

MAKERERE UNIVERSITY

COLLEGE OF COMPUTING AND INFORMATION SCIENCES

SCHOOL OF COMPUTING AND INFORMATICS TECHNOLOGY

DEPARTMENT OF INFORMATION SYSTEMS

CURRICULUM FOR BACHELOR OF INFORMATION SYSTEMS (BIS) DEGREE PROGRAMME

REVISED FEBRUARY 2013

(DAY / EVENING PROGRAMME)

TO RUN – AUGUST 2013/2014 to 2017

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1. BACKGROUND TO THE BACHELOR OF INFORMATION SYSTEMS PROGRAMME

This programme was launched in the 2009/2010 academic year. The primary objective of the Bachelor of Information Systems (BIS) degree program is to train students as Information Systems specialists in a business organization context. The business subjects provide business practice framework for information systems development, while the information technology subjects provide the knowledge and technical skills required to build business information systems. The BIS program aims to provide students with the concepts, analytical and developmental skills required for the information systems that underpin business computer systems and electronic services. The core units provide a foundation in the information systems areas of programming, system design, database, and project management.

1.1 Who is an Information Systems Graduate?

Previously, an information systems graduate was mostly regarded as a person who provides an interface and translation between business and technology. However, as noted in the 2010 ACM guidelines for the Information Systems curriculum, the Information Systems discipline currently contributes to domains outside business (such as government, education, non-profit sector, health care, etc.) which now expands the scope for the high-level capabilities of an IS graduate. From an international perspective, the following is a reproduction of the descriptions of the capabilities of an IS graduate from the 2010 ACM guidelines:

Improving organizational processes

Understanding and improving organizational processes comprises one of the key capabilities of all IS graduates. This requires the graduates to:

- a. Understand the fundamental concepts related to organizational processes
- b. Understand general principles of process analysis in order to apply them to specific situations
- c. Analyze existing processes based on interviewing, observation, documentation analysis, and other similar methods.
- d. Understand how the very large amounts of data collected by modern organizations can be used to review, redesign, and improve processes.
- e. Identify and capture the essential findings from the large amount of data produced by the analysis process
- f. Research and apply industry reference models and best practices in order to improve process designs
- g. Use analysis results as a basis for designing revised processes based on the graduates' strong understanding of both organizations and information technology
- h. Simulate proposed processes and revising them as necessary
- i. Negotiate solutions that satisfy the political requirements for new processes
- j. Understand the limitations of what can be achieved with available technology, financial resources, and organizational capabilities
- k. Lead the implementation of new processes.
- l. Customize processes to address cultural and ethnic needs.

Exploiting opportunities created by technology innovations

IS graduates are expected to be experts in seeing how organizations can benefit from technology capabilities, converting opportunities created by information technology innovations into sustainable organizational value through systematic processes. An essential element of this capability is the ability to understand both information technology and the needs of an organization within a specific domain at such a deep level that IS graduates see new opportunities to create value faster and with greater clarity during various analysis processes than their non-IS counterparts. Achieving a high level of performance related to this capability requires in-depth knowledge of technology and the domain, skills in analyzing problems and designing solution alternatives, ability to analyze the strengths and weaknesses of various alternatives, understanding issues related to the feasibility of possible solutions, as well as demonstrable skills in sourcing, designing, and implementing technology solutions.

Understanding and addressing information requirements

IS graduates should be able to analyze and document organizational information requirements at various levels, starting from those of individual knowledge workers responsible for specific tasks and ending with very high level institutional requirements. IS graduates should be able to analyze information needs of an individual, organizational unit, or an organization in order to determine how information technology-based solutions can best be designed to support these informational needs. Increasingly, the core capabilities in this area are related to effective utilization and integration of data that is generated in a rich variety of organizational systems and includes multiple types and formats.

Designing and Managing Enterprise Architecture

IS graduates should be experts in high-level design and management of IT capabilities that are fully aligned with general organizational goals. These capabilities are typically organized and presented as an enterprise architecture, consisting of high-

level internally compatible representations of organizational business models, data applications, and information technology infrastructure.

Identifying and Evaluating Solution and Sourcing Alternatives

IS graduates should be capable of producing high-level design alternatives for various organizational IT-based solutions. There are always a large number of ways to achieve a specific set of organizational capabilities using information technology, but not all approaches are always feasible in a specific context. An essential high-level capability that IS graduates should have is an ability to identify a small subset of operationally, financially, and technically feasible solution resources.

Securing data and infrastructure

It is important for organizations to ensure that their data and IT infrastructure resources are protected from various security threats, which can potentially create significant financial liabilities as well as damage the organizational image. Understanding these threats and identifying high-level solutions to protecting the organizations are essential capabilities of all graduates of information systems degree programs.

Understanding, managing, and controlling IT Risks

IS graduates should have strong capabilities in understanding, managing, and controlling organizational risks that are associated with the use of IT-based solutions (e.g., security, disaster recovery, obsolescence, etc.).

Information Systems graduates are perfectly placed to adapt their careers to the evolving workplace and new career opportunities. Some of the roles IS graduates are able to fill include: Business analyst, Network analyst, Intelligence/threat analyst, Web developer, Creative Internet campaigner, Systems designer/engineer, E-commerce project officer, Assistive technology designer, Technical support analyst, Bio-informatics analyst, Change and transition manager, IS security auditor, IS Technical research officer, Business systems consultant, and IS manager.

2. RATIONALE FOR THE REVISION OF THE INFORMATION SYSTEMS PROGRAM

The Bachelor of Information Systems started running in the 2009/2010 academic year. Since then, it has not been revised. National Council for Higher Education (NCHE) recommends revision of academic programmes every after three years. In addition, with the continuously changing Information Technology field and an economy that is based on dynamic skills, we realized a need for revising the curriculum to update our programme and provide the best for our graduates. We understand that for us to achieve an effective curriculum revision, it requires a thorough understanding of the processes and principles of the changing paradigms affecting curriculum development. In lieu of this, we considered various aspects in this process including:

- Requirement from National Council for Higher Education (NCHE) to review academic programmes every after 3 years
- Market analysis: We undertook a preliminary market analysis to evaluate the attractiveness and the dynamics of the Information Systems Market within East Africa. Special attention was paid on the kind of jobs/roles being advertised within this market segment and the different skills set that are being sought. We compared this with the Internship feedback obtained from our industrial partners where our students get posted. With this information, we were able to identify the opportunities, strengths, weaknesses and threats of our program.
- Industrial and Alumni feedback: We also held a workshop with our industrial partners to generate input into this process. In particular, key stakeholders and experts from regulatory authorities, industry and academia were invited to evaluate our current program. The feedback generated in this final phase of this process was very important in reconsidering certain content of the courses we have been offering.
- Student sample: A sample of our students in year II and III were also sampled. In here, we were testing their understanding of what we are offering against what they expected. They pointed out various areas which they considered a duplication of effort or redundancy in the program. Their feedback was thus important in helping us to eliminate duplicates and also for strengthening certain areas of our program.
- External examiners' and Quality Assurance reports: These reports were also a great input into this review process. Although some of the comments given were majorly on assuring quality of students' learning experiences and also the

fair assessment, other comments given to improve the program were very helpful in highlighting areas which were found lacking in our program.

