Master in Information Technology (M.I.T)
Course Catalogue
2007/2008

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Introduction

Traditionally computer technology was confined to financial, military, space and high-end industrial engineering. Today the same technology is present in homes, schools, shops, transport systems, life enhancing systems, medical systems etc. The sustainability and the development of such systems require the formation and the development of a greater number of people in this area of science and technology. Additionally these people must be representative of a wide area of applications. The MIT degree is targeted towards those graduates from departments that traditionally have no link with the development of IT technologies.

In simple words this degree is for those who would like to apply computer and communications technologies in their graduate area of study. Therefore graduate in medicine may be interested in biomedical signal processing or bio-informatics, a psychology graduate may be interested in cognitive science, linguistics may be interested in machine voice systems, etc.

All these different areas have one thing in common though: One must learn how to design and develop robust solutions in software. In this degree you will be studying the art and science of software engineering, interfacing computer technologies to other technologies that you may be familiar with in your undergraduate area and eventually developing your own IT contribution in your preferred area. Furthermore if you would like to go even further you can read a full masters in a specialised area and eventually to the Ph.D.

In order to help you assess whether this is the right degree for you, we have identified a small number of degrees and a number of I.T. that may apply to this degree. Go through the following list and see whether you can identify yourself in it. Note that this is just an indicative list and is on no way exhaustive. If you have any questions do not hesitate in contacting us at mit@cs.um.edu.mt or phone May Lawrence at 2340-2530

Architects
- Knowledge based CAD
- Acoustic modelling of buildings
- Light modelling in buildings

Psychology graduates
- Computer Modelling of cognitive sciences
- Computer Modelling of human behaviour

BA comms graduates
- Computer Graphics
- Web interactive systems

BCom graduates
- Efinance
- E business
- Prediction and forecasting tools

Linguistics
- Speech studies using computers
- Speech recognition
- Speech synthesis

Brief Summary of Course Structure.

What follows is a quite summary of how the course is organised. For more information please refer to the M.I.T. regulations found at Appendix A of this document or at http://home.um.edu.mt/bosit/courses.

This course will be offered through a series of lectures that will be held in the evening. This course will last three years. Each student is expected to register for 30 ECTS credits annually. In the first year, exactly 30 ECTS credits will be on offer and thus all credits are compulsory. In the second and third years several units each offering 5 ECTS credits are offered and the student can chose those units that more appropriate to his or her career prospects. The units that are offered in the second and third years are split up into Advanced Units A and Advanced Units B. At any one year only one of these sets will be on offer. Note that certain units will require a minimum amount of registered students to be offered. The students will be notified in due time if some course will not be offered and the students will have ample time to chose an alternative unit. In addition a project holding an extra 12 credits will be submitted by the student at the end of the three year course.

The Board of Studies reserves the right to withdraw, change or enhance units described in this catalogue.

PROGRAMME OF STUDY 2007/8
COURSE GROUP 2007-2010

STUDENTS ARE REQUIRED TO REGISTER FOR ALL 30 CREDITS IN YEAR I OF THE COURSE.

IN YEAR 2 STUDENTS ARE REQUIRED TO CHOOSE STUDY-UNITS TO WHICH 30 CREDITS ARE ASSIGNED.
IN YEAR 3 STUDENTS ARE REQUIRED TO CHOOSE STUDY-UNITS (INCLUDING A RESEARCH PROJECT) TO WHICH 42 CREDITS ARE ASSIGNED.
PLEASE NOTE THAT CERTAIN UNITS WILL BE OFFERED ONLY IF A MINIMUM NUMBER OF STUDENTS REGISTER FOR THEM. IF A UNIT IS NOT OFFERED STUDENTS WILL BE NOTIFIED IN TIME TO ALLOW THEM TO CHOOSE AN ALTERNATIVE UNIT.

YEAR I (2007/8)

Semester 1

Status of Unit	Unit Code	Title of Unit	ECTS Credits
Compulsory	BIT5101	Computer Systems	4
Compulsory	BIT5103	Introduction to Computer Science I: Mathematics of Discrete Structures Algorithms and Data Structures	5
Compulsory	BIT5105	Programming in Java and Problem Solving Techniques	5

Semester 1 and 2

Status of Unit	Unit Code	Title of Unit	ECTS credits
Compulsory	BIT5108	IT Fundamentals	3

Semester 2

Status of Unit	Unit Code	Title of Unit	ECTS credits
Compulsory	**BIT5102**	**Foundations of Information and E-Business**	**4**
Compulsory	**BIT5104**	**Introduction to Computer Science II:** **Structured Development Principles** **Operating Systems and Networking**	**4**
Compulsory	**BIT5106**	**Signal Analysis and Measurement**	**5**

YEAR II (2008/2009)

STUDENTS ARE REQUIRED TO REGISTER FOR 30 CREDITS

Semester I

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5202	Basic Intelligent Systems	5
Elective	BIT5203	Computer and Communication Networks	5
Elective	BIT5204	Computer Modelling of Continuous Physical Systems	5
Elective	BIT5207	Information Systems Engineering	5

Semester II

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5201	A.I. as Representation and Search	5
Elective	BIT5205	Databases and their Implementations	5
Elective	BIT5206	Digital Image Processing	5
Elective	BIT5208	Object Oriented Programming applied to development of Windows, Web and Distributed Applications	5

