

The University of Jordan

Accreditation & Quality Assurance Center

Curriculum for Doctorate Degree

1.	Faculty	King Abdullah II School for Information Technology
2.	Department	Computer Science
3.	Program title (Arabic)	الدكتوراة في علم الحاسوب
4.	Program title (English)	Doctor of Philosophy in Computer Science

	Serial #	Degree	Dep #	Faculty #	Year	Track
Plan Number	1	PhD	11	19	2015	Thesis

First: General Rules & Conditions:

1. This plan conforms to valid regulations of the programs of graduate studies.
2. Specialties of Admission:
 - The First Priority: MA in Computer Science.
 - The Second Priority: MA in Computer Information Systems.
 - The Third Priority: MA in Software Engineering.
 - The Fourth Priority: MA in Computer Networking.
 - The Fifth Priority: MA in Web Intelligence.
 - The Sixth Priority: MA in Computer Engineering.
 - The Seventh Priority: MA in Communication Engineering.

Second: Special Conditions:

The Supervisory Committee of the PhD program has the rights to determine a set of special conditions for admission to the program where these conditions do not conflict with the general framework of admission and include the following:

First: These special conditions are considered for admission to the doctoral program in computer science and they represent an integral part of the total requirements for student competitive admission and they are complementary to the general conditions and instructions determined by the Ministry of Higher Education and Scientific Research and the College of Graduate Studies at the University of Jordan. These conditions include:

- A. Teaching and course offering in the program is applicable to the rules of the university of Jordan during the working hours of the University.

- B. It is required that a PhD student has to be available in his office and in the research labs for at least (9-12) hours per week for each course (3 credit hours) to do research, conducting experiments, downloading research papers, investigating new research topics and helping his advisor as well as other faculty members in all aspects of research.**
- C. Passing the general acceptance exam in computer science with a score not less than 70%**
1. After the PhD committee has received the applications for all candidates from the Graduate School, students will set for a general exam in the core fields of knowledge in computer science. Announcements for the exam will be made directly after the closing date for applications and will be made through the official website of the University of Jordan, the College of Graduate Studies and the Faculty of King Abdullah II School for information technology.
 2. Only students who pass the exam with a score **not less than** 70% will be considered for a short presentation and allowed to proceed for completing their admission requirements to the program.
 3. If the student fails the exam or he was absent on the day of the exam he will be excluded from the competition and his application will be rejected.
- D. Passing a short presentation in a research area with a score not less than 70%**
1. A student who pass the exam will be asked to prepare for a short presentation in a research area of his choice to be delivered in front of the supervising committee of the PhD program. The date of the presentations will be announced on the official website of the University of Jordan and the College of Graduate Studies and King Abdullah II School for Information Technology .
 2. If a student did not deliver the presentation he/she will be excluded from the competition and his application will be rejected.
- E. The score of parts (C+D) above are calculated out of 20 points (10 points for each part) and the result is used along with the policies followed by the graduate college to prepare the final acceptance list.**

Second: The supervising committee of the PhD program is responsible for preparing the forms and the results and submit the final results to the Graduate College to be announced for the students.

Third: Study Plan: This program has (54) credit hours as follows: it is required that a PhD student has to be available in his office and in the research labs for at least (9-12) hours per week for each course (3 credit hours) to do research, conducting experiments, downloading research papers, investigating new research topics and helping his advisor as well as other faculty members in all aspects of teaching and research.

1. Obligatory Courses (21) credit hours:

Course Number	Course Name	Credit Hours	Prerequisite
١٩٠١٩٠٠	Research Methodologies in Computer Science	٣	-
١٩٠١٩٠٢	Computer Algorithms	٣	-
١٩٠١٩٠٤	Operating Systems & Distributed Systems	٣	-
١٩٠١٩٠٦	Computer Networks	٣	-
١٩٠٢٩١٠	Software Engineering	٣	-
١٩٠٢٩١٢	Databases	٣	-
١٩٠٢٩١٤	Artificial Intelligence	٣	-

2. Elective Courses (15) credit hours:

Course Number	Course Name	Credit Hours	Prerequisite
1901907	Mobile Computing	٣	-
1901908	Network Systems Security	٣	-
1901913	Computer Architecture	٣	-
1902915	Data Mining	3	-
1902916	Machine Learning	3	-
1901917	Theory of Computation	٣	-
1902918	Natural Language Processing	3	-
1901920	Image Processing	٣	-
1901925	Parallel Processing	٣	-
1901928	Modeling and Simulation	٣	-