3. BACHELOR OF INFORMATION SYSTEMS PROGRAMME

3.1 Target Group

The program targets two categories of people, namely Direct Entry and Diploma holders in relevant programs.

3.2 Nature of the Programme

The day Programme has both government and privately sponsored students. The evening Programme has privately sponsored students only.

3.3 Duration

The duration of this Programme is three (3) academic years consisting of six semesters and two recess terms. Each semester lasts for seventeen (17) weeks from which two (2) weeks are for examinations.

3.4 Tuition Fees

Tuition fees for privately sponsored students shall be UGX 3,024,000 Uganda Shillings per year for Ugandans and UGX 4,536,000 Uganda Shillings per year for non-Ugandans.

4. REGULATIONS

4.1 Admission Requirements

a) Direct Entry

A candidate must satisfy the general minimum entry requirements of Makerere University. In addition, the following regulations shall hold:

- Candidates must have a Uganda Advanced Certificate of Education (UCE) or its equivalent with credits in English and Maths.
- The minimum weighted points set by the Admissions Board. For purposes of computing weighted points, the advanced level subjects shall be grouped and weighted as follows:-

Group	Weight	Subjects
Essential	3	Any two best done subjects among: Mathematics, Physics, Economics, Chemistry, Biology and Geography, Entrepreneurship.
Relevant	2	Any other best done subject of all A level subjects
Desirable	1	General Paper, Sub-Mathematics, ICT-related subjects
Others	0.5	All others

Table 1: Weights for A level subjects to be used for computing weighted points for comparison with minimum weighted points.

b) Diploma Holders

Applicants should possess at least a second class (lower division) Diploma in Computer Science or any other Diploma with Business or Computing aspects from any recognized institution.

4.2 Progression

Progression shall be regarded as normal, probationary, or discontinuation as per the standard Makerere University Senate guidelines.

4.2.1 Normal Progress

This occurs when a student passes each course taken with a minimum Grade point of 2.0

4.2.2 Probationary Progress

This is a warning stage and occurs if either the cumulative grade point average (CGPA) is less than 2.0 and / or the student has failed a core course. Probation is waived when these conditions cease to hold.

4.2.3 Discontinuation

When a student accumulates three consecutive probations based on the CGPA or the same core course(s), he / she shall be discontinued.

4.2.4 Retaking a Course

A student may re-take any course when it is offered again in order to pass if the student had failed the course. A student may take a substitute elective, where the student does not wish to re-take a failed elective.

4.3 Weighting System

The weighting unit is the Credit Unit (CU). The Credit Unit is a contact hour per week per semester. A contact hour is equal to (i) one lecture hour, (ii) two practical hours or (iii) two tutorial hours.

4.4 Semester Load and Minimum Graduation Load

The normal semester load is between 15 and 20 credit units. The minimum graduation load is 115 credit units. 100 are from core course units and 15 are from elective course units.

4.5 Course Assessments

- a) Each Course will be assessed on the basis of 100 total marks with proportions as follows:
Course work – 40%
Examination – 60%
- b) A minimum of two course assignments / tests shall be required per course.
- c) Course work shall consist of individual tests, group assignments (case studies, field studies, mini projects, and presentations in each semester.

4.6 Grading of Courses

- a) Each course will be graded out of a maximum of 100 marks and assigned an appropriate letter grade and a grade point as follows:

Marks (out of 100%)	Letter Grade	Grade Point
90 – 100	A+	5
80 – 89	A	5
75 – 79	B+	4.5
70 – 74	B	4

65 – 69	C+	3.5
60 – 64	C	3
55 – 59	D+	2.5
50 – 54	D	2
45 – 49	E	1.5
40 – 44	E-	1
Below 40	F	0

Table 2: Letter Grades and Grade Points for final Course marks.

b) The following additional letters will be used, where appropriate:

- W – Withdrawal from Course;
- I – Incomplete;
- AU – Audited Course Only;
- P – Pass;
- F – Failure.

4.7 Minimum Pass Mark

A minimum pass grade for each course shall be 2.0 Grade Points.

4.8 Calculation of Cumulative Grade Point Average (CGPA)

The Cumulative Grade Point Average (CGPA) shall be calculated as follows:

$$CGPA = \frac{\sum_{i=1}^n (GP_i \times CU_i)}{\sum_{i=1}^n CU_i}$$

Where GP_i is the Grade Point score of a particular Course i ; CU_i is the number of Credit Units of Course i ; and n is the number of courses done so far.

4.9 Knowledge Areas covered in the Bachelor of Information Systems Programme

4.9.1 Categories

The curriculum is based on 11 broad knowledge areas that make up practical and resourceful Information Systems specialists. These are:

General Computing Knowledge Areas

- Programming Fundamentals & Languages
- Net Centric Computing
- Intelligent Systems

Information Systems Specific Knowledge Areas

- IS Management and Leadership
- Data and Information Management
- Systems Analysis & Design
- IS Project Management
- Enterprise Architecture

- User Experience
- Professional Issues in Information Systems

Foundational Knowledge Areas

- Leadership and Communication

4.9.2 Content Distribution by Knowledge Area

Below is a summary of the distribution of the different course units in the different knowledge areas:-

Programming Fundamentals & Languages

- MTH1110 Basic Mathematics
- CSC 1107 Structured Programming
- CSC 1214 Object Oriented Programming
- BIS 2207 Applications Development

Net Centric Computing

- BIT 2111 Web Systems & technologies
- BIS2109 E-services
- BSE 3106 Mobile Networks and Computing

Intelligent Systems

- BIS3101 Intelligent Systems

IS Management and Leadership

- BIS 1203 Management Information Systems
- BIS 2105 Information Systems Security and Risk management
- BIS 2206 Information Systems Project Management
- BIS 1208 IT Infrastructure

Data and Information Management

- BIS 1204 Data and Information Management I
- BIS 2106 Data and Information Management II
- BIS 3200 Data Warehousing and Business Intelligence
- BIS 3201 Information Systems strategy, Management and Acquisition
- BIS 1205 Business Statistics

Systems Analysis & Design

- BIS 1206 Systems Analysis and design
- BIS 3104 Business Process Management

IS Project Management

- BIS 2206 Information Systems Project Management
- BIS 3103 Project in Information Systems I
- BIS 3202 Project in Information Systems II

Enterprise Architecture

- BIS 2208 Information Systems Architecture

User Experience

- BIS 2107 Human Computer Interaction

Professional Issues in Information Systems

- BIT 2207 IT Law & Ethics

Leadership and Communication

- BIS 1104 1101 Communication Skills for IT
- BAM 2102 Business & Entrepreneurship

5. THE CURRICULUM

As a base for the curriculum review, we used the international industry standard for Information Systems undergraduate programmes i.e. the ACM Computing curricula guidelines for undergraduate programmes in Information Systems 2010.

However, because these curricula are intended for students who are computer literate when entering the university, the BIS students of the School of Computing and Informatics Technology need the introductory course of Computer Literacy which has been added in the curricula.