YEAR III (2009/10)

STUDENTS ARE REQUIRED TO REGISTER FOR 42 CREDITS

Semester I

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5301	Applied Web Engineering and e-Business Techniques	5
Elective	BIT5302	Computer Modelling of Discrete Physical Systems	5
Elective	BIT5304	Internet Technologies	5
Elective	BIT5306	Software Engineering	5

Semester II

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5303	Ethics in I.T.	5
Elective	BIT5305	IT Quality, Security and Risk Management	5
Elective	BIT5307	Speech Technology with Digital Signal Processing	5
Elective	BIT5308	Operating Systems II	5

To be selected prior the start of the summer period following Year II and is to be finalised by the end of summer period following Year III

Type of Unit	Unit Code	Title of Unit	ECTS credits
Compulsory	BIT5000	RESEARCH PROJECT	12

PROGRAMME OF STUDY 2007/8
COURSE GROUP 2006 - 2009

IN YEAR 2 STUDENTS ARE REQUIRED TO CHOOSE STUDY-UNITS TO WHICH 30 CREDITS ARE ASSIGNED.
IN YEAR 3 STUDENTS ARE REQUIRED TO CHOOSE STUDY-UNITS (INCLUDING A RESEARCH PROJECT) TO WHICH 42 CREDITS ARE ASSIGNED.
PLEASE NOTE THAT CERTAIN UNITS WILL BE OFFERED ONLY IF A MINIMUM NUMBER OF STUDENTS REGISTER FOR THEM. IF A UNIT IS NOT OFFERED STUDENTS WILL BE NOTIFIED IN TIME TO ALLOW THEM TO CHOOSE AN ALTERNATIVE UNIT.

YEAR II (2007/8)

STUDENTS ARE REQUIRED TO REGISTER FOR 30 CREDITS

Semester I

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5301	Applied Web Engineering and e-Business Techniques	5
Elective	BIT5302	Computer Modelling of Discrete Physical Systems	5
Elective	BIT5304	Internet Technologies	5
Elective	BIT5306	Software Engineering	5

Semester II

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5303	Ethics in I.T.	5
Elective	BIT5305	IT Quality, Security and Risk Management	5
Elective	BIT5307	Speech Technology with Digital Signal Processing	5
Elective	BIT5308	Operating Systems II	5

YEAR III (2008/09)

STUDENTS ARE REQUIRED TO REGISTER FOR 42 CREDITS

Semester I

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5202	Basic Intelligent Systems	5
Elective	BIT5203	Computer and Communication Networks	5
Elective	BIT5204	Computer Modelling of Continuous Physical Systems	5
Elective	BIT5207	Information Systems Engineering	5

Semester II

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5201	A.I. as Representation and Search	5
Elective	BIT5205	Databases and their Implementations	5
Elective	BIT5206	Digital Image Processing	5
Elective	BIT5208	Object Oriented Programming applied to development of Windows, Web and Distributed Applications	5

To be selected prior the start of the summer period following Year II and is to be finalised by the end of summer period following Year III

Type of Unit	Unit Code	Title of Unit	ECTS credits
Compulsory	BIT5000	RESEARCH PROJECT	12

PROGRAMME OF STUDY 2007/8
COURSE GROUP 2005-2008

IN YEAR 3 STUDENTS ARE REQUIRED TO CHOOSE STUDY-UNITS (INCLUDING A RESEARCH PROJECT) TO WHICH 42 CREDITS ARE ASSIGNED.
PLEASE NOTE THAT CERTAIN UNITS WILL BE OFFERED ONLY IF A MINIMUM NUMBER OF STUDENTS REGISTER FOR THEM. IF A UNIT IS NOT OFFERED STUDENTS WILL BE NOTIFIED IN TIME TO ALLOW THEM TO CHOOSE AN ALTERNATIVE UNIT.

YEAR III (2007/8)

Semester I

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5301	Applied Web Engineering and e-Business Techniques	5
Elective	BIT5302	Computer Modelling of Discrete Physical Systems	5
Elective	BIT5304	Internet Technologies	5
Elective	BIT5306	Software Engineering	5

Semester II

Status of Unit	Unit Code	Title of Unit	ECTS credits
Elective	BIT5303	Ethics in I.T.	5
Elective	BIT5305	IT Quality, Security and Risk Management	5
Elective	BIT5307	Speech Technology with Digital Signal Processing	5
Elective	BIT5308	Operating Systems II	5

Unit starts at beginning of the summer period following Year II and is to be finalised by the end of summer period following Year III

Type of Unit	Unit Code	Title of Unit	ECTS credits
Compulsory	**BIT5000**	**RESEARCH PROJECT**	**12**

BIT5101 Computer Systems

Lecturer: Dr C J Debono

In this unit the student learns what is required to interface a computer to real world applications and how to input and output signals to an from a computer. This unit starts with an understanding of the hardware requirements for the realisation of a simple computer. After this, the focus turns on interfacing peripherals to computers and hardware and software requirements are discussed.

