

## MSc Computer Science - E528

### 1. Introduction

Available in both full and part-time mode, the MSc Computer Science programme will provide graduates from IT and related fields with the necessary skills to apply their knowledge to a wide range of areas impacting on the computer industry, both at present and in the foreseeable future. It is a response to the increasing prominence of digital information in our society. The course has been designed to permit a high degree of flexibility in that students may take varying combinations of modules.

### 2. Aims and Objectives

The programme aims at developing personal skills in problem solving and research in the field of Computer Science. This challenging programme is geared towards producing high-calibre computer science specialists with the required forefront theory and practice essential managing the increasingly complex, technology-driven organisation. The programme is also designed to enable interested graduates to proceed to a research degree in Computer Science and related areas.

### 3. General Entry Requirements

Successful completion of an undergraduate degree with at least a Second Class or 50%, whichever is applicable, or a GPA not less than 2.5 out of 4 or equivalent, from a recognised Higher Education Institution, or alternative qualifications acceptable to the University of Mauritius.

### 4. Programme Requirements

A degree in Computer Science, Information Systems or any other IT related field from a recognised University.

### 5. Programme Duration

The normal duration of the programme will be as detailed below.

	<b>Full time</b> <b>(yrs)</b>	<b>Part Time</b> <b>(yrs)</b>
<b>Minimum</b>	1	2
<b>Maximum</b>	2	4

However students wishing to exit before the end of the course may do so as follows:

- (a) After successfully completing **four (4)** modules for the award of a **Postgraduate Certificate**.
- (b) After successful completion of **eight (8)** modules, for the award of a **Postgraduate Diploma**.

The programme will be run on a semester system, where an academic year consists of two semesters. A semester is of 15 weeks duration (excluding Exam Period).

**6. Minimum Credits Required for Award of:**

Master's Degree	: 36
Postgraduate Diploma	: 24
PostGraduate Certificate	: 12

**Breakdown as follows:**

	<b>Minimum Core Taught Modules</b>	<b>Dissertation</b>	<b>Electives Optional Modules</b>
Master's Award	12 credits	12 credits	12 credits
Postgraduate Diploma	12 credits		12 credits
Postgraduate Certificate	12 credits		

**7. Assessment**

All modules are of 45 hours duration and carry equal weightage [i.e of 3 credits].

All modules will carry 100 marks and will be assessed as follows (unless otherwise specified).

- A written examination of 3 hours and
- Continuous assessment carrying a range of 10% to 30% of total marks. Continuous assessment may be based on laboratory works, and/or assignments but should include at least 1 class test.
- A minimum of at least 30% should be attained in each of continuous assessment and Written Examination, with an overall total of 40% for a candidate to pass a module.

Students are required to register for modules which they intend to follow in a given semester on date(s) specified by the Faculty.

**Submission Deadlines for MSc Project:**

	<b>Full time</b>	<b>Part Time</b>
<b>Start</b>	January – Level I	January – Level 2
<b>Submission</b>	August –Post Level 1	August – Post Level 2

## 8. List of Modules

<b>Code</b>	<b>Module Name</b>	<b>Hrs/wk L+P</b>	<b>Credits</b>
<b>CORE MODULES</b>			
CSE 6020	Advanced Distributed Systems	2+2	3
CSE 6021	Software Architecture	2+2	3
CSE 6022	Mobile and Wireless Networks	2+2	3
CSE 6023	Intelligent Systems	2+2	3
<b>PROJECT</b>			
CSE 6000	M.Sc Project		12
<b>ELECTIVE MODULES</b>			
<b>Stream 1: Software Development</b>			
CSE 6024	Middleware Technologies	2+2	3
CSE 6025	Aspect-Oriented Programming	2+2	3
CSE 6026	Service Oriented Architecture	2+2	3
CSE 6027	Enterprise Applications Development	2+2	3
CSE 6028	Principles of Software Project Management	3+0	3
<b>Stream 2: Mobile and Ubiquitous Computing</b>			
CSE 6041	Real-time Systems	3+0	3
CSE 6042	Ubiquitous Computing	3+0	3
CSE 6043	Multimedia Communications	3+0	3
CSE 6044	Security and Privacy	3+0	3
CSE 6045	Embedded Systems	3+0	3
<b>Stream 3: Intelligent System</b>			
CSE 6051	Pattern Recognition	2+2	3
CSE 6052	Knowledge Management and Data Mining	2+2	3
CSE 6053	Multi-Agents	2+2	3
CSE 6054	Intelligent Systems in Bioinformatics	2+2	3
CSE 6055	Artificial Life	2+2	3
CSE 6056	Intelligent Robotics	2+2	3

*Note: All modules are of equal weightage.*

## 11. Programme Plan – MSc Computer Science

### (Full time)

	Module Code	Module	Hrs/WK L + P	Credits
<b>Semester I</b>	CSE 6020	Advanced Distributed Systems	2+ 2	3
	CSE 6021	Software Architecture	2+2	3
	CSE 6022	Mobile and Wireless Networks	2+2	3
	CSE 6023	Intelligent Systems	2+2	3
		Elective 1	-	3
<b>Semester II</b>		Elective 2	-	3
		Elective 3	-	3
		Elective 4	-	3
	CSE 6000	Project	-	12