5.1 Course Outline

The degree Programme will extend over a period of three years. An academic year shall consist of two semesters of 17 weeks (15 weeks for classes and 2 weeks for examinations). The first and second years will in addition have a recess term of 10 weeks. For students without the Cisco Certified Networking Associate (CCNA) certification will take CCNA as an audited course during the first year recess term. A full-time student shall not carry less than 15 credit units and not more than 21 credit units per semester. All the students must make extensive use of the computing facilities outside the scheduled lecture, tutorial and practical hours. The details of the course structure are shown below, where LH, TH, PH, CH and CU stand for Lecture Hours, Tutorial Hours, Practical Hours, Contact Hours and Credit Units respectively.

SEMESTER 1 (5 Courses)

Key:

1. **Modified:** Modified remark means that the course unit has been revised by content.
2. **Star on Course Code:** This means the course unit has been modified only by credit units and not by content.
3. **New:** Means the course unit has been freshly introduced in the department
4. **Old:** Means no change on the course unit's name, code and content

Course Code	Course Name	LH	PH	TH	CH	CU	Type	Remark	Mother dep't
Cores: (5 core courses)									
BIS 1100	Foundations of Information Systems	45	--	--	45	3	Core	Old	IS
BIS 1104	Communication Skills for IT	45	30	--	60	4	Core	Modified	Lang.
BAM 2102	Entrepreneurship Principles	30	--	30	45	3	Core	New	IT
CSC 1100	Computer Literacy	30	60	--	60	4	Core	Old	CSC
MTH1110	Basic Mathematics	30	--	30	45	3	Core	New	MTH
Total CU						17			

SEMESTER 2 (5 Courses)

Course Code	Course Name	LH	PH	TH	CH	CU	Type	Remark	Mother dep't
Cores: (5 core courses)									
BIS 1206	Systems Analysis and Design	45	--	30	60	4	Core	Modified	IS
BIS 1204	Data and Information Management I	30	60	--	60	4	Core	New	IS
BIS 1203	Management Information Systems	30	30	--	45	3	Core	Modified	IS
BIS 1205	Business Statistics	30	--	30	45	3	Core	Modified	IS
BIS 1208	IT Infrastructure	30	30	--	45	3	Core	Modified	IS
Total CU						17			

YEAR 1: RECESS TERM

Course Code	Course Name	LH	PH	TH	CH	CU	Type	Remark	Mother dep't
*CSC 1304	Practical Skills Development	15	90	--	60	5	Recess	Modified	CS
CSC 1303	Cisco Certified Network Associate (Audited Course)	15 0	--	--	75	5	Recess	Old	IT
Total CU						5			

- Minimum load for recess term should be minimum 5, maximum 10

SEMESTER 3 (5 Courses)

Course Code	Course Name	LH	PH	TH	CH	CU	Type	Remark	Mother dep't
Cores: (5 core courses)									
BIS 2106	Data and Information Management II	30	60	--	60	4	Core	New	IS
BIS 2105	Information Systems Security and Risk Management	30	30	--	45	3	Core	Modified	IS
BIS 2107	Human Computer Interaction	30	30	--	45	3	Core	Modified	IS
CSC 1107	Structured Programming	30	30	--	45	3	Core	Modified	CS
Electives: (1 elective course)									
BIS 2109	E-Services	45	30	--	60	4	Elective	Modified	IS
*BIT 2111	Web Systems and Technologies I	45	30	--	60	4	Elective	Modified	IT
Total CU						17			

SEMESTER 4 (5 Courses)

Course Code	Course Name	LH	PH	TH	CH	CU	Type	Remark	Mother dep't
Cores: (4 core courses)									
BIS 2208	Information Systems Architecture	45	--	30	45	3	Core	Old	IS
BIS 2206	Information Systems Project Management	45	--	30	60	4	Core	Modified	IS
BIS 2207	Applications Development	45	30	--	60	4	Core	Old	IS
BIT 2207	Research Methodology	30	--	30	45	3	Core	Modified	IT
Electives: (1 elective course)									
CSC 1214	Object Oriented Programming	30	60	--	60	4	Elective	New	
BIT 2205	System Administration	45	30	--	60	4	Elective	New	IT
Total CU						18			

YEAR 2: RECESS TERM

Course Code	Course Name	LH	PH	TH	CH	CU	Type	Remark	Mother dep't
*BIS 2302	Field Attachment	---	300	--	75	5	Recess	Modified	IS
Total CU						5			

*Changed Name to University Name and CUs changed to 5

SEMESTER 5 (5 Courses)

Course Code	Course Name	LH	PH	TH	CH	CU	Type	Remark	Mother dep't
Cores: (4 core courses)									
*BIS 3100	Modeling and Simulation	30	30	--	45	3	Core	Modified	IS
BIS 3101	Intelligent Systems	45	30	--	60	4	Core	Modified	IS
BIS 3102	Business Process Management	45	30	--	60	4	Core	New	IS
BIS 3103	Project in Information Systems I	--	150	--	75	5	Core	Modified	IS
Electives: (1 elective course)									
BSE 3106	Mobile Networks and Computing	45	30	--	60	4	Elective	New	
BIS 3108	Information Systems Audit	45	30	--	60	4	Elective	New	IS
Total CU						20			

SEMESTER 6 (4 Courses)

Course Code	Course Name	LH	PH	TH	CH	CU	Type	Remark	Mother dep't
Cores: (4 core courses)									
BIS 3200	Data Warehousing and Business Intelligence	45	30	--	60	4	Core	Modified	IS
BIT 2207	IT Law and Ethics	30	--	30	45	3	Core	New	IT
BIS 3202	Project in Information Systems II	--	150	--	75	5	Core	New	IS
Electives: (1 elective course)									
BIS 3201	Information Systems Strategy, Management, and Acquisition	30	30	--	45	3	Elective	Modified	IS
BIS 3207	Emerging Trends in Information Systems	30	--	30	45	3	Elective	Modified	IS
Total CU						15			

6. DETAILED CURRICULUM

6.1 Semester 1

BIS 1100 Foundations of Information Systems (3 CU)

Course Description: Information systems are an integral part of all business activities and careers. This course is designed to introduce students to contemporary information systems and demonstrate how these systems are used throughout global organizations. The focus of this course will be on the key components of information systems – people, software, hardware, data, and communication technologies, and how these can be integrated and managed to create competitive advantage. Through the knowledge of how IS provides a competitive advantage students will gain an understanding of how information is used in organizations and how IT enables improvement in quality, speed, and agility. This course also provides an introduction to systems and development concepts, technology acquisition, and various types of application software that have become prevalent or are emerging in modern organizations and society.

