Master of Science in Information Technology (MS-IT)

Program Objectives

The primary aim of the program is to allow IT professionals an opportunity for professional upgrading or an extension of their qualifications and experience in order to develop to their full intellectual potential. It is a professional degree program, designed to provide candidates with appropriate practical understanding, life-long learning skills and knowledge for IT use, research, development and management and turn into competent and morally responsible professional individual to better serve the community. Having this knowledge, skills and practical understanding, graduates will be able to assume careers in research, development, operations and management of medium and large organizations, in all sectors, where IT is vital.

Learning Outcomes

The MS-IT program is designed to prepare professionals and recent graduates for work in the IT sector at the highest levels in today's thoroughly globalised and networked environment. It will provide the individual with the knowledge, understanding and skills to deal effectively with advanced applied and research issues in IT. Graduates of the course will possess a solid foundation that will allow them to maintain their skills as their specialized fields evolve.

Upon completion of the MS-IT program, graduates will be able to:

- Apply cutting edge technologies to real life business problems.
- Demonstrate teamwork abilities and outcome oriented deliverables.
- Explain and apply the core aspects of IT principles and tools, and manage their implementation in a business context.
- Understand and facilitate the strategic and operational aspects of business and technology applications.
- Manage complex IT projects with consideration of the human factors, business requirements, environmental aspects, risk management processes, and operational and policy implications.
- Understand the strengths and limitations of current technologies and apply them intelligently to meet the needs of each application.
- Apply their practical skills in IT projects developed for real world applications.
- Utilize high level interpersonal skills to negotiate and communicate effectively with both technical and non-technical stakeholders verbally and in writing**.**
- Possess advanced knowledge of the state of the art in research in specialist areas related to Information Technology.
- Have an understanding of research methodologies at a level that enables students to conduct research in the areas of information technology.

Graduate Attributes

- Practice life-long, self-dependant learning skills.
- Demonstrate the ability to act independently and creatively in analyzing problems.
- Demonstrate their knowledge and skills in the investigation of problems and development of solutions.
- Be able to make sound judgments on complex issues and communicate their conclusions effectively to specialist and non-specialist audiences.
- Own the responsibility for their own learning and future professional development.
- Be able to collaboratively work in identifying issues and resolving problems.
- Develop the culture of doing appropriate literature review before the start of any research project.

Teaching and Learning Strategies

The teaching and learning strategies designed to satisfy the graduate attributes of the program are:

- Students are expected to participate actively in class discussions and out-of-class assignments (i.e. via Forum on Moodle), and to contribute to the process of constructing knowledge.
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- Students are expected to do independent reading, especially before the class period. They are encouraged to apply the SQ3R (Survey, Question, Read, Recite, Review) method and to reflect on the readings by writing a short report of what they have read.
- Students are encouraged to engage in critical thinking and to challenge ideas of others tactfully.
- Students will be required to analyze problems or write reports, and present their findings/work in class, workshops or seminars.
- Students are encouraged to visit instructors during office hours to ask questions, give feedback, or just chat about ideas related to the class.
- Faculty members are expected to provide real-life examples and application areas of the delivered concepts. Students are then provided problem sets the solution to which require additional reading and analytical skills.
- Students are expected to be engaged in individual and group projects whereby each student will be expected to contribute his own findings about a specific problem.
- Faculty members are expected to create opportunities in classrooms for students to demonstrate problem solving abilities through assignments, home works and projects.
- Students are expected to be engaged in appropriate literature review prior to commencement of any project assignment.

Admission Criteria

Applicants must have completed a Bachelors degree in Computer Science, IT or a related discipline from a university recognized by the Ministry of Higher Education in Oman. Students with other majors are also eligible for admission subject to successful completion of a number of pre-requisite courses that will be determined by the department.

The student must have achieved a score not less than 75%, which is equivalent to a GPA of 2.4 out of 4.0 or a cumulative grade letter of C+. Graduates from other majors will be expected to have successfully completed introductory courses in the areas shown below, with a grade not less than B in each course. If not, they will have to complete at least 12 credit hours (4 courses), before they can be officially enrolled in the program. The exact entry requirements can only be determined after the qualifications of the student are observed and analyzed.

Graduates from other majors will be expected to have successfully completed introductory courses in the following areas:

- Data Structures
- Databases
- Networks and Security
- Programming
- Software Engineering

Program Curriculum Plan

The MS-IT program is offered in two tracks as follows:

1) Thesis option
2) Course work option

The thesis option consists of course work and a thesis, whereas, the course work option comprises of course work and a research project.