### (Part time)

	Module Code	Module	Hrs/WK L + P	Credits
<b>Semester I</b>	CSE 6020	Advanced Distributed Systems	2 + 2	3
	CSE 6021	Software Architecture	2 + 2	3
	CSE 6022	Mobile and Wireless Networks	2 + 2	3
<b>Semester II</b>	CSE 6023	Intelligent Systems	2 + 2	3
		Elective 1	-	3
		Elective 2	-	3
<b>Semester III</b>		Elective 3	-	3
		Elective 4	-	3
<b>Semester IV</b>	CSE 6000	Project	-	12

**Note 1:** Students will choose their electives but not more than two from any one stream (as per table for elective modules)

**Note 2:** An elective will be provided only if sufficient number of students have opted for it and depending on availability of resources.

**Note 3:** Some courses may be run during/after office hours depending on availability of resources.

## **10. Outline Syllabus**

### **CSE 6020 - DISTRIBUTED SYSTEMS FUNDAMENTALS**

Distributed Systems Models, Interprocess Communication Protocols, Distributed Objects & Innovation, Distributed Events-based systems, CORBA, Names Services, Peer-To-Peer Systems, Time and Synchronization, Coordination in Distributed Systems, Distributed Transactions, Replication, Web Services & Grid, Distributed Multimedia.

### **CSE 6021 - SOFTWARE ARCHITECTURE**

The Architecture Business Cycle, Achieving Qualities, Designing the Architecture, Documenting Software Architectures, Analysing Software Architectures, Software Product Lines, Building Systems from COTS, Design Patterns & Frameworks, Case Studies.

### **CSE 6022 - MOBILE AND WIRELESS NETWORKS**

Wireless LANs and Wireless WANs Technologies (Bluetooth, IEEE 802.11, GSM), Network and Transport Protocols for Wireless Networks, Mobile IP and Variants of TCP, Distributed Systems Platforms for Mobile Computing, Service Discovery, File Systems Support for Mobile Computing, Mobile ad hoc networks (MANET), Routing in MANET, Mobility Management, Mobile Applications Development, Programming Environments, Privacy and Security Issues, Next Generation Mobile Applications.

### **CSE 6023 - INTELLIGENT SYSTEMS**

Overview of Artificial Intelligence, Knowledge Based Systems, Knowledge Representation, Inference Mechanisms, Uncertainty Management, Fuzzy Systems, Artificial neural networks, Evolutionary computation, Hybrid Intelligent Systems, Data Mining, AI tools, Computer Vision, and Planning. Emphasis will be on AI problem solving techniques.

### **CSE 6024 - MIDDLEWARE TECHNOLOGIES**

Object-Based Middleware, Microsoft Middleware Technologies, Java-based Middleware Support, Adaptive and Reflective Middleware, Message-Oriented Middleware, Transaction Middleware, Database Middleware, Web-based Middleware, QoS-Enabled Middleware, Model-driven Middleware.

### **CSE 6025 - ASPECT-ORIENTED PROGRAMMING**

The AspectJ Programming Language, The AspectJ Development Tools in Eclipse, Join Points, Poincuts and Poincut Designators, Different Types of Advice, Inter-Type Declarations, Aspect Instantiation and Inheritance, Using the AspectJ API, Aspect-Oriented Design, Alternative Aspect-Oriented Programming Languages, Latest Research in Aspect-Oriented Software Development.

### **CSE 6026 - SERVICE ORIENTED ARCHITECTURE**

Service Oriented Methodology, Defining a Service in WSDL, Simple Object Access Protocol (SOAP), Service Oriented Analysis and Design, Enterprise Service Bus (ESB), Business Process Implementation, Service Oriented Architectures, Integration Mechanisms, Software Platform for SOA.

### **CSE 6027 - ENTERPRISE APPLICATIONS DEVELOPMENT**

Design Patterns and Abstraction Layers in Enterprise Applications, organizing Domain Logic, Inversion of Control, Cross-Cutting Concerns, Mapping to Relational Databases, Transaction Management, Web Presentation Layer, Remoting and Web Services, Concurrency, Scripting, Testing, Using an Enterprise Framework, Tool Support, Latest Research in Enterprise Applications Development.

### **CSE 6028 - PRINCIPLES OF SOFTWARE PROJECT MANAGEMENT**

Features of Software Projects, Project-Life Cycle, Team Organisation and People Management, Software Processes, Evaluation and Estimation Techniques, Scheduling Principles, Budgeting, Procurement and Contract Management, Resource Allocation, Risk Management, Testing Goals and Plan, Defects, Hypotheses, Testing Strategies and Methods, Quality Management, Capability Maturity Model, Configuration Management, Project Management Software Tools.