Aims:

To

1. make students understand how and why information systems are used today
2. introduce students to the technology, people, and organizational components of information systems
3. make students understand globalization and the role information systems have played in this evolution
4. make students understand how businesses are using information systems for competitive advantages vs. competitive necessity
5. make students understand the value of information systems investments as well as to learn to formulate a business case for a new information system, including estimation of both costs and benefits
6. introduce to students the major components of an information systems infrastructure
7. give students knowledge and equip them with skills in mitigating risks as well as planning for and recovering from disasters
8. make students understand how information systems are enabling new forms of communication, collaboration, and partnering
9. make students understand how various types of information systems provide the information needed to gain business intelligence to support decision making for the different levels and functions of the organization
10. make students understand how enterprise systems foster strong relationships with customers and suppliers and how these systems are widely used to enforce organizational structures and processes
11. make students understand how organizations develop and acquire information systems and technologies
12. make students understand how to secure information systems resources, focusing on both human and technological safeguards
13. make students evaluate the ethical concerns that information systems raise in society and the impact of information systems on crime, terrorism, and war.

Learning outcomes:

At the end of this course, students should be able to:

- explain correctly how and why information systems are used today
- describe the technology, people, and organizational components of information systems
- describe globalization and the role information systems have played in this evolution
- explain correctly how businesses are using information systems for competitive advantage vs. competitive necessity
- describe the value of information systems investments as well as formulate a business case for a new information system, including estimation of both costs and benefits
- describe the major components of an information systems infrastructure

- mitigate risks as well as plan for and recover from disasters
- explain how information systems are enabling new forms of communication, collaboration, and partnering
- describe how various types of information systems provide the information needed to gain business intelligence to support decision making for the different levels and functions of the organization
- explain correctly how enterprise systems foster strong relationships with customers and suppliers and how these systems are widely used to enforce organizational structures and processes
- describe how organizations develop and acquire information systems and technologies
- describe how to secure information systems resources, focusing on both human and technological safeguards
- evaluate the ethical concerns that information systems raise in society and the impact of information systems on crime, terrorism, and war.

Teaching and Learning patterns:

Teaching will be in terms of lectures, problem-based/case studies, group work, and presentations.

Indicative content:

- Characteristics of the Digital World
- Information systems components
- Information systems in organizations
- Globalization
- Valuing information systems
- Information systems infrastructure
- The Internet and WWW
- Security of information systems
- Business intelligence
- Enterprise-wide information systems
- Development and acquisition
- Information systems ethics and crime

Assessment:

Course work (Tests, Take home assignments, case studies, individual / group projects): 40% (Tests-20%, take home-20%)

Final written exam: 60%

References:

1. Ralph Stair and George Reynolds, 2013. *Fundamentals of Information Systems*, 7th Edition. Publisher: Cengage South-Western.
2. Ralph Stair and George Walter Reynolds, 2009. *Principles of Information Systems: A Managerial Approach*, 9th Edition. Publisher: Cengage Learning.
3. Vladimir Zwass, 1997. *Foundations of Information Systems*. Publisher: McGraw Hill..
4. Joseph Valacich and Christoph Schneider, 2012. *Information Systems Today*, 5th Edition. Publisher: Prentice Hall.
5. Leonard Jessup and Joseph Valacich (2004). *Information Systems Today*, Pearson Education Prentice Hall.

BIS 1104 Communication Skills for IT (4 CU)

Course Description: This course provides students with skills of effective communication. Emphasis is provided on communications in today's business environment that has increasingly been shaped by Information technology. Students will be taught how to effectively communicate technical information to lay audiences using oral, written and non-verbal communication.

Aims: The aims of this course unit are to:

- Ensure that students develop and apply effective communication and writing skills in management of information systems.
- To familiarize students with the concept and Effective communication, reports and business documents required effectively in the management of information systems.
- To teach students the principles of designing formal and informal reports to meet the needs of a variety of information system managers.
- To enable students understand the importance of effective organization and personal communication.
- To enable students prepare some business documents in the organization / institutions.
- To provide tools and strategies with which students can systematically improve their communication skills.

Learning Outcomes

Students who complete this unit of study should be able to:

- Identify, explain, and demonstrate different types of communication techniques.
- Organise and present ideas individually and as part of a team.
- Demonstrate interpersonal skills including business etiquette, active listening, team participation, and leadership skills.
- Identify ways of communicating effectively through an appropriate balance between interpersonal and technical capabilities.
- Produce a text-based report or proposal, using Microsoft Word.
- Apply a universal process that enables you to solve communication problems now and throughout your entire carrier

Teaching and Learning Pattern:

This is a very practical course. Students will be required to use real life examples and illustrations to enable them apply knowledge with the business context.

Indicative Content:

- Understanding the Foundations of Business Communication
 - Effective Business Communication 3
 - Communicating in Teams and Mastering Listening and Nonverbal Communication
- The Writing Process
 - Planning Business Messages
 - Writing Business Messages
 - Completing Business Messages
- Crafting Brief Messages
 - Crafting Messages for Electronic Media
 - Writing Routine and Positive Messages
 - Writing Negative Messages
 - Writing Persuasive Messages
- Planning, Writing, and Completing Reports and Proposals
- Designing and Delivering Oral and Online Presentations
 - Creating and Delivering Oral and Online Presentations
 - Enhancing Presentations with Slides and Other Visuals
- Writing Employment Messages

Assessment Method:

Students should be encouraged to analyse business domain problem and come up with communications to address the needs as part of their coursework assessment. Other assessments include test and exams.

Reference Books:

1. Courtland L. Bovée and John V. Thill, *Business Communication Today*. 8th edition. Upper Saddle River, NJ: Prentice Hall International Inc. (Call No. HF5718 Bov2005)
2. Locker, Kitty O. 2006. *Business and Administrative Communication*. 7th edition. Boston, Mass.: Irwin/McGraw-Hill(Call No. : HF5718 Loc2006)
3. *Mastering Business communication* By L. A Woolcott & W.R Unwin, Macmillan Publishing House.
4. *Effective Business communication* by Asha Kaul, Printice of India
5. *Business & Administrative communication* by Kitty O. Locker (1995) 3rd Edition.
6. *Effective Business communication. Getting the message around* by Waswa Balunywa and Ngoma Muhammad

BAM 2102 Entrepreneurship Principles (3 CU)

Course Description: This course teaches how to recognize a business opportunity and develop the opportunity into a business. The controlling functions—accounting, finance, marketing, management—as well as legal and economic considerations are applied. In this course Student responsibility and initiative are encouraged as business strategies are created, planned, and presented as a final product—a business plan for an actual business venture. Through the process of developing the business plan, students acquire skills necessary to operate a successful business.

Course aims:

The aims of this course are to:

- Make students understand entrepreneurial behavior with reference to business
- Equip students with the skills involved in creating, planning, developing and managing the entrepreneurial business.

Learning outcomes:

After successfully completing this course, students should be able to:

- Describe small and medium-sized businesses
- Describe the difference between an entrepreneur and the business owner-manager
- Describe the influence of external environmental factors on small business survival and success
- Explain what is meant by innovation, how it is measured, and why it is important both for individual small businesses and for the economy in general
- Describe the factors which have an impact on the initiation of strategic planning in small businesses
- Assess the different needs of investors in reviewing a business plan, and recognize the key factors for writing a successful business plan
- Describe the strategic management process for entrepreneurs and differentiate it from that for business owners
- Account for small business strategy in terms of the 4Ms: management, marketing, money and motives
- Describe the resources to be deployed for setting up and running an entrepreneurial business
- Evaluate the facilities and business processes required to manage an entrepreneurial business
- Describe the types of management control used by owner-managers and the composition of entrepreneurial teams
- Describe the differences between classical marketing and entrepreneurial marketing; evaluate the marketing strategies and methods available to an entrepreneur; assess the impact of the Internet on entrepreneurial marketing
- Understand the different funding sources available to small businesses, and the circumstances under which they should be approached
- Appreciate the importance of sound financial management, through reporting of profit and loss, cash flow and balance sheet

Teaching and Learning Patterns:

Teaching and learning is primarily based on lectures. Take-home assignments and group/class discussions will be employed to help students understand basic concepts and techniques.

