



UNIVERSITY
of
TECHNOLOGY,
MAURITIUS

School of Innovative Technologies And Engineering

BSc (Hons.) Software Engineering

PROGRAMME DOCUMENT

BSE v7.0
May 2017

University of Technology, Mauritius

La Tour Koenig, Pointe aux Sables, 11134, Mauritius

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A. Programme Information

The BSc (Hons) Software Engineering is designed to satisfy the increasing demand for well trained graduates to work in the export-oriented software development industry. The curriculum provides a balanced and intellectually stimulating programme which combines together state-of-art techniques and emerging trends to produce skilled software engineers.

The programme introduces students to the necessary foundations in computing and mathematical techniques. Following which, software engineering knowledge and skills are developed with modules such as programming, databases, web development and systems analysis and design. More specific technical skills and emerging techniques are further introduced with Web Services, Mobile computing and Artificial Intelligence and Machine Learning. The programme also prepares the students for research, management, communication, entrepreneurship and legal aspects through interactive seminars.

Work placement attached with the software development industry is an integral part of this course and allows students to gain practical work experience during the final semester of the third year.

B. Programme Aims

This programme aims at producing graduates who have a keen interest in software development and who aspire to work as software developers in the export-oriented software development industry.

C. Programme Objectives

After successful completion of the Programme, the graduate will be able to:

- Appreciate the functioning of a computer system and its operating systems
- Understand the principles of data modelling
- Solve problems through optimal modelling and implement solutions by developing applications
- Design and develop network based solutions
- Communicate both orally and in writing using traditional and electronic media
- Understand how a business is organised and relate to how ICT is ubiquitously applied across the different business functions
- Identify and solve a research a problem in the software industry
- Define, plan and monitor ICT projects in organisations
- Design and develop interactive multimedia applications
- Define and implement quality management systems in a software engineering environment
- Develop web and mobile applications using a variety of technologies and architectures

PART I - Regulations

D. General Entry Requirements

As per UTM'S Admissions Regulations, and 'Admission to Programmes of Study at First Degree Level'.

E. Programme Entry Requirements

'A' Level in Mathematics or Computer Science.

F. Programme Mode and Duration

Full Time: Minimum 3 Years, Maximum 6 Years (Minimum 6 Semesters, Maximum 12 Semesters)

Part Time: Minimum 4 Years, Maximum 7 Years (Minimum 8 Semesters, Maximum 14 Semesters)

G. Teaching and Learning Strategies

- Lectures, Tutorials and Practical Laboratory Sessions;
- Class tests and Assignments;
- Structured discussions and Self-directed study;
- Research projects;
- Workshops / Seminars / Lab Sessions ;
- Case study material & scenari centered on real world problems;
- Work placement (full time mode only).

H. Student Support and Guidance

Each cohort of the programme is allocated a Programme Coordinator who acts as a liaison between the students and school management and provides support for academic management of the programme.

I. Attendance Requirements

As per UTM's Regulations and Policy.

J. Credit System

For the award of a Certificate, a minimum of 34 credits are required.

For the award of a Diploma, a minimum of 68 credits are required.

For the award of an Ordinary Degree, a minimum of 92 credits are required.

For the award of a Honours Degree, a minimum of 101 credits are required.

K. Student Progress and Assessment

The programme is delivered mainly through lectures, tutorials, and practical laboratory sessions. Each module carries 100 marks and unless otherwise specified will be assessed as follows:

- Written and/or practical examination, and continuous assessment carrying up to 50% of total marks.
- Continuous assessment can be based on a combination of assignments, workshops, practical and class tests.
- Seminars are evaluated on continuous assessment only. Each seminar must consist of a **minimum of two** assessments.
- Modules which are evaluated on continuous assessment only (100% coursework) must consist of a **minimum of three assessments, inclusive of one class test**. The following is a list of modules which are evaluated by continuous assessment only: Object Oriented Software Development, Mobile Application Development, Web Services and Multimedia & Applications.
- The system development project carries 300 marks (9 credits)

- Module grading structure:

| Grade | Marks x (%) |
|-------|----------------------|
| A | $70 \leq x \leq 100$ |
| B | $60 \leq x < 70$ |
| C | $50 \leq x < 60$ |
| D | $40 \leq x < 50$ |
| F | $x < 40$ |
| A-D | Pass |
| F | Fail |

L. Evaluation of Performance

1. The % mark at Level 1 contributes a 20% weighting towards the degree classification.
2. The % mark at Level 2 contributes a 30% weighting towards the degree classification.
3. The % mark at Level 3 contributes a 50% weighting towards the degree classification.