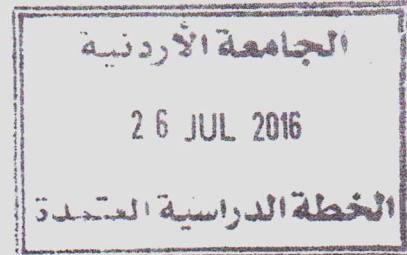
1902930	Digital Media	3	-
1901935	Information Visualization	3	-
1902960	Special Topics	3	-

3. Qualifying Exam

Course Number	Course Name	Perquisite
1901998	Qualifying Exam	Passing 21 credit hours of obligatory courses

4. PhD Thesis (18 credit hours)

Course Number	Course Name	Perquisite
1901999	PhD Thesis	Passing 1901998



Faculty of King Abdullah II School for Information Technology
Department of Computer Science
Doctor of Philosophy in Computer Science
(Thesis Track)

Course Description :

1. Obligatory Courses (21) credit hours:

1901900 Research Methodologies in Computer Science (3)

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.

1901902 Computer Algorithms (3)

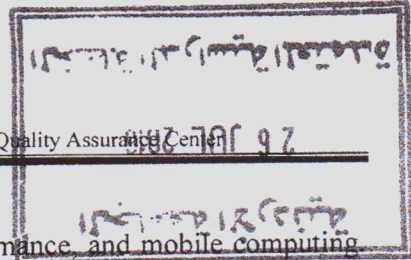
This is an advanced graduate level course on algorithms, with the emphasis on computational problems that are central to both theory and practice, and on developing techniques for the design and the rigorous analysis of algorithms and data structures for such problems. It discusses topics such as network flows (max flow and min-cost flow/circulation), data structures (Fibonacci heaps, splay trees, dynamic trees), linear programming (structural results, algorithms), dealing with intractability, approximation algorithms, dealing with large data sets and computational geometry.

1901904 Operating Systems & Distributed Systems (3)

Students will study advanced operating system topics and be exposed to recent developments in operating systems research. In addition to being conversant in classic and recent research papers, this course aims to teach students to read research papers critically, formulate new research questions, and evaluate these questions experimentally. A study of specific topics of modern distributed and real-time systems, the theory behind them, and their implementation. Topics may include advanced concepts in distributed systems, wireless sensor networks, resource management in multi core and in distributed systems, and memory management, protection and security.

1901906 Computer Networks (3)

This course explores advanced topics in computer networks, focusing on fundamental research being conducted to improve the Internet. Topics include Large-Scale Dynamics of the Internet, Network Protocols and Security, Network Interface Design, Switching Networks, Wireless Ad



Hoc Networks, Network traffic measurement, Web server performance, and mobile computing. Emphasis will be placed on network performance issues for next-generation Internet protocols and applications.

1902910 Software Engineering (3)

This course discusses high-level, up-to-date topics in software engineering including new methods, models, and theories. It includes advanced topics in software engineering, such as fault-tolerant software, software architecture, software patterns, multi-media software and knowledge-based approaches to software engineering. Investigation and application of agile software development practices will be discussed too. The course also includes a number of case studies. Papers from the current literature will be discussed and student participation in a seminar style format may be expected.

1902912 Databases (3)

Foundations of database applications and database systems, plus some advanced topics in data management systems will be introduced. Distributed database systems; topics covered include: architecture, data design, query processing, transaction management, multi databases, web-based data management, cloud computing and data management, object-oriented databases and advanced system issues. Papers from the current literature will be discussed and student participation in a seminar style format may be expected.

1902914 Artificial Intelligence (3)

This course covers selected topics from: advanced pattern recognition, neural networks, expert systems and fuzzy systems, evolutionary computing, learning theory, constraint processing, logic programming, probabilistic reasoning, inductive inference, decision-making under uncertainty, reinforcement learning, intelligent agents, information theory. Papers from the current literature will be discussed and student participation in a seminar style format may be expected.

2. Elective Courses (15) credit hours from the following courses

1901907 Mobile Computing (3)

Understanding and building systems support mechanisms for mobile computing systems including client-server web/database/file systems, and routing in mobile ad hoc and sensor networks for achieving the goal of anytime, anywhere computing in wireless mobile environments. Mobility and service management, data management and security issues in mobile

computing environments. Presentations of research papers and survey articles selected from recent conferences and journals will be discussed.

1901908 Network Systems Security (3)

Topics discussed in this course include: attacks on networked systems, tools and techniques for detection and protection against attacks including firewalls and intrusion detection and protection systems, authentication and identification in distributed systems, cryptographic protocols for IP networks, security protocols for emerging networks and technologies, privacy enhancing communication. Legal and ethical issues will be introduced as necessary. Research papers of high impact published recently in the literature will be provided as reading assignments.