Indicative Content:

- Introduction to Business
- Introduction to Entrepreneurship
- Business and the entrepreneurial environment

Creating the entrepreneurial business

- Business planning
- Successful business strategies
- Forming and protecting a business

Managing the Entrepreneurial business

- Management of Resources in the entrepreneurial business
- Marketing in an entrepreneurial business
- Managing Money in an entrepreneurial business

Assessment:

Course work (Tests (20%) and assignments (20%))

Final written exam: 60%

References:

1. Anil S. Kumar, 2008. *Small Business and Entrepreneurship*. Publisher: I.K. International Publishing House Pvt. Ltd.
2. David R. Stokes and Nick Wilson, 2010. *Small Business Management and Entrepreneurship*, 6th Edition. Publisher: Carnegie Learning EMEA.
3. David John Storey and Francis J. Greene, 2010. *Small Business and Entrepreneurship*. Illustrated Edition. Publisher: Financial Times Prentice Hall.
4. Graham Beaver. 2002. *Small Business, Entrepreneurship & Enterprise Development*. Publisher: Financial Times Prent. Int.

MTH1110 Basic Mathematics (3 CU)

Course Description: This course is designed to provide a general overview of selected mathematical concepts with useful everyday life applications. The course is also designed to develop the ability to think critically, and to realize that the proper use of logic is a reasonable way to solve problems. Topics include: numbers, equations, logic and set theory, statistics and probability, graphs, sets, vectors, and functions.

Aims:

This course aims to introduce basic ideas of mathematics such as formal mathematical reasoning techniques, basic counting techniques and their applications for information systems students. The objective is intended for students to develop an appreciation for critical thinking and problem solving using basic mathematical tools and operations as well as relating to real world situations.

Learning outcomes:

By the end of this course, students should be able to:

- Have the basic mathematical knowledge required to undertake the Bachelor of Information Systems course
- Have critical thinking and problem solving skills.

Teaching and learning patterns:

Teaching and learning is primarily based on lectures. Take-home assignments and group/class discussions will be employed to help students understand basic mathematical concepts and techniques.

Indicative content:

- Numbers: natural numbers, integers, prime numbers, rational and irrational numbers, sequences, fractions, simple algebraic statements, estimates and approximations, ratios, direct and indirect proportions, percentage increases and decreases, simple and compound interest.

- Algebra: multiplying, adding and subtracting algebraic expressions. Expanding brackets. Factor theorem. Multiplying, dividing, adding, and subtracting algebraic fractions.
- Equations: solving a quadratic equation by factorization by completing the square and by formula. Solving simultaneous equations.
- Logic and set theory introduction: propositions, negations, disjunction, conjunction, conditional, bi-conditional and truth tables.
- Statistics and probability: bar charts, pie-charts, histograms, cumulative frequency, mean, mode, median, frequency table, scatter graphs, probability of single and combined events.
- Coordinate geometry: Cartesian coordinates, the length, midpoint and gradient of a line joining two points. The equation of a straight line in the form of $y = mx + c$. Finding the equation of a straight line. Drawing accurate graphs, coordinates, and constructing tables of values.
- Sets, vectors, and functions: language notation, Venn diagrams, inverse functions, composite functions, logical problems, vector addition, multiplication by scalar, column vectors and parallel vectors.

Assessment:

Course work (Tests (20%) and assignments (20%))

Final written exam: 60%

References:

1. Linda Bostock and Suzanne Chandler, 2000. *Core Maths for Advanced Level*. Publisher: Nelson Thornes.
2. Backhouse J.K., Houldsworth S.P.T, and. Horril P.J.F., 1985. *Pure Mathematics*. Publisher: Longman.
3. Robert R. Stoll, 1979. *Set Theory and Logic*.
4. William Mendenhall, Robert J. Beaver and Barbara M. Beaver, 2013. *Introduction to Probability and Statistics*. 14th Edition. Publisher: Brooks/Cole.

CSC 1100 Computer Literacy (4 CU)

Course Description

In this course, students are to learn about the basic organization, concepts and terminologies in a computerized environment. They are also to get an in depth understanding of common computer applications. The use of related applications in different operating systems will be explored.

Aims:

The aims of the course unit are to:

- Equip students with basic knowledge about computer organization;
- Equip students with skills of using common office applications;
- Expose students to different operating systems;
- Equip students with skills of how to use the Internet and
- Equip students with knowledge about common text editors in different operating systems.

Learning outcomes

By the end of the course unit, the student should be able to:

- Describe the different parts of a computer;
- Describe the historical evolution of computers;
- Competently use the common office applications in at least two operating systems;
- Competently use common text editors in at least two operating systems.

Teaching and learning pattern

Teaching will be by lectures and laboratory demonstrations/practicals

Indicative content

- General computer organization
- Historical perspectives of computing
- Common Microsoft office packages
- Office packages in other operating systems
- Text editors
- Common Linux commands
- Using the web

Assessment method

The assessment will be in form of tests and assignments (40%) and final written exam (60%)

References

1. John Preston, Robert Ferrett and Shelly Gaskin, 2007. *Computer Literacy*
2. Jelne Janrich and Dan Oja, 2001. *Practical Computer Literacy*
3. Rajaraman, V., 2004. *Introduction to Information Technology*, available in google books
http://books.google.co.uk/books/about/Introduction_To_Information_Technology.html?id=JMdiacuAsplC&redir_esc=y
4. Efraim Turban, Kelly R. Rainer, Richard E. Potter, 2004. *Introduction to Information Technology*
5. James A. Senn, 2003. *Information Technology: Principles, Practices, and Opportunities* (3rd Edition)

6.2 Semester 2

BIS 1206 Systems Analysis and Design (4 CU)

Pre-requisites: Requirements engineering

Course Description: This course discusses the processes, methods, techniques and tools that organizations use to determine how they should conduct their business, with a particular focus on how computer-based technologies can most effectively contribute to the way business is organized. The course covers a systematic methodology for analyzing a business problem or opportunity, determining what role, if any, computer based technologies can play in addressing the business need, articulating business requirements for the technology solution, specifying alternative approaches to acquiring the technology capabilities needed to address business requirements, and specifying the requirements for the information systems solution in particular, in-house development, development from third-party providers, or purchased commercial-off-the-shelf (COTS) packages.

