

Ministry of Education
King Saud University (KSU)
Deanship of Graduate Studies



College of Computer and
Information Sciences
Department of Information
technology

Master of Science in Information Technology

(Thesis Option / Non-thesis Option)

1445 AH

2023 G

● Introduction

The Department of Information Technology (IT) is one of the five departments in College of Computer and Information Sciences. Department of IT is the first purely female department (students and faculty members) in the kingdom of Saudi Arabia. Since the department's inception in 1408, it has launched as Computer Application Department, and hence changed to the current name Department of Information technology in 1425. Number of students in the department exceeds 700 students, and the total number of graduates from the Bachelors in Information Technology program since its inception in 1408 is 2276 graduates. In addition, the department hosts a number of academia's elite in a range of IT fields and introduce academic and research best practices.

In light of the ever changing and merging between computing fields, Information Technology became a vital and multidisciplinary specialization that can be unique in both research and academia. Information Technology forms the infrastructure of business, government, and academia; it is the enabler of the information age. Information Technology as a discipline has been recognized by ACM (Association for Computing Machinery) and IEEE (Institute of Electrical and Electronics Engineers) as a peer in the menu of academic computing disciplines. In addition, and inspired by today's world dependents on Information Technology and its applications, these are, and will continue to be the driving force of every industry in the world. The program provides in-depth exposure to various Information Technology specializations. Students will develop deep theoretical and practical knowledge and skills in specific areas so that they will have the intellectual and conceptual experience to play leading roles in the development of the information technology industry; including a number of core and elective courses in the areas of advanced web technologies and applications, advanced networks security, cloud computing and mobile

computing, big data analytics, semantic and social web, usability and user experience, eBusiness, government, eLearning, multimedia applications, data mining, natural language processing, advanced IT project management.

The M.Sc. in IT program is a unique opportunity to equip the graduates with the advanced skills in identifying the up-to-date real-world problems, designing of technological information solutions, developing the appropriate solutions in the fields of business, health, education, research and communications fields. The program provides the rich environment for students to get experience and learn from highly skilled IT specialists in both academia and research. This would in turn reflect on the IT graduates job performance for those who are already employed and to find better job opportunities for those who are no employed.

The MSc in Information Technology was launched in 1435, and more than 130 female students have graduated from the department by the end of this year. IT MSc students' have recorded effective research participation in conferences and indexed scientific journals with distinguished research papers. In addition, IT MSc students participated in the college post graduate research competition for two years as they won best paper and best project prizes over two years.

- **Degree's Name:**

- ❖ Master of Science in Information Technology.

- **Program Language of Instruction:**

- ❖ English.

- **Significance and Justifications of Program Modification**

1. Due to the rapid growth and development in the kingdom in the fields of smart applications (including the mobile computing, cloud computing, smart cities and infrastructure) this program aims at providing skillful graduates to local industries who attests to the need of IT professionals in the fields of smart cities, mobile technologies, cloud computing technologies
2. The program offers a unique opportunity to enhance knowledge economy and create educational opportunities in recent advances in information technologies to produce graduates who equipped with knowledge and able to contribute to the world of smart cities and areas of cloud computing technologies, mobile technologies. This would in turn enrich IT graduates qualifications to enhance their career development and progress with the new industrial and market needs.
3. The program supports and enhances the research activities in the IT discipline and encourage scientific contribution to the local and global community in the fields of Mobile, Cloud computing and smart cities.
4. The program enforces the research and social partnerships with community institutions and business and companies through community services.

- **Program's Vision**

Preparing highly qualified IT leaders who will be nationally and internationally recognized in Information Technology industry, research and community services.

- **Program's Mission**

Our mission is to foster an innovative educational atmosphere, focusing on the development of unique skills, deep scientific comprehension, practical experience, and robust research abilities in graduates. Our Master of Science program aims to enable impactful local and global IT solutions.

