

BSc (Hons) Information and Communication Technologies - E316

1. Objectives

This programme is geared towards producing ICT professionals, with the ability to adapt to the rapid developments in Information & Communication Technologies. The programme is intended to facilitate the integration of our graduates into the job market. Students will be provided with a strong background in the various areas of ICT, such as wireless technology, mobile computing and computer networks.

2. General Entry Requirements

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

3. Programme Requirements

2 GCE 'A' Level Passes in Mathematics and one of the following subjects: Physics, Physical Science, Engineering Science, Physics with Chemistry.

4. (i) Minimum Requirements for Degree Award

MODULES	CREDITS
Basic Sciences & Mathematics	9
Engineering	93
TOTAL	102

- For the degree award all core modules prescribed by the department must be completed.

(ii) Minimum Requirements for Diploma Award

A student may opt for a Diploma in Information and Communication Technologies provided s/he satisfies the following minimum requirements. The Diploma project would normally be of 8 weeks duration for an input of at least 90 hours.

MODULES	CREDITS
Basic Sciences & Mathematics	6
Engineering	48
Diploma Project (ELEC 2000(3))	6
TOTAL	60

5. **Programme Duration:** Normal 3 years
Maximum 5 years

6. **Credits per Year:** Minimum 18, Maximum 48 subject to Regulation 5.

7. Assessment

Assessment will be based on a written examination of 2 to 3-hour duration (normally a paper of 2 hour duration for modules carrying less or equal to 3.5 credits and 3 hour paper for modules carrying four-six credits) and on continuous assessment done during the semester or year.

Written examinations for all modules, whether taught in semester 1 or in semester 2 or both, will be carried out at the end of the academic year (unless otherwise stated).

The continuous assessment will count for 10-40% of the overall percentage mark of the module(s), except for a Programme where the structure makes for other specific provision(s). Continuous assessment may be based on laboratory work, seminars and/or assignments and **should include at least 1 class test.**

There will be a compulsory class test for all modules taught in semester 1 at the end of semester 1 of the given academic year unless stated otherwise in the Programme Structure.

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.

Special examinations (e.g. class tests) will be arranged at the end of semester 1 or semester 2 for exchange students who have registered only for one semester. In case of yearly modules, credits will be assigned on a pro-rata basis.

8. List of Modules - BSc (Hons) Information & Communication Technologies

<u>CORE MODULES</u>		Hrs/Wk	Credits
		L+P	
Basic Sciences & Mathematics			
MATHS 1111(1)	Mathematics 1	D.E.	3
MATHS 1211(1)	Mathematics 2	D.E.	3
MATH 1231(1)	Probability and Statistics 1	D.E.	3
Engineering			
CSE 1001Y(1)	Fundamentals of Computer Science	2.5+1	6
CSE 1004Y(1)	Structured Systems Development	2+2	6
CSE 2002Y(3)	Database Systems	2.5+1	6
CSE 2004Y(3)	Programming Languages and Algorithms	2+2	6
ELEC 1052Y(1)	Electrical Engineering and Analog Electronics	2+1	5
ELEC 1053Y(1)	Digital Electronics 1	2+1	5
ELEC 1054Y(1)	Analog Communications	2+0	4
ELEC 1055Y(1)	Computer Programming	2+1	5
ELEC 1200	Practical Training	8 weeks	0
ELEC 2051Y(3)	Network Computing	2+1	5
ELEC 2052Y(3)	Basics of Digital Communications	2+2	6
ELEC 2053Y(3)	Digital Electronics 2	2+1	5
ELEC 3000(5)	Degree Project	-	10
ELEC 3051Y(5)	Data Communications and Networking Technologies	3+0	6
ELEC 3052Y(5)	Mobile Communications and Wireless Technologies	3+0	6
<u>ELECTIVES</u>			
Engineering			
CSE 2001Y(5)	Software Engineering	2.5+1	6
CSE 2003Y(3)	Web Technologies	2+2	6
CSE 3014Y(5)	System Security and Control	2+2	6
ELEC 3053Y(5)	Telecommunications Network	3+0	6
ELEC 3054Y(5)	RF Design and Microwave Engineering	3+0	6

NOTE 1:

Core module for Diploma: ELEC 2000(3): Diploma Project (6 credits)

NOTE 2:

For a student to clear the module ELEC 1200 s/he must obtain Grade S (Satisfactory) in the module.