Aims:

To:

1. make students understand the types of business needs that can be addressed using information technology-based solutions
2. equip students with the skills of initiating, specifying, and prioritizing information systems projects and for determining various aspects of feasibility of these projects
3. introduce to students problems, opportunities, or mandates that initiate projects
4. introduce to students different methodologies for: analyzing a business situation (problem or opportunity); modeling it using formal techniques; and specifying requirements for a system that enables a productive change in a way the business is conducted
5. equip students with the skills of writing clear and concise business requirements documents that can be converted into technical specifications within the context of the methodologies they learn
6. equip students with skills for: communicating effectively with various organizational stakeholders, collecting information using various techniques, and conveying proposed solution characteristics to the stakeholders
7. equip students with the skills needed to manage information systems projects using formal project management methods

8. introduce students to various systems acquisition alternatives, including packaged systems (such as ERP, CRM, SCM, etc.) and outsourced design and development resources
9. equip students with the skills for using contemporary CASE tools in process and data modeling
10. introduce students to the principles leading to high levels of security and user experience from the beginning of the systems development process
11. equip students with the skills needed for developing high-level logical system characteristics
12. introduce students to the ethical, cultural, and legal issues and their feasibilities among alternative solutions.

Learning outcomes:

At the end of this course, students should be able to:

- describe the types of business needs that can be addressed using information technology-based solutions
- initiate, specify, and prioritize information systems projects and determine various aspects of feasibility of these projects
- use at least one specific methodology for analyzing a business situation (a problem or opportunity), modeling it using a formal technique, and specifying requirements for a system that enables a productive change in a way the business is conducted
- write clear and concise business requirements documents and convert them into technical specifications within the methodologies that they learn.
- Communicate effectively with various organizational stakeholders to collect information using various techniques and to convey proposed solution characteristics to them.
- Articulate various systems acquisition alternatives, including the use of packaged systems (such ERP, CRM, SCM, etc.) and outsourced design and development resources.
- Use contemporary CASE tools for use in process and data modeling.
- Compare the acquisition alternatives systematically.
- Incorporate principles leading to high levels of security and user experience from the beginning of the systems development process.
- Design high-level logical system characteristics (user interface design, design of data and information requirements).
- Analyze and articulate ethical, cultural, and legal issues and their feasibilities among alternative solutions.

Teaching and learning patterns:

- Lectures
- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Indicative content:

- Identification of opportunities for IT-enabled organizational change
- Business process management
- Analysis of business requirements
- Structuring of IT-based opportunities into projects
- Project specialization
- Project prioritization
- Analysis of project feasibility
- Fundamentals of IS project management in the global context
- Using globally distributed communication and collaboration platforms
- Analysis and specification of system requirements
- Different approaches to implementing information systems to support business requirements
- Specifying implementation alternatives for a specific system
- Impact of implementation alternatives on system requirements specification
- Methods for comparing systems implementation approaches

- Organizational implementation of a new information system
- Different approaches to systems analysis and design: structured SDLC, unified process/UML, agile methods

Assessment:

Course work (Tests (20%), Take home assignments, case studies, individual / group projects 20%)

Final written exam: 60%

References:

1. Gary B. Shelly and Harry J. Rosenblatt, 2012. *Systems Analysis and Design* (9th Edition). Publisher: Course Technology, Cengage Learning, Boston.
2. Hawryszkiewicz, I.T., 2001. *Introduction to Systems Analysis and Design* (5th Edition). Publisher: Prentice Hall.
3. Shouhong Wang and Hai Wang, 2012. *Information Systems Analysis and Design*. Publisher: Universal-Publishers
4. Kenneth E. Kendall, Julie E. Kendall, 1999. *Systems Analysis and Design*
5. Hoffer, 2012. *Modern Systems Analysis and Design*, 5/e, Pearson Education.

BIS 1204 Data and Information Management I (4 CU)

Course Description: This course provides the students with an introduction to the core concepts in data and information management. It is centered around the core skills of identifying organizational information requirements, modeling them using conceptual data modeling techniques, converting the conceptual data models into relational data models and verifying its structural characteristics with normalization techniques, and implementing and utilizing a relational database using an industrial-strength database management system.

Aims:

The aims of this course are to:

1. Provide the students with systematic approaches to the design and implementation of database applications
2. Give hands on experience and knowledge in developing database (driven) applications

Learning outcomes:

At the end of this course, students should be able to:

- Understand the role of databases and database management systems in managing organizational data and information; the historical development of database management systems and logical data models; the basics of how data is physically stored and accessed & the fundamentals of the basic file organization techniques.
- Apply information requirements specification processes in the broader systems analysis & design context.
- Use at least one conceptual data modeling technique (such as entity-relationship modeling) to capture the information requirements for an enterprise domain.
- Link to each other the results of data/information modeling and process modeling.
- Design high-quality relational databases.
- Understand the purpose and principles of normalizing a relational database structure. Design a relational database so that it is at least in 3NF.
- Implement a relational database design using an industrial-strength database management system, including the principles of data type selection and indexing.
- Use the data definition, data manipulation, and data control language components of SQL in the context of one widely used implementation of the language.
- Understand the basic mechanisms for accessing relational databases from various types of application development environments.
- Understand the role of databases and database management systems in the context of enterprise systems.

Teaching and learning patterns:

This course will be delivered through lectures, tutorials and laboratory Practicals. Students will be offered a range of experiences that include:

- Large group lectures
- working with team members in small groups (small group tutorials)
- Take home assignments
- Oral presentations
- Self-assessment and peer assessment
- Electronic discussion forum.

Indicative content:

This course will in the preliminary cover operations like requirements gathering and database planning. The course will also introduce students to developing application programs that talk to a database. These applications may be online or offline. The course will also include the following topics:

- Database approach
- Types of database management systems
- Basic file processing concepts and physical data storage concepts including file organizations techniques
- Database Development Life Cycle
- Conceptual data model
 - Entity-relationship model
 - Object-oriented data model
 - Specific modeling grammars
- Logical data model
 - Hierarchical data model
 - Network data model
 - Relational data model
 - Relations and relational structures
 - Relational database design
 - Mapping conceptual schema to a relational schema
 - Normalization
- Physical data model
 - Indexing
 - Data types
- Database Application development
 - Database Languages
 - SQL: DDL, DML, and DCL
 - Scripting
 - Interface Development

Assessment:

Course work (Tests (20%), Take home assignments, practical exercises (20%))

Final written exam: 60%

References:

1. Thomas Connolly and Carolyn Begg. 2003. *Database Solutions: A Step by Step Guide to Building Databases* (2nd Edition). Publisher: Pearson Addison Wesley. ISBN 0321173503.
2. Thomas Connolly and Carolyn Begg. 2002. *Database Systems: A Practical Approach to Design, Implementation, and Management* (3rd Edition). Publisher: Pearson Addison Wesley.

