

BACHELOR OF SCIENCE (INFORMATION COMMUNICATION TECHNOLOGY)

1. INTRODUCTION

Information and communication technologies (ICT) are an integral part of our lives. Working with ICT involves finding technological solutions to everyday communication needs. The School of Informatics and Innovative Systems (SIIS) at Bondo University College has introduced a BSc in Information Communications technology a four year undergraduate program for the information engineering and IT professional industry. On this course, students will develop skills and experience required to work as a professional network solutions providers and IT Support systems, particularly in environments where competence in network solutions systems analysis and design and project management are required. It is becoming widely recognised that when developing business practices with a technological foundation, the most difficult (and interesting) problems are not the technical challenges but the organisational and human-centred factors. The course provides a solid technical foundation, so that students have a practical understanding of how software systems are developed, and how such systems are applied in a business context. The course provides rigorous foundations of the concepts of networks and Information Technology. In the final year, students also get an opportunity to do project work and undertake industrial attachment training in the third year of studies. Case studies will amplify your understanding of what works well in modern business practice. The skills developed on this degree are highly sought after by employers and will build a strong foundation for working in industry.

2. OBJECTIVES

The overall objective of the programme is to produce skilled, motivated and internationally competitive Information and Communications Technology graduates to work in both private and public informatics sector of the economy. The specific objectives of the programme are:

- a) To produce graduates with the ability to apply business computer networks knowledge, skills, techniques and tools to create best-possible solutions to complex ICT problems.

- b) To train students with skills necessary to facilitate the acquisition, adoption and adaptation of ICT knowledge, techniques and tools to improve business performance.
- c) To train graduates who are innovative and creative, who possess good problem-solving skills and are capable of life-long learning.
- d) To produce all-rounded graduates with demonstrable ethical and professional behaviour, and who possess effective communication, management, entrepreneurial and interpersonal skills.
- e) Train and equip students with capability to pursue postgraduate studies.

3. ADMISSION REQUIREMENTS

Candidates must satisfy the minimum entry requirements of Bondo University College. In addition they should meet the following requirements:

-) Have at least a mean grade of C+ in Kenya Certificate of Secondary Education (KCSE). In addition, candidates are expected to have at least a grade C- or above in Mathematics, Physics or Physical Science.
OR
-) Have two principal passes in science subject in KACE and at least a credit in pass in Mathematics.
OR
-) Have a Higher Diploma or Diploma in IT or any other related discipline from a recognized university or college.
OR
-) Have a degree from a recognized University.

4. CREDIT TRANSFER

- (a) Transfer of academic credits shall be accepted on individual basis for courses undertaken and successfully completed by students at accredited universities/institutions who request to transfer the same to the university, for incorporation into the degree course and final classification of the degree.
- (b) The relevant academic body as approve by the Bondo University College Academic Board shall make official evaluation and transfer of credits.
- (c) The number of hours, content and grading of courses for which credit transfer is sought should be similar to the courses offered at the Bondo University College.
- (d) Only a maximum of 1/3 or equivalent of the study programme at the university can be transferred.
- (e) Such courses are to satisfy the requirements of the first and second years of study only.

5. COURSE STRUCTURE AND DURATION

- (a) The Degree course shall normally take four academic years covering 8 semesters.
- (b) Courses shall be offered in units. A course unit is defined as that part of a semester subject described by coherent syllabus and taught normally over a period of a semester. It is designated as a total of 42 hours. For this purpose, one 1-hour lecture is equivalent 2-hours tutorial or 3-hours practical or any combination as may be approved by the Board of the School of Informatics and Innovative Systems.
- (c) Part-time students shall be allowed to take not less than 50% of the courses prescribed for the year.
- (d) All course units will be taught for a total of 42 contact hours, including examinations except industrial attachment which will take 480 hours of practical work in a relevant industry.
- (e) Students shall be required to undertake Informatics Industrial Attachment of 480 hours at the end of third year semester.

6. EXAMINATIONS REGULATIONS

Jaramogi Oginga Odinga University Examinations rules and regulation shall apply.

7. COURSE DISTRIBUTION

One semester shall comprise minimum of seven (7) units and a maximum of nine (9) units.

YEAR ONE: SEMESTER ONE

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3111	Introduction to Computer Systems	28	14	42	1C
ICT 3112	Linux/Unix Systems Administration	28	14	42	1C
IIT 3112*	Introduction to Programming	28	14	42	1C
IIT 3114*	HTML Programming and Internet Tools	28	14	42	1C
SMA 3113*	Logical Functions	42	0	42	1R
SMA 3114*	Analytical Methods for Computing	42	0	42	1R
EEL 3115*	Communication Skills	42	0	42	1R
SBI 3114*	HIV and AIDS	42	0	42	1R
Total		280	56	336	8

*Senate approved courses

YEAR ONE: SEMESTER TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3121	Computer Systems Fundamental	28	14	42	1C
ICT 3122	Programming in Java	28	14	42	1C
ICT 3123	Fundamentals of ICT	42	0	42	1C
ICT 3124	Systems Theory	42	0	42	1R
ICT 3125	Fundamentals of Database Systems	28	14	42	1C

IIT 3121*	Data Communications Principles	28	14	42	1C
SLB 3111*	Development Studies	42	0	42	1R
ESD 3121*	Social Ethics and Integrity	42	0	42	1R
Total		238	98	336	8