Graduation Requirements

The University does not follow the notion of yearly education. The students are awarded the degrees on the basis of completion 36 credit hours with an overall GPA not less than 3.00 out of 4.00(refer DU Grading System. GPA 3 refers to 80%). However, the University has put forward a regulation that a student must complete minimum of 18 credit hours to be eligible for Master's thesis registration process.

The duration of the program is considered to be 24 months for full-time students. However, the students can extend the period of study up to a maximum of 4 years in order to acquire 36 credits. Additionally a residency requirement of no less than 2 years and a maximum residency of 4 are also embedded in the regulations.

The courses are designed in accordance with the American system of higher education. A graduate course is worth 3 credit hours. Such a class would generally meet for 3 contact hours per week over a 15-week semester, totaling roughly 45 hours of "contact" with the instructor(s) per course. Such classes may meet 3x1 hour weekly (for example Sundays, Tuesdays and Thursdays from 0900-1000), or 2x1.5 hours weekly (for example Mondays and Wednesdays from 0800-0930).

The contact hours of a typical 3 credit course would comprise of lectures and/or class discussion and/or lab works/applications or other options. In addition to lectures, one or several textbooks would be required reading, and there would often be recommended supplementary reading as well. The students are expected to do 3-2 hours of self study referring the reference materials available in the library or online resources to meet the learning outcomes of the course. Students shall also be expected to complete a number of homework assignments including problem solving, programming, course projects, course papers and theoretical issues. They are required to perform these tasks at their own time. The university is equipped with latest computers and software tools but many students may work from home. As a general rule, students are expected to work at least 3 hours of homework against each contact hour in the class, however, detailed work-load guidelines shall be provided in each course outline.

There are three exit routes from this program which are:

- successful completion of the program and award of Master degree or
- successful completion of all taught modules (thereby acquiring 30 credits in total) and award of a Postgraduate Diploma or
- unsuccessful completion of the program and award of transcript showing a set of completed/attempted courses.

The breakdown of 36 credits is given below for both Thesis and Course Work options:

Thesis Option

- 15 credits of core courses
- 15 credits of technical electives, of which at least 6 credits must be chosen from level 600 or higher courses
- 6 credits of Master's Thesis

Important

- A student, who successfully completes 18 credits, shall be considered for the Master's Thesis option. The final decision shall be made by the department based on the student's grades and his/her ability to do research.
- A student shall be given up to three semesters to finish his/her thesis work. In case the student does not finish the thesis work on time, he/she must re-register for the thesis course CMPS690.

Course Work Option

- 15 credits of core courses
- 18 credits of technical electives, of which at least 12 credits must be chosen from level 600 or higher courses.
- 3 credits of research project

List of Core Courses

- CMPS 500 Advanced Software Engineering
- CMPS 510 Computer Networks and Security
- CMPS 520 Research Methodology
- CMPS 530 Advanced Database Systems
- CMPS 540 Information Technology Project Management

List of Elective Courses

- CMPS 550 Advanced Artificial Intelligence
- CMPS 551 Intelligent Systems
- CMPS 552 Information Technology Entrepreneurship
- CMPS 553 Mobile Computing
- CMPS 554 Advance Programming Languages and Techniques
- CMPS 555 Strategic Information Systems Planning
- CMPS 556 Analysis and Design of Algorithms
- CMPS 557 Security in Networks
- CMPS 558 Advanced Web Development
- CMPS 559 Multimedia Applications
- CMPS 560 Object Oriented Software Development
- CMPS 600 Emerging Trends in Information Technology
- CMPS 601 Research Topics in Information Technology
- CMPS 602 Information Technology Auditing and Assurance
- CMPS 603 Knowledge Management
- CMPS 604 Research Project

Grading System

The grading system for the MS-IT program is given below:

Numerical Grade	Grade Type	Equivalent Letter Grade	Equivalent Grade Points
90-100	Outstanding	A	4
85-89	Excellent	B+	3.5
80-84	Very Good	B	3
75-79	Good	C+	2.5
70-74	Fair	C	2
60-69	Weak	D	1
Below 60	Fail	F	0
	Incomplete	I	
	Pass	P	
	In progress	PR	
	Withdrew	W	
	No Grade Reported	-	

Study Plan

Year I		
Semester 1 (Fall)	**09 Credits**	**(Both Course Work and Thesis Options)**
Course Code	**Course Title**	**Credit Hours**
CMPS 500	Advanced Software Engineering	3

CMPS 510	Computer Networks and Security	3
CMPS 520	Research Methodology	3

Semester 2 (Spring) 09 Credits (Both Course Work and Thesis Options)

Course Code	Course Title	Credit Hours
CMPS 530	Advanced Database Systems	3
CMPS 540	Information Technology Project Management	3
CMPS 5XX	Elective*	3