3. Silberschatz A., Korth H. F. and Sudarshan. 2002. *Database Systems Concepts* (4th Edition). Publisher: McGraw-Hill.
4. Greg R. 2001. *Principles of Database Systems with Internet and Java Application*. Publisher: Addison Wesley.
5. Keith Gordon (2007). *Principles of Data Management: Facilitating Information Sharing*

BIS 1203 Management Information Systems (3 CU)

Course Description: With the ongoing efforts to open markets and speed up international trade (globalization of trade), Information and Communication Technologies (ICTs) and networks have become central drivers of these processes by affecting societal activities including businesses. Thus the ICTs and networks have recast the role of information systems in business; and management information systems (MIS) have become essential for creating competitive firms, managing global corporations, and providing useful products and services to customers. This course therefore focuses on the development, use and analysis of the impact of MIS on decision-making, planning, and control; the changes in organizational structures to accommodate ICTs; and the design of information systems to facilitate management of the functional areas within an organization. Specifically, the MIS course prepares students to manage an organization's information resources, analyze and manage the flow of information within and across the organization; effectively manage the acquisition and utilization of information technology; and use both information and technology to enhance the organization's strategic advantage.

Aims:

The main aim of this course is to provide an in-depth understanding of the role of management information systems in supporting business activities and enhancing an organization's decision making to achieve competitive advantage. The course aims to enable students to:

1. Describe the main concepts of management information systems and the related concepts;
2. Develop an appreciation of the strategic issues in management information systems and ways in which organizations might strengthen their competitive position through the use of well-designed and well-managed information systems;
3. Explore the different aspects and types of managing business information;
4. Demonstrate how management information systems can enhance business decision making and help create business partnerships and competitive advantage;
5. Describe and understand how organizations develop (techniques, tools and methodologies), acquire and implement management information systems;
6. Develop an understanding of some of the technologies used in business functions (e.g. TPS, DSS, ES, EIS, and BI etc) and the opportunities and challenges they represent.
7. Discuss and understand issues related to computer crime and security, and management information systems ethics.

Learning outcomes:

On completion of this course unit, the students will be able to:

- Evaluate, select, and apply appropriate analytical and measurement techniques, tools and system development life cycle (SDLC) methodologies to meet organizational needs;
- Research, assess, recommend/select, and implement MIS that align with business needs, provides capability for business continuity, and meets business objectives;
- Effectively communicate with stakeholders orally, visually, and in writing to determine stakeholders' business requirements, explain how their requirements will be met, and provide ongoing audience-appropriate information;
- Demonstrate how management information systems can enhance business decision making and help create business partnerships and competitive advantage;
- Explain the significance of enterprise resource planning (ERP), supply chain management (SCM) and customer relation management (CRM) software(s) as the integration of functional software systems in creating business value for an enterprise business;
- Describe the role of business intelligence (BI) in supporting strategic decision making in an enterprise.

Teaching and learning pattern:

Teaching will be in terms of lectures, industry/field visits, problem-based/case studies, group work, presentations, and laboratory demonstrations.

Indicative content:

- Introduction to Management Information Systems: Definitions, Functions and Importance
 - Basic concepts and definitions:
 - Data, Information, and Knowledge
 - Information Systems
 - Information Architecture
 - Information Infrastructure
 - Application and Application Programming
 - Management Information Systems
 - Functions of Management Information Systems
 - Characteristics of Management Information Systems
 - Role and Applications of Management Information Systems
 - Importance and Impact of Management Information Systems in Business Enterprises
 - Management
 - Understanding of Business
 - Managerial Efficiency
- What is Management: Its relationship to Management Information Systems
 - Basic concepts and definitions: Management; Manager; and Management for MIS
 - Approaches to Management
 - Functions of an Information Systems Manager
 - Functions of MIS in Management
 - A support to the management
 - A tool for management process
- Types of Management Information Systems: Opportunities and Challenges
 - Management Information Systems (MIS)
 - Transaction Processing Systems (TPS)
 - Decision Support Systems (DSS)
 - Expert Systems (ES)
 - Enterprise Information Systems (EIS)
 - Geographic Information Systems (GIS)
 - Difference between DSS and MIS
- Information System Development: Phases, Tools, and Techniques
 - Systems Development Life Cycle
 - Component-based Development
 - Self-sourcing (End-user development)
 - Prototyping
 - In-sourcing and Outsourcing
- Creating Business Value: Gaining Competitive Advantage with IT
 - Michael Porter's model - Five Forces Model; Generic Strategies
 - Enterprise Resource Planning (ERP)
 - Supply Chain Management (SCM)
 - Customer Relationship Management (CRM)
 - E-commerce
 - IT Culture - An organizational perspective
- Database Management and Business Intelligence
 - Databases and the relational database model
 - Database management systems tools

- Data warehouses and data mining
- Business intelligence revisited
- MIS Infrastructure and Maintenance
 - IT Hardware and Software
 - Networks and Telecommunications
 - Data Communications
 - Systems implementation, maintenance, review, and audit
- Ethics and Professional Practice in IT: People, Information & IS
 - Crime and Ethics
 - Privacy
 - Security

Assessment method:

The assessment will be in form of tests and assignments (40%) and final written exam (60%)

Reference Books:

1. Stephen Haag and Maeve Cummings, 2011. *Management Information Systems* (8th edition). Publisher: Mc Graw Hill Education. Reprinted by China Machine Press.
2. Raymond McLeod Jr. and George P. Schell, 2006. *Management Information Systems* (9th Edition). Publisher: Prentice hall Pearson Education. Reprinted by Peking University Press.
3. Kenneth C. Laudon and Jane P. Laudon, 2006. *Management Information Systems—Organization and Technology in the Networked Enterprises* (6th Edition). Publisher: Prentice Hall Pearson Education. Reprinted by Higher Education Press.
4. Kenneth C. Laudon and Jane P. Laudon, 2008. *Essentials of Management Information Systems* (8th Edition). Publisher: Prentice Hall Pearson Education.
5. Kenneth C. Laudon and Jane P. Laudon, 2012. *Management Information Systems: Managing the Digital Firm* (12th edition). Publisher: Prentice Hall Pearson Education.
6. Bocij, P., Greasley, A., and Hickie, S., 2008. *Business Information Systems* (4th edition). Publisher: Prentice Hall Pearson Education.

BIS 1205 Business Statistics (3 CU)

Course Description: This course unit enables the student to: understand basic concepts of statistics, and be able to apply them in describing and interpreting business problems (or incidences that occur or incidences that are likely to occur in the business environment).

Aims:

- The course aims at equipping students with skills that will enable them to use the various data collection techniques, and understand how gathered data is coded, captured, cleaned, analyzed, interpreted, and presented.
- The course aims at equipping students with skills to enable them use tools such as SPSS, EPIINFO, MS Excel to perform statistical analysis of data associated with business operations and obtain meaningful information that can guide decision making.

Learning outcomes:

- The student will be able to appropriately apply basic tools of data gathering and data analysis to provide insight into business problems or business environments.
- Students will be able to integrate basic tools of data gathering and analysis into an overall approach to scientific inquiry.