Syllabus

Computer Hardware and Organisation:

- The Electronic Digital Computer
- Gates – NOT, AND, OR, XOR
- Number Systems
- Computer Arithmetic
- Von Neumann machine
- Processor Organisation
- Data Storage elements
- PC organization - Hardware elements - Motherboard, Cards, Power Supply

Computer Interfacing and Communications:

- Busses and Connectors
- Relationship with Main Memory and Peripherals
- Machine Instructions
- How Peripherals work and interface to the main computer system. - CD, Disk, VDU, Printer, Keyboard, Mouse,

LAB Sessions:

- Interfacing to a parallel port, leds, switch sensors.
- Development of simple applications such as intruder alarm, level sensor and simple traffic lights controller.

Reading List:

Course Notes and List of Reference Texts

Method of Assessment:

Assignments plus presentation :50%.
Exam: 50%.

BIT5102 Foundations of Information and E-business Systems

Lecturer: Prof. A. Leone Ganado and Mr S Caruana

This unit focuses on the way information is utilised as a critical resource in organisations both traditional and those based on modern structues such as distributed and virtual organisations

Contents:
Components of an information system. Characteristics of Data and Information.

Cost/value and quality of information. Types of information systems. Business management and reporting functions. Transaction processing systems, Office Information systems including groupware, Management information systems. Information Management Issues, Role and Nature of IS managers and management.

Functional Information Systems including financial, marketing, manufacturing andhuman resources systems. New information systems models based on thedistributed and virtual organisation.

The structure and components of decision support, executive and expert information systems. Their role within organizational decision making. The role and scope of communication and networking services as a means to increase information flow and business productivity. E-Commerce models. Internet marketing. Web usability issues. Web security. Legal, ethical and social issues. Financial issues on the web. Introduction to professionalism and ethical issues in IS. Real world examples and case analysis application of the above will be included.

Reading List

Zwass*, Information Systems*, Mc Graw-Hill
Laudon & Traver *E-Commerce*, Addison-Wesley
Effy OZ*, Management Iinformation Systems* Thomson
Laudon & Laudon, *Management Information Systems*, Prentice-Hall

Method of Assessment*:*

Group Assignment: 25%
Exam: 75%

BIT5103 Introduction to Computer Science I

Mathematics of Discrete Structures

Lecturer: Dr. Gordon Pace

The course is primarily aimed to introduce the basic mathematical tools that are required for the formal and rigorous treatment of the various aspects of computing. The importance of formal reasoning is emphasised in the course, concentrating on syntax, and formal proofs. The course also explains various mathematical notions and structures that will be used in later courses.

Syllabus:

- § Propositional Calculus
- § Predicate Calculus
- § Set theory
- § Relations and Functions
- § Natural Numbers and cardinality
- § Graph theory

Algorithms and Data Structures

Lecturer: Dr. John Abela

The aim of this unit is to introduce the concepts of algorithm and data structure, highlighting the relation which exists between the two. These concepts are introduced in a gradual fashion, proceeding from abstract principles to concrete examples. Correctness and efficiency will be emphasized as the main properties of algorithms. In the first part of the course a number of algorithms will be discussed, with emphasis on sorting and searching. Abstract data types (ADT's) will be formally defined and illustrated with case studies for list, stack, queue, priority queues and heaps, and the ADT table. The structure of binary trees and associated algorithms will be investigated. In the second part of the course, the 'Big O' notation will be introduced as a formal framework for describing resource use (i.e. time and space) of an algorithm. Further topics covered are: graphs and their associated searching and traversal algorithms, hashing techniques, AVL trees, 2-3 trees, B-trees.

Reading List:

Mark Allen Weiss *Data Structures and Algorithm Analysis* Benjamin Cummings.
David Harel *Algorithmics: The Spirit of Computing* Addison-Wesley.
Aho J.E. Hopcroft J.D. Ullman *Data Structures and Algorithms.*

Method of Assessment: 10% Assignment
90% Examination

BIT5104 Introduction to Computer Science II

Structured Development Principles

Lecturer: Dr. Ernest Cachia

It should be stressed that this unit is not in any way a "programming" course. It could, however, expose students to some very limited practical programming in the form of examples to consolidate theoretical discussion. This course will very briefly introduce the basic concepts of imperative programming languages from the viewpoint of principle algorithmic structure. Such notions as state, variable, and transition, the notion of syntax and semantics, data declaration and usage, representation of control flow and basic programming constructs. Structure theorems and their application will also be introduced and discussed. As its second part, this unit will introduce a rigorous structured approach to program specification and design using simple universal concepts, and guidelines applied in an ever-increasing spectrum of development environments. This course will introduce the student to such basic concepts as functional connectivity through data flow, modularity, module structure and relationships, through basic development paradigms such as stepwise refinement and levels of abstraction. This course will also acquaint students with the basic system building paradigms such as entity/event modelling. Throughout this unit, the student will be exposed to various standard analysis and design paradigms and notations as well as their interactions.
This course will also introduce the student to the procedure and quality attributes associated with a rigorous approach to the construction of reliable software systems. It will take the student from the basic heuristic as well as more formal principles outlining software engineering, through a systematic insight into software quality aspects and their indicative nature. Whenever possible, theoretical material will be complemented with practical examples

Operating Systems and Networking

Lecturer: Dr. Kevin Vella

The aim of the operating systems course is to tackle the issues involved in designing a general purpose multiprogramming operating system, and to enable students to understand the internals of an operating system. This first part covers topics such as the role of an operating system in providing a process abstraction, CPU scheduling, inter-process synchronisation and communication. The second part can be found at BIT5308.

