

# **BSc (Hons) Computer Science & Engineering - E310**

## **1. Objectives**

With the emergence of the Information and Communication Technologies sector as one of the pillars of the Mauritian economy, there is a need for more of IT professionals with a strong computing background. These graduates should not only fit into mainstream ICT fields but also have the ability to exploit opportunities that new technologies offer to create niche markets.

This Programme is oriented towards producing graduates with a thorough understanding of computer-based systems. It will cover a range of areas including Software Engineering, Multimedia, Web-based technologies, Computer Networks and Distributed Systems and its main aim is to give the student a broader knowledge of the areas that s/he is likely to come into contact with in the commercial environment. With a strong computing background, graduates of this Programme can expect to find a range of attractive career opportunities ranging from software engineering, multimedia and web-based software development to network design, implementation and administration.

In sum, the Programme will keep abreast of the latest technologies required to design efficient computer-based systems.

## **2. General Entry Requirements**

As per General Entry Requirements for admission to the University for Undergraduate Degrees.

## **3. Programme Requirements**

At least 2 GCE 'A' Level Passes including Mathematics and Physics or Computing.

## **4. Minimum Requirements for Awards**

### **(i) Degree Award**

<u>MODULES</u>	<u>CREDITS</u>
Humanities & Management	3
Departmental	99
<b>TOTAL</b>	<b>102</b>

For the award of the **BSc (Hons) Degree Computer Science & Engineering**, the student must obtain at least 102 credits including 90 credits from all the core modules prescribed by the department and at least 12 credits from the departmental elective modules.

### **(ii) Diploma Award**

The diploma is provided as a possible exit point in the programme. A student may opt for a Diploma in Computer Science and Engineering, by making a written request, provided s/he satisfies the minimum requirements, as specified below. The Diploma project would normally be of 8 weeks duration for an input of at least 90 hours.

<u>MODULES</u>	<u>CREDITS</u>
Humanities & Management	3
Departmental	54
Diploma Project (CSE 2000(3))	6
<b>TOTAL</b>	<b>63</b>

## 5. Programme Duration

	Normal (Years)	Maximum (Years)
Degree:	3	5

## 6. Credits per Year: Maximum 48 credits, Minimum 18 credits, subject to regulation 5.

Semester modules to be registered for on a semester basis.

Yearly modules to be registered for only once at the start of the module, normally at the beginning of academic year.

## 7. Assessment

Each module will be assessed over 100 marks (i.e. expressed as %) with details as follows (unless otherwise specified):

Assessment will be based on written examination and continuous assessment. The written examination will be of 3-hour duration except for MGT 1111(1) for which the exam will be of 2-hour duration. The continuous assessment will carry 30% of total marks except for the following modules:

	Continuous Assessment	Exams
CSE 1004Y(1) - Structured Systems Development	40%	60%
CSE 2003Y(3) - Web Technologies	50%	50%
CSE 1008 - Communication Skills for IT	100%	
CSE 3015Y(5) - Network Design and Services	50%	50%

Continuous assessment may be based on laboratory work and/or assignments and should include at least two class tests (one per semester) for all modules except for CSE 1008 and MGT 1111(1) for which there should be at least one class test.

For a student to pass a module, a minimum of 30% should be attained in both of Continuous Assessment and Written Examination separately, with an overall total of a minimum of 40% in that module.

Written examinations for the yearly modules will be carried out at the end of the academic year.

### Diploma Project

For those students exiting at Diploma level, the assessment of diploma project CSE 2000(3) will be partially based on a project report.

### Final Year Project

The assessment of final year project CSE 3000(5) will be partially based on a project report.

## 8. Interruption of Studies

Students may be allowed to interrupt studies for a minimum period of one academic year, renewable for one more period of up to one academic year, subject to their satisfying provisions in the general regulations in respect of interruption of studies.

**9. Specific Regulations**

If CPA < 40, the student will have to repeat the entire academic year, and retake the modules as and when offered. However, s/he will not be required, if s/he wishes, to retake module(s) for which Grade C or above has been obtained.

Students are allowed to repeat only once over the entire duration of the Programme of Studies.

**10. List of Modules - BSc (Hons) Computer Science and Engineering**

<b><u>CORE MODULES</u></b>		<b>Hrs/Wk</b>	<b>Credits</b>
		<b>L+P</b>	
<b>Humanities and Management</b>			
MGT 1111(1)	Organisation and Management	D.E.	3
<b>Departmental</b>			
CSE 1008	Communication Skills for IT	2+0	0
CSE 1001Y(1)	Fundamentals of Computer Science	2.5+1	6
CSE 1002Y(3)	Programming Methodology	2+2	6
CSE 1003Y(1)	Mathematics for Computing	3+0	6
CSE 1004Y(1)	Structured Systems Development	2+2	6
CSE 1005Y(1)	Computer Hardware	2.5+1	6
CSE 2001Y(5)	Software Engineering	2.5+1	6
CSE 2002Y(3)	Database Systems	2+2	6
CSE 2003Y(3)	Web Technologies	2+2	6
CSE 2004Y(3)	Programming Languages and Algorithms	2+2	6
CSE 2005Y(3)	Interface Design and Computer Graphics	2+2	6
CSE 2006Y(3)	Systems Software	2+2	6
CSE 3001Y(5)	Distributed Systems and Multimedia	3+0	6
CSE 3002Y(5)	Computer Networks	3+0	6
CSE 3000(5)	Project	-	9
<b><u>ELECTIVES</u></b>			
<b>Departmental</b>			
CSE 3005Y(5)	Artificial Intelligence	2+2	6
CSE 3006Y(5)	Operations Research and Simulation	2+2	6
CSE 3007Y(5)	Parallel Processing	2+2	6
CSE 3008Y(5)	Computer Vision	2+2	6
CSE 3009Y(5)	Real Time Systems	2+2	6
CSE 3010Y(5)	Neural Networks, Fuzzy Systems and Genetic Algorithms	2+2	6
CSE 3011Y(5)	Compilers	2+2	6
CSE 3015Y(5)	Network Design and Services	2+2	6
CSE 3016Y(5)	Virtual Reality and Entertainment Systems	2+2	6
<b>CORE MODULE FOR DIPLOMA</b>			
CSE 2000(3)	Diploma Project	-	6

\*Note: 3-credit module run only over one semester.

## 11. Programme Plan - BSc (Hons) Computer Science and Engineering

### YEAR 1

Semester 1 Code CORE	Module Name	Hrs/Wk L+P	Credits	Semester 2 Code CORE	Module Name	Hrs/Wk L+P	Credits
CSE 1001Y(1)	Fundamentals of Computer Science	2.5+1	-	CSE 1001Y(1)	Fundamentals of Computer Science	2.5+1	6
CSE 1002Y(3)	Programming Methodology	2+2	-	CSE 1002Y(3)	Programming Methodology	2+2	6
CSE 1003Y(1)	Mathematics for Computing	3+0	-	CSE 1003Y(1)	Mathematics for Computing	3+0	6
CSE 1004Y(1)	Structured Systems Development	2+2	-	CSE 1004Y(1)	Structured Systems Development	2+2	6
CSE 1005Y(1)	Computer Hardware	2.5+1	-	CSE 1005Y(1)	Computer Hardware	2.5+1	6
MGT 1111(1)	Organisation and Management	D.E.	3	CSE 1008	Communication Skills for IT	2+0	0

### YEAR 2

Semester 1 Code CORE	Module Name	Hrs/Wk L+P	Credits	Semester 2 Code CORE	Module Name	Hrs/Wk L+P	Credits
CSE 2001Y(5)	Software Engineering	2.5+1	-	CSE 2001Y(5)	Software Engineering	2.5+1	6
CSE 2002Y(3)	Database Systems	2+2	-	CSE 2002Y(3)	Database Systems	2+2	6
CSE 2003Y(3)	Web Technologies	2+2	-	CSE 2003Y(3)	Web Technologies	2+2	6
CSE 2004Y(3)	Programming Languages and Algorithms	2+2	-	CSE 2004Y(3)	Programming Languages and Algorithms	2+2	6
CSE 2005Y(3)	Interface Design and Computer Graphics	2+2	-	CSE 2005Y(3)	Interface Design and Computer Graphics	2+2	6
CSE 2006Y(3)	Systems Software	2+2	-	CSE 2006Y(3)	Systems Software	2+2	6

### YEAR 3

Semester 1 Code CORE	Module Name	Hrs/Wk L+P	Credits	Semester 2 Code CORE	Module Name	Hrs/Wk L+P	Credits
CSE 3000(5)	Project	-	-	CSE 3000(5)	Project	-	9
CSE 3001Y(5)	Distributed Systems and Multimedia	3+0	-	CSE 3001Y(5)	Distributed Systems and Multimedia	3+0	6
CSE 3002Y(5)	Computer Networks	3+0	-	CSE 3002Y(5)	Computer Networks	3+0	6
<b>ELECTIVES</b>				<b>ELECTIVES</b>			
(5)	Elective 1	2+2	-	(5)	Elective 1	2+2	6
(5)	Elective 2	2+2	-	(5)	Elective 2	2+2	6

## 12. Outline Syllabus

This outline syllabus is not prescriptive and is intended to serve as a guide only.

Note: Pre-requisite (PR); Pre-requirement (PQ).

### **CSE 1001Y(1) - FUNDAMENTALS OF COMPUTER SCIENCE (L/P - 6)**

Introduction to Computers; Hardware and Software; Input, Output and Storage; Organization of Data; Systems Analysis and Design; Data Communications; Computers and Society; Future of Computing. Propositional Logic; Syntax, Semantics, Truth tables, Simplification Rules, Normal Forms & Proofs; First Order Logic: Syntax, Semantics and Proofs.

### **CSE 1002Y(3) - PROGRAMMING METHODOLOGY (L/P - 6)**

Pseudocode; Structured Programming Techniques; Program Structure; Simple Data Type; Control Structures; Modularity; Structured Data Types; Introduction to Object Oriented Programming; Programming Style and Testing, Abstract Data Types, Arrays, Linked Lists, Stacks, Queues, Trees, Graphs, Operations on Trees and Graphs.

**CSE 1003Y(1) - MATHEMATICS FOR COMPUTING (L - 6)**

Types of matrices, Determinants, Cramer's rule, Solution to Systems of Linear Equations, Eigenvalues, Eigenvectors, Vector Algebra, Nature of Statistical Data, Data collection, Presentation of data, Central Tendency Measurement, Time series analysis, Probability, Sampling, Regression Analysis, Sets, Proofs; Relations; Functions; Recurrences; Series; Combinations; Graphs Theory; Trees, Binary Operations, Groups; Rings; Fields, Propositional Calculus.

**CSE 1004Y(1) - STRUCTURED SYSTEMS DEVELOPMENT (L/P - 6)**

Introduction to SSAD; Software life cycles, Introduction to information systems, Components in a system, Preliminary investigation, Requirements Gathering, Requirements Modeling, Data flow analysis, DFD, Data Dictionary, Systems Design, ERD, State Transition Diagram, systems implementation, software design, flowcharts, review methods, managing the development process, estimation and management of development time, Testing, Maintenance Fundamentals of computer applications development, Application Architectures, Databases, Implementation of databases, User interface development, Query By Example, Queries using SQL, Database Access, Forms and Controls, Reports.

**CSE 1005Y(1) - COMPUTER HARDWARE (L/P - 6)**

Data representation; Number systems; Boolean Algebra and Logic Simplification; Regular Structures; Combinational Circuits; Advanced Simplification Techniques; Programmable Logic Devices; Sequential Logic Design Principles; Sequential PLD's; Arithmetic Circuits; Microprocessor Internal Architecture.

**CSE 1008 - COMMUNICATION SKILLS FOR IT**

Scientific Writing; Report writing – preparation of title, abstract, introduction, material preparation, result writing, discussion writing, references, acknowledgements, designing effective tables and preparing effective illustrations; use and misuse of English; Oral presentations.

**CSE 2000(3) - DIPLOMA PROJECT (P - 6)**

Analysis, Design and Implementation of computerised solution to a real-life problem.

**CSE 2001Y(5) - SOFTWARE ENGINEERING (L/P - 6) (PQ: CSE 1002Y(3))**

Data abstraction, encapsulation, classes, objects, inheritance, polymorphism, aggregation, OO analysis and design using UML, patterns and frameworks, components and component object models, software engineering concepts and practices, software processes, software process improvement, CMM, requirements engineering, software modelling and design techniques, software quality assurance, software project management, software evolution, software maintenance, software procurement.

**CSE 2002Y(3) - DATABASE SYSTEMS (L/P - 6) (PQ: CSE 1004Y(1))**

DBMS functions/Components, Database Abstractions, Relational Model ERD, Relational algebra, Normalization, Query Language – SQL, DB design issues, Optimisation, Security Issues, Transactions, Distributed Computing, Synchronisation, Overview Of Distributed Databases, Distribution Transparency, Distributed Database Design - Commit Protocols and Concurrency Control, Query Processing.

**CSE 2003Y(3) - WEB TECHNOLOGIES (L/P - 6) (PQ: CSE 1002Y(3))**

Overview of Internet, Internet Protocols and Network Components; HTML; XML; Scripting languages; Client-side scripting; Server-side scripting, Hypermedia; Data processing on a web server (ASP, Asp. NET, PHP, Cold Fusion); Concepts of Web-based applications; Integrating applets; Administration of web servers; Principles of E-Commerce; Administration of web servers; Web site related issues; Web site design issues.

**CSE 2004Y(3) - PROGRAMMING LANGUAGES AND ALGORITHMS (L/P - 6) (PQ: CSE 1002Y(3))**

Overview of programming languages; language design and implementation issues; language evaluation and selection issues; programming paradigms; programming environments; programming constructs, compilation process; Algorithms Analysis Techniques; Algorithms Design Techniques; Sorting; Searching; String Processing; Graph Algorithms; Dynamic Programming; Backtracking; Mathematical algorithms.

**CSE 2005Y(3) - INTERFACE DESIGN AND COMPUTER GRAPHICS (L/P - 6)**

Characteristics of a good UI; User Centred UI; Design tools and methods; Interactive System Design; Prototyping Techniques; Evaluation Techniques; Output Primitives & attributes; Geometric transformations

(e.g. Homogeneous coordinates, 2D and 3D matrix representations); Viewing models (2D viewing and 3D viewing); Curves & surfaces; Line clipping; Polygon clipping; Illumination; Visible surface detection; Fractal generation; Animation. Use of advanced graphics libraries (e.g. OpenGL and/or DirectX) for the implementation of the different concepts discussed.

**CSE 2006Y(3) - SYSTEMS SOFTWARE (L/P - 6)**

Overview of Computer Systems, Processes, threads, Memory Management, Processor Scheduling, Input/Output, Files, Computer Security, Systems programming. Stored Program Computer, Advancements in Architectures, Pipelined Systems, Implementation of Pipelining, RISC, RISC v/s CISC, Comparative Architectures.

**CSE 3000(5) - PROJECT (9)**

Analysis, Design and Implementation of computerised solution to a real-life or research-oriented problem.

**CSE 3001Y(5) - DISTRIBUTED SYSTEMS AND MULTIMEDIA (L - 6) (PQ: CSE 2006Y(3))**

Characterization of distributed systems, system models, Interprocess Communication, Remote Method Invocations, Distributed OS and File Services, Security, Name Services, Replication. Emergence of Multimedia, System Requirements, Existing Supports.

**CSE 3002Y(5) - COMPUTER NETWORKS (L - 6) (PQ: CSE 2004Y(3) and CSE 2006Y(3))**

Reference Models (TCP/IP, ATM); Physical Layers (SONET/SDH, ISDN, X21); Data Link Layer (MAC, LLC); Network Layer (IP, ATM); Transport Layer (TCP, UDP, RTP, XTP); Application Layer (Email, Directory Services, File Transfer); ISP Network Design In-depth Application layers (E-mail, Directory Services, File Transfer); Introduction to Network Design.

**CSE 3005Y(5) - ARTIFICIAL INTELLIGENCE (L/P - 6) (PQ: CSE 2004Y(3))**

Knowledge representation; Intelligent agents; Search; Heuristics; Game playing; Natural language processing; Planning; Neural networks; AI languages, Toolkits and application; Inference; Knowledge Acquisition; Explanation; Uncertainty; Fuzzy systems; Machine Learning; CBR; Truth maintenance; Trends.

**CSE 3006Y(5) - OPERATIONS RESEARCH AND SIMULATION (L/P - 6)**

Linear Programming; Simplex Algorithm; Transportation Problems; Network Techniques; Game Theory; Markov's Chains; Queuing Theory; Simulation.

**CSE 3007Y(5) - PARALLEL PROCESSING (L/P - 6)**

Classification of Parallel Machines, SISD, MISD, SIMD, MIMD, SPMD, Inter-processor Communication, Shared Memory, Interconnection Networks, EREW, CREW, ERCW, CRCW, All-to-All, Mesh, Rings, Hypercube, Shuffle Exchange Cube Connected Cycles, Parallel Algorithm Construction, Geometric Parallelism, Asynchronous/Relaxed Parallelism, Speedup and Efficiency, Amdahls Law.

**CSE 3008Y(5) - COMPUTER VISION (L/P - 6)**

Image Processing and Computer Vision Background; Image Processing and Computer Vision Applications; Digital Image Processing Hierarchy: Human Perception of Pictures, Digital Image Processing Hardware, Digital Image Characterisation and 2-D Linear Processing: Image Model; Amplitude Digitisation, Intensity Quantisation; Spatial Co-ordinate Digitisation: Image Sampling; Image Quality; Image Pixel Relationships; Linear Operators; 2-D Transforms, Image Enhancement: Spatial Domain Methods; Frequency Domain Methods, Image Restoration: Inverse Filtering; Wiener Filtering (Least Mean Square), Edge Detection Methods: Edge Likening and Boundary Detection; Thresholding Methods, Region-oriented Methods, Image Representation and Description: Representation Schemes; Description, Pattern Recognition: Introduction and Basic Definitions; Decision Theoretic Method for Recognition, Object recognition: Computational representations, Models and model matching, Image Compression: Introduction; Redundancy Types; Lossless Compression; Lossy Compression; Image Compression Standards, Colour processing: RGB and HSV models. Colour space, Other Image Features: Shape and Texture.

**CSE 3009Y(5) - REAL TIME SYSTEMS (L/P - 6) (PQ: CSE 2006Y(3))**

Real-Time Applications; Hard Versus Soft Real-Time Systems; Reference Model of Real-Time Systems; Commonly Used Approaches to Hard Real-Time Scheduling; Clock-Driven Scheduling; Priority-Driven

Scheduling of Periodic Tasks; Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems; Resources and Resource Access Control; Multiprocessor Scheduling and Resource Access Control; scheduling Flexible Computations and Tasks with Temporal Distance Constraints Real-Time Communications.

**CSE 3010Y(5) - NEURAL NETWORKS FUZZY SYSTEMS AND GENETIC ALGORITHMS (L/P - 6)**

An Overview of Combinatorial Optimisation, Theoretical Foundations of Genetic Algorithms, Genetic Algorithms in Engineering and Optimisation, Genetic Algorithms in Natural Evolution, Simulated Annealing and Tabu Search. Fuzzy set theory, fuzzy systems, Fuzzy Logic, Fuzzy Inference. Artificial Neural networks, Neural Networks Architectures and Algorithms, Historical perspective (What, Why, When), simple model neurons, learning and generalisation, perceptrons, multi-layered perceptrons, radial basis function networks, classification and regression problems, temporal learning, recurrent and self-organizing networks, Neural network simulations using appropriate software (Practical/Laboratory based study), Evolving Neural Networks Implementing Genetic Algorithms.

**CSE 3011Y(5) - COMPILERS (L/P - 6)**

Lexical Analysis; Syntactic Specification; Parsing Techniques; Parsers; Syntax-Directed Translations; Symbol Tables; Storage Administration; Error Handling; Optimisation and Code Generation; Sets; Relations and Languages; Deterministic and Non-deterministic Finite Automata; Transition Graphs; Context Free Grammars; Pushdown Automata; Turing Machines; Church's Thesis; Uncomputability.

**CSE 3015Y(5) - NETWORK DESIGN AND SERVICES (L/P - 6)**

The Kernel, Core features of Linux, Connectivity, NFS, Network Configuration, IP Addressing, Sub-netting, Subnet Masks, Gateways, IP Aliases, DNS Server, IP Chains, Samba Server, Access Control, Permissions, ARP and RARP, ICMP, BOOTP and DHCP Servers, TCP Ports and Protocols, UDP, Dial-in/Dial-Out Server, Telnet and SSH, Print Server, FTP, Web Server, Mail Server, SMTP and POP3, DNS Server, NAT, IP Masquerading, Firewalls, VPNs, System Maintenance, Network Security, Proxy Server.

**CSE 3016Y(5) - VIRTUAL REALITY AND ENTERTAINMENT SYSTEMS**

Introduction to Virtual Reality; Virtual Reality Hardware and Software; VR Applications in Education, Science and Technology; VR applications in Social Sciences and Humanities; Available Platforms, Game Development tools, Cross-Compilation and Cross-Platform Development, Games Life Cycle, Market Trends, Psychological and Sociological Aspects of Computer Games, Story Telling and Narration, Simulators, Planning, Implementation.

**MGT 1111(1) - ORGANISATION & MANAGEMENT**

Management Concepts and Functions. Development of Management Theories. The Internal and External Environments of the Organisation. Social Responsibility and Ethics in Management. Managerial Decision Making. The planning process. The nature of Organisation Structure. Organisational Control. Contemporary issues in Management. Management in Future.