M. Award Classification

| Overall weighted mark y (%) | Classification |
|-------------------------------|--|
| $70 \leq y \leq 100$ | 1 st Class Honours |
| $60 \leq y < 70$ | 2 nd Class 1 st Division Honours |
| $50 \leq y < 60$ | 2 nd Class 2 nd Division Honours |
| $45 \leq y < 50$ | 3 rd Class Honours |
| $40 \leq y < 45$ | Pass Degree |
| $y < 40$ | No Award |

N. Programme Organisation and Management

Programme Director and Coordinator: **Dr. Geerish Suddul**

Contact Details:

- Telephone number: 207 5250
- Email: g.suddul@umail.utm.ac.mu

Part II - Programme Structure

O. BSc (Hons) Software Engineering – Full Time (Version 7.0)

This programme is offered on a Full-Time basis only.

| YEAR 1 (Level 1) | | | | | | | |
|------------------|--------------------------------------|-----------------|---------|------------|--------------------------------------|-----------------|---------|
| Semester 1 | | | | Semester 2 | | | |
| Code | Modules | Hrs/Wk L+T/P | Credits | Code | Modules | Hrs/Wk L+T/P | Credits |
| HCA1106C | Computer Organisation & Architecture | 2+1 | 3 | PROG1119C | Object Oriented Software Development | 2+2 | 4 |
| PROG1101C | Programming Concepts | 2+2 | 4 | WAT1132C | Web Programming Fundamentals | 2+2 | 4 |
| MATH1103C | Decision Mathematics | 2+1 | 3 | MGMT1101C | Management Seminar | 2+1 | 3 |
| ITE1107C | Language and Communication Seminar | 2+1 | 3 | DBT1111C | Database Design | 2+2 | 4 |
| CAN 1104C | Networking Essentials | 2+1 | 3 | OSS1112C | Operating System Concepts | 2+1 | 3 |

| YEAR 2 (Level 2) | | | | | | | |
|------------------|--|-----------------|---------|------------|--------------------------------|-----------------|---------|
| Semester 1 | | | | Semester 2 | | | |
| Code | Modules | Hrs/Wk L T/P | Credits | Code | Modules | Hrs/Wk L T/P | Credits |
| SDT1117C | Analysis & Design | 2+2 | 4 | SEM2121C | Agile Project Management | 2+1 | 3 |
| WAT2133C | Web Application Development | 2+2 | 4 | MCT2104C | Mobile Application Development | 2+2 | 4 |
| MATH1337C | Discrete Mathematics and Numerical Methods | 2+2 | 4 | WAT2124C | Web Services | 2+2 | 4 |
| DBT2113C | Database Application Development | 2+2 | 4 | MGMT2104C | Research & Development Seminar | 2+1 | 3 |
| PROG2110C | Data Structures & Algorithms | 2+2 | 4 | | | | |

| YEAR 3 (Level 3) | | | | | | | | |
|------------------|----------------------------------|-----------------|---------|------------|-----------------------------|-----------------|---------|---|
| Semester 1 | | | | Semester 2 | | | | |
| Code | Modules | Hrs/Wk L T/P | Credits | Code | Modules | Hrs/Wk L T/P | Credits | |
| SDT3104C | Enterprise Software Development | 2+2 | 4 | SECU3119C | Secure Software Development | 2+2 | 4 | |
| MULT3118C | Multimedia & Applications | 2+2 | 4 | | | | | |
| SCG3126C | AI & Machine Learning Techniques | 2+2 | 4 | | | | | |
| UTM2102C | Life Skills & Good Practice | 2+2 | 4 | PROJ2119C | Work Placement | | 4 | |
| PROJ3105C | System Development Project | | | | | | | 9 |

P. MODULE OUTLINE

HCA1106C COMPUTER ORGANISATION & ARCHITECTURE

Introduction to digital Computers. Digital Components: Boolean variables, Truth tables, Logic Gates, De Morgan's Theorem and its application, Multiplexers, Decoders/Encoders, Flip-flops, counters, registers, memory unit. Information representation: Number systems, Floating point number representations, Error detecting and correcting codes, Alphanumeric Codes, Representation of signed and unsigned numbers. Basic Computer Design: Registers, Main Memory, Computer Instructions, Timing Signals. CPU Organisation: Addressing modes, Instruction format and types, Stack organised CPU, Programme Control, Arithmetic Logic Unit. Programming Basic Computer: Machine language, Assembly language. I/O Organisation. Memory Organisation. Parallel Processing.