Reading List:

Silberschatz, P. Galvin and G. Gagne. Operating System Concepts. 6th Ed. Addison-Wesley.

Method of Assessment:

Assignment: 10%(for Structured Development Principles)
Examination: 90%

BIT5105 Programming in JAVA and Problem Solving Techniques

Lecturer: Dr. V. Nezval and Mr. J. Galea

This unit covers both the Java Language and important algorithms and datastructures applied to solving practical problems in the lab.

The accent will be given to writing efficient and correctly structured programs Java language topics will include structure of Java program, compilation and execution, concept of classes and objects, data types, assignment, basic I/O using streams, if and switch statements, loops, methods, arrays, strings, arrays of classes, utility classes, concept of applets with awt and swing classes.

Practical problem solutions will be based on use and application of basic algorithms in user written programs both during practical sessions guided by tutor as well as by set of assignments to be worked out independently at home and problems to be solved in laboratory and assessed by a tutor. A gradual increase of load and difficulty will be adopted as the unit progresses.

Reading List:

To Be Announced

Method of Assessment:

Programming Worksheets: 100%

BIT5106 Signal Analysis and Measurements

Lecturer: Dr J Briffa

PREREQUISITES: none. Leads to: Digital Image Processing (BIT5206), Speech Technology with Digital Signal Processing (BIT5307).

COURSE OBJECTIVES: To introduce the concepts of signals, their acquisition, and processing, as applied to digital systems. Practical concerns are stressed.

TOPICS: In detail (items in *italics* will be covered as time allows):

- Introduction; Transducers
  - Electrical representation of physical phenomena
  - Examples include: temperature, light intensity, audio, and video
- Sinusoids
  - Time-domain manipulation – amplification, attenuation, DC offset
  - Signal energy and power
  - Mixing signals
- The Complex Exponential & Phasors
  - Phasor representation & arithmetic
- Spectrum Representation
- Analysis & Synthesis of Periodic Waveforms
- Time-Frequency Spectrum
- Sampling and Aliasing
- FIR Filters & *Convolution*

Reading List:

- James H. McClellan, Ronald W. Schafer, and Mark A. Yoder, "DSP First: A Multimedia Approach", 1st edition, Prentice Hall, 1998.

REFERENCE:

- John G. Proakis, Dimitris K. Manolakis, "Digital Signal Processing", 4th edition, Prentice Hall, 2006.

Method of Assessment:

Coursework: 40%
Examination: 60%

BIT5108 IT Fundamentals

Lecturer: Dr. Montebello

"This course aims to provide a fundamental knowledge base in IT issues which are required throughout other study units within the Masters Conversion Course. It also aims to assist students into gaining a useful insight into the background skills required throughout IT-related course topics which require a more academically advanced attainment level."

Reading List:

http://staff.um.edu.mt/mmon1/lectures/bit5107/

Method of Assessment

Assignment: 100%

BIT5201 A.I. as Representation and Search

Lecturer: Mr. Sandro Spina/ Kristian Guillaumier

Programs which apparently exhibit intelligent behaviour (like for example winning a game of chess) usually employ some sort of AI technique. This course will focus on the basic elements of AI namely knowledge representation and search strategies. AI is intimitely linked to the representation of a given problem domain. This role of representation is to capture the essential features of a problem domain and make that information accessible to the problem-solving procedure. State space strategies are used to enumerate a number of solutions to a given problem domain. The validity of this enumeration is manifest in the apparent "intelligence" of these algorithms. The course is divided into the following three main sections:

--- Knowledge Representation
--- Strategies for State Space Search
--- Heuristic Search

Reading List:

- George F Luger. Artifial Intelligence, Structures and Strategies for Complex Problem Solving. Addison Wesley
- Russell, Norvig. Artificial Intelligence A Modern Approach. Prentice Hall.

Method of Assessment:

Coursework: 30%
Examination: 70%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5202 Basic Intelligent Systems

Lecturer: Dr. Matthew Montebello

A slow introduction to basic AI techniques which touches a number of related material like Agent Technology, Web Services, XML and other Markup Languages within the environment of the Internet, WWW and related applications.

Reading List

http://staff.um.edu.mt/mmon1/lectures/bit5202/

Method of Assessment

Assignment: 20%
Examination: 80%

BIT5203 Computer and Communication Networks

Lecturer: Dr C J Debono

In this unit the student will learn on the benefits of communication networks and how large systems can be realised. The unit introduces the concept of distributed systems and gives an insight to the software and hardware requirements. At the end of the unit the student is capable of specifying the needs of the systems for the application in hand.

Syllabus

- Network Infrastructure:
  - Network topologies
  - Technologies available
  - Packet and circuit switched networks
  - Wireless systems, wired systems and benefits of each
- Network Capacity:
  - Information sources and rates
  - Transmission of signals - carrier, modulation, multiplexing, bandwidth, noise
  - Compression, error correction and security
  - Quality of service, BER, throughput, blocking, propagation delays, network delays, queue delays.
  - Information source rate vs transmission rate/ throughput rate
  - Blocking systems and dynamic systems.

Assignments

- Assign in one of the following applications: Medical, transport, education, multimedia, weather, space, agriculture, sports, aviation, elderly care, etc.