YEAR TWO: SEMESTER ONE

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3211	Systems Development Methods	28	14	42	1C
ICT 3212	Computer Systems Architecture	28	14	42	1C
ICT 3213	Programming in .NET	28	14	42	1C
ICT 3214	Technical and Professional Communications Skills	28	14	42	1C
ICT 3215	Multimedia Technology	28	14	42	1C
ICT 3216	Data Structures and Algorithms	28	14	42	1C
IIT 3215*	Systems Analysis and Design	28	14	42	1C
IIT 3217*	Network Design and Implementation	28	14	42	1C
Total		224	112	336	8

YEAR TWO: SEMESTER TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3221	Mobile Communications	28	14	42	1C
ICT 3222	Wireless Internet Applications	28	14	42	1C
ICT 3223	Fundamentals of e-Business	28	14	42	1C
ICT 3224	Operating Systems	28	14	42	1C
ICT 3225	IT Security	28	14	42	1C
ICT 3226	Management Information Systems	28	14	42	1C

ICT 3227	Research Skills and Design	28	14	42	1C
BCM 3226*	Entrepreneur Business Process	42	0	42	1R
Total		238	98	336	8

YEAR THREE: SEMESTER ONE

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3311	ICT Project Management	28	14	42	1C
ICT 3312	Advanced Operating Systems	28	14	42	1C
ICT 3313	ICT Policy and Internet Governance	28	14	42	1C
ICT 3314	ICT Diffusion, Transfer and Adoption	28	14	42	1C
ICT 3315	Human Computer Interactions	28	14	42	1C
ICT 3316	Distributed Systems	28	14	42	1C
ICT 3317	Firewalls and Network Defense Security	28	14	42	1C
ICT 3318	Independent ICT Capstone Research	0	42	42	1C
Total		196	140	336	8

YEAR THREE: SEMESTER TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3321	Network Systems Integration and Maintenance	28	14	42	1C
ICT 3322	Special Topics in Contemporary ICTs	28	14	42	1C
ICT 3323	E-government and Institutional Change	28	14	42	1C
ICT 3324	Service-Oriented Computing	28	14	42	1C
ICT 3325	User Interface Design & Programming	28	14	42	1C
ICT 3326	Software Engineering	28	14	42	1C
ICT 3327	Social Networking Computing	28	14	42	1C
ICT 3328	ICT Group Project	28	14	42	1C

Total		224	112	336	8
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YEAR THREE: SEMESTER THREE

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3331	Industrial Attachment	0	480	480	1C

YEAR FOUR: SEMESTER ONE

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3411	ICT and Society	28	14	42	1C
ICT 3412	Cyber Law	28	14	42	1C
ICT 3413	Advanced Network Management	28	14	42	1C
ICT 3414	Web Application Technologies	28	14	42	1C
ICT 3415	ICT Policy and Strategic Planning	28	14	42	1C
ICT 3416	Introduction to Knowledge Management	28	14	42	1C
ICT 3417	Innovation Techniques and Models	28	14	42	1C
ICT 3418	Group Design Workshop	0	42	42	1C
Total		196	140	336	8C

YEAR FOUR: SEMESTER TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3421	Strategic Management of Information systems	28	14	42	1C
ICT 3422	Fundamentals of Information Security Policy & Compliance	28	14	42	1C
ICT 3423	Information Technology and	28	14	42	1C

	Innovation				
ICT 3424	Knowledge Management	28	14	42	1C
ICT 3425	Project	0	42	42	1C
PSP 3214*	Geographic Information System	28	14	42	1R
	Electives (Any 4 Electives)*				

***ELECTIVES**

Any 3 Electives

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICT 3441	High Speed Networks	28	14	42	1E
ICT 3442	Networked Multicomputer Systems	28	14	42	1E
ICT 3443	Network Supported Multimedia Technologies	28	14	42	1E
ICT 3444	Performance Modelling of Communications Networks	28	14	42	1E
ICT 3445	Design Topics in Deeply Networked Systems	28	14	42	1E
ICT 3446	Computer and Multimedia Network Security	28	14	42	1E
ICT 3447	Network Business and Distributed Information Management	28	14	42	1E
IIT 3441*	Advanced Linux/UNIX System Administration	28	14	42	1E
IIT 3444*	HPC Cluster, Virtualization and Cloud Computing	28	14	42	1E

C: Core course, which is central to the discipline of study.

R: required course, which is supportive or beneficial to the programme.

E: Elective course, optional course to the discipline of study.

8. COURSE DISCRIPTION

YEAR ONE SEMESTER ONE

ICT 3111 Introduction to Computer Systems

(42 hrs)

Fundamental concepts of computers and computing: number systems, hardware, architecture, information processing, operating systems, networks (including the Internet) and web design. Additionally, students will complete significant projects utilizing contemporary word processing, spreadsheet, and presentation graphics software. Fundamentals of programming will be explored using modern programming languages. Other software applications may be examined during the semester.

ICT 3112 Linux/Unix Systems Administration (42 Hrs)

Linux administration: install, maintain, configure and tune a Linux system in a networked environment. Perform basic administrative tasks: adding and managing users, creating and maintaining file systems, maintaining shell and Perl scripts, and imposing a security policy. Kernel management: rebuilding the kernel, installing and supporting the X Window System, and installing and supporting network facilities: Samba, NFS, DNS, DHCP and firewall. LAMP stack installation and configuration. Web server management and security framework.

IIT 3112 Introduction to Programming* (42 Hrs)

Fundamental concepts of object oriented programming: introduction to object-oriented programming paradigm, definition and use of classes along with the fundamentals of object-oriented design. Programming language principles: simple analysis of algorithms, control structures, functions, arrays, files, and the mechanics of running, testing and debugging, basic searching, and sorting techniques.