PROG1101C PROGRAMMING CONCEPTS

This module introduces the basic programming concepts using a problem solving approach. Writing Algorithms. Definition of Source Code & Compiler. Integrated Development Environments (IDEs). Data types & Variables. Conditional Statements. Arrays. Loops. Basic Input and Output System. Functions/Methods: definition, passing parameters/arguments, return types. Calling Methods

MATH1103C DECISION MATHEMATICS

Digital Systems: number systems and codes, digital arithmetic operations, boolean algebra & logic gates and combinational logic circuits. Linear Programming Involving Two Variables: formulation, graphical solution, feasible and optimal solutions and integer-valued problems. Sets: set operations & identities and computer representation of sets. Functions. Probability: axioms of probability, discrete & continuous random variables, probability density function & cumulative distribution function and expectation & variance.

ITE1107C LANGUAGE AND COMMUNICATION SEMINAR

Review of grammar and punctuation. Prepare curriculum vitae. Write job applications, business letters and reports (in an ICT context). Formal writing using electronic media. Description of communication process. Barriers to communication. Oral communication: prepare for job interviews, carry out presentations on a theme, organise and participate in meetings. Electronic communication: emails, websites & social media.

MGMT1101C MANAGEMENT SEMINAR

Development of the firm. Management functions: planning, organising, staffing, directing, controlling, co-ordinating. Organisation structure. Change & innovation management. Human resource management process. Intellectual property rights – copyright and patents. Electronic transactions. Computer misuse. Data protection and privacy

PROG1119C OBJECT ORIENTED SOFTWARE DEVELOPMENT

Introduction to object programming paradigm. Object & Class Concepts. Inheritance. Interface and Polymorphism. Casting. Collection Classes. Exception Handling. Streams & File Manipulation

WAT1132C WEB PROGRAMMING FUNDAMENTALS

Internet History, Basics of web design, HTML5, Site development processes, Design principles, Page Layout with CSS3, Navigation, Responsive Web Design using Bootstrap, Form development, Testing and publishing, Web accessibility, The Document Object Model, Client-side scripting with JavaScript, Using the JQuery library.

SDT1117C ANALYSIS & DESIGN

Intro to Large Scale Systems development, Software Life Cycles, Model-view-controller(MVC) concept, Requirements elicitation process, Software development methodologies (waterfall, agile & hybrids), Object Oriented Analysis & Design with UML: Use case modelling, Class modelling, Sequence diagrams, Activity diagrams, State chart diagrams, Component diagrams. Requirements management. Testing techniques & strategies

DBT1111C DATABASE DESIGN

Introduction to Databases. Database Environment. Database Architecture. The Relational Model. Relational Integrity. Entity Relationship Modelling. Normalisation. Relational Algebra. SQL: Data definition and Data Manipulation. Triggers.

OSS1112C OPERATING SYSTEM CONCEPTS

Evolution of Operating Systems. Overview of Computer System Structure. Building blocks of modern operating systems. Process management, synchronisation, deadlocks. Threading & parallel processing. Memory management. Virtual Memory management. File management system. Input/Output.

WAT2133C WEB APPLICATION DEVELOPMENT

.NET FRAMEWORK, Overview of MVC architecture, MVC Folder Structure, Routing and Action, Consistent Page Layout with Layout view, Bundling, Using HTML Helpers, Integrate Model, Views and Controller, Validation, Advanced Control Programming Using Rich Control, Creating Custom controls using Partial Views, AJAX and user control, Authentication, Data Management with ADO.NET, XML Data Binding, Advance Data handling and page techniques, Multitier Applications, Concurrency Controls, Error Handling Techniques.

MATH1337C DISCRETE MATHEMATICS AND NUMERICAL METHODS

Logic and proofs, Relations and mappings: One-to-one and onto functions, Inverse and composite functions, Exponential, logarithmic and trigonometric functions, Differentiation and integration, Taylor series expansion, Growth of functions. Complexity of algorithms. Matrices and vectors: Matrix algebra, Dot and cross products, Two-dimensional graphical transformations using matrices. Counting techniques: The Pigeonhole principle, Permutations and combinations. Recurrence Relations: Solving linear recurrence relations using generating functions. Computer arithmetic and error Analysis. Numerical solutions of nonlinear equations in one variable by direct and iterative methods. Polynomial interpolation. Numerical differentiation and numerical integration. Numerical solution of linear systems of equations by direct and iterative methods

DBT2113C DATABASE APPLICATION DEVELOPMENT

Client/Server Databases and the Oracle9i Relational Database, Creating and Modifying Database Tables (DDL Commands).Using SQL Queries to Insert, Update, Delete, and View Data (DML Commands). PL/SQL Fundamentals. Learn the basics of building forms using Forms Builder (Properties, Layout, Control, Master-Details forms etc). Creating Custom forms (Create command buttons that use form triggers to manipulate data, Using Alerts and Messages facilities to provide feedback). Creating Database Reports using Oracle report Builder. Creating an Integrated database Application (Menu, Splash Screen. Learn how to create server-side stored program units. Learn how to configure forms that retrieve and manipulate large data sets.