Reading List:

- To Be Announced

Method of Assessment:

- Assignment - 40%
- Exam - 60%

BIT5204 Computer Modelling of Continuous Physical Systems

Lecturer: Dr A Muscat

In this unit the student will learn how to create computer models for physical systems such as acoustical systems and energy systems and how to use the model for performance prediction and optimisation.

Syllabus

- Introduction
  - Reason for modelling and example applications; acoustics, energy systems.
- Basic blocks in physical modelling
  - Linear equation model
  - Non-linear equation model
  - Examples in energy systems
- Physical model validation
  - Model validation techniques
  - Improving simulation-time efficiency
  - Convergence problems and criteria
  - Errors in modelling
- Advanced building blocks
  - Numerical solution of differential equation
  - Numerical solution of integral equations
  - Wave propagation modelling in acoustics

Reading List:

Course Notes
Laboratory Exercises

Method of Assessment:

Lab assignment - 50%
Exam - 50%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5205 Databases and their Implementations

Lecturer: Mr. Joe Vella

The unit starts with an introduction to databases and Database Management Systems (DBMS) in context of their role in Computer Information Systems. Also a quick summary of major developments of databases, DBMSs and related computing artifacts is presented - e.g. for example the development of CODASYL, ANSI/SPARC generalisation of databases and DBMSs, and the emergence of the relational model. Also the main sub-systems expected in any DBMS are explained.

The first effort of this unit is the understanding of data models and an introduction to a language to model database schemas at an abstract level. This language is graphical in its representation of models and is independent of any implementation or physical details – the favourite of this unit is Chen's notation (and its derivatives). The second effort is an introduction of a database model that is popular with the majority of implementations - Codd's relational model. The initial part concerns understanding the relational data model. We then study various languages that interact over the relational model: the relational algebra and Structured Query Language (SQL). We also study how a database schema, specified in an ERM diagram is converted into a set of SQL data definition constructs (e.g. CREATE TABLE commands). Related to the relational database model is our concern to control data redundancy in a database design, consequently we study Codd's original normal forms and their later refinements. The third part of the units describes practical facets that deal with striving for the DBMS to make efficient use of the available resources (e.g. RAM, HDs, communication networks, tapes). These include data sharing, query processing, and sophisticated data definition and manipulation languages. Also an important part is the emphasis of a multi tier implementation of a computer information systems (three tier for presentation, business and data processing) and how and with what can software developers design, implement and test these tiers.

Reading List:

Fundamentals of Database Systems, by Ramez Elmasri, Shamkant B. Navathe, Addison Wesley

Method of Assessment:

Assignment: 20%
Exam: 80%

BIT5206 Digital Image Processing

Lecturer: Dr J Briffa

PREREQUISITES: Signal Analysis & Measurements (BIT5106).

COURSE OBJECTIVES: To introduce the fundamental techniques for manipulating and storing digital representations of images. Emphasis is placed on the practical use of the various algorithms. This is supported by a significant coursework component and a practical examination.

TOPICS: In detail (items in *italics* will be covered as time allows):

- Introduction
  - Conventions
  - Images as two-dimensional signals
  - Use of Matlab for image processing
- Spatial filtering
  - Intensity transformations
  - Histogram processing
  - Convolution & linear filtering
  - Non-linear filtering
- Frequency-domain filtering
  - The 2D discrete Fourier transform
  - Filtering in the frequency domain
  - Relationship with spatial filtering
- Image restoration
  - Noise models; estimating noise parameters
  - Noise removal using spatial and frequency-domain filtering
  - **Noise removal using inverse methods**
  - Geometric transformation
- Color image processing
  - Color representation
  - Color space conversion
  - Color transformations
  - Spatial filtering – smoothing & sharpening
  - **Color vector processing**
- Image data compression
  - Entropy encoding
  - Inter-pixel redundancy
  - Psycho-visual redundancy
  - Standards

Reading List:

- Gonzalez, Woods, & Eddins, "Digital Image Processing using Matlab", Prentice-Hall, 2004.

References:

- Gonzalez & Woods, "Digital Image Processing", 2nd edition, Prentice-Hall, 2002.
- Jain, "Fundamentals of Digital Image Processing", Prentice-Hall, 1989.

Method of Assessment:

Coursework: 40%
Examination: 60%

BIT5207 Information Systems Engineering

Lecturer: Prof. Leone Ganado

Design and building of valid Information systems is critical to the success of many organisations. The aim of this course is to give an understanding of how IS methodologies can support the development of applications and to impart the necessary skills.

The philosophy of methodologies. (the traditional waterfall structure versus iterative and evolutionary development). The Software Development lifecycle. Introduction to various software methodologies such as SSADM, DSDM, SSM, and UML2. Methodology frameworks. Developing the object model (properties of objects and classes: finding objects and classes in the real world). Object states and behaviour (events and states, transitions and actions, the state diagram).

Developing the object oriented requirements model (Use Case, primary scenarios, secondary scenarios). The three main perspectives of data modelling, Process Modelling and Behavioural modelling. The concept of an integrated development environment and 4GL Case tools).

Significance of case tool to this approach (significance of 4GLs to this approach, socio-technical aspects of systems analysis and design, checkland's soft systems method (SSM)background to the method, the seven stages in summary, rich pictures as a technique, CATWOE and root definitions, Conceptual models, ETHICS methodology: philosophy of ETHICS, overview of methodology.