*Elective courses ranging from CMPS 550 to CMPS 599

Year II

Semester 3 (Fall) 09 Credits (Both Course Work and Thesis Options)

Course Code	Course Title	Credit Hours
CMPS 5XX	Elective*	3
CMPS 6XX	Elective**	3
CMPS 6XX	Elective**	3

*Elective course ranging from CMPS 550 to CMPS 599

**Elective courses ranging from CMPS 600 to CMPS 689

Semester 4 is offered into two different options: Thesis or Course Work (choose any one option)

Semester 4 (Spring) 09 Credits (Thesis Option)

Course Code	Course Title	Credit Hours
CMPS 6XX	Elective**	3
CMPS 690	Master Thesis***	6

*** Subject to successful completion of 18 credit hours and CMPS 520 (Research Methodology) if deemed necessary by the advisor, followed by approval of the department.

Completion of the "Master of Science in Information Technology (MS-IT)" program - Total Credits 36

Semester 4 (Spring) 09 Credits (Course Work Option)		
Course Code	**Course Title**	**Credit Hours**
CMPS 604	Research Project	3
CMPS 6XX	Elective**	3
CMPS 6XX	Elective**	3
**Elective courses ranging from CMPS 600 to CMPS 689		
Completion of the "Master of Science in Information Technology (MS-IT)" program - Total Credits 36		

Course Descriptions

Core courses

CMPS 500 Advanced Software Engineering (3 credits)

This course focuses on latest trends in architecture, process, framework, methodologies and tools used in software development. It emphasizes software metrics, quality, management, reliability, testing, integration, verification, validation, deployment, testing and maintenance.

CMPS 510 Computer Networks and Security (3 credits)

The course covers theory and practice of computer security, focusing in particular on the security aspects of the web and Internet. It surveys cryptographic tools used to provide security, such as shared key encryption (DES, 3DES, RC-4/5/6, etc.); public key encryption, key exchange, and digital signature (Diffie-Hellmann, RSA, DSS, etc.). It then reviews how these tools are utilized in the internet protocols and applications such as SSL/TLS, IPSEC, Kerberos, PGP, S/MIME, SET, and others (including wireless). System security issues, such as viruses, intrusion, and firewalls, will also be covered.

CMPS 520 Research Methodology (3 credits)

This course is designed to support postgraduate students in developing their research project and to assist them in defining their mode of enquiry. The course has been constructed to guide students through a range of issues and considerations which should inform their general approach to research. It will give students a general introduction to postgraduate research, its methodologies, its challenges and its organization, including in creative practice. Students will be introduced to a range of research tools and will be equipped to plan and organize their research, as well as to communicate their findings.

CMPS 530 Advanced Database Systems (3 credits)

This course covers design principles and techniques for medium to very large databases. Topics include user database issues, concurrency control and recovery, query processing and optimization, transaction processing, object-relational databases, and data mining. Design and implementation issues related to multi-database systems are also discussed.

CMPS 540 Information Technology Project Management (3 credits)

This course is designed to prepare students with project management skills needed to better manage IT projects. It covers detailed topics of the basic concepts of IT project management, including initiating, planning, controlling, executing, and closing projects. The course also shows how IT projects should be managed, from inception to post implementation review. The students who take this course will likely improve their management skills and abilities to define the project scope, create a workable project plan, and manage within the budget and schedule. *Prerequisite or Co-requisite: CMPS 500*

Elective courses

CMPS 550 Advanced Artificial Intelligence (3 credits)

In this course we will start with the question like "What is intelligence", "What is not intelligent", "Can a machine mimic intelligent behavior". We will look at the history and philosophy behind different notions of intelligence developed so far. We will have an overview of streams of development leading to modern intelligent systems, knowledge based tools, expert systems, fuzzy logic, probabilistic methods, neural networks, and genetic algorithms.

CMPS 551 Intelligent Systems (3 credits)

In this course we will study the design of computer systems that exhibit traits we normally associate with intelligence in human behavior, such as the ability to search and solve problems, the ability to understand natural language or to reason about the visual environment.

CMPS 552 Information Technology Entrepreneurship (3 credits)

This course is designed to introduce students to the nature and different forms of IT entrepreneurship and entrepreneurial behaviour. Taking an opportunity-based approach to entrepreneurship, the course covers the key areas of entrepreneurial process, including entrepreneurial motivation, new venture creation process, opportunity identification and development, environmental analysis, business planning, leadership and management of an enterprise, and sustainability and growth of an IT business.

CMPS 553 Mobile Computing (3 credits)

This course discusses a balance mixed of topics related to mobile computing. Topics include mobile and wireless networking, operating systems and middleware, reliable distributed file systems, location discovery, wireless routing, and location management and prediction.

Prerequisite: CMPS510

CMPS 554 Advanced Programming Languages and Techniques (3 credits)

This course focuses on comparative study of programming languages from both theoretical and applied viewpoints. Typical issues include syntax and semantics, scope and binding times, storage allocation, parameter-passing techniques, control structures, run-time representation of programs and data. Detailed examples are from the imperative, functional, parallel, object-oriented and logical programming paradigms.

CMPS 555 Strategic Information Systems Planning (3 credits)

The course builds on both the Management and Information Systems skills. It ties the study of management and computing together at the top level and focuses on issues that bring competitive advantage into modern and partially automated organizations.

CMPS 556 Analysis and Design of Algorithms (3 credits)

The course will cover some of the core topics already studied in DU's undergraduate course on algorithms (or in some equivalent course at another university), but with more details and rigor. In addition, we will present a selection of advanced topics, mainly the theory of NP-completeness, the theory of fixed-parameter tractability, approximation algorithms, and algorithms for parallel computers.

CMPS 557 Security in Networks (3 credits)

This course focuses on network security infrastructure technologies such as firewalls, Virtual Private Networks (VPN), Intrusion Detection and Prevention Systems (IDS/IPS), vulnerability assessment tools, as well as overall security infrastructure engineering and design.

Prerequisite: CMPS 510

CMPS 558 Advanced Web Development (3 credits)

This course focuses on the design, development and implementation of Internet technologies. Students will design, build and place online a web site for a live client. Web server implementation, administration and ongoing support will also be discussed.

CMPS 559 Multimedia Applications (3 credits)

This course provides students with the opportunity to train for a career in Multimedia and Web Development sector. It will focus on 3D animation, Digital Video processing, Game Design and Web Development.

CMPS 560 Object Oriented Software Development (3 credits)

This course provides broad and coherent coverage of object–oriented technology, teaching object oriented design and development to the students. The course focuses on design and programming through the use of UML, design patterns and frameworks. Aspect and Extreme Programming, Reuse, and Refactoring of components in object-oriented technology will be the highlights of this course. The Class libraries and illustration of incremental software development is also covered.

Prerequisite: CMPS 500

CMPS 600 Emerging Trends in Information Technology (3 credits)

This course focuses on new and emerging applications in information technology. Topics may include but not limited to such as platform architectures, social platforms, cloud computing, data privacy and security, user experience, and analytics.In addition it focuses on the new trends and disruptive technologies in IT. Emphasis will be given to the way technologies create a competitive edge and generate business value. There will be a broad range of views presented by different guest speakers, including entrepreneurs, analysts, and IT executives.

Prerequisite: Instructor's consent

CMPS 601 Research Topics in Information Technology (3 credits)

This course offers the student the entry to self-directed scientific work. The student chooses a topic, does the literature review and presents his/her work in a written report along with a presentation. Topics would be chosen based on a literature review focused on emerging technologies in the field of IT not limited to such as Artificial Intelligence; Machine Learning; Human-Computer Interaction; Medical Informatics; Games; Networks & Communications; Image Processing; Simulation; Evolutionary Computation; Energy Informatics; Knowledge Management.

Prerequisite: Instructor's consent

CMPS 602 Information Technology Auditing and Assurance (3 credits)

This course introduces the fundamentals of IT auditing and assurance services, core reasons why IT auditing is a specialized area of auditing, evolution of IT assurance, and the principle objectives of IT auditing and assurance services.

CMPS 603 Knowledge Management (3 credits)

This course covers the latest theory and practice of Knowledge Management (KM), with an integrated interdisciplinary presentation that makes sense of the confusingly wide variety of computer science and business KM perspectives arising simultaneously from artificial intelligence, information systems, and organizational behavior. It solidly covers the "hard" technical components of computer tools and technology for managing knowledge, without losing sight of the "soft" management needs and challenges in leveraging knowledge effectively within an organization. The course also critically evaluates the nature, computer representation, access, and utilization of knowledge versus information within a human context.

CMPS 604 Research Project (3 credits)

This course requires students to develop a research project. It gives students the opportunity to obtain, develop and demonstrate research skills in Information technology and related areas. A diverse range of projects can be proposed and each will require and develop different research skills. Having successfully completed this course, students shall be better prepared to undertake further research projects or to apply their research skills in an industry context.

Prerequisite: Instructor's consent

CMPS 690 Master Thesis (6 credits)

This course addresses research question(s) of interest to the student. It consists of an integrated piece of work, with critical analyses of approaches and results, a software implementation of the proposed system (if applicable), and a discussion of further works.

Prerequisite: Successful completion of 18 credit hours and CMPS 520 (Research Methodology) if deemed necessary by the advisor, followed by approval of the department.

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