10. Programme Plan - BSc (Hons) Information and Communication Technologies (ICT)

YEAR 1

Semesters 1 & 2 Code	Module Name	Hrs/Wk L+P	Credits
CORE			
MATHS 1111(1)	Mathematics 1	D.E.	3
MATHS 1211(1)	Mathematics 2	D.E.	3
MATH 1231(1)	Probability and Statistics 1	D.E.	3
ELEC 1052Y(1)	Electrical Engineering and Analog Electronics	2+1	5
ELEC 1053Y(1)	Digital Electronics 1	2+1	5
ELEC 1054Y(1)	Analog Communications	2+0	4
ELEC 1055Y(1)	Computer Programming	2+1	5
CSE 1001Y(1)	Fundamentals of Computer Science	2.5+1	6
ELEC 1200	Practical Training	8 weeks	0

YEAR 2

Semesters 1 & 2 Code	Module Name	Hrs/Wk L+P	Credits
CORE			
ELEC 2051Y(3)	Network Computing	2+1	5
ELEC 2052Y(3)	Basics of Digital Communications	2+2	6
ELEC 2053Y(3)	Digital Electronics 2	2+1	5
CSE 1004Y(1)	Structured Systems Development	2+2	6
CSE 2002Y(3)	Database Systems	2.5+1	6
CSE 2004Y(3)	Programming Languages and Algorithms	2+2	6

YEAR 3

Semesters 1 & 2 Code	Module Name	Hrs/Wk L+P	Credits
CORE			
ELEC 3000(5)	Degree Project	-	10
ELEC 3051Y(5)	Data Communications and Networking Technologies	3+0	6
ELEC 3052Y(5)	Mobile Communications and Wireless Technologies	3+0	6
ELECTIVES			
ELEC 3053Y(5)	Telecommunications Network	3+0	6
ELEC 3054Y(5)	RF Design and Microwave Engineering	3+0	6
CSE 2001Y(5)	Software Engineering	2.5+1	6
CSE 2003Y(3)	Web Technologies	2+2	6
CSE 3014Y(5)	System Security and Control	2+2	6

NOTE: Students should take at least two (2) electives in Year 3, of which at least one CSE module and one ELEC module.

10. Outline Syllabus

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

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

CSE 1001Y(1) - FUNDAMENTALS OF COMPUTER SCIENCE

Introduction to Computers; Hardware and Software; Input, Output and Storage; Organisation 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 1004Y(1) - STRUCTURED SYSTEMS DEVELOPMENT

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 2001Y(5) - SOFTWARE ENGINEERING (PQ: ELEC 1055Y(1))

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

DBMS functions/Components, Database Abstractions, Relational Model ERD, Relational algebra, Normalisation, 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 (PQ: ELEC 1055Y(1))

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 (PQ: ELEC 1055Y(1))

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 3014Y(5) - SYSTEM SECURITY AND CONTROL

Cryptology, historical ciphers, modern ciphers attack, efficient cryptographic primitives, data integrity and authentication, digital signature schemes, key exchange and key management, standard protocols, mobile communications security, key escrow schemes, zero-knowledge identification schemes, Smart cards and PCMCIA cards, quantum cryptography, firewalls cryptographic technology and services, tunnelling protocols, virtual private networks, intrusion detection systems.

ELEC 1052Y(1) - ELECTRICAL ENGINEERING AND ANALOG ELECTRONICS

Circuit concepts, Kirchhoff's laws, Network theorems, DC circuit analysis, Magnetic circuits, AC circuit analysis, Power and power factor, Resonance, Three-phase systems, Semiconductors, PN Junction, Diode Circuits and Applications, Bipolar Junction Transistors, Field-Effect Transistors, Operational Amplifier and Applications.

ELEC 1053Y(1) - DIGITAL ELECTRONICS 1

Data representation, Number Systems and Codes, Boolean algebra, Combinational logic circuit analysis and design, minimization techniques for logical functions, Representation of signed numbers, Digital arithmetic operations and circuits, Decoders, Demultiplexers, magnitude comparators, Encoders and Multiplexers, Introduction to sequential logic, Basic memory cells, flip-flops, counters and registers.

ELEC 1054Y(1) - ANALOG COMMUNICATIONS

Fourier Transform, Signals and spectra, Amplitude Modulation (AM, DSB, SSB), angle modulation (PM, FM), Noise in amplitude and angle modulation.

ELEC 1055Y(1) - COMPUTER PROGRAMMING

Introductory concepts, C fundamentals, Operators and Expressions, Data Input and Output, Flowcharts and Pseudocodes, Control Statements, Functions, Arrays, Pointers, Data files, Introduction to Object Oriented Programming, Abstract data Types including stacks, linked lists, queues, trees and graphs.

ELEC 1200 - PRACTICAL TRAINING

Electrical and Electronic Workshop Practice. Simulation software for Electrical/ Electronic Engineering. Mini Design Project.

ELEC 2051Y(3) - NETWORK COMPUTING (PQ: ELEC 1055Y(1))

Introduction to networking, types of networks, server platforms, Internetworking, distributed systems, client server models, network application development. Introduction to networking and Internet protocols via programming. TCP/IP protocol architecture; user datagram protocol (UDP); multicasting; transmission control protocol (TCP); standard Internet services, and protocol usage by common Internet applications. Sockets programming; client/server; peer-to-peer; Internet addressing; TCP sockets; UDP sockets; raw sockets. Multithreading and exception handling. Finger, DNS, HTTP, and ping clients and servers. Routers and architectures, routing protocols. Router and switch configurations, Internet operating systems. Internetwork setup, network topology, wireless internetworking.

ELEC 2052Y(3) - BASICS OF DIGITAL COMMUNICATIONS (PQ: ELEC 1054Y(1))

Introduction to digital communications systems, Introduction to Information theory, compression techniques, Channel coding, Bandpass modulation and demodulation, Digital modulation and demodulation techniques, Multiple access techniques.

ELEC 2053Y(3) - DIGITAL ELECTRONICS 2 (PQ: ELEC 1053Y(1))

IC logic families and applications in digital design, Digital system components, ADC and DAC, Sequential Logic circuit (synchronous and asynchronous) analysis and design, Finite State Machines, Programmable Logic Devices and applications.

ELEC 3000(5) - DEGREE PROJECT

Degree project in Information and Communication technologies and related areas, consisting of literature review, analysis, design, hardware and/ or software implementation, project report and project presentation.

ELEC 3051Y(5) - NETWORKS AND DATA COMMUNICATIONS

Data communications fundamentals, asynchronous and synchronous transmissions, data synchronizations, data link control protocols, switching techniques, ISDN, X.25, Frame Relay, ATM, Internetworking. Network services and Architectures, Network routing and Addressing, Congestion Control, Queuing theory and network queues, Quality of Service, network management, delay and loss performance models.

ELEC 3052Y(5) - MOBILE COMMUNICATIONS AND WIRELESS TECHNOLOGIES (PQ: ELEC 2052Y(3))

Historical development, Fundamentals of cellular communications, Modulation techniques for cellular communications, Propagation and propagation path loss, GSM system, Gprs, Edge, UMTS, Benefits of wireless Communications, point to multipoint and multipoint to multipoint links, wireless data network, Bluetooth technology and other wireless technologies.

ELEC 3053Y(5) - TELECOMMUNICATIONS NETWORK

Network services and Architecture, ATM networks, Layered Network Architecture: SS7, Network Routing, Addressing, Transmission Protocols: Bit-oriented, character-oriented, DLL Protocols, ARQ, Selective Repeat, HDLC, Performance evaluation and monitoring: SNMP, CMOT, Queuing theory and Network Queues, ATM, F.R switching and network models. Multimedia Networks, VoIP networks, Mobile computing.

ELEC 3054Y(5) - RF DESIGN AND MICROWAVE ENGINEERING

Basic theory of high frequency circuits, transmission line theory, propagation coefficient, reflection coefficient for a terminated line, impedance transformation, impedance matching, VSWR, Smith Chart, stubs and matching networks, Equations of a linear two-port network, z, y and h parameters, Interconnected two-ports, series and parallel arrangements, cascaded connections, ABCD parameters, Loaded two-ports, S parameters, Insertion loss and return loss, analysis and design of RF filters.

MATHS 1111(1) - MATHEMATICS 1 (PR: A-LEVEL MATHEMATICS)

Calculus of one and several variables. Polar coordinates. Complex numbers. Hyperbolic functions. Limits. Ordinary differential equations.

MATHS 1211(1) - MATHEMATICS 2 (PR: A-LEVEL MATHEMATICS)

Matrix Algebra: Matrices and determinants. Solution of linear systems of equations. Eigenvalues and eigenvectors. Infinite Series: Comparison test and Ratio test for non-negative series. Vector Algebra: Scalar and vector products, triple products. Vector equations. Vector Analysis: Gradient, divergence and curl. Line and multiple integrals. Green's theorem in the plane, Divergence theorem and Stokes' theorem.

MATH 1231(1) - PROBABILITY AND STATISTICS I (PR: A-LEVEL MATHS)

Elementary probability. Conditional probability. Discrete and continuous distributions. The Central Limit Theorem. Introduction to Linear Regression. Estimation and Hypothesis testing.