User Participation in systems development (Prototyping systems , Joint Application development and requirements, Design, role of a 4GL environment in prototyping). Rapid Applications Development techniques (General RAD concepts, DSDM method: background to the method, framework of the method, DSDM principles, time versus functionality, when to use the method, technology support. Appraisal of application development environments) User Interaction Design (the problem space, user collaboration and communication, interfaces)

Object-Oriented Approaches (Object-oriented analysis and design, Unified Process and UML, the Rational Unified Process)

Reading List:

To Be Announced

Method of Assessment:

Assignment: 30%
Exam: 70%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5208 Object Oriented Programming applied to development of Windows, Web and Distributed Applications

Lecturer: Dr. Nezval

Main language used for development of applications will be Java however C# language will be used as well at all relevant areas and for the comparisons of the two.

- Development of Windows Applications using both Swing and .NET components
- Three tier architecture of distributed systems, Applets, Servlets, JSP's.
- Connectivity to databases using ODBC and data access using SQL.
- Distributed Systems on Java, CORBA and .NET technology systems. Middleware services provided.
- Interoperability of objects implemented by automation and Web Services.
- Interoperability issues between different technology systems

Reading List:

To Be Announced

Method of Assessment:

Assignment: 20%
Exam: 80%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5301 Applied Web Engineering and e-Business Techniques

Lecturer: Prof. Leone Ganado, Dr. Nezval and Mr. Spiteri Staines

e-Business Models (Storefront, Auction, Portal, Dynamic Pricing Models, B2B, e-learning).
Internet marketing (e-mail marketing, e-business advertising, search engines) .

Web technologies, HTTP, web clients and web servers , Markup languages, XHTML Web clients and client side technologies; Browsers, XHTML, CSS, JavaScript, cookies). Web servers and server-side technologies (CGI (Perl), PHP, ASP.NET, sessions, database connectivity XML including DTDs, XSD schemas, namespaces, XSLT, Xpath, and DOM Perl and CGI programming. Form processing, SSI, cookies, Connecting and accessing databases.

Java and .NET technologies used in Web programming. Java Beans and Java Enterprise beans. Web services (SOAP, WSDL, ASP.NET).

Web site development tools and multimedia: e.g. Visual Studio, Macromedia StudioMX.Web and Frontpage .

Reading List:

To Be Announced

Method of Assessment:

Application: 40%
Coursework: 60%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5302 Computer Modelling of Discrete Physical Systems

Lecturer: **Dr. Adrian Muscat**

In this unit the student will learn how to model systems such as communications and transport networks and how to use the model for optimisation and performance prediction.

Syllabus

- Introduction
  - Reason for modelling and example applications; road transport networks and communication networks.
- Basic blocks in systems modelling
  - Sources
  - Data generation
  - Deterministic signal modelling
  - Random generators
  - Non-deterministic signals and data
  - Statistical tools
- Model validation
  - Model validation techniques
  - Improving simulation-time efficiency
  - Convergence problems and criteria
  - Errors in modelling
- Advanced building blocks
  - Modelling of queues and servers
  - Modelling of contention based systems
  - Modelling of human generated traffic

Reading List:

Course Notes
Laboratory Exercises

Method of Assessment:

Lab assignment - 40%
Exam - 60%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5303 Ethics in I.T.

Lecturer: Dr. Chris Staff

Rapid innovation in technology inevitably creates "policy vacuums". Situations are created that have no legislation to decide whether some activity is legal or illegal. Changes in information technology, the rapid growth and versatility of the Internet, the emergence of e-business, e-education, e-entertainment, e-life, e-communication, and the proliferation of instantly accessible information about anything, are creating situations that legislation cannot keep up with.

Information and Communication Technology has created and is still creating situations that have far-reaching consequences on a scale never before anticipated. This study-unit will draw on moral concepts and theories to work out the ethical implications arising from scenarios and case studies.

Reading List:

Hester D.M. and Ford P.J., (2001), Computers and Ethics in the Cyberage, Prentice Hall. ISBN 0-13-082978-1.

Johnson, D.G., (2001), Computer Ethics. Prentice Hall. ISBN 0-13-083699

Reynolds, G., (2003), Ethics in Information Technology. Thomson Course Technology. ISBN 0-619-06277-0

Method of Assessment: (pass required in both Assignment and Exam)

Assignment: 40%

Exam: 60%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5304 Internet Technologies

Lecturer: Mr. Karlston D'Emanuele

This unit investigates the Internet as an example of a real-world distributed system.

Fundamental Internet technologies such as the TCP/IP protocol stack, network addressing, the IP routing mechanism, subnetting, ICMP, the TCP protocol including sliding windows and congestion avoidance, DNS, dynamic routing protocols such as RIP and OSPF, security (firewalls, packet filters and proxies) and various application level protocols (FTP, Telnet, HTTP, SMTP, etc.), will be dissected. Further an overview of wireless networking will be covered depending on time constraints.