IIT 3114 HTML Programming and Internet Tools* (42 hrs)

Basic Network and Web Concepts: Internet standards, TCP and UDP protocols, URLs, MIME. CGI, Introduction to SGML. Java Programming: Java basics, I/O streaming. Files. Looking up Internet Address: Socket programming, client/server programs, E-mail client, SMTP and POP3 programs; Web page retrieval: protocol handlers, content handlers, applets, image handling, Remote Method Invocation. Scripting Languages: HTML, forms, frames, tables, web page design; JavaScript introduction: control structures, functions, arrays, objects, simple web applications. Dynamic HTML: Dynamic HTML, Introduction, cascading style sheets, object model and collections, event model, filters and transition, data binding, data control, ActiveX control, handling of multimedia data. Server Side Programming: Servlets, deployment of simple servlets, web server (Java web server / Tomcat / Web logic); HTTP GET and POST requests, session tracking, cookies; JDBC: simple web applications, multi-tier applications.

SMA 3113 Logical Functions* (42 hrs)

Overview of basic algebra: Extracting relationships from data, manipulation, solving simple equations, rearranging formulae. Number: Number types and their representation in computing. Number bases, binary and hexadecimal, and arithmetic operations. Sets: definitions, laws of operation, Venn diagrams, product set and projection mappings. Propositional logic: Translation between natural language and logic, truth tables, laws of propositional calculus. Validity of arguments; Boolean algebra: application to circuits. Predicate logic: Predicate Logic as Generalised Propositional Logic, Scope of quantifiers, N-place predicates. Application of logic in programming.

SMA 3114 Analytical Methods for Computing* (42 hrs)

Functions: Function definitions and types, function composition and inversion. Logarithmic, exponential and trigonometric functions. Introduction to Algorithms: Structure and interpretation of algorithms. Issues of computability, efficiency, complexity. Matrices and Vectors: Vectors, matrices and arrays. Applications of matrices to solve equations and to effect 2D graphical transformations. Graphs and Networks: Definitions, Spanning trees, Algorithms, Application to paths and searches. Calculus: Definitions of integration and differentiation. Manipulation of

simple functions. Application to area under a curve and gradient. Complex numbers: Definition of i . Manipulation of complex numbers. Representation on the Argand diagram.

EEL 3115 Communication Skills* (42 hrs)

Study Skills: planning study time, making references, filing notes; preparing for examinations. Library Skills: organizations; classification, shelving; using reference books, listening in lectures, speeches and instructions, understanding lectures, note taking, speaking skills, asking and answering questions in lectures and seminars, making and defending arguments, agreeing and disagreeing, explaining points clearly, academic reading skills, skimming and scanning, understanding footnotes and bibliographical references.

SBI 3114 HIV and AIDS* (42 hrs)

Introduction, historical background and magnitude of HIV and AIDS, general organization of the human body, immune system (human physiology) and other factors; sex and sexuality; the biology of the human immunodeficiency virus and viral transmission; stages of infection and the development of HIV and AIDS; opportunistic infections; HIV and AIDS prevention and infection control; peer education for HIV; treatment options and vaccine development; blood transfusion and HIV and AIDS; Factors that influence the spread of HIV and AIDS in Africa; case studies in selected countries in Africa; HIV and AIDS as a national disaster impacts; myths and emerging issues on HIV and AIDS.

YEAR ONE: SEMESTER TWO

ICT 3121 Computer Systems Fundamental (42 Hrs)

Computer systems fundamental concepts: organization, performance, and low-level software control of the elements of a complete computer system. CPU instruction-set architecture, basic Assembly Language programming. low-level control interfaces, basic system hardware components; keyboards, video screens, and disk drives; and develops their low-level interrupt processing control software. Surveys of system components: their organization, performance, and low-level software interfaces to the operating system. Modern high-performance processor

architecture, and non-traditional computing. Hands-on labs: weekly programming labs with implementation in C and assembly language of a bootable, nano operating system.

ICT 3122 Programming in Java (42 Hrs)

Design algorithms for problem-solving; translation of algorithms into working computer programs. Programming and object-oriented techniques of Java. Introduction to Object-oriented programming (OOP) concepts: fundamentals of the Java language and syntax, major class libraries in Java, and java database connectivity. Concepts of data structures and algorithms; Techniques for constructing programs of moderate size. Java-based Internet concepts and web design and Internet Programming: Internet and web design techniques, web graphics, and web interface design.

ICT 3123 Fundamentals of ICT (42 Hrs)

Concepts and overview of ICT development: Systems; customers, users, and their requirements. Principles of computing: Problem solving, abstraction, division of the ICT system into manageable components, reuse, and simple interfaces. Programming concepts: Control constructs; expressions; use of APIs; simple data including arrays and strings; classes and inheritance. ICT solutions Design concepts: Evaluation of alternative.

ICT 3124 Systems Theory (42 Hrs)

System theory and IT: theory, design, stability, and control of general systems. Applications of systems theory in organisational management and software development. Basic concepts and models in systems thinking. Discuss how holistic or systems approach is helpful when dealing with complex social phenomena and organizational issues. IT-management and how to handle complex issues related to IT and organizations.

ICT 3125 Fundamentals of Database Systems (42 Hrs)

Database systems concepts; focus on relational database management systems. Data modeling, database design theory, data definition and manipulation languages, storage and indexing

techniques, query processing and optimization, concurrency control and recovery, and database programming interfaces. Emerging topics: XML and Web data management.

IIT 3121 Data Communications Principles* (42 Hrs)

Introduction to data communication; Data transmission system components: DTEs, DCEs and Channels; Data transmission media; The OSI reference model; Data encoding; Basic serial communications interfacing standards; Analysis and synthesis of wave forms; Channel characteristics, Bandwidth, data rates, capacity; Transmission modes, Modulation and Multiplexing; Synchronization; Error control: detection and correction; Data security; Data encryption and compression; Introduction to Network topologies; Data link layer: Line configurations, flow control, error control, bit oriented link control, simplex and sliding window protocols. Data communication standards and best practices.