- **Program Objectives**

1. Provide students with in-depth knowledge and practical skills in core technical areas of information technology.
2. Enhance student's ability to identify suitable solutions to complex technological challenges and apply critical thinking.
3. Equip students with advanced research skills to promote growth of knowledge in the field of information technology.
4. Encourage students to foster innovation in the field of information technology by exploring new approaches and emerging technologies.
5. Introduce graduates to the community with advanced IT standards, communication skills and ethical values.

- **Program's Outcomes**

A. Knowledge and Understanding:

The graduate student at this level will have:

- ❖ In depth and specialized body of knowledge and understanding covering theories, principles, and concepts in main areas of a discipline, profession, or field of work
- ❖ Advanced knowledge and understanding of recent developments in one or more disciplines, areas of practice, or professions.

B. Skills:

The graduate student at this level will have a range of advanced and specialized cognitive and communication skills to:

- ❖ Analyze a problem, identify requirements and design appropriate IT solution, and provide appropriate justification for the solutions and design
- ❖ Evaluate and explain findings of the developed systems/solutions.
- ❖ Communicate effectively in oral and in writing to both technical and general audiences.

C. Values, Autonomy and Responsibility

- ❖ Recognize the importance of standards of academic and professional integrity.
- ❖ Effectively collaborate and participate in research or professional projects or groups, undertake leadership roles, and take high responsibility of the work.

• Program Beneficiaries:

1. Health Sector
2. Research Centers
3. Industrial Sector
4. Commercial Sector
5. Telecommunication Sector
6. Private companies that work on smart technologies and smart cities applications such as Elm.

- **Employment Opportunities Available:**

The department conducted a study; early 2017, on the market new required skills in the IT sector and this study deduced that the IT graduates are required in the following job opportunities:

- ❖ Supervisory positions on IT (Manger/Director).
- ❖ Systems Analysts & Designers
- ❖ Programmers and Senior programmers
- ❖ Software engineers in the fields of smart applications: smart cities applications, smart cloud computing.
- ❖ Database administrator for serving the cloud computing applications and smart devices
- ❖ Computer Networks operators and Network Administrator
- ❖ Experts in bioinformatics and e-Government, e-learning systems for training in large organizations
- ❖ Web designers and Web and Multimedia developer
- ❖ Security assurance engineers (smarty security applications developers, System and Network Penetration Tester, Breakthroughs system and network Detectives, security analysts, software security guards, Vulnerability Researcher.

- **Admission Requirements**

In addition to the admission requirements mentioned in the unified regulations for graduate studies in Saudi universities and the organizational and executive rules and procedures for postgraduate studies at King Saud University, the department requires the following to enroll in the program:

1. Applicant must have a bachelor's degree in information technology, information systems, software engineering, computer science, computer

engineering or specializations from college: engineering, architecture and planning, science, management from King Saud University or an accredited university.

2. Applicant must hold a bachelor's degree with a minimum of a Very Good" GPA or "3.25/5" or equivalent
3. A score of at least (4) in the IELTS test or equivalent
4. A score of at least (70) in the General Aptitude Test (the Quantitative section) or at least (144) in the GRE-Quantitative

- **Requirements for obtaining the Degree:**

- ❖ **Thesis Option**

- Passing (28) study units of master's courses
- Successful completion of master's dissertation

- ❖ **Non-thesis option**

- Passing (36) study units of master's courses including the project

- **Program General Structure:**

- ❖ **Thesis Option**

- Number of required units is (28) units in addition to (6) thesis units as follows:

| Type of Courses | No. of Courses | No. of Units Required |
|------------------|----------------|---|
| Core Courses | 6 | (16) Units |
| Elective Courses | 4 | (12) Units |
| Thesis | 1 | (6) Units |
| Total | 11 | (28) Study units + (6) study units for thesis |

❖ **Non-thesis Option**

- Number of units required is (36) including the project as follows:

| Type of Courses | No. of Courses | No. of Units Required |
|------------------|----------------|-------------------------|
| Core Courses | 5 | (15) Units |
| Elective Courses | 5 | (15) Units |
| Research Project | 2 | (6) Units |
| Total | 12 | (36) Study units |