Reading List:

Recommended:

- M.W. Murhammer, O. Atakan, S. Bretz, L.R. Pugh, K. Suzuki, D.H. Wood. TCP/IP Tutorial and Technical Overview. IBM International Technical Support Organisation 2006.
  (http://www.redbooks.ibm.com/abstracts/gg243376.html)

Further Reading (FYI):

- W.R. Stevens. TCP/IP Illustrated, Volume I: The Protocols. Addison Wesley 1994.
- Beyond DHCP - Work Your TCP/IP Internetwork with Dynamic IP
  (http://www.redbooks.ibm.com/abstracts/sg245280.html)
- Understanding IP Addressing: Everything You Ever Wanted To Know
  (http://tcpip.nm.ru/pdf/ip-addressing.pdf)
- D.E. Comer. Internetworking With TCP/IP Volume 1: Principles Protocols, and Architecture, 5th edition. Prentice Hall 2006
- RFCs related to topics covered.
- J. Schiller. Mobile Communications, 2nd Edition. Addison Wesley 2003.
- Introduction to IP Version 6. Microsoft Corporation 2007
  (http://www.microsoft.com/technet/network/ipv6/introipv6.mspx)

Method of Assessment

Assignment: 40%
Exam: 60%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5305 IT Quality, Security and Risk Management

Lecturer: Prof. A. Leone Ganado, Mr. C. Meli

To produce and manage quality systems it is important that an IT manager is aware of the need to set up a framework for quality assurance, risk and security. A Project Leader also needs advanced skills in using a project management methodology such as PRINCE .

An introduction to project management standards. The universal quality approach. Building a project quality environment. Effective quality planning. Incorporating quality function deployment. Implementing quality assurance. Applying quality controls .

This course will focus on project management (e.g. using PRINCE and MS Project), quality assurance and Risk management (SERIM and SEI procedures).

Project Management concepts and practice (MS-project)

Project Management and the IT Context. The PRINCE methodology: Framework, organisation, project initiation, product based planning. . Project control and people management.

Philosophy and Concept of Risk management. Elements of software risk. Software risk problems. The SERIM methodology.

Security issues: Network security and system security (threats and countermeasures), Authentication applications Transport Layer Security, Intrusion Detection, Firewalls

Quality issues . The ISO 9000 standards. TickIt. Quality plans. The Quality file. Quality metrics. Testing for Quality. Configuration management . Post implementation reviews. Quality products.

Reading List:

To Be Announced

Method of Assessment:

Assignment: 25%
Exam: 75%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5306 Software Engineering

Lecturer: Dr. Ernest Cachia

The aim of this course acquaint the student with various techniques used in the creation of specific and effective software development environments – both technical and human. This course will acquaint the student with basic software engineering approaches towards effective method, notation, tool, and collaborative development – all the ingredients necessary for modern software development. Students will also be exposed to traditional problematic issues (and possible countermeasures) encountered in software development and will be given a flavour of how different methodological approaches can be brought to bear for maximum effectiveness. Specialised SDLCs such as those based on prototyping and RAD will be explained. Fundamental concepts, such as that of a data dictionary and its notation, usage and properties, which lie at the heart of modelling techniques as well as inter-tool communication, will be discussed. Another aim of this course is to introduce students to the more specialised topics of software engineering, which include direct metrication of such qualities as reliability, availability, and maintainability, as well as the use of fault/testing models and specialised software systems such as e-commerce, real-time and concurrent systems - specification and basic scheduling theory will also be introduced for these last two. Topics such as Function and Object Point Analysis, Stochastic system modelling and analysis will be discussed. This course will provide students with an insight into system representation forms other than the traditional ones, further analyse the principles behind the definition of system specifications which lie at the basis of correct system development and therefore introduce the student to the concepts and practical aspects of formal system specification using fundamental propositional and predicate calculus concepts as well as basic algebraic specification methods and, depending on time and progress, the use of Z-notation. Depending on time and progress, hands-on experience of a modern commercial-strength RAD development tool will be also be supplied.

Reading List:

To Be Announced

Method of Assessment:

Coursework: 20%
Examination: 80%

BIT5307 Speech Technology with Digital Signal Processing

Lecturer: Prof. P. Micallef

In this unit the student learns basic techniques for handling and processing speech signals.

Introduction to Speech Technology
Speech and Hearing;Vocal Chords and Pitch;Vocal System; Articulatory Model; Phones; Formants of Phonemes

Speech Analysis
Time Waveform; The relationship between time information and frequency information; Pitch Period, Harmonics; Frequency Spectrum
Introduction to Digital Signal Processing; Sampling and Aliasing;
Various speech standards for sampling rate, telephone, mobile, MPEG.
The Linear Predictive Coding Model; The Spectral Envelope; Segmentation of Speech; Acoustic Parameters

Speech Synthesis
Segment concatenation; Harmonic Model; LPC Model; Problems of Noise'
PSOLA and MBROLA; Intonation and Intonation Modelling

Text-to-Speech Synthesis
The Grapheme to Phoneme Problem; Rule Based and Neural based Solutions;
The Bilingual Problem; Analysis of broad phrases; Phonetic Assembly;
Duration and Stress;

Speech Corpora
Need for annotated corpora; Spoken Corpora Types; Methods used for Annotation; Relation between Annotation and Recognition

Speech Recognition
Speech parameters used for recognition;
Tools available:The statistical approach: Hidden Markov Model,Neural nets;
Problems of background noise; Problems of variability

Reading List:
To Be Announced

Method of Assessment:
Lab assignment for audio, image and weather signals applications using appropriate software tools - 40%
Exam - 60%

This unit will be offered on the condition that a minimum number of students register for the unit.