1901913 Computer Architecture (3)

Memory-system design, advanced pipeline structures, instruction-level parallelism, compiler-assisted optimization, multi-processor architecture, interconnection network, advances storage systems. Within each topic, the emphasis is on quantitative evaluation and fundamental issues, e.g., data and control dependence, memory bandwidth, reliability, and coherence of distributed storage.

1902915 Data Mining (3)

The goal of the course is to study the main methods used today for data mining and on-line analytical processing. Topics include Data Mining Architecture; Data Preprocessing; Mining Association Rules; Classification; Clustering; On-Line Analytical Processing (OLAP); Data Mining Systems and Languages; Advanced Data Mining (Web, Spatial, and Temporal data). Presentations of research papers and survey articles selected from recent conferences and journals will be discussed.

1902916 Machine Learning (3)

This is an advanced machine learning course which will be giving in-depth coverage of currently active research areas in machine learning. The course will connect to open research questions in machine learning, giving starting points for future work. Presentations of research papers and survey articles selected from recent conferences and journals will be discussed.

1901917 Theory of Computation (3)

This course discusses topics in finite automata, regular languages, regular grammars, and applications. Push down automata, trees, context-free grammars, and applications. Turing machines. Introduction to computability and complexity theory as well. Research papers of high impact published recently in the literature will be provided as reading assignments.

1902918 Natural Language Processing (3)

This course is designed to introduce students to the fundamental concepts and ideas in natural language processing (NLP), and to get them up to speed with current research in the area. It covers syntactic, semantic and discourse processing models, emphasizing machine learning or corpus-based methods and algorithms. It also covers applications of these methods and models in syntactic parsing, information extraction, statistical machine translation, dialogue systems, and summarization. Research papers of high impact published recently in the literature will be provided as reading assignments.

1901920 Image Processing

Advanced topics including but not limited to computational, mathematical, multi-scale, and spatial statistical methods for multi-dimensional signal processing, multi-spectral imagery, image and video processing. Papers from the current literature will be discussed and student participation in a seminar style format may be expected.

1901925 Parallel Processing (3)

This course examines the advances of sequential computers for gaining speed and application of these techniques to high-speed supercomputers of today. Programming methodologies of distributed and shared memory multiprocessors, vector processors and systolic arrays are compared. Performance analysis methods for architectures and programs are described. Research papers of high impact published recently in the literature will be provided as reading assignments.

1901928 Modeling and Simulation (3)

The course covers both theory and application of computer modeling and simulation, with focus on discrete event system modeling and simulation. It includes basic systems modeling concepts and in-depth discussions of modeling elements, simulation protocols, and their relationships. In-class exposition of modeling and simulation techniques will be illustrated by relevant examples. Possible application domains of this course are numerous, including communication, manufacturing, social/biological systems, and business, to name a few. Selected advanced concepts and practices will also be presented to support students' interests.

1902930 Digital Media (3)

This course presents novel research and academic topics related to the theory and practice of the science of digital media. These topics are, mainly, associated with the representation (encoding/decoding) and the processing of digital media components such as audio, graphics, images and video. The course will include a detailed discussion of the latest research in the field of digital signal encoding, decoding, transmission, and processing. Topics related to digital media compression including JPEG, GIF, H.263, MPEG video, MPEG Audio, and Dolby Audio,

noise reduction through averaging, filtering, convolution, etc. will be explained. The course will also highlight the concept of MIDI audio including MIDI control of audio synthesis. In addition, Issues associated with Multimedia networks and communication such as frameworks for media authoring, integration, interchange and transmission will be expressed.

1901935 Information Visualization (3)

This course discusses the theory and development of interactive visual representations of abstract data for the purpose of amplifying cognition. Topics covered can include representational issues, perceptual issues, visual literacy, spatial abstraction, and interaction issues. Research papers of high impact published recently in the literature will be provided as reading assignments.

1902960 Special Topics (3)

Topics vary from one semester to the other and will be announced prior to registration.

3. Qualifying Exam

1901998 Qualifying Exam

The qualifying examination is a requirement for advancement to candidacy. Prior to taking the qualifying examination a student must have satisfied the departmental competency, course and research exam requirements. The examination is administered by a doctoral committee appointed by the PhD steering committee. The examination is taken after the student finished and passed all the obligatory courses.

4. PhD Thesis

1901999 PhD Thesis (18) (Perquisite (passing (1901998)))

The Thesis defense is the final PhD examination. A candidate for the PhD is expected to write a Thesis and defend it in an oral examination conducted by the PhD steering committee.