SLB 3111 Development Studies* (42 hrs)

Development studies as an autonomous discipline; the concept of development the theories and paradigms of development; the relationship between economic growth and development; science and technology in development; developed and developing countries; issues in development; Social, economic and political; actors in development: The state, national and international NGO's, bilateral and multilateral institutions, multinational corporations (MNC's) and social movements.

ESD 3121 Social Ethics and Integrity* (42 hrs)

Definitions and concepts; categories of ethics; national cohesion; integrity; unity; structural injustices; ethnicity: positive ethnicity, negative ethnicity; peace: peace making, peace building, peace transformation, stakeholders in national cohesion.

YEAR TWO: SEMESTER ONE

ICT 3211 Systems Development Methods (42 Hrs)

Overview of software development: systems, customers, users, and their requirements. General principles of computing: Problem solving, abstraction, division of the system into manageable

components, reuse, and simple interfaces. Programming concepts: Control constructs; expressions; use of APIs; simple data including arrays and strings; classes and inheritance. Design concepts: Evaluation of alternative.

ICT 3212 Computer Systems Architecture (42 hrs)

Concepts of computer architectures: architectural design of modern computer systems in terms of instruction sets and the organization of processors, controllers, memories, devices, and communication links. Concepts of system components, theoretical foundations, instruction-level and thread-level pipelining, multifunction pipelines, multi-core systems, caching and memory hierarchies, and multi-core and parallel computer organization; in-order and out-of-order superscalar architectures; VLIW machines; vector supercomputers; multithreaded architectures; symmetric multiprocessors; and parallel computers. Designing and implementing programs that simulate significant components of modern computer architectures.

ICT 3213 Programming in .NET (42 Hrs)

Introduction to .NET framework programming; .NET framework as an emerging API for developing online and offline applications of varying scope. Use of object oriented concepts to present .Net environment as a unifying developer engine for Java applications. Programming in: .NET using ADO.NET, generic methods, connection objects, interface design and client server systems. Introduction; basic infrastructures of .NET using C# to build simple server-side Web services. A cursory look at .NET and ASP.NET technology.

ICT 3214 Technical and Professional Communications Skills (42 Hrs)

Intensive survey of technical writing: report preparation reports, instructions, memos, and other communications for business and industry. Analyzing audiences and writing for readers both with and without technical expertise. Techniques and strategies: effective technical writing; conventions used in document: letters, memos, proposals, abstracts, and reports. Project management documentation; Software production documentation; Technical support and training materials documentation and delivery. Writing enterprise IT policy documentation.

ICT 3215 Multimedia Technology (42 Hrs)

Concepts and overview of digital audio and video technology, different interchange formats, multimedia hardware, multimedia software, multimedia communications, video conference, and multimedia systems. Basics of multimedia technology: its effects on communications and computation technology. Multimedia Authoring and Tools; Graphics and Image Data Representations; Color in Image and Video; Fundamental Concepts in Video; Basics of Digital Audio; Lossless Compression Algorithms; Image Compression Standards(The JPEG Standard).

ICT 3216 Data Structures and Algorithms (42 hrs)

Introduction: Definitions, Data type, Data Structure, Algorithms, Abstraction, Objects and Abstract data types (ADTs). Mathematical models of data as an abstract concept such as set, list or graph. Distinction between an abstract data type and an implementation of that data type. The role of data structures in programming. Data structures and algorithms: Arrays, Linked lists, Lists, Stacks, Queues, Priority Queues, Hash tables, Heaps, Trees: Binary search trees; Graphs; Searching and sorting techniques: Sequential Searches, Binary Search; Application areas for data structures and algorithms

IIT 3215 System Analysis and Design* (42 hrs)

Introduction to a methodical approach to developing computer systems: systems planning, analysis, design, testing, implementation and software maintenance. Overview of strategies and techniques: systems analysis and design for producing logical methodologies for dealing with complexity in the development of information systems. Identification and Structuring of IT-

based opportunities into projects; Project conceptualization and feasibility of IS projects; Business process management and improvement; Analysis of business requirements; Analysis and specification of system requirements: Data collection methods, Methods for structuring and communicating requirements: Modeling, Data and Process Specification, presentation; Feasibility analysis of technical alternatives; System Design: Factors affecting user experience, User interface design, System data requirements, Factors affecting security, Ethical considerations; Organizational implementation of a new information system.

IIT 3217 Network Design and Implementation* (42 hrs)

Networking Media, Structured Cabling, Cable Testing. Communication basics, network types, functions (transmission, firewalls, switching, multiplexing, routing, addressing, error recovery, congestion control); layered architectures (OSI, TCP/IP, IEEE 802.x); standards and bodies. Applications: data, telephony, music, image, video; traffic characteristics, requirements, characterisation and parameters. Network performance: concepts and parameters. Performance prediction techniques: simple queueing theory, simulation, reliability and availability. LANs: overview of Ethernet, FDDI; emphasis on QoS support. TCP/IP suite of protocols. Frame relay, ATM: operation, leaky bucket, token bucket for traffic shaping. Routing algorithms, protocols RIP, OSPF, IGRP, EIGRP, BGP. IP routers: advanced features: address filtering, IP QoS, IntServ, RSVP, DiffServ, queue management, congestion control. WANs; IP WANs, IP over ATM, IP over Frame Relay, MPLS. Router configuration based on Cisco routers. Troubleshooting network configurations. Wireless networking systems: configuration and security. Performance issues on networks. Diagnostic tools for network.