**CSE 6041 - REAL-TIME SYSTEMS**

Hard versus soft real-time systems, Temporal parameters of real-time workload, Precedence constraints and data dependency, Real-time scheduling, Clock-driven approach, Priority-driven approach, Algorithms (EDF, LST, RM and DM), Optimality, Dynamic versus static systems, Cyclic executives, Scheduling a periodic and sporadic jobs in priority-driven systems.

**CSE 6042 - UBIQUITOUS COMPUTING**

Enabling Technologies for Ubiquitous and Pervasive Computing, Protocols and Architectures for Ubiquitous Computing, Smart Embedded Devices and Wearable Computers, Infrastructure Issues, Location Based Services, Context-Awareness and Context-based Systems for Ubiquitous Computing, Smart Sensors and Sensor Networks for Ubiquitous Computing, Middleware for Ubiquitous Computing, Tools and Techniques for Designing, Implementing, and Evaluating Ubiquitous Computing Systems, Human Interaction in Ubiquitous Computing Environments, Privacy, Security, and Trust in Ubiquitous and Pervasive Systems, Current Trends in Ubiquitous Computing.

**CSE 6043 - MULTIMEDIA COMMUNICATIONS**

Advanced Multimedia Compression Paradigms – Principles, Algorithms and Applications, Image, Audio and Video Compression Systems (JPEG2000, MPEG 1/2/4 Standards), New Paradigms in Wavelet Compression for Image and Video Data, Video Coding Standards for Low-Bit Rate Communications (H.261.X, H.263.X, H.264 Series), Scalable Video Coding – Principles and Standards, Challenges for Robust Video Transmission over Error-Prone Networks, Error Resilience in Video Communications (Packetisation Schemes, Recovery Algorithms), Multimedia Streaming Architectures, Media Broadcasting Schemes, Voice over IP, States-Of-The –Art Error and Loss Concealment Strategies, Quality of Service Issues, Future Trends in Multimedia Communications.

**CSE 6044 - SECURITY AND PRIVACY**

Security Principles and Risk Analysis, Security Threats/Attacks, Encryption Algorithms (Block Cipher and Stream Cipher), Cryptographic Key Establishment, key Distribution Mechanisms, Authentication Techniques, Wireless LAN Security Standards (WEP, TKIP and IEEE 802.11i), Security Protocols for Sensor Networks (SPINS), SNEP, TESLA/ $\mu$ TESLA, Anonymous Communication, Privacy Techniques for Location-Based Systems, K-Anonymity, Mix Zone Models, Variable Quality Privacy Techniques (Spatial and Temporal Cloaking), Access Control Mechanisms in Context-Aware Systems, Multilevel Security Approach, New Trends in Security.

**CSE 6045 - EMBEDDED SYSTEMS**

Embedded Hardware Support, Embedded System Software & Optimisation, Embedded System Architectures, Hardware/Software Co-design, Real-time & Operating Systems, Application-specific Processors and Devices, Power-aware Computing, Sensor Networks, System/network-on-Chip, Reconfigurable Computing, Applications Implementation Issues and Development Tools, Challenges for Next Generation Embedded Computing Systems.

**CSE 6051 - PATTERN RECOGNITION**

Noise Removal and Feature Enhancement Techniques, Shape Descriptors, Feature Selection and Measurement Techniques, Classifiers and Performance, Decision Rules, Supervised and Unsupervised Learning, Application of Pattern Recognition in Different Fields.

**CSE 6052 - KNOWLEDGE MANAGEMENT AND DATA MINING**

Decision Support Systems, DSS Types and Architectures, OLAP, Data Warehousing, Data Warehousing, Data Pre-Processing, machine Learning, Statistical Methods, Association Rules, Cluster Analysis, Visualization Tools, Data Mining Tools and Applications, Web Mining.

**CSE 6053 - MULTI-AGENTS**

Intelligent Agents and Agent Learning, Organisation, Interactions and Negotiation, Communication Patterns, Distributed Problem Solving, Applications (Agent Toolkits), Recent Developments.

**CSE 6054 - INTELLIGENT SYSTEMS IN BIOINFORMATICS**

Basic Molecular Biology, Cell Structure and Function, the Hereditary Material, Recombinant DNA Technology, Genomics and Structural Genomics, Biological Databases, Gene Prediction, Detecting Distant Homology, Protein Structure Prediction, Transcriptomics, Agent-Based Genome Analysis, Drug Discovery Informatic, Ontologies and Algorithms in Bioinformatics.

**CSE 6055 - ARTIFICIAL LIFE**

Introduction to AL, Cellular Automata, Morphogenesis, Evolution and Genetic Algorithms, Swarm Intelligence, Emergent Behaviours, Computer Viruses, Animal Intelligence, Chaos, Robots and Autonomous Agents.

**CSE 6056 - INTELLIGENT ROBOTICS**

Sensors and Signal Processing, Planning Approaches to Robot Control, Control Theory, Probability Based Approaches, Behaviour-Based Control, Adaptive Approaches to Robot Control, Case Studies and Applications.