● **Program Study Plan:**

- **Thesis Option**

❖ **First Level**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|--------------|-------------|-------------------------------------|--------------------|---------------|
| 1 | IT 505 | Research Methods | 3 (3 + 0) | |
| 2 | IT 502 | Advanced Topics in Web Technologies | 3 (3 + 0) | |
| 3 | IT xxx | Elective course (1) | 3 | |
| Total | | | (9) Units | |

❖ **Second Level**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|--------------|-------------|---------------------------------------|--------------------|---------------|
| 1 | IT 506 | Advanced Topics in Internet of Things | 3 (3 + 0) | |
| 2 | IT 549 | IT Project Management | 3 (3 + 0) | |
| 3 | IT xxx | Elective course (2) | 3 | |
| Total | | | (9) Units | |

❖ **Third Level**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|--------------|-------------|------------------------------------|--------------------|---------------------|
| 1 | IT 507 | Advanced Topics in Cloud Computing | 3 (3 + 0) | |
| 2 | IT xxx | Elective course (3) | 3 | |
| 3 | IT xxx | Elective course (4) | 3 | |
| 4 | IT 593 | Thesis Proposal Preparation | 1 units | 18 units + (IT 505) |
| Total | | | (10) Units | |

❖ **Fourth Level**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|--------------|-------------|--------|--|---------------|
| 1 | IT 600 | Thesis | units (6) | IT 593 |
| Total | | | (28) Study units + (6) study units for thesis | |

○ **Non-thesis Option**

❖ **First Level**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|--------------|-------------|-------------------------------------|--------------------|---------------|
| 1 | IT 505 | Research Methods | 3 (3 + 0) | |
| 2 | IT 502 | Advanced Topics in Web Technologies | 3 (3 + 0) | |
| 3 | IT xxx | course (1) Elective | 3 | |
| Total | | | (9) Units | |

❖ **Second Level**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|--------------|-------------|---------------------------------------|--------------------|---------------|
| 1 | IT 506 | Advanced Topics in Internet of Things | 3 (3 + 0) | |
| 2 | IT 549 | IT Project Management | 3 (3 + 0) | |
| 3 | IT xxx | course (2) Elective | 3 | |
| Total | | | (9) Units | |

❖ **Third Level**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|--------------|-------------|------------------------------------|--------------------|---------------------|
| 1 | IT 507 | Advanced Topics in Cloud Computing | 3 (3 + 0) | |
| 2 | IT 596 | Graduation Project (1) | 3 (3+0) | 18 units+ (IT 505) |
| 3 | IT xxx | course (3) Elective | 3 | |
| Total | | | (9) Units | |

❖ **Fourth Level**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|--------------|-------------|------------------------|--------------------|---------------|
| 1 | IT 597 | Graduation Project (2) | 3 (3+0) | IT 596 |
| 2 | IT xxx | Elective course (4) | 3 | |
| 3 | IT xxx | Elective course (5) | 3 | |
| Total | | | (6) Units | |

○ **List of Elective Courses**

| # | Course Code | Name | No. of Study Units | Pre-requisite |
|----|-------------|---|--------------------|---------------|
| 1 | IT 501 | Advanced Topics in Computer Networks | 3 (3+0) | |
| 2 | IT 504 | Selected Topics in Information Technology | 3 (3+0) | |
| 3 | IT 531 | Security Advanced Networks | 3 (3+0) | |
| 4 | IT 533 | Pervasive Computing & Ubiquitous | 3 (3+0) | |
| 5 | IT 536 | Bioinformatics | 3 (3+0) | |
| 6 | IT 537 | Mobile Computing | 3 (3+0) | |
| 7 | IT 539 | Semantic Web | 3 (3+0) | |
| 8 | IT 540 | Government-E | 3 (3+0) | |
| 9 | IT 543 | User Experience in IT & Usability | 3 (3+0) | |
| 10 | IT 544 | Interactive Multimedia Applications | 3 (3+0) | |

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|----|--------|--|---------|--|
| 11 | IT 545 | Business-E | 3 (3+0) | |
| 12 | IT 547 | Technologies Open-Source | 3 (3+0) | |
| 13 | IT 548 | Information Visualization | 3 (3+0) | |
| 14 | IT 552 | Big Data Analytics | 3 (3+0) | |
| 15 | IT 553 | Virtual Reality Technologies | 3 (3+0) | |
| 16 | IT 554 | Applications Health Informatics | 3 (3+0) | |
| 17 | IT 555 | Recommender Systems | 3 (3+0) | |
| 18 | IT 556 | Engineering Intelligent IT Applications | 3 (3+0) | |
| 19 | IT 557 | Enterprise Management Applications | 3 (3+0) | |
| 20 | IT 558 | Natural Language Processing for Arabic Language | 3 (3+0) | |
| 21 | IT 559 | Cyber Security | 3 (3+0) | |
| 22 | IT 560 | Social Computing | 3 (3+0) | |
| 23 | IT 561 | Information Retrieval and Web Search | 3 (3+0) | |

- **Description of Courses:**

A. Core Courses

| IT 505 | Research Methods | 3 (3+0) |
|---|-------------------------|----------------|
| <p>The course will introduce topics and issues in professional and research practice for computing professionals in an academic context. This will include the philosophy of research, qualitative and quantitative research, accessing and evaluating research materials, assessing outcomes and dissemination. Topics to be covered include: introduction to research; research process, research methods, paper and report writing; speaking and presentations; research tools, communication skills, critical thinking, introduction to technical writing, teamwork and team communications, oral communications and presentation skills.</p> | | |

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| IT 502 | Advanced Topics in Web Technologies | 3 (3+0) |
| <p>This course explores technologies, programming languages and environments that underpin the development of modern web applications. It builds on student's previous programming and data management experience to develop and demonstrate technologies in action. Topics and techniques evolve from year to year to stay at the technological front end of the rapidly changing web and internet fields.</p> <p>This course includes concepts, principles, and methods in current client and server-side web technologies. The focus is rather on advanced topics in emerging web Technologies and the latest or current technology used in the market. These include extension of Web standards, Web toolkits and development environments, current backend Web frameworks, frontend web frameworks and combination of different Web technologies. This course follows a student-centered and project-based learning approach. Web technologies will be presented in the lecture by student groups. The presented technologies are further investigated and applied in hands-on sessions as well as small student projects carried throughout the course.</p> | | |
| IT 506 | Advanced Topics in Internet of Things | 3 (3+0) |
| <p>This course is designed to teach theoretical and practical aspects of the Internet of Things (IoT). It covers a review of the IoT reference model, systems architecture, embedded systems, and IoT protocol stack. Also, it explains the data analytics in IoT, which includes: big data, data processing, streaming, machine learning for IoT, and caching of IoT data. Also, it covers the security aspects of IoT systems and discuss different challenges, use case scenarios and future trends in this field. The course helps students conduct research and understand the state-of-the-art developments in the IoT field. It also provides practical coursework to design and implement IoT solutions.</p> | | |

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| IT 549 | IT Project Management | 3 (3+0) |
| <p>This course is designed to provide students with the skills and knowledge necessary to effectively manage IT projects. It covers topics such as project planning and integration, project scope, time, cost, stakeholders, human resources, communication, quality assurance and risk management. The course also provides project management software tools and techniques. Students will gain an understanding of the principles of project management and how they can be applied in the IT environment.</p> | | |
| IT 507 | Advanced Topics in Cloud Computing | 3 (3+0) |
| <p>This course provides an overview of the different methodologies, tactics, and tools used to build a well-architected cloud infrastructure. Topics include resource virtualization, resource management and scheduling, cloud migration, cloud networking and interoperability, security and alternative cloud architectures.</p> | | |
| IT 593 | Thesis Proposal Preparation | 1 unit |
| <p>In this course, students develop a research proposal for their thesis. Students are guided by their research supervisors in selecting a research idea relevant to Information Technology, planning the research and preparing the research proposal. The components of the research proposal include the research aim and objectives, methods, timeline in addition to a thorough review of the literature to gain an understanding of key concepts relevant to the research topic.</p> | | |
| IT 600 | Thesis | (6) units |
| <p>The course provides the student with the opportunity to undertake original research at depth level and contribute to the existing body of knowledge in a specific area of information technology under the supervision of a faculty member from the IT department. Throughout the course, the student is expected to develop advanced knowledge and skills in the selected research field, gain experience in conducting independent research, and learn to communicate the research findings in a professional manner.</p> | | |

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| IT 596 | Graduation Project (1) | 3 units |
| <p>For the non-thesis option, students should complete a project in the last two semesters of the program. This project is offered for students who are interested in developing practical or real-world applications in an area of Information Technology (IT) in preparation for professional practice. In IT 596, the project idea is registered with a faculty member from the IT department as the student supervisor.</p> <p>Through this course, students can partner with organizations or companies to collect data, challenges, or requirements. This partner can be the project client that needs the developed solution and will use the final product in the following semester. Having a partner or client is not mandatory in this course but rather recommended. Upon completion of this course, students should have conducted their research to fully understand the problem, investigated the literature to identify the current gaps, and propose a general solution to be developed in the following semester. By the end of the semester, the student should submit a complete report about their work so far and present their findings and proposed solution (public presentation). The main goal of this course is to bring together all learned skills and knowledge and apply concepts learned through the program.</p> | | |
| IT 597 | Graduation Project (2) | 3 units |
| <p>This course is continuous to IT596 course, in which students implement, test, verify, and validate the proposed solution and expected results. Upon completion of this course, students should submit a complete report about their solution with the validation results and present their results in technical settings (public presentation). The main goal of this course is to apply practical skills and knowledge learned through the program and produce their final application/product.</p> | | |

B. Elective Courses

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| IT 501 | Advanced Topics in Computer Networks | 3 (3+0) |
| <p>The course will cover a wide range of advanced topics in both wired and wireless networks. Covered topics include: review of OSI layered architecture, multimedia networking, software-defined Networking (SDN), cognitive networks, programmable networks, mobile ad hoc networks (MANETs), and wireless sensor networks. In the process of learning network architectures and protocols, students will evaluate the performance of various design concepts.</p> | | |
| IT 504 | Selected Topics in Information Technology | 3 (3+0) |
| <p>This course covers the topics: introduction to special topics of current interest of the field in Information Technology.</p> | | |
| IT 531 | Advanced Networks Security | 3 (3+0) |
| <p>Topics will reflect the current research in network security. Students will learn about security flaws in the network infrastructure protocols. Topics include: DNS security, denial of service protection, cryptography, anonymity and privacy enhancing technologies, malware containment, wireless network security, Network Security protocols, email security, firewalls architectures, virtual private networks, and Intrusion Detection Systems.</p> | | |
| IT 533 | Ubiquitous & Pervasive Computing | 3 (3+0) |
| <p>This course will introduce students to the area of ubiquitous and pervasive computing (UPC). Topics to be covered include: overview of ubiquitous and pervasive computing, mobile and social computing, networked appliances, sensors and context information, intelligent/smart spaces, human computer interaction issues, security and privacy problems in UPC and real-world applications of UPC. Students will practically learn how to build, deploy and evaluate UPC systems.</p> | | |

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| IT 536 | Bioinformatics | 3 (3+0) |
| <p>This course is an overview of the fundamental algorithmic approaches in analyzing the large datasets generated from experiments in molecular biology. It introduces the students to the basis of evolutionary genomics and how to apply modern bioinformatics tools and methods to develop the most effective and useful computational tools for genomics data analysis. The course will cover phylogeny, transcriptomics analysis and comparison of genomics tools to solve the practical challenges in bioinformatics.</p> | | |
| IT 537 | Mobile Computing | 3 (3+0) |
| <p>This course introduces the main aspects of mobile computing – software, hardware and embedded sensors, and communication networks with main focus on distributed mobile applications. It discusses several topics related to mobile applications including context awareness, localization and location-based services, mobile data management and mobile middleware.</p> | | |
| IT 539 | Semantic Web | 3 (3+0) |
| <p>The course will focus on understanding the fundamentals of the Semantic Web, including its principles, components, and technologies. Students will learn how to create and use RDF and OWL models, as well as domain-specific standards and ontologies (formal specifications of how to represent objects and concepts) to represent and query data, and how to integrate Semantic Web technologies into web applications. The course will also cover other topics, such as Linked Data and Knowledge Graphs.</p> | | |

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| IT 540 | E-Government | 3 (3+0) |
| <p>This course will introduce students to e-government and its impacts and different types. It also will highlight the challenges of e-government implementation and how to overcome these challenges, the benefits and economic advantages of successful e-government implementation and the socio-technical infrastructure required for e-government.</p> <p>Moreover, it will investigate the design and evaluation of e-government services. Furthermore, it will explore the technology and data aspects of e-government. Lastly, recent research in e-government will be addressed to emphasize the applications of the emerging technologies in this domain.</p> | | |
| IT 543 | Usability & User Experience in Information Technology | 3 (3+0) |
| <p>This course introduces students to the fundamentals of User Experience (UX) and usability (UX). The course covers a series of methods and tools in two areas: design, and evaluation. Methods and tools to design may include requirements analysis, use cases, scenarios, sketching, prototyping toolkits, and sequential storyboards. Method and tools to evaluate designs may include heuristic inspections, walkthroughs, usability testing, analytics, predictive models, and lean validation. More practical topics may include design thinking, UX strategy, UX ethic, agile and Lean UX, building a UX portfolio, and institutionalization of UX.</p> | | |
| IT 544 | Interactive Multimedia Applications | 3 (3+0) |
| <p>The course covers an overview of the hypermedia/interactive multimedia technology through working with various hypermedia/interactive multimedia tools and applying them in developing interactive multimedia-based applications.</p> | | |

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| IT 545 | E-Business | 3 (3+0) |
| <p>This course covers the topics: introduction to E-business, evolution of E-business, E-business management, E-business activities, applications in E-business, E-business technology infrastructure; strategic, managerial, operational and technical factors in the development of an organization's E-business competencies and capabilities; E-Commerce, common techniques to enhance business processes; ethics, challenges and regulatory environments for conducting E-business models, current business and technology trends including the individual, business and societal implications of E-business, influence of E-business on the market creation and web business relations.</p> | | |
| IT 547 | Open-Source Technologies | 3 (3+0) |
| <p>This course will cover the fundamentals of Free and Open-Source software development. Topics to be addressed include: Licensing, Linux, Methodologies, frameworks, typical software development tools, applications, and techniques for managing remote servers. Students will work on a significant development project involving free and open-source software and learn how to participate in open-source projects effectively.</p> | | |
| IT 548 | Information Visualization | 3 (3+0) |
| <p>This course will provide introduction of the relevant concepts, issues and practices in this diverse field including a brief history of data/ information visualization; principles of visual literacy; an overview of contemporary systems and techniques used in information visualization; common applications of information visualization; and considerations in analyzing and evaluating applications in information visualization.</p> | | |

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| IT 552 | Big Data Analytics | 3 (3+0) |
| <p>An introduction to data analytics: how to convert data into information. Tasks required to answer an analytic question, make predictions or make decisions starting from raw data. Covers topics in data preparation, identification of patterns and structures, modeling, statistical analysis, learning, and mining. In addition, an overview of advanced topics is made, including time series analysis and text analysis.</p> | | |
| IT 553 | Virtual Reality Technologies | 3 (3+0) |
| <p>This course provides an overview of virtual reality technologies. It introduces virtual reality systems and their components. It describes the basics of virtual reality world generators such as the geometry of virtual worlds and visual rendering. It explores visual perception and how it is used in virtual reality systems. It describes user interaction mechanisms, and some concepts in evaluating a virtual reality system. The course also provides hands-on-experience by building a virtual reality game.</p> | | |
| IT 554 | Health Informatics Applications | 3 (3+0) |
| <p>This course will cover the critical role of the e-Health and Health information technology systems in the planning, operation and management of health care organizations, standards and interoperability, decision support systems, health informatics specialties, organizing health information, analysis and design, selection, implementation and evaluation of health information technologies in a variety of settings such as health systems, hospitals and medical practices.</p> | | |

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| IT 555 | Recommender Systems | 3 (3+0) |
| <p>Recommender systems offer personalized access to online information in product catalogs, social media networks, and document collections, among other applications. This course provides an in-depth introduction to the field of recommender systems. It introduces the fundamental concepts and techniques in designing and evaluating these systems. Students will be given a hands-on experience with implementing recommender systems using an open-source toolkit and conducting experimental evaluations on real-world data. Topics will cover various approaches for building recommender systems including collaborative, content-based, and hybrid methods; and evaluation metric.</p> | | |
| IT 556 | Engineering Intelligent IT Applications | 3 (3+0) |
| <p>This course will cover the engineering aspects of building reliable AI systems. The course will follow Machine Learning Model Operationalization Management (MLOps) framework for developing real-world machine learning systems that are deployable, reliable, and scalable. It starts by considering all stakeholders of each machine learning project and their objectives. Different objectives require different design choices, and this course will discuss the tradeoffs between these choices. This course will involve lectures, seminar-style discussions, hands-on exercises, and student presentations. Students will be responsible for paper readings, and completing a hands-on project.</p> | | |
| IT 557 | Enterprise Management Applications | 3 (3+0) |
| <p>The course provides students with a foundation in enterprise-wide IT systems and their characteristic domains such as business processes management, configuration and integration of enterprise systems, and change management in enterprise systems. Thus, enable companies to achieve their strategic, tactical, and operational goals.</p> | | |

Students will learn about the IT capabilities needed by companies to coordinate their activities and strategic attributes addressed by different extensions of enterprise management systems such as business process re-engineering, supply chain management, customer relationship management, cloud enterprise system and enterprise system project life cycle. The course will also provide hands-on experience using industry-standard enterprise software application.

IT 558

Natural Language Processing for Arabic Language

3 (3+0)

The course covers the fundamentals of natural language processing (NLP) with an emphasis on Arabic. It includes foundational NLP concepts and ideas, such as regular expressions, n-gram models, part-of-speech tagging, syntactic parsing, and semantic representations (including word embeddings).

The course will cover an understanding of various NLP applications such as sentiment analysis, information retrieval, summarization and machine translation. The course will also introduce cutting-edge research progress in NLP, including multilingual, cross-lingual methods and state of the art techniques for effectively modeling human language.

IT 559

Cyber Security

3 (3+0)

This course introduces cybersecurity and its main goals. It explains the security of cloud and IoT, their main concepts, and security issues. Also, it covers cybercrime including malware and spyware by exploring their various types, characteristics, and current detection and defense techniques.

The course investigates modern cryptographic algorithms and their application in secure systems. In addition, Access control topics including its implementation, authorization, and authentication are provided. The course covers significant risk management concepts and security policies to support private and governmental sectors.

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| IT 560 | Social Computing | 3 (3+0) |
| <p>Social networking platforms and other online interaction and content generation mediums have introduced a powerful tool for people to communicate and exchange information. Social computing lies at the intersection of computational systems and social behavior. This course aims to develop a broad understanding of the current state of online social systems. It discusses how and why social computing works, the real-world opportunities and challenges in current social computing systems. Moreover, it introduces methods for analyzing and understanding how people use social computing technologies and their societal implications. The course will also introduce students to the science and social science of network analysis.</p> | | |
| IT561 | Information Retrieval and Web Search | 3 (3+0) |
| <p>The aim of the course is to provide an introduction to the core principles and techniques used in modern Information Retrieval (IR). Topics include retrieval models (e.g., Boolean, vector space, probabilistic, and learning-based methods), search evaluation, retrieval feedback, and applications of search engine technologies; summarization and recommendation systems.</p> | | |