Teaching and learning patterns:

- Lectures

- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Indicative content:

- Designing effective data gathering instruments for capturing data and/or information on business operations or incidences that occur in business environments.
- Procedure and Methods used to gather data using the data gathering instruments, determining suitable sample size, choosing a sampling method, drawing items or objects that constitute a sample.
- Data analysis including ways students can analyze qualitative data and quantitative data, data coding, theme formulation (especially for qualitative data), data entry, data cleaning, preparing a data analysis plan.
- Generating and interpreting descriptive statistics, statistical inference, probability distributions, and hypothesis testing, linear regression and correlation, and time series using SPSS, EPIINFO, STATA, MSEXcel etc
- Scenarios showing how business statistics concepts can be applied in real and operational business environments

Assessment:

Course work (Tests (20%), Mini survey project on applying concepts of Business Statistics in a real business environment (20%))

Final written exam: 60%

References:

1. Anderson, D. R., Sweeney, D. J. and Williams, T. A., 2002. *Modern Business Statistics with Microsoft® Excel*. Publisher: South-Western/ Thomson Learning.
2. Anderson, D. R., Sweeney, D. J., Williams, T. A. and Freeman J., 2006. *Statistics for Business and Economics* (European Edition). Publisher: Thomson Learning.
3. Sobol M. G., 1982. *Statistics for Business and Economics: An Action Learning Approach*. McGraw-Hill series in quantitative methods for management.

BIS 1208 IT Infrastructure (3 CU)

Course description: This course provides an introduction to IT infrastructure issues for students majoring in information systems. It covers topics related to both computer and systems architecture and communication networks, with an overall focus on the services and capabilities that IT infrastructure solutions enable in an organizational context. It gives the students the knowledge and skills that they need for communicating effectively with professionals whose special focus is on hardware and systems software technology and for designing organizational processes and software solutions that require in-depth understanding of the IT infrastructure capabilities and limitations. It also prepares the students for organizational roles that require interaction with external vendors of IT infrastructure components and solutions. The course focuses strongly on Internet-based solutions, computer and network security, business continuity, and the role of infrastructure in regulatory compliance.

Aims:

To:

- make students understand key principles of data representation and manipulation in computing solutions
- make students understand the principles underlying layered systems architectures and their application to both computers and networks
- make students understand the differences and similarities between the core elements of an IT infrastructure solution, such as clients, servers, network devices, wired and wireless network links, systems software, and specialized security devices
- make students understand how IT infrastructure components are organized into infrastructure solutions in different organizational environments

- make students understand the principles underlying service virtualization
- make students understand through practical examples how protocols are used to enable communication between computing devices connected to each other
- equip students with skills for configuring an IT infrastructure solution for a small organization, including a network based on standard technology components, servers, security devices, and several different types of computing clients
- equip students with skills for applying core concepts underlying IP networks to solve simple network design problems, including IP subnetting
- make students understand the components and structure of a large-scale organizational IT infrastructure solution at a level that allows them to use it effectively; the role of IT control and service management frameworks in managing a large-scale organizational IT infrastructure solution & opportunities that virtual computing service provision models, such as cloud computing create for organizations
- equip students with skills for negotiating with vendors providing design and implementation solutions; analyzing and understanding the security and business continuity implications of IT infrastructure design solutions; configuring simple infrastructure security solutions & minimizing environmental and resource consumption impacts of IT infrastructure decisions.

Learning outcomes:

After successful completion of this course, students should be able to:

- describe key principles of data representation and manipulation in computing solutions; the principles underlying layered systems architectures and their application to both computers and networks; the differences and similarities between the core elements of an IT infrastructure solution, such as clients, servers, network devices, wired and wireless network links, systems software, and specialized security devices; how IT infrastructure components are organized into infrastructure solutions in different organizational environments; the principles underlying service virtualization
- demonstrate through practical examples how protocols are used to enable communication between computing devices connected to each other
- configure an IT infrastructure solution for a small organization, including a network based on standard technology components, servers, security devices, and several different types of computing clients
- apply core concepts underlying IP networks to solve simple network design problems, including IP subnetting
- describe the components and structure of a large-scale organizational IT infrastructure solution at a level that allows them to use it effectively
- describe the role of IT control and service management frameworks in managing a large-scale organizational IT infrastructure solution
- negotiate with vendors providing design and implementation solutions
- identify the opportunities that virtual computing service provision models, such as cloud computing create for organizations
- analyze and understand the security and business continuity implications of IT infrastructure design solutions
- configure simple infrastructure security solutions
- Minimize environmental and resource consumption impacts of IT infrastructure decisions.

Teaching and learning patterns:

- Lectures
- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Indicative content:

- Core computing system architecture concepts
- Core computing system organizing structures
- Core technical components of computer-based systems

- Role of IT infrastructure in a modern organization
- Operating systems
- Networking
- Organizing storage on organizational networks
- Data centers
- Securing IT infrastructure
- The role of IT control and service management frameworks (COBIT, ITIL, etc.)
- Ensuring business continuity
- Grid computing
- Cloud computing, computing as a service
- System performance analysis and management
- Purchasing of IT infrastructure technologies and services

Assessment:

Course work (Tests (20%) and take home assignment (20%

Final written exam: 60%

References:

1. Sjaak Laan, 2011. *IT Infrastructure Architecture – Infrastructure building blocks and concepts*. 1st Edition. Publisher: Lulu Press Inc.
2. Manoj Kumar Choubey, 2012. *IT Infrastructure and Management*. First Impression. Publisher: Dorling Kindersley (India)
3. Phalguni Gupta, Surya Prakash, and Umarani Jayaraman, 2010. *IT Infrastructure and its Management*. 2nd Reprint.
4. Viktor Mayer-Schönberger. *Governance and Information Technology: From Electronic Government to Information Government*
5. Rana Tassabehji, *Applying E-Commerce in Business*, 2003.
6. Sue Whetton, 2005. *Health Informatics: a socio-technical perspective*. Illustrated Edition. Publisher: Oxford University Press.

6.3 Semester 3

BIS 2106 Data and Information Management II (4 CU)

Course Description: This course provides the students with the basic database administration tasks. In addition it will provide key concepts of database confidentiality, data quality, database transaction management and database performance.

Aims:

The aims of this are to provide the students with;

- Knowledge and hands on experience in database administration tasks
- Knowledge on data and user security mechanisms implemented by a database management system, data quality management, database transaction management and database performance mechanisms.

Learning outcomes:

- Perform simple database administration tasks.
- Understand the key principles of database security and identify data security risk and violations in data management system design.
- Understand the core concepts of data quality and their application in an organizational context.

- Understand the concept of database transaction and apply it appropriately to an application context.
- Understand various mechanisms and techniques for improving on the performance of a database.

Teaching and Learning patterns:

This course will be delivered through lectures, tutorials and laboratory Practicals. Students will be offered a range of experiences that include:

- Large group lectures
- Working with team members in small groups (small tutorials)
- Take home assignments
- Oral presentations
- Self-assessment and peer assessment
- Electronic discussion forum.

Indicative content:

This course will cover basic database administration tasks and key concepts of data quality and data security. In addition to developing database applications, the course helps the students understand how large-scale packaged systems are highly dependent on the use of DBMSs. The course will also include coverage of topics such as;

- Functions of a DBMS
- Data and database administration
- Database security management
 - Basic data security principles
 - Data security implementation (database authentication, database authorization, database encryption)
- Data quality management
 - Data quality principles
 - Data quality audits
 - Data quality improvement
- Database transaction management concepts
- Database performance mechanisms like (but not limited to