BIT5308 Operating Systems II

Lecturer: Dr. Kevin Vella

The aim of this operating systems course is to tackle the issues involved in designing a general purpose multiprogramming operating system, and to enable students to understand the internals of an operating system. This course follows from BIT5104. This part of the course covers topics such as memory management, virtual memory, file system facilities, I/O device handling, as well as security and protection.

Reading List:

Silberschatz, P. Galvin and G. Gagne. Operating System Concepts. 6th Ed. Addison-Wesley.

Method of Assessment

Exam – 100%

This unit will be offered on the condition that a minimum number of students register for the unit.

Appendix A: MIT Degree Course Regulations

IN exercise of the powers conferred upon him by sections 30 (5) and 31 (6) of the Education Act (Cap. 327), the Chancellor of the University of Malta has promulgated the following regulations made by the Senate of the University of Malta by virtue of the powers conferred upon it by sections 31 and 35 of the said Act:

Citation and Interpretation

1.

(1) These regulations may be cited as the Master in Information Technology – M.IT. - Degree Course Regulations, 2003.

(2) In these regulations, unless the context otherwise requires –

"the Board" means the Board of Studies for IT,

"the Course" means the Course leading to the Degree of Master in Information Technology – M.IT.; and

"the Degree" means the Degree of Master in Information Technology – M.IT.

"the Departments" mean The Department of Computer Science and AI, The Department of Communications and Computer Engineering, and the Department of Computer Information Systems.

Applicability

2. These regulations shall apply to courses starting in October 2003 or later.

Admission Requirements

3. The Course is normally intended for University graduates without formal qualifications in IT.

(1) The Course shall be open to applicants in possession of either:

(a) A Bachelor Honours degree **EITHER** in a numerate subject area, normally not less than Second Class Lower
OR at a minimum of Second Class Upper in a nonnumerate subject area.

(b) Equivalent qualifications approved by Senate on the recommendation of the Board.

Course of Studies

4.

(1) The Course shall be offered in areas of study in IT where the Departments can offer expert guidance and supervision. The areas of study shall be indicated by the Board before the commencement of each Course.

(2) The Course shall consist of 102 ECTS credits divided up as follows:

- transition study units: 30 credits
- advanced taught study-units: 60 credits
- project-related study units: 12 credits

(3) Students must obtain all transition study units before being allowed to register for advanced study units.

(4) Students shall be required to obtain all the credits within the stipulated period.

(5) The Board may exempt a student from the requirement of obtaining selected transition study units if he has obtained from the University or an institution recognised by Senate for the purpose, a qualification the study of which, in the opinion of the Board, at least equivalent in content and standard to that required for the study unit concerned.

Duration of Course

5.

(1) The Course shall extend over a period of 3 years of part-time study including two summer semesters made up as follows:

Year 1: 2 Semesters
Year 2: 2 Semesters + Summer Semester
Year 3: 2 Semesters + Summer Semester

(2) Students pursuing the Course on a part-time basis shall be required to register at the beginning of each academic year.

Programme of Studies

6. The Board shall draw up the programme of studies for the Course and shall publish a catalogue of study-units. The catalogue shall indicate the code, title, description and type of study-unit, the credits assigned to each, and the methods of teaching and assessment. The Board shall publish the catalogue for the Course prior to its commencement, following the approval of Senate.

Progress and Assessment

7.

(1) Taught study-units shall be assessed through coursework and examinations held at the end of the semester in which they were held.

(2) Students who fail to obtain all the credits assigned to the transition study units after re-assessment, will be deemed to have failed the degree.

(3) Boards of Examiners shall be appointed for each study-unit in accordance with the provisions of the University Examinations Regulations.

(4) Students who in any year fail in study-units to which not more than a total of ten credits are assigned, shall be given the opportunity to be re-assessed in a supplementary session in September.

(5) Students who in any year fail in study-units to which more than a total of ten credits are assigned or who fail in any re-assessed study units shall be required to withdraw from the course.

Projects

8.

(1) Students shall be required to submit a project title and description by the end of the 4th Semester of study. Any substantial modification in the title or content must be approved by the Board.

(2) The project will comprise part 1 (literature survey and proposal) and part 2 (artifact, report and presentation).

(3) Project parts one and two shall be carried out during the Summer Semester of years 2 and 3 respectively of the course.

(4) The Board shall propose to Senate a Board of Examiners for each project. The Board of Examiners shall be composed of at least three examiners, one of whom shall be the supervisor. The Board of Examiners may include also additional examiners who shall participate in it deliberations only in so as far as the deliberations concern areas in which they are the expert authority.

(5). Project reports must conform to the relevant guidelines as regards format and must satisfy the Board of Examiners as regards content and presentation.

(6) Three spiral-bound copies of the project report shall be submitted for examination. After successful defence of the project, students shall be required to submit two hard-bound copies, one of which shall be deposited in the University Library and the other in the library of the department concerned.

(7) A student who fails to satisfy the examiners in the project may, at the discretion of the Board, be allowed to resubmit the project or to complete some other appropriate task within three months of the first submission.

Results

9.

(1) The results shall take into consideration the performance of the students in the last two years of the course only, i.e. in the advanced study-units and in the project.

(2) The names of the students who qualify for the award of the Degree shall be published in a list in alphabetical order classified as follows:

Passed with Distinction
Passed