculty of Computer Science and Informatics	1 MSc CS 2 CIS 3 SE 4 MC	1,....,6			In the Area	

Knowledge Areas

Area Code	Knowledge Area
1	Research
2	Computer Systems
3	Computer Networks
4	Information Science and Applications
5	Software Engineering
6	Artificial Intelligence

Thesis Track

First: Core Requirements: 15 Credit Hours

Course Code	Course Name	Credit Hours
40110701	Statistics and Research Methodology in Computer Science	3
40120701	Advanced Operating Systems	3
40130701	Advanced Computer Networks	3
40140701	Advanced Database and Data Warehouse Systems	3
40120702	Advanced Algorithms	3
Total		**15**

Second: Elective Requirements: 9 Credit Hours

Course Code	Course Name	Credit Hours
40150701	Advanced software engineering	3
40140702	Advanced Information Security and Cryptography	3
40140703	Advanced Information Retrieval	3
40160701	Advanced Artificial Intelligence	3
40160702	Advanced Image Processing	3
40160703	Advanced Natural Language Processing	3
40110704	Selected Topics in Computer Science	3
40130702	Cloud Computing and Big Data	3

Third: Program Requirements: 9 Credit Hours
The student prepares a thesis of (9) credit hours after successfully studying the required courses.

Courses Descriptions

40110701 Statistics and Research Methodology in Computer Science (3 Credit Hours, Prerequisite: -)
Providing experiences using the tools and techniques for doing research in Computer Science. Subjects include aspects of research from developing a project proposal to various forms of dissemination. Emphasizes communication skills, creative thinking, problem-solving, and integration of knowledge from prior computer science courses. Includes a study of computer science research tools, principles of experiment design, and statistics. There will be a semester-long project in which, student will select a research problem, review relevant literature, produce a report, and present the results of their research to their peers.

40120701 Advanced Operating Systems (3 Credit Hours, Prerequisite: -)
Operating Systems Theoretical and practical aspects of operating systems. Process and thread communication and synchronization. File systems, disk management, I/O systems, protection and security systems, distributed system, real-time systems, mobile operating systems, current trends in operating systems, the course includes complete a research or project by the students.

40130701 Advanced Computer Networks (3 Credit Hours, Prerequisite: -)
The course covers the principles of computer networking with emphasis on algorithms, protocols, and implementation aspects of advanced networking services. The topics covered in this course include the design of the Internet and its basic mechanisms and protocols in addition to selected advanced recent topics of research in networking such as routing, congestion control, wireless and mobile networks, and performance analysis of computer networks, the course includes complete a research or project by the students.

40140701 Advanced Database and Data Warehouse Systems (3 Credit Hours, Prerequisite: -)

The course describes the basic concepts, which underpin the technology of database systems. The main areas covered are Database System Architecture, database design, Entity relationship Model, Normalization of database tables, an Introduction to SQL (Standard Query Language), SQL Queries, Distributed Systems, and the Internal Management and Control of database Systems. The Course introduces the data Warehouse and how it may serve as the foundation for decision support activities. We explore several approaches to the implementation of decision support systems, online processing (OLAP) using relational DBMS and multidimensional database. Given the existence of the data warehouse, data mining system provide automated tools to perform data extraction and data analysis, also covers in this course, the course includes complete a research or project by the students.

40150701 Advanced Software Engineering (3 Credit Hours, Prerequisite: -)

This course includes advanced principles and practices in software engineering: exploring evolutionary software development, software prototyping, object-oriented analysis and design, software system architectures, software project management, software testing, software metrics and measurement, software quality assurance, software reuse, software maintenance, reverse engineering, and computer-aided software engineering, the course includes complete a research or project by the students.

40120702 Advanced Algorithms (3 Credit Hours, Prerequisite: -)

The course introduces advanced techniques for design and analysis of algorithms and focuses on the range of algorithms available for computational tasks, considering the fundamental division of tractable tasks, with linear or polynomial-time algorithms; Algorithmic techniques such as (greedy, divide-and-conquer, dynamic programming, graph traversal, backtracking, and branch-and-bound); applications include sorting and searching, graph algorithms, and optimization. Concept of algorithm correctness, NP-Complete theory.

40140702 Information Security and Cryptography (3 Credit Hours, Prerequisite:-)

The course gives a comprehensive study of the principles and practices of computer system security including operating system security, network security, software security and web security. Topics include common attacking techniques such as virus, trojan, worms and memory exploits; the formalisms of information security such as the access control and information flow theory; the common security policies such as BLP and Biba model; the basic cryptography, RSA, cryptographic hash function, and password system; and real system implementations; intrusion detection; software security theory; web security; legal and ethical issues in computer security, the course includes complete a research or project by the students.

40140703 Information Retrieval (3 Credit Hours, Prerequisite: -)

This course will discuss theory and practice of searching and retrieval of text and bibliographic information. Topics covered include: automated indexing, statistical and linguistic models, text classification, Boolean and probabilistic approaches to indexing, query formulation and output ranking, information routing and filtering, topic detection and tracking, as well as measures of retrieval effectiveness, including relevance, utility, miss/falsealarm. Techniques for enhancing retrieval effectiveness including relevance feedback, query reformulation, thesauri, concept extraction, and automated summarization. The course includes complete a research or project by the students.

40160701 Advanced Artificial Intelligence (3 Credit Hours, Prerequisite: -)

The main aim of this course is to learn the basic AI techniques, the problems for which they are applicable and their limitations. The concept of AI is to describe and build agents that receive precepts from the environment and perform actions. Topics covered include search (solving puzzles, playing games), planning, logical inference (drawing conclusions from data), expert systems, natural language processing and machine learning. We explain the role of learning as extending the reach of the designer into unknown environments, and show how it constrains agent design, favoring explicit knowledge representation and reasoning, the course includes complete a research or project by the students.

40160702 Advanced Image processing (3 Credit Hours, Prerequisite: -)

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, the course includes complete a research or project by the students.

40160703 Natural Language Processing (3 Credit Hours, Prerequisite: -)

This course offers an overview of natural language processing (NLP) and natural language understanding (NLU) for educational practitioners, leaders, and researchers. This class introduces analysis of and analytical tools for research work with unstructured data such as student writing, responses to learner surveys, interview data, or audio and video recordings in an educational setting. Topics will include an overview of How to collect unstructured data in an educational environment for research purposes; How to use NLP software to analyze a sample, unstructured data set; Operational applications of Natural Language Processing (NLP) and Natural Language Understanding (NLU) , the course includes complete a research or project by the students.

40110703 Graduation Project (3 Credit Hours, Prerequisite: -)

The purpose of this course is to prepare graduate students in computer science to write a research paper. This course should demonstrate the student's ability to do independent work in reviewing the relevant literature, identifying a problem in a research area, organizing existing concepts, suggesting and developing new approaches to solving the problem and reporting the results. In addition, students should be expected to develop their skills and abilities in oral presentation.

40130702 Cloud Computing and Big Data (3 Credit Hours, Prerequisite: -)

The aims of this course are to show how cloud computing and big data techniques can be used to solve massive scale problems. The course will aim to introduce students to both the theoretical background of cloud computing as well as the practical applications. The processing of large datasets using Big Data techniques, map-reduce and other techniques will be a large focus. In addition the course will cover approaches to building applications and managing them on the cloud.

40110704 Special Topics in Computer Science (3 Credit Hours, Prerequisite: -)

The aim of this course is to study advanced topics and techniques in merging of different topics of computer science, the course includes complete a research or project by the students.