Faculty of Computing Science and Engineering
Department of Information Systems

Course Contents

PART 1**: HARMATTAN SEMESTER**					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core-Compulsory courses	MTH101	Elementary Mathematics I		4-1-0	5
	PHY101	General Physics I		3-1-0	4
	PHY107	Physics Practical I		0-0-3	1
	BOT 101	Introductory Botany I		3-0-0	3
	BOT 103	Experimental Botany I		0-0-3	1
	CSC 101	Introduction to Computing I		2-0-0	2
	ACC 103	Introduction to Business I		3-0-0	3
	TPD101	Engineers in Society		1-0-0	1
General Courses	CHM101	Introductory Chemistry I		3-1-0	4
	CHM 103	Experimental Chemistry IA		0-0-3	1
	LIB001	*Use of Library, Study Skills and ICT Resources		0-0-0	0
	SER ??	Special Electives		2-0-0	2
	SEO 003	Special Electives		2-0-0	2

				18-2-6	22

PART 1**: RAIN SEMESTER**					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core-Compulsory courses	CIS 102	Fundamentals of Information Systems	CSC 101	2-0-3	3
	MTH 102	Elementary Mathematics II	MTH 101	5-0-0	5
	PHY 102	General Physics II	PHY 101	3-0-0	3
	PHY 108	Experimental Physics II		0-0-3	1
	BOT 101	Introductory Botany II		3-0-0	3
	BOT 103	Experimental Botany II		0-0-3	1
	ACC 104	Introduction to Business II		3-0-0	3
General Courses	CHM 102	Introductory Chemistry I	CHM 101	3-1-0	4
	CHM 104	Experimental Chemistry IB		0-0-3	1
	SER ???	Special Electives		2-0-0	2
	SEO 004	Special Electives		2-0-0	2
				20-0-9	23

PART 2: HARMATTAN SEMESTER					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
	CIS 201	Introduction to Problem Solving		3-0-0	3
	CIS 203	Information Assurance and Security		2-0-0	2

	CIS 205	Web Technologies		2-0-0	2
	CSC 201	Computing Programming I		2-0-3	3
	STT 201	Introduction to Statistics		2-1-0	3
	PHL 201	Introduction to Logic		2-1-0	3
General Courses	SE??	Special Electives		2-0-0	2
	SE??	Special Electives		2-0-0	2
				19-1-3	20

200 LEVEL: RAIN SEMESTER					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core-Compulsory courses	CIS 202	Computer Programming for IS	CSC 201	0-0-6	2
	CIS 204	Human Computer Interaction		2-0-3	3
	CIS 206	Analysis of Business Requirements		2-0-0	2
	CSC 204	Introduction to Operating Systems		3-0-0	3
	STT 202	Probability Distribution I		3-1-0	4
	PHL 204	Introduction to Symbolic Logic	PHL 201	2-1-0	3
General Courses	SE??	Special Electives		2-0-0	2
	SE??	Special Electives		2-0-0	2
				16-2-9	21

200 LEVEL: RAIN SEMESTER- LONG VACATION

Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core course	CIS 200	Student Industrial Work Experience Scheme I		0-0-9	3
				0-0-9	3

300 LEVEL: HARMATTAN SEMESTER					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core-Compulsory courses	CIS 301	Data Analytics		2-0-3	3
	CIS 303	E -Business Systems Development Management		2-0-3	3
	CIS 305	Systems Thinking, Modeling and Computer Simulation		2-0-3	3
	CIS 307	Database Management Practice		1-0-3	2
	CIS 309	Enterprise Architecture		2-0-0	2
	CSC 301	Fundamentals of Data structures		2-0-3	3
	PSY 315	Organizational and Industrial Behaviour I		2-1-0	3
General Courses	SE??	Special Elective		2-0-0	2
				15-1-15	21