PROG2110C DATA STRUCTURES & ALGORITHMS

Implementation of simple and Complex data structures using an object oriented approach: Queues, Nodes, unordered & ordered Lists, Stacks, Sorting & Searching, Recursion, Tree Algorithms, Graph Algorithms, Complexity Analysis.

SEM2121C AGILE PROJECT MANAGEMENT

Agile movement. Agile Values. Agile methodologies. Business Case. Roll-wave planning. Software estimation. User stories. Managing self-organising teams. Project Monitoring. Project Termination & Closure

MCT2104 MOBILE APPLICATION DEVELOPMENT

Overview of wireless communication networks: Wireless Wide Area Networks (Cellular Networks), Wireless LAN (IEEE 802.11), Wireless Personal Area Networks (Bluetooth), Wireless Sensor Networks. Mobile Platforms and Development Tools. Developing for the Mobile Web (HTML5, CSS3, Server Side Scripting). Developing Native Mobile Applications (possible platforms: Android SDK or Objective C). Hybrid Mobile Applications (Convergence of Native and Web).

WAT2124 WEB SERVICES

Software Architecture. Overview of XML: Definition and Role of XML, XML Syntax and Semantics, XML Schema Syntax and Semantics. Service Oriented Architecture: Service, Service Bus, Registry. Service Consumers/Application Front-ends. Web Service Development: SOAP, WSDL, UDDI. Interoperability between different platforms and programming languages. Working with Web APIs and understanding the RESTful Approach.

MGMT2104C RESEARCH & DEVELOPMENT SEMINAR

Research process. Literature review. Developing a research problem. Choosing a research method (case study, survey, experiment) for a specific problem. Presenting and analysing findings. Product development process. Entrepreneurship perspective. Funding a venture. Managing innovation

SDT3104C ENTERPRISE SOFTWARE DEVELOPMENT

SAP Enterprise Portals Fundamentals. Components of ERP Implementation. SAP Enterprise Portal System Administration. Portal API, HTMLB, JSP Portal Components. ABAP- BASIS. Eventing Framework (EPCF), Connector Framework, Custom Portal Services, User Management API, Localization of Components Web Services, Web Application Server Integration, WebDynpro, Customization of the Portal, Performance Considerations , Visual Composer.

MULT3118C MULTIMEDIA & APPLICATIONS

Overview of mainstream multimedia technologies in 2D & 3D graphics, animation & sound. Computer graphics for games. Multimedia and Game application design and development. Sound & Image processing. Datasource connectivity. User interaction and scripting. Integration of multimedia and Internet technologies. Physics Engine Controls and Artificial Intelligence.

UTM2102C LIFE SKILLS & GOOD PRACTICES

Employability development skills. Good Governance. Prevention of corruption. Personal development skills and role of youth in addressing societal challenges. Coping skills. Addressing Societal Challenges including Substance Abuse, Poverty, Climate Change, Social Media and Family problems.

SCG3126C AI & MACHINE LEARNING

Foundation and definition of Artificial Intelligence. Intelligent Agents: problem-solving, knowledge-based, planning, acting under uncertainty, learning, communicating. Problem Solving by Search. Programming for AI. Overview of Machine Learning Techniques. Supervised Learning Techniques. Unsupervised Learning Techniques.

SECU3119C SECURE SOFTWARE DEVELOPMENT

Security attacks and vulnerabilities. OWASP top 10 web application vulnerabilities. SANS Top 25 coding errors. Secure design principles. Threat modelling. Common security mistakes. SQL injection. Authentication with ASP.Net authentication. Hashing for passwords. Cryptography: concepts, generate keys and use encryption to protect data in .NET. Web security: SSL and its use in protection of applications in .NET Securing Ecommerce applications: Mastercard/Visa secure payment. Cross-site request forgery attacks and defence. Cross-site scripting attacks and defence. Client state manipulation

PROJ3105: SYSTEM DEVELOPMENT PROJECT

Run a full-fledged software development project: from concept, through logical modelling and up to physical implementation. Demonstration of core competencies acquired on the degree. Demonstration of creative acumen, self-management and self-development skills