YEAR TWO: SEMESTER TWO

ICT 3221 Mobile Communications

(42 hrs)

Network architectures: cellular networks, ad hoc networks; access protocols; radio and network resource management; security, quality of service; mobility and location management; routing; mobile-IP; current wireless technologies for personal, local and satellite networks. Overview of the latest developments and trends in wireless mobile communications, and addresses the impact of wireless transmission and user mobility on the design and management of wireless mobile systems.

ICT 3222 Wireless Internet Applications

(42 hrs)

Introduction: cellular and wireless networks and their components. First generation analog cellular phone systems; traffic engineering; mobility management; intersystem operation; second generation digital cellular standards: GSM, IS-95 (cellular CDMA); short message service (SMS); Cellular networks: from 1 to 5G Networks; location technology, wireless local area networks (802.11a to n), wireless personal area networks (Bluetooth, Zigbee), wireless metropolitan networks (WiMax), and satellite systems; Mobile Ad Hoc and Sensor Networks; Platforms to Support Mobile Applications: Architecture of Mobile devices, Mobile IP, Wireless middleware (WAP/WML, iMode, J2ME, BREW, MMIT); Mobile Applications: M-Business, M-Government, M-Life, Positional Apps; Security, Integration, and Management Issues. Students will acquire hand-on experience in writing WAP/WML software applications as a term project.

ICT 3223 Fundamentals of e-Business

(42 hrs)

Overview and evaluation of electronic commerce applications, technologies, and tools used to conduct business on the World Wide Web, assess the impact of e-business on competition and on business-to-customer relationships. Analyses and discussion of entry strategies, emerging Web-based business models, Web site design strategies, payment systems, and various other issues: Internet marketing, legal, regulatory, technological, social and ethical relating to electronic business. The role of business-to-business (B2B) commerce, electronic data interchange, Web base marketing, e-supply chains, e-procurement, e-marketplace, customer relationship management, and Web-enabling mobile business. E-business case studies.

ICT 3224 Operating Systems**(42 hrs)**

Introduction; design and implementation of operating systems: processes, memory management, synchronization, scheduling, protection, filesystems, and I/O. Illustration of wider concepts in the design of other large software systems, including simplicity; efficiency; event-driven programming; abstraction design; client-server architecture; mechanism vs. policy; orthogonality; naming and binding; static vs. dynamic, space vs. time, and other tradeoffs; optimization; caching; and managing large codebases. Group in-class projects provide experience in working with and extending a real operating system.

ICT 3225 IT Security**(42 hrs)**

Fundamentals of Information Technology and computer security: security standards, policies and best practices; principles of ethical and professional behaviour; regulatory compliance and legal investigations; information assurance; risk management and threat assessment; business continuity and disaster recovery planning; security architecture and design; elements of cryptography; digital forensics; physical (environmental) security; secure networking fundamentals; access control and authentication; network and application security; exploiting network, web, software and insider vulnerabilities.

ICT 3226 Management Information Systems**(42 hrs)**

Fundamental concepts of management information systems (MIS) are explained and integrated into organizational structures. Basic system modeling tools and techniques are introduced. MIS Subsystems; Conceptual foundations; hardware/software platforms and trends; database trends, e-commerce, ethical and social issues in the digital .rm. MIS Structure: Operating Elements; Management Activity; Organizational Functions; features of organizations; Organizational and Management support systems: Decision making and decision support; Phases in Decision Making; Concepts of Decision Making; Models: Formal; Business Process Integration; User Machine; Concepts of Information. New types of e-business infrastructure and applications: ERP (enterprise resource planning), IOS (inter-organisational systems), and CRM (customer relationship management). Opportunities and problems organisations face as they attempt to use

these IT applications to add value to their businesses; transformational changes within and across industries.

ICT 3227 Research Skills and Design (42 hrs)

Research Skills and Design course aims to acquaint students with types of scientific research methods that are applicable to the ICT field. It is designed to enable students develop capacity to conduct basic research projects recognised by universities and publishable in the international peer reviewed journals. Topics: from research planning to thesis writing.

BCM 3226 Entrepreneur Business Process (42 hrs)

Effective business planning is the cornerstone of success. This course teaches entrepreneurs to state their business passion in practical terms with methods for analyzing their market and competition, setting achievable goals and focusing on a strategic business plan. Understanding the probability of risks, along with developing crisis management, disaster recovery and business continuity plans, provide entrepreneurs with a solid basis to sustain their business and achieve their vision.

YEAR THREE: SEMESTER ONE

IIT 3311 ICT Project Management* (42 hrs)

Fundamentals of Project Management: Project life cycle: initiation, develop a project charter, create a scope statement, create management plans, develop a statement of work, create a project schedule, manage project relationships, execution, implement a project, acceptance, support and closure. Project selection, planning, scheduling and controlling associated with applications such as new product development, technology implementation of ICT. Elements of a disciplined Project Management process along with interpersonal skills required by an effective Project Manager. Project management and ICT: the ICT project management process; Project management methodologies and tools; ICT project management standards; Change management; Project reporting and writing; Case studies of ICT project management.

ICT 3312 Advanced Operating Systems (42 hrs)

Introduces advance operating systems: understand the design and implementation issues for modern operating systems. Key design issues in implementing an operating system: memory management, scheduling, protection, inter-process communication, device drivers, and file systems. System structures that differ from traditional monolithic arrangements of Unix/Linux and Windows.

ICT 3313 ICT Policy and Internet Governance (42 hrs)

ICT Policy and Internet Governance (IG) concepts; Introduction to the IG process and actors: Evolution, Meaning, Negotiations, Classification; Infrastructure and Standardisation: Standards, TCP/IP protocol, DNS and Root Zone Management, Internet Service and Bandwidth Providers, Economic Models, Security, Spam, Open Source; Legal Issues: Legal Mechanisms, Jurisdiction, Arbitration, Intellectual Property Rights, Cybercrime; Economic Issues: e-Commerce, Consumer Protection, Taxation, Digital Signatures, Customs, e-Payments; Socio-cultural: Content Policy, Human Rights, Privacy, Multilingualism and Cultural Diversity, Public Goods, Education; ICT Development: Digital Divide and Strategies, Universal Access; The Internet Governance Process, Actors, Process, Negotiations, Internet Governance Forum.

ICT 3314 ICT Diffusion, Transfer and Adoption (42 hrs)

Introduction, examine the interplay between the diffusion, transfer, adoption and impact of ICTs on resource poor environments and institutional elements that shape it. Diffusion, transfer and adoption of ICTs at three levels: individual, firm and national; theories of technology diffusion and transfer and the behavioral, cultural and environmental factors which influence adoption and usage.

ICT 3315 Human Computer Interaction (42 hrs)

Design and evaluation of human-computer interfaces: task analysis techniques for gathering design information, iterative design through prototyping, and formative and summative usability testing; theoretical foundations of HCI and cognitive modeling of user interactions; the integration of HCI techniques into the software development life cycle and the use of user

constraints to generate new interaction designs. Process for user-centered development: early focus on users, empirical testing, iterative design; Different measures for evaluation: utility, efficiency, learnability, user satisfaction; Models that form human-computer interaction (HCI) design: attention, perception and recognition, movement, and cognition; Conceptual Design Process: perceived affordance, conceptual model, mental model, metaphor, interaction paradigm, interaction design, feedback; Social issues influencing HCI design.

ICT 3316 Distributed Systems

(42 hrs)

Overview and broad range of topics related to parallel and distributed computing: parallel and distributed architectures and systems, parallel and distributed programming paradigms, parallel algorithms, and scientific and other applications of parallel and distributed computing. Advances and trends in recent research in distributed computing. Lab session in programming projects using different programming paradigms. Multi-core, SMP, MMP, client-server, clusters, clouds, grids, peer-to-peer systems, GPU computing, scheduling, scalability, resource discovery and allocation, fault tolerance, security, parallel I/O, sockets, threads, message passing, MPI, RPC, distributed shared memory, data parallel languages, MapReduce, parallel debugging, and applications of parallel and grid computing.

and governments. Emerging trends in ICTs, issues of the evolution of information technology, its application, value added as well as concerns.

ICT 3323 E-government and Institutional Change (42 hrs)

Explore how ICTs are affecting how people interact with government, and how governments are using and managing ICTs to promote transparency and offer better information and services to the public. Methods for developing and assessing e-government applications using Internet, mobiles and other forms of ICTs, policy, privacy and ethical issues relevant to the implementation and management of e-government systems. Use of ICTs in non-governmental organizations, tele-democracy and aligning IT resources in the public sector and private sectors.

ICT 3324 Service-Oriented Computing (42 hrs)

Concepts and techniques for enabling Web service based interactions on the Web. Recent trends in industry to address Web service issues. Service foundations: Service-oriented Architecture (SOA); Realizing SOA with web services; Various aspects of Web services: reference model for Web services (UDDI, SOAP, WSDL), Web service composition, semantic Web services, security/privacy in Web services, and overview of Web service standards (BPEL4WS, WS-Security, etc.). Service management and monitoring; Developing Web services based distributed applications; Introduction to service oriented computing applications in enterprise computing, grid computing and cloud computing. Business Process Execution Language for Web Services (BPEL4WS).

ICT 3325 User Interface Design & Programming (42 hrs)

Introduction to user interface design concepts: design, implementation, and evaluation of human-computer interfaces, with emphasis on user-centered design and graphical interfaces. Choosing the right user interaction technique and developing an interface that is well-suited to end-users. Introduction to non-traditional interfaces: examine the technological and usability issues in constructing non-traditional (non-WIMP) interfaces. Styles of interfaces: natural language-based interfaces, tangible interfaces, vision-based interfaces, and pen-based interfaces.

ICT 3326 Software Engineering (42 hrs)

Overview of software engineering principles: evolving role of software, Software crisis, important qualities of software products. The software life cycle, Software Development process models, Project Management, Software metrics, Role of software metrics, Size-oriented metrics, Function-oriented metrics, Metrics for software quality, Software Requirements and Specification, Need for SRS Characteristics of SRS, Components of SRS, Software Design, Design principles, Top-down and Bottom-up Strategies, Module level concepts, Coupling, Cohesion, Structured design, methodology, Structure charts, Design reviews, Coding, Programming style, Internal documentation, Verification, Software Testing and Maintenance, Testing Fundamentals, Types of testing, Software Maintenance, Software Quality assurance, Introduction to UML.

ICT 3327 Social Networking Computing (42 hrs)

Fundamental of social computing: computational techniques for collaborative and collective intelligence of group behaviors on the Internet. Social computing: data mining and knowledge discovery of social interactions, signals and data; social media services: search engines, social network sites, blogs, micro-blogs, wikis. Current technologies: web 2.0, Web data mining, knowledge discovery on the web, web analytics, web information retrieval, ranking algorithms, recommender systems, human computation, models and theories about social networks, large graph and link-based algorithms, social marketing, monetization of the web, security/privacy issues related to social computing. Learning in social networks; Applications.

ICT 3328 ICT Group Project (42 hrs)

Lectures together with supervised practical work and supported by tutorials in small groups. The group software project documentation and presentation will entail a collection of documents prepared/used at different stages of the software development process.

YEAR THREE: SEMESTER THREE

ICT 3331 Industrial Attachment (42 hrs)

Students will liaison with their designated departmental supervisor and the respective onsite supervisor at the designated industrial attachment organization, to determine a suitable project or task to be pursued during the industrial attachment. Students may also work in groups on a predetermined project/task. During the Industrial Attachment, students will work under company supervision. Students will maintain a logbook of daily activities and will be required to submit a comprehensive final report for assessment at the beginning of the following semester. Students will be visited at their work place twice by their Lecturers.

YEAR FOUR: SEMESTER ONE

ICT 3411 ICT and SOCIETY

(42 hrs)

Introduction, basic concepts and applications of computer and Internet-related ICT and its impacts on: individual users, businesses, groups, organizations, and society. Internet and network access, evaluation, and use of digital information, ethical and security implications of information use and storage; human-computer interactions; social aspects of information systems; economic and legal issues; privacy and confidentiality, ethical use of and dissemination of health related data, digital divide, and professional presentation and communication of information. Information literacy skills that promote lifelong learning through exposure to various existing and emerging technologies, including information resources, communication methods and technology.

ICT 3412 Cyber Law

(42 hrs)

Concepts of Information Technology and Law: Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence. Law of Digital Contracts: The Essence of Digital Contracts, The System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography. Intellectual Property Issues in Cyber Space: Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World. Rights of Netizens and E-Governance: Privacy and Freedom Issues in the Cyber World, E-Governance, Cyber Crimes and Cyber Laws. Information Technology Act, International Scenario in Cyber Laws, Cyber Law Issues for Management, Security Perspective, Internet Security Issues, Digital Signatures for Securing Information Assets, Security Policies.

ICT 3413 Advanced Network Management**(42 hrs)**

Network management: basics (history and basic definitions, management frameworks, functional areas). The simple network management protocol framework (history, protocol architecture, functional architecture, information architecture, RMON, management by delegation, distributed management and JASMIN NIB, case studies). OSI systems management, TNM and other frameworks (OSI communication, information and functional models, TMN functional, physical and information architecture, case study, CORBA based management, web based management, DTMF, JMX). Network interoperability. Specific functional area overview of known techniques (dual MIBs), alarm filtering techniques (artificial intelligence), alarm correlation techniques (artificial intelligence, coding theory). Future trends: mobile agent based network management, active network based network management, policy based artwork management, use of SML/web services.

ICT 3414 Web Application Technologies**(42 hrs)**

Web clients and client side technologies: Firefox, IE, XHTML, CSS, JavaScript, DOM, cookies. Web servers and server-side technologies: Apache, IIS, PHP, ASP.NET sessions, database connectivity. XML technologies and web services: DTD, XSD, XSLT, DOM, SAX, SOAP, REST, WSDL, UDDI, AJAX. Web site development tools: EditPlus, FTP, Firefox, Visual Studio. Web site design issues: HTTP, state preservation, usability, accessibility, standards and best practices, Web2.0 and its security.

ICT 3415 ICT Policy and Strategic Planning (42 hrs)

ICT Policy and Strategic Planning concepts: introduction to ICT strategy; National ICT policies and strategies, context, and background; ICT policy development; E-readiness assessment and ICT benchmarking; Development of ICT action plans: actions, Pathfinder projects, funding, partners; Implementation of an action plan: implementation, monitoring, and evaluation of national ICT strategies, scope, project plans, deliverables, roles and responsibilities, dependencies, risks and mitigation strategies, change management; ICT governance and management of the implementation process: governance structures and the implementation process, including monitoring and follow-up of the strategy; ICT Policy and Strategic Planning capstone case studies

ICT 3416 Introduction to Knowledge Management (42 hrs)

Contemporary issues in knowledge management, knowledge engineering, technology management, and intelligent systems. Overview of knowledge acquisition, intelligent database design, decision support systems, artificial intelligence technologies, designs and tools, and collaborative development.

ICT 3417 Innovation Techniques and Models (42 hrs)

Creativity concept and principles, software tools for innovation, modelling the mind using mind maps will be covered. Software Innovation Tools: result-oriented, customizable Software solutions to enhance the Innovation process according to organization's strategies, goals and challenges. Selection of Open Innovation software tools: development of an Internet of Things (IoT) experiential platform involving citizens and users from the early stage of idea creation to the further implementation of innovative IoT applications and services.

ICT 3418 Group Design Workshop (42 hrs)

Group Design Workshop aims to test students' innovation knowledge and skills learnt to undertake real-life project development through team-based project implementation in any area of ICT. Research identification, planning, proposal writing, execution, writing and finally presentation.

YEAR FOUR: SEMESTER TWO

ICT 3421 Strategic Management of Information Systems (42 hrs)

Introduction: information systems strategy and management: business models and organization forms in the information age, IT as a business enabler, IT and competitive strategy, information for management control, analysis and redesign of business structure and processes, knowledge management and information networks, interorganizational networks, sourcing strategies, interfacing with the IT function, reliability and security, and ethical and policy issues. Case studies using current information obtained from the Web, or directly from the firms under study in the cases.

ICT 3422 Fundamentals of Information Security Policy & Compliance - (42 hrs)

Fundamental of information security policy: concepts and issues related to securing information systems and the development of policies to implement information security controls. Historical view of networking and security, security issues, trends, security resources, and the role of policy, people, and processes in information security. Identification of information security risks, creation of an information security policy, and identification of processes to implement and enforce policy. Implementation of techniques for establishing and implementing an organization-wide security policy designed to protect the information assets. Legal and privacy issues; Evaluation tools: standards and best practices. Techniques: install, monitor and audit key information security regulatory requirements: SOX, PCI, HIPAA, GLBA & best practices like COBIT, ITIL and ISO17799.

ICT 3423 Information Technology and Innovation (42 hrs)

Concepts and overview of information technology, innovation and applications. Roles of information technology in the advancement of our society over the past decades. Building information system applications used in programming. Creative ideas in IT: Case studies, new problems, development of new ventures and eventually become a successful entrepreneur.

ICT 3424 Knowledge Management (42 hrs)

ICT 3442 Networked Multicomputer Systems**(42 hrs)**

Systems engineering of a networked multicomputer system concepts. Distributed multicomputer architectures, architecture of a network operating system, and key system components. Development of a client/server system, requirements analysis of a client/server web computing, system planning and implementation. Client-server architecture: Analysis and design of distributed communication systems. Distributed applications and various protocols used in such applications. Algorithms for iterative and concurrent server designs, and design of client application level protocols. Multicomputer systems and a discussion of future directions.

ICT 3443 Network Supported Multimedia Technologies**(42 hrs)**

Concepts, theories and applications of modern, Internet-based multimedia technologies. Focus on the formats, production and distribution of digital audio and digital video. Investigates current multimedia standards and tools. Explore recent advances in multimedia networking technologies: multimedia compression and standards, quality of service (QoS) support mechanisms and protocols, performance analysis, network calculus, IP multicasting, Internet multimedia applications, and multimedia transport over wireless networks. Roles and uses of multimedia technology: education, advertisement, corporate, military and public relation. Multimedia standards (audio, music, graphics, image, telephony, video, TV), Capacity planning and performance issues, Input and output devices; Multimedia servers and systems. Tools to support multimedia development.

ICT 3444 Performance Modelling of Communications Networks (42 hrs)

Key aspects of communications networks: design, implementation and performance modelling and simulation of communication networks. Probability theory, distributions functions, stochastic processes, queuing theory, arrival process and performance analysis of actual network application systems. Simulation of Communication Network Models is highlighted for performance comparison. Workload characterization, collection and analysis of performance data, instrumentation, tuning, analytic models including queuing network models and operational analysis, economic considerations.

ICT 3445 Design Topics in Deeply Networked Systems (42 hrs)

This project-intensive capstone research seminar will explore a series of non-traditional systems areas that are critical to deeply networked systems of extreme devices: the small, the large, and the numerous. It will be a hands-on project-oriented course, with scheduled speakers, substantial readings, and in-depth discussions. Elements considered: Tiny connected devices and operating systems, wearables, embedded servers, low-power networks, sustainable power harvesting, sensor networks, tiny IP stacks, directed diffusion, address-free routing, global coordination through local actions, scalable discovery, smart spaces, vehicles and buildings, negotiation architectures, self-assembly, service composition, mobility, and scalable services.

ICT 3446 Computer and Multimedia Network Security (42 hrs)

Computer and multimedia network security fundamentals; up-to-the-minute techniques in securing IP and multimedia networks: classic cryptography, Diffie-Hellman, RSA, end-to-end authentication, Kerberos, viruses, worms, and intrusion detection. Learn about steganography, digital watermarking, covert channels, hacking, jamming, security features in MPEG-4, secure media streaming, wireless multimedia, copy control, and other mechanisms for secure storage and transfer of audio, image, and video data.

ICT 3447 Network Business and Distributed Information Management(42 hrs)

Network business design concepts: internet business strategy and business models. Functional architecture and implementation strategies. Creating and managing content. Payment and transaction systems. Network security and cryptography. Technological building blocks of Internet business systems. Interactive content and managing state information. Systems design. Internet applications and the construction of web pages to support electronic commerce, mobile commerce and information processing. Distributed Information Management: Business needs and information system trends. Static (stored) and dynamic (live) information, multiservice and multimedia. Case studies illustrating the issues in different styles of organisation. Rationale, styles and examples of distributed and co-operative systems both loosely coupled and tightly coupled - Transaction processing, Client/server processing, web services. Message passing using XML and SOAP. Platform and language independent communication between applications. Distributed systems design; Aligning the information strategy to the business; Preparing a technical architecture plan. Metadata and referencing/retrieval issues.

IIT 3441 Advanced Linux/UNIX System Administration (42 hrs)

Overview and concepts of DNS (domain name system) servers and the Apache Web server (httpd). Fundamental concepts of LDAP (lightweight directory access protocol) directory queries and authentication; LDAP Id management & SSO. Administration and configuration of server-side programming tools (CGI, mod_perl, PHP, JSP, Jakarta Tomcat, and Java SDK). Setup and configure: SAMBA, FTP, Telnet, and SQUID proxy servers. SMTP (simple mail transfer protocol) theory implemented via Sendmail and Postfix e-mail systems. E-mail protocols such as IMAP and POP are configured; spam filtering techniques. Discuss next generation networks, applications, and services: Voice over IP (VoIP), Instant Messaging (IM), Streaming media (unicast, broadcast, and multicast), and peer-to-peer networking.

IIT 3444 HPC Cluster, Virtualization and Cloud Computing (42 hrs)

Introduction to High Performance Computing (HPC), HPC Cluster, Virtualization and Cloud Computing. Building virtual machines using Xen hypervisor and other virtualization technology like: Xen Server, Citrix XenServer, VMware, VirtualPC and VirtualBox. Setup HPC Cluster mimicking supercomputers. Extend Virtualization technology to build Cloud Computing solutions, Cloud computing network and security.