300 LEVEL: RAIN SEMESTER					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
	CIS 302	Data Science 1	CIS 301	2-0-3	3
	CIS 304	Systems Analysis and Design		2-0-3	3
	CIS 306	Knowledge management and Information retrieval		2-0-0	2
	CSC 302	Object Oriented Programming	CSC201	2-0-3	3
	CIT 316	Artificial Intelligence		2-0-3	3
	PSY 312	Organizational and Industrial Behaviour II		2-1-0	3
General Courses (Students to take one restricted CIS electives)	CIS 352	IS Innovation and New Technologies		2-0-0	2
	CIS 351	Business Process Management		2-0-0	2
	SE??	Special Elective		2-0-0	2
				16-1-12	21

300 LEVEL: RAIN SEMESTER- LONG VACATION					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core course	CIS 300	Student Industrial Work Experience Scheme II		0-0-9	3
				0-0-9	3

400 LEVEL: HARMATTAN SEMESTER					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core-Compulsory courses	CIS 401	Data Science II	CIS 302	2-0-3	3
	CIS 403	Information Systems Project Management		2-0-3	3
	CIS 405	Systems Integration and Architecture		2-0-3	3
	CIS 407	Business Process Re-engineering		2-0-3	3
	CIS 409	Mobile Application Development		2-0-0	2
	CIS 411	Computer Crimes, Forensics and Auditing	CIS 203	2-0-3	3
	CPE 413	Data Communication and Networking		2-0-0	2
	CIT 401	Technical Communications in Computing		2-0-3	3
				16-0-18	22

400 LEVEL: RAIN SEMESTER- LONG VACATION					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core course	CIS 400	Student Industrial Work Experience Scheme III	Not more than 12 units outstanding	0-0-27	9
				0-0-27	9

500 LEVEL: HARMATTAN SEMESTER					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core course	CIS 501	Business Models and Innovation		2-0-0	2
	CIS 503	Final Year Research Project I		0-0-9	3
	CIS 505	Ethics, Legal & Professional issues in Information System		2-0-0	2
	CIS 507	Research Methodology in IS		2-0-0	2
	CIS 509	Web Application Development		2-0-0	2
	CIS 511	Application Design and Development		2-0-3	3
Free electives Electives **(Students to take TWO electives)**	CIS 551	Network Administration		2-0-0	2
	CIS 555	Database Analysis and Design		2-0-0	2
	CIS 553	Information Storage and Management Technologies		2-0-0	2
	CIS 557	Agile Web Development with OpenSource Frameworks		2-0-0	2
				14-0-12	18

500 LEVEL: RAIN SEMESTER					
Grouping	Course Code	Course Title	Prerequisite/ Corequisite	L-T-P	Units
Core course	CIS 502	Special Topics in Information System		2-0-0	2

	CIS 504	Final Year Research Project II		0-0-9	3
	CIS 506	Information Systems Audit and Controls		2-0-3	3
	CIS 508	Strategy Management and Acquisition in IS		2-0-3	3
Free electives (Students to take TWO electives):	CIS 522	Database Administration		2-0-0	2
	CIS 524	Database Programming		2-0-0	2
	CIS 526	Network Servers and Infrastructures		2-0-0	
				10-0-15	15

OUTLINE OF COURSE DESCRIPTION

BOT 101 Introductory Botany I **3-0-0 (3Units)**

Biology in a modern world: The growth and ways of science. Scientific method. The science of Botany. Why Study Botany. Why study Botany? The Cell-Structure and Function: Cell theory, Cell components; similarities and differences of animal and plant cells; similarities and differences between eukaryotic and prokaryotic cell; Cell division - mitosis, Cell in development — growth, differentiation, integration. Elementary treatment of genetics: The physical and chemical nature of genetic material; the major historical events in the elucidation of the nature of division in cells. Mendelian genetics; human genetics and genetic counseling; genetic engineering and biotechnology. Plant Physiology: - Elementary treatment of the mechanism of movement of materials in and out of the cell, transpiration, plant and mineral nutrition, photosynthesis, respiration; plant growth substances and their functions. Ecology: definition; elementary consideration of biotic and abiotic components, cycling of matter and energy flow. Types of ecosystems. Pollution - water, air, oil pollution, global warming.

BOT 102 Introductory Botany II **3-0-0** (3 Units)

Variety of forms: classification and evolution in the plant kingdom. Elementary treatment of cryptogams – algae, fungi, bryophytes. Pteridophytes – their distribution, classification, morphology, reproduction and economic importance. Evolution and significance of the seed habit in the spermatophytes (non-flowering and flowering seed plants). Elementary treatment of the anatomy and morphology of angiosperms: Simple and complex tissue system in roots, stems and leaves. Scope of morphology — external and internal morphology; morphology of plant organs – root morphology and variations; leaf morphology and variations. Morphology of inflorescence and flowers. Fruit morphology and variations.

BOT 103 Experimental Botany I 0+0+3 (1 Unit) Harmattan semester

BOT 104 Experimental Botany II 0+0+3 (1 Unit) Rain Semester

CSC101: Introduction to Computing I **2-0-0 (2 units)**

Definition of computer and computer related concepts such as programme, computer software: Systems and application programmes; minicomputers, mainframes and supercomputer, Discussion of selected application of personal computers: word processing, database management, spreadsheet, graphics, data analysis, Comprehensive history of modern computer technology. Evolution of microcomputer systems. History of computer programme, Number system: Binary, Decimal, Hexadecimal. Binary arithmetic; Addition, subtraction, multiplication, division and Social impact of computers: positive impacts, negative impacts.

CIS 102: Fundamentals of Information Systems **2-0-3 (3 units)**

This course presents information systems principles and demonstrates how they form an integral part of organisations and how information is used to conduct business and solve problems. Topics include information systems concepts; communication and network concepts, systems and applications; organizational processes; Information systems infrastructure concept; Information systems components; types of information system and their role in business; Information systems in organisations; Technology enabled change, Digital divide, Globalisation: Cultural, ethnic, & political challenges, Global information systems strategies; the Internet; information technology security, crime and ethical issues;

CSC 201: COMPUTER PROGRAMMING I **2-0-3 (3 Units)**

Brief survey of programming paradigms – Procedural programming – Object-oriented programming, Functional programming – Declarative programming, non-algorithmic programming– Scripting languages. The effects of scale on programming methodology.
Programming the computer in current version of PYTHON: Declarative statements; Input and Output statements; Program compilation and execution; Control and conditional statements; Loops and iteration; Functions, Routines and Sub-programmes. Input/Output; File processing; Port addressing. Program testing and debugging techniques.

CIS 201: Introduction to Problem Solving **3-0-0 (3 Units)**

Introduction to Problem to problem solving methods, roles of algorithms in problem solving process, concepts and properties of algorithms. Programming algorithm development, implementations strategies. Development of flowcharts, pseudocodes, program objects, implementation of algorithms in a programming language- Fortran 95/ Visual Basic.

CIS 202: Computer Programming for Information Systems 0-0-6 (2 Units) (Pre; CSC 201)

The purpose of this course is to provide frameworks, tools and skill in the understanding and use of IT in business, consisting of applications of programming, through case study problems. Through the principles of good programming, structured programming concepts, debugging and testing, string processing, internal searching and sorting, recursion.

CIS 203: Information Assurance and Security 2-0-0 (2 Units)

History and terminology, information assurance analysis model, disaster recovery, and forensics, Principles of applied information security management, governance and security policy, security design principles-system/security life cycle,; security mechanisms–cryptography, authentication, redundancy, and intrusion detection; operational issues–trends, auditing, cost/benefit analysis, asset management, standards, enforcement, legal issues; policy–creation of policies, maintenance of policies, and domain integration (physical, network, internet, etc.); prevention, avoidance, incident response (forensics),attacks – social engineering, denial of service, protocol attacks, active and passive attacks, buffer overflow attacks,

CIS 204: Human Computer Interaction 2-0-3 (3 Units)

Introduces the principles of user interface development, focusing on three key areas: Design: How to design good user interfaces, starting with human capabilities and using those capabilities to drive design techniques: task analysis, user centred design, human cognitive and physical ergonomics, iterative design, usability and affordances guidelines, interaction styles, and graphic design principles, design for disability and busy professionals. Implementation: Techniques for building user interfaces, including low-fidelity prototypes, Wizard of Oz, and other prototyping tools; input models, output models, model-view-controller, layout, constraints, and toolkits. Evaluation: Techniques for evaluating and measuring interface usability, including heuristic evaluation, predictive evaluation, and user testing. Structured around a set of case studies in which notable interface designs, and/or projects are analyzed as illustrative of underlying principles. Discussion of cases and interface analysis and design exercises.

CIS 205: Web Technologies 2-0-0 (2 units)

Web technologies; Information architecture–hypertext/hypermedia, effective communication, interfaces, navigation schemes, and media types; Web design process–user modelling and user- driven design, web design patterns, information organization, usability, and n-tier architectures; Digital media–digital libraries, media formats, capture, authoring and production tools, compression, and streaming media; Web development–web interfaces, web site implementation and integration, database integration, and accessibility issues; Vulnerabilities–client security, server security, attacks via clients, DNS poisoning; Social Software–asynchronous and synchronous communication modalities, broadcast communication modalities, collaborative and community modalities, and ethical issues

CIS 206: Analysis of Business Requirements 2-0-0 (2 Units)

This course will provide a solid foundation for a career in business analysis. This course

explores the strategy, phases, components and process that a business analyst uses to develop a project. From conducting an enterprise analysis to assessing the solution's implementation, students will learn the basics of how to manage the process and determine the appropriate parties to be involved.

CIS 301 Data Analytics **2-0-3 (3 Units)**

Data sources and reference architecture; Data importing, manipulating (cleaning, transformation, etc.), visualization and exploration; Roles of statistics in organization decisions, business analysis and data interpretation, merits and limitations of statistical techniques; Data analysis techniques (i.e. statistical, data mining, machine learning, Linear regression and regularization), Data analytics techniques (descriptive analytics, predictive analytics, and prescriptive analytics); Spatial analysis; Text analytics

CIS 302 Data Science 1 **2-0-3 (3 units) (Pre; CSC 301)**

Introduction to data science; Big data storage and retrieval: noSQL, GraphDB; Big data distributed computing: mapreduce, spark rdd. Data visualization and visualization tools; Merits and limitations of statistical techniques, Review of machine learning models, Feature engineering and selection, Clustering: k-means, hierarchical clustering, prediction, and anomaly detection problems.

CIS 303: E-Business System Development Management **2-0-3 (3 Units)**

The course will be directed to provide a broad understanding of information systems so as to streamline intra-organizational and inter-organisational e-business process. This course also provides hands on training on developing the e-business applications and web sites using currently popular software packages, web authoring and development tools. The business processes enabled by integrating information systems, telecommunications and internet-based technologies formed in various industry, e-security challenge will also be covered.

History of e-commerce and their technologies. Underpinning ideas and models of e-commerce. Learning from history (case examples such as pets.com, Dell, Google etc). And e-commerce requirements such as e-payment and e-security and auctions; Broad description of different Internet technologies: from network protocols; routing, discuss server-side vs. client side, concepts such as restfulness and cloud. Structured web (from SGML to XML and HTML4/5). Rich Internet Apps; and Web standards (W3C). Description and discussion of ethical issues such as netiquette and professional issues for web tech development; Architectures and Technologies, critiquing systems; abstracting and categorising components. Different technologies for different roles (e.g., Java vs. Javascript vs Flash); Applications vs Scripting; In depth client side programming, web scripting: JavaScript (syntax, typing, type conversion, interpreting, late bound, debugging etc). DOM and SVG. ECMAscript, W3C and web standards. Language issues of JavaScript vs. Java.

CIS 304: Systems Analysis and Design 2-0-3 (3 Units)

This course presents a structured approach to analysis and design of information systems for businesses. Software development life cycle; structured top-down and bottom-up design, dataflow diagramming, entity relationship modelling; study of computer aided software engineering, input and output, prototyping design and validation, file and database design; design of user interfaces; comparison of structured and object-oriented design. Case studies that promote critical-thinking skills provide the context for these techniques.

CIS 305: Systems Thinking, Modelling Computer & Simulation 2-0-3 (3 Units)

An introduction to Business Dynamics in the context of a Complex World; the course covers the basic principles governing complex systems and some techniques for modelling and creating corresponding computer-based simulation models to study their behaviour over time. A principal focus of the course is the significance of information feedback and circular causality in the behaviour of business systems. The course begins with the principles of systems thinking and then moves to problem mapping and computer simulation. The emphasis is on giving students the ability to both see complex problems as systems and to better understand how to build "management flight" simulators to shed insight on problem structure and how that drives behaviour over time; leading to how best to manage those situations. Students should be introduced to the most appropriate ways of visualizing complex interrelationships between the various parts of real-world dynamic problems, that is, problems that continually change over time and are resistant to corrective action.

CIS 306 Knowledge management and Information Retrieval 3-0-0 (3 Units)

Inverted files, PAT trees, signature files, indexing, morphological analysis, stemming, phrases, stop lists, term frequency distributions, uncertainty, fuzziness, weighting Vector space, probabilistic, logical, and advanced models Information needs, relevance, evaluation, effectiveness thesauri, ontologies, classification and categorization, metadata, bibliographic information, bibliometrics, citations routing and (community) filtering Search and search strategy, information seeking behavior, user modeling, feedback Information summarization and visualization. Digital libraries, Integration of citation, keyword, classification scheme, and other terms; and Protocols and systems (including Z39.50, OPACs, WWW engines, research systems)

CIS 307: Database Management Practice 1-0-3 (2 Units)

Database concepts; file versus databases systems, data models, ANSI/SPARC 3-level view of a database, and the relational database model and its advantages over older and even emerging models; design concepts and implementation: entity relationship modelling; normalisation of database tables, structured query language; database design and implementation; introduction to transaction management and concurrency control, distributed database management systems; database privacy, security, failure and recovery. Some emerging topics in databases such as semi-structured (XML or NoSQL) databases and object-oriented database systems.

CIS 309: Enterprise Architecture **2-0-0 (2 Units)**

Information technology infrastructure and the systems that support the operational, administrative and strategic needs of an organisation. The design, selection, implementation and management of enterprise information technology solutions. Frameworks and strategies forinfrastructure management, distributed computing, middleware, legacy system integration, system consolidation, software selection, total cost of ownership calculation, information technology investment analysis, and emerging technologies. Managing risk and security within audit and compliance standards.

CIS 351: Business Process Management **2-0-0 (2 Units)**

This course integrates core concepts from Management Information System (MIS) with those of Operations Management (OM) and introduces a process-oriented view of the flows of materials, information, products and services through and across organizational functions. All organizations must carefully analyse and document their business processes and must continuously assess the efficiency and effectiveness of these processes to minimize cost and maximize value creation. The course helps students identify information-bearing events, assess and improve process efficiency, learn to model and analyse business processes, and understand the interactions between human behaviour and process design.

CIS 352: IS Innovation and New Technologies **2-0-0 (2 Units)**

The objective of this course is to prepare the students for the type of professional communication they are likely to engage in during their first post-college jobs and beyond. This course focuses on technical communication—the presentation of specialized information in an accessible way to a variety of different audiences, but audiences who, no doubt, will expect clarity, accuracy, and professionalism. This course stresses the key skills that highlight a successful professional technical communicator. Specifically, the focus will be on the process of writing (including the planning, drafting, and revising stages) and at the work that goes into the final finished product.

CIS 401 Data Science II **2-0-3 (3 units) (Pre; CSC 302) (2units.)**

Building and evaluating machine learning models. SVMs, kNN, decision trees random forest, gradient boosting, neural networks (DNNs, CNNs) for classification, Overfitting and regularization, hyper-parameters tuning, causal inferencing, hands-on exposure (using relevant programming language- R, Python, MATLAB) to develop models for addressing real-life problems. Recommender systems.

CIS403: Information Systems Project Management **2-0-3 (3 Units)**

Introduction to Project Management; The Project Management Lifecycle: Project management and systems development or acquisition, The project management context, Technology and techniques to support the project management lifecycle, and Project management processes; Managing Project Teams: Project team planning, Motivating team members, Leadership, power and conflict in project teams, and Managing global project teams; Managing Project Communication and enhancing team communication; Project Initiation and Planning; Managing Project Scope: Project initiation, How organisations choose projects, Activities, and Developing the project charter; Managing Project Scheduling: Common problems in project scheduling, and Techniques for project scheduling; Managing Project Resources: Types of resources (human, capital, time), and Techniques for managing resources; Project quality and tools to manage project quality; Managing project risk and tools for managing project risk; Managing Project Procurement: Alternatives to systems development, External acquisition, Outsourcing-domestic and offshore, Steps in the procurement process, and Managing the procurement process; Project Execution, Control and Closure: Managing project execution, Monitoring progress and managing change, Documentation and communication, and Common problems in project execution; Managing Project Control and Closure: Obtaining information, Cost control, Change control, Administrative closure, Personnel closure, Contractual closure and Project auditing

CIS 405: System Integration and Architecture **2-0-3 (3 Units)**

This course focuses on the integration of information systems in organizations, the process by which different computing systems and software applications are linked together physically or functionally. This course examines the strategies and methods for blending a set of interdependent systems into a functioning or unified whole, thereby enabling two or more applications to interact and exchange data seamlessly. The course will explore tools and techniques for systems integration as well as proven management practices for integration projects.

CIS407: Business Process Re-engineering **2-0-3 (3 Units)**

Business Process Reengineering involves changes in structures and in processes within the business environment. The entire technological, human, and organizational dimensions may be changed in BPR. Information Technology plays a major role in Business Process Reengineering as it provides office automation, it allows the business to be conducted in different locations, provides flexibility in manufacturing, permits quicker delivery to customers and supports rapid and paperless transactions. In general, it allows an efficient and effective change in the manner in which work is performed. Students learn to leverage business strategy to drive improvement, develop tools, identify problem areas, measure performance, validate change, and create models of current and future processes in order to maximize efficiency and productivity.

CIS409: Mobile Application Development 2-0-0 (2 Units)

Introduction to developing mobile applications, beginning with mobile operating systems capabilities and application architecture and extending to major components, such as activities, services, broadcast receivers, etc. Web technologies for mobile platforms; factors in developing mobile applications security and hacking. Development of interactive applications using widget libraries, web-based services, animation, an SQL database engine, and multithreading.

CIS 411: Computer Crimes, Forensics and Auditing 2-0-3 (3 Units)

Concepts of cybersecurity and information security, Components of cybersecurity network architecture attack vectors affecting enterprise, Introduction to Biometrics, Brief Introduction of digital image processing and Mathlab- biometric- Algorithm and System with emphasis on Face, Fingerprint, Iris, Multimodal biometrics, Privacy issues and other aspects of biometrics, recognition rate and privacy as well as alternatives of passwords and smart cards; Formal models of security - cryptography, Steganography, network and distributed system security, denial of service (and other), intrusion detection systems, attack strategies- viruses. Mobile and Web-enabled information security, risks, and vulnerabilities associated with mobile and Web-enabled applications, crisis, and management

ISO 27000 series and the Plan-Do-check-Act (PDCA) model, Digital investigation, sources of digital evidence, Limitations of forensics. and forensics tools - legal and regulatory drivers and issues (Right to privacy, Types of legal authority, Protection from legal processes including compliance, affidavits, testimony and testifying), Investigatory process (Alerts, Identification of evidence, Collection and preservation of evidence, Timelines, reporting, chain of custody, and Authentication of evidence), Acquisition (preservation, and Analysis of evidence: Pull-the-plug versus triage, Write-blocking, Forensically-prepared destination media, Imaging procedures, Acquisition of volatile evidence, Live forensics analysis, and Chain of custody). Terminologies are introduced

CIS 200/CIS 300/CIS 400: Students Industrial Work Experience Scheme (15 units)

Students are attached to private and public organizations for a period of three months during the long vacation, for levels two and three hundred, with a view to making them acquire practical experience and to the extent possible, develop skills in all areas of computing. Students are supervised during the training period and shall be expected to keep records designed for the purpose of monitoring their performance. They are also expected to submit a report on the experience gained and defend their reports.

CIS 501: Business Models and Innovation **2-0-0 (2 Units)**

An innovative product may be a feat of engineering, but that does not automatically turn it into a commercial success. What makes the difference between success in the lab and success in the marketplace is the business model. How will you create and deliver value for your customers? How will you extract some of that value for your organization? The business model encompasses your product or service, your customers, and the economic engine that will enable you to meet your profitability and growth objectives. Business model analysis is important for startups, new and established businesses which need to discover, defend or evolve their business models. This course introduces a structured way to think about, analyse, and develop a sound business model. Topics include entrepreneurial thinking; innovation management; opportunity spotting and evaluation; industry and market research; business strategy; business models and business plans; financial forecasting and entrepreneurial finance; pitching to resource providers and negotiating deals; and launching new ventures.

CIS 502: Special Topics in Information Technology **2-0-0 (2 Units)**

Recent topics and developments in information systems are expected to be introduced from year to year. Apart from seminars to be delivered by lecturers or guests, students are expected to do substantial readings on their own

CIS 503/504: FINAL YEAR RESEARCH PROJECT **3 Units each**

An independent or group investigation development of an information system to address a business problem under the supervision of a lecturer. Before registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the project, estimated schedule of completion, and computer resources needed. This offers an opportunity for final year students to apply theoretical, conceptual and practical knowledge gained to solve selected problem within Computer Science and Information System or any application area in the society. Students should embark on work that will lead to substantial software development. At the end of the first semester, the student submits & present the first three chapters of the report to a team of academics for assessing the work done. Upon the

successful demonstration of clear understanding and application of the conceptual and practical knowledge in the chosen project, students will continue the course in the second Semester where solution will be proffered by the application of Computer Science and Information Technology knowledge. At the end of the project, the student submits & present the report to a team of academics for assessing the work done. Since the Department is Software oriented, solutions must reflect software system development. It is expected that chapter four and five are by this time completed. A bound project report consisting of Chapters 1-5 is presented in an approved format for assessment.

Prerequisite: ***Chapters 1-3 must have been approved and submitted***

CIS 505: Ethics, Legal, & Professional Issues in IS 2-0-0 (2 Units)

This course examines the importance of ethics in the workplace and the role of organizational leaders in fostering ethical behaviour. Case studies, discussion, self-assessment exercises and reading assignments explore the basic frameworks of ethical dealings and moral leadership. Students will demonstrate a competency in critical thinking skills to both identify and remedy ethical issues typically encountered in organizational settings and interactions.

CIS 506: Information Systems Audit and Controls 2-0-3 (3 Units)

The need for information technology audit and controls; Information technology risks – Business Process and Business Continuity: Protection of information assets, Business process evaluation and risk management, Systems development and maintenance activities, and Disaster recovery and business continuity; Auditing ethics, guidelines, and standards of the profession: Generally Accepted Auditing Standards, Control Objectives for Information and related Technology, ISACA, and Val IT; Undertaking an information system audit: Internal audit and external audit; Controls over information and processes: Physical and environmental controls, Network controls, System software controls, Database controls, Application controls, Internet and e-commerce controls, Installation and operational controls, Change controls, Access controls, Encryption, authentication and non-repudiation, End-user controls, Software licensing controls, and Governance; Controls Assessment: Separation of duties, Delegation of authority and responsibility, System of authorisations, Documentation and records, Physical control over assets and records, Management supervision, Independent checks, and Recruitment and training

CIS 507: Research Methodology in Information Systems 2-0-0 (2 Units)

Foundations of research; problem identification and formulation; research design; Positivism and Interpretivism research approach; Project, research, aim, objectives, methodologies, applications, solution, data, information, etc.Communication of computing projects and research: Review of the literature, Research methodology requirement specification, design, implementation and evaluation. Project progress monitoring; project schedule and Path Chart. Structure of computing documentations: proposal, term paper, user manual or

documentation??), projects, thesis, technical reports, work in progress, journal and conference papers. Presentation slides and postal. Documentation: effective communications with symbols and technical terms in computing, illustrations, algorithm: pseudocode and flowchart, UML diagram, program segments, tables, drawings.Citation and listing of bibliography items, and bibliographic style. Research Ethics and tools for detection of plagiarism

CIS 508: Strategy, Management and Acquisition in Information Systems 2-0-0 (2 Units)

The information systems function; information systems strategic alignment; Strategic use of information; Impact of information systems on organisational structure and processes; information systems economics; information systems planning; Role of information systems in defining and shaping competition; Managing the information systems function: information systems leadership: The role of the CIO and information systems management, Structuring the information systems organisation, Hiring, retaining, and managing information systems professionals, Managing a mixed set of internal and external resources, and Determining staffing skills allocation models; Financing and evaluating the performance of information technology investments and operations; Acquiring information technology resources and capabilities: Acquiring infrastructure capabilities, Sourcing information systems services, and Sourcing information systems applications; Using information systems information technology governance frameworks; information systems risk management: Managing business continuity and Managing security and privacy

CIS 509: Web Application Development 2-0-3 (3 Units)

Introduction, content transport, caching techniques for web content and streaming media, navigating content networks, peer-to-peer content networking, interactive content delivery – instant messaging, beyond web surfing, building content networks. The basics of PHP, the PHP language, code organization and reuse; object-oriented programming, moving beyond libraries and object-oriented programming, extending objects, working with arrays, strings and characters of the world, character set and Unicode, interacting with server, redirecting the user. Database basics using MySQL, PHP and data access, planning and implementing web applications – cookies and sessions, user authentication, advanced input and output buffering, data validation with regular expression, files and directories; strategies for successful web applications.

CIS 511: Application Design and Development 2-0-3 (3 Units)

This course provides students with the concepts and techniques to design and develop software applications, and to understand the design process. Students will learn the importance of user- centred design and will develop a prototype of a web application as a course project. In the process of developing the application, students will learn how to design and create relational databases, how to acquire competency in new programming languages quickly, how to use the Model-View-Controller pattern to develop software applications, how to ensure

technical quality in software development, and how to apply principles of user-centred design.

CIS 551: Network Administration **2-0-0 (2 Units)**

As organisations grow and merge their information infrastructures expand and demand both larger scale solutions to some of those problems as well as different approaches to various processes. This course will examine the issues surrounding several of these areas in lecture and representative solutions in lab. The topics will include selections from: storage, authentication, enterprise administration, clustering & load balancing, thin client support, fault tolerant/high availability services and policies and procedures.

CIS 552: Database Administration **2-0-0 (2 Units)**

Explores advance concepts of database administration using enterprise level database management system. Topics include: backup, recovery, corruption, automatic management, resource management, job scheduling, space management, memory management, storage management, diagnosis and corresponding tools.

CIS 553: Information Storage and Management Technologies **2-0-0 (2 Units)**

This course provides a comprehensive understanding of the various storage infrastructure components in data centre environments. This course will prepare students in making informed decisions on storage-related technologies in increasingly complex IT environments, which are fast changing with the adoption of software-defined infrastructure management and third platform technologies (cloud, Big Data, social, and mobile technologies).

CIS 554: Database Programming **2-0-0 (2 Units)**

The course introduces students to Oracle Developer application development utilities and tools and describes how to create and manipulate databases in Oracle database management system. The course provides an extensive overview of SQL and introduction to PL/SQL. Topics include data definition and manipulation languages, stored procedures, triggers, indexing techniques, and elementary query optimization.

CIS 555: Database Analysis & Design **2-0-0 (2 Units)**

Focus on enterprise data requirements gathering, analysis/specification and modeling using graphical modeling tools like ER and UML and normalization for logical design.

CIS 556: Network Servers and Infrastructures **2-0-0 (2 Units)**

Covers IP networking concepts and practices for IPv6 addressing, DHCP and DNS in IPv6 networks, secure communication over VPNs, VoIP architecture, Virtual Computing. Cloud Computing, MPLS, traffic monitoring and network connectivity between operating systems. Students learn the latest technologies of IP networks and understand application level services used in the Internet. Lab sessions focus on installation of applications on virtual servers.

CIS 557: Agile Web Development with Open Source Frameworks 2-0-0 (2 Units)

This course introduces the principles and techniques for TDD (test-driven development) and deployment using open source frameworks (i.e., Ruby on Rails). Topics such as agile development methodology, version control, and Lean Startup are also presented. Students will work in small teams and propose, develop, and deploy interactive web applications and use an open source application framework to solve real-world problems