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)

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- **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, eGovernement, 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, currently, the department hosts 61 MSc students who are registered in this semester MSc classes. 22 of the admitted students were graduated and 15 students are expected to be graduated this semester. The IT MSc students' records reflect superior achievements as the students have 6 research participations in international and national conferences. 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**

Creating an innovative educational environment for preparing graduates who will be equipped with distinct competencies, scientific knowledge and practical skills to contribute to efficient and effective IT solutions of national and international extent.

- **Program Objectives**

1. Develop, enhance and promote outstanding IT graduate education.
   - ❖ Provide a technical body of knowledge that will allow students to analyze, design, deploy, maintain and manage Information Technology in large organizations.
   - ❖ Provide a course of study that will allow professionals to pursue either thesis or project approach to Information Technology.
   - ❖ Introduce graduates to the community with advanced IT standards, communication skills and ethical values.
2. Create national opportunities for knowledge economy by hosting education and research environments.
   - ❖ Encourage students to enhance their career by exposing them to wide range of the topics and applications in the field.
   - ❖ Establish innovative knowledge transfer into technology business Startup incubators.
   - ❖ Establish research groups in order to provide graduate students to perform research activities and present research at international venues.

- **Program's Outcomes**

A. Knowledge and Comprehension:

- An ability to describe the problem using advanced IT knowledge.
- An ability to describe the appropriate solution to a given problem using advanced IT knowledge in new and future application

B. Mental Skills:

- Ability to design appropriate IT solution and provide appropriate justification for the solutions and design
- Ability to analyze and design tools to evaluate the technical solutions.
- Ability to conduct research analysis and inferring results in appropriate context and recommendations to share in national and international scientific society.

C. Professional and Practical Skills:

- An ability to use IT skills in decision and problem solving using modern and up-to-date technologies.
- Ability to develop IT solutions and explaining findings.

D. General Skills:

- An ability to use effective teamwork skills while working with groups.
- An ability to effectively communicate orally and in writing to both technical and general audiences.

• Program Beneficiaries:

1. Health Sector
2. Research Centers
3. Industrial Sector
4. Commercial Sector
5. Telecommunication Sector
6. Private companies that works 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, computer science, software engineering, or computer engineering from King Saud University or an accredited university; such disciplines as computer education, information studies, or management information systems are not accepted.
2. Applicant must hold a bachelor's degree with a minimum of a "Very Good" GPA or "3.75/5" or equivalent
3. A score of at least (6) in the TOEFL-IBT 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	One unit	(14) units
Total			**(10) Units**	

❖ **Fourth Level**

#	Course Code	Name	No. of Study Units	Pre-requisite
1	IT 600	Thesis	(6) units	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	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 596	Graduation Project (1)	3(3+0)	(18) Units + (IT505)
3	IT xxx	Elective course (3)	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			**(9) 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	Advanced Networks Security	3(3+0)	
4	IT 533	Ubiquitous & Pervasive Computing	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	E-Government	3(3+0)	
9	IT 543	Usability & User Experience in IT	3(3+0)	
10	IT 544	Interactive Multimedia Applications	3(3+0)	
11	IT 545	E-Business	3(3+0)	
12	IT 547	Open Source Technologies	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	Health Informatics Applications	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)
This course introduces students to a number of research methods useful for academic and professional investigations of information practices, texts and technologies, and executing a research methodology, as well as a critically informed assessment of published research. This course also covers the philosophy of research, qualitative and quantitative research, accessing and evaluating research materials, peer reviewing, assessing outcomes and dissemination.		
IT 502	**Advanced Topics in Web Technologies**	**3(3+0)**
This course focuses on the Service Oriented Computing paradigm and web services technology, motivations that led to the emergence of web services from middleware and Enterprise Architecture Integration (EAI), introduction to fundamental concepts of Service Oriented Architectures (SOA), web services and the key standards that underpin web services: SOAP, WSDL and UDDI. Various service discovery protocols will be evaluated and compared.		
IT 506	**Advanced Topics in Internet of Things**	**3(3+0)**
The course explores the key advances in concepts of IoT architectures, applications, standards and regulations. It describes the typical components of IoT device, and the different IoT design considerations, constrains and challenges, technologies relevant to the design and development of IoT including object identification, localization, sensing & actuation, data and security. Finally it explores the IoT effect on society and businesses and describes the trends for the future. Aspects of networking considerations in the design and development of the advanced applications areas		

IT 549	IT Project Management	3(3+0)
This course covers detailed topics of the basic concepts of IT project management, including initiating, planning, controlling, executing, and closing projects, managing IT project from inception to post implementation review, create a workable project plan, and project management within the budget and schedule, understanding customer		

behavior, The IT Infrastructure for E-Business.

IT 507	Advanced Topics in Cloud Computing	3(3+0)

This course, the Cloud infrastructure, architecture, and different service models (Saas, Paas and Iaas) are presented. A comprehensive study of the Cloud reference model is provided, including: storage technologies, virtualization, resources control, services orchestration. The course also covers important concerns regarding Cloud deployment: security, business continuity and service management. The course explores the EMC solutions and the IBM Smart Cloud Enterprise and other solutions provided by multiple other vendors out there as well.

IT 593	Thesis Proposal Preparation	One unit

Students in the thesis option will normally complete their core courses before starting their thesis, so this course provides the student the opportunity to select their research idea and prepare their proposal by contacting the faculty member in the fields and agree the research in a field that is relevant to Information Technology.

IT 600	Thesis	(6) units

The student has to undertake research at depth level under the supervision of a faculty member from the IT department, define a specific problem in the area of IT. The student is expected to defend the outcomes of the research work in public and deliver a thesis in a format determined by the college.

IT 596	Graduation Project (1)	3(3+0)

Students in the non-thesis option will normally complete their project in the last two terms of the program. Students will undertake an independent project in an area of Information Technology. Students should apply to the non-thesis option in their initial application rather than attempting to transfer to this option once registered in the program. The project supervisor must be a member of IT dept. A project report summarizing the work and includes the literature review, analysis and design of the project.is to be submitted and the student is requested to deliver a (public presentation).

IT 597	Graduation Project (2)	3(3+0)
Students should continue developing the project. This part is more dedicated to detailed design, implementation, and validation issues. A project report summarizing the work is to be submitted and the student is requested to deliver a (public presentation).		

B. elective Courses

IT 501	Advanced Topics in Computer Networks	3(3+0)
This course covers the topics: Review of OSI layered architecture, security, privacy, text compression, application layer: distributed computing, network operating systems, topics of research and development such as routing, congestion control, multicasting and resource reservation in the internet, wireless networks, multimedia networks, Voice over IP (VoIP) and Quality of Service (QoS), crosslayer design, cognitive networks, programmable network, future Internet design, overlay networks, ad hoc and sensor networks, performance study of computer networks, current research problems and proposed solutions in the field.		
IT 504	**Selected Topics in Information Technology**	**3(3+0)**
This course covers the topics: introduction to special topics of current interest of the field in Information Technology.		

IT 531	Advanced Networks Security	3(3+0)
Topics will reflect the current research in network security, topics include: malware containment, formal specifications and logics, denial of service protection, ubiquitous/pervasive computing security, cryptography, anonymity and privacy enhancing technologies, access controls, systems integrity, wireless network security, system-of-systems security, digital rights management.		
IT 533	**Ubiquitous & Pervasive Computing**	**3(3+0)**
This course covers the topics: Defining Pervasive and Ubiquitous Computing (PUC), Evolution paths for PUC; mobile and social computing, networked appliances, Role of sociology and psychology in designing PUC, Sensors and context information, Intelligent/smart spaces, Security and privacy problems in PUC, Human Computer Interaction issues, Applied systems: social, health, art, gaming.		

IT 536	Bioinformatics	3(3+0)
This course covers the topics: Introduction to methods and tools used in bioinformatics, molecular biology, mathematical, statistical and data mining principles, biological database and programming database access, relational scheme for storing, accessing and using the biological data types, bioinformatics software, resources, practical and programming skill, design and develop bioinformatics software and libraries.		
IT 537	**Mobile Computing**	**3(3+0)**
This course covers the topics: introduction to mobile computing and its applications, mobile technologies for developing regions, smart mobile devices, database and web client-server systems for achieving the goal of computing in wireless mobile environment anytime and anywhere, data management in mobile computing environment, and in particular in distributed mobile applications and virtualization.		

IT 539	Semantic Web	3(3+0)
This course aims to provide the basic overview of what the Semantic Web is and how it can be used. It mainly contains three parts: Semantic Web language, ontology and its applications. The major part of the course is the Semantic Web languages. It starts from XML and goes further to RDF and OWL. The ontology part contains ontology engineering and the survey of the most popular ontologies (or metadata). The application part shows some current trends and other semantic related applications.		
IT 540	**E-Government**	**3(3+0)**
This course will cover the role in the delivery of government information and services, e-government relation to the political and to information policy, challenges to access and usage, the roles of database in providing e-government access and training, understanding of technologies supporting e-governance, case studies in electronic government.		
IT 543	**Usability & User Experience in Information Technology**	**3(3+0)**
This course covers the conceptual frameworks and applied methodologies for user-centered design and user experience research. Emphasis is placed on learning and practicing a variety of usability research methods/techniques such as scenario development, user profiling, tasks analysis, contextual inquiry, card sorting, usability tests, log data analysis,		

expert inspection and heuristic evaluation.		
IT 544	**Interactive Multimedia Applications**	**3(3+0)**
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.		
IT 545	**E-Business**	**3(3+0)**
This course covers concepts of IT project management, including Lifecycle and process models; process metrics, planning and managing IT project from inception to post implementation review, monitoring and controlling IT project schedule, budget, quality, and productivity; and leadership, motivation, and team building.		
IT 547	**Open Source Technologies**	**3(3+0)**
This course covers the following topics: open source history and ecosystem, understanding of Open Source and Free Software Licensing, Adaption of Open source Software, Producing Open Source Software, open source tools and techniques and future directions in open source movement.		
IT 548	**Information Visualization**	**3(3+0)**
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.		
IT 552	**Big Data Analytics**	**3(3+0)**
Course Outline: This course covers two extremely important, and interrelated, emerging data management technologies: cloud computing and big data. You will analyze the reasons why cloud computing provides an attractive alternative to an on-site data center, and the technical and economic impacts of migrating to the cloud. You will also gain an appreciation of the challenges of managing vast quantities of structured		

and unstructured big data, and how organizations are trying to leverage big data stores via analytics for strategic decision-making. You will conduct research into current and proposed solutions for both of this information.		
IT 553	**Virtual Reality Technologies**	**3(3+0)**
Course Outline: This course covers the topics: Virtual reality, multiple modal interaction, visual-auditory-haptic, interaction immersion and imagination, visual computation and environmental modeling; geometric behavior and physically based simulation; management of large scale environment, VR development tools, augmented reality, mixed reality, digital entertainment, the concepts of computer and video game technology and how they have evolved, explain the importance of the different technologies in video games production, explain various techniques to produce 3D model and animation, implement animation techniques using modern programming language and 3D modeling tools.		
IT 554	**Health Informatics Applications**	**3(3+0)**
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.		
IT 555	**Recommender Systems**	**3(3+0)**
The course introduces key principles of adaptive information systems and modern techniques for user modeling and personalization. It covers the construction of user models and user profiles. The course examines the use of various personalization techniques such as adaptive search, recommendation, and navigation support and reviews major types of adaptive information systems and explores important application areas		
IT 556	**Engineering Intelligent IT Applications**	**3(3+0)**
The course explores diverse research areas of Artificial Intelligence techniques' applications and outlines recent advancement in the selected topics. Selected topics are covered from: recommender systems and fuzzy systems, Case-based Reasoning, Information retrieval, etc. Variety of applications cases will be studied in the course. Students will study the underlying concepts of intelligent systems such as expert systems and neural networks and learn how these systems support different		

environments such as business, economy, and government and so on		
IT 557	**Enterprise Management Applications**	**3(3+0)**
The course covers how to strategically apply IT to support business change and thus enable companies to achieve their strategic, tactical, and operational goals. By focusing on the capabilities needed to improve enterprise performance, this Master's program prepares you for an international career at the interface of IT, business, and management		
IT 558	**Natural Language Processing for Arabic Language**	**3(3+0)**
This course covers the topics: Introduction to Arabic computing, Arabic character sets, standardization, Arabization systems, Arabic software tools, and programming languages, introduction to Arabic computations, challenges and future research in the area of Arabic computing.		
IT 559	**Cyber Security**	**3(3+0)**
This course covers issues concerning management of risks, which both digital information and network assets in an organization are exposed to, and provides information and guidelines that can help with the establishment of an effective framework to assure that information security strategies are aligned with the objectives of the business and are consistent with legal and regulatory obligations. Topics include existing risk management frameworks, models, processes and tools to equip students with the theory, science and practical knowledge to deal appropriately with risk in an enterprise.		
IT 560	**Social Computing**	**3(3+0)**
The course is covers key issues around social computing, a field of study concerning with using computing techniques and artifacts to support, mediate, and understand aspects of social behaviors and social interactions. It is a multidisciplinary research area that consists of (i) computational social science, (ii) social analytics and (iii) hybrid collaborative intelligence.		
IT 561	**Information retrieval and Web Search**	**3(3+0)**

This course provides fundamentals of current information retrieval techniques and their application to commonly known Web search. This course exposes the students to the challenges and solutions of designing, evaluation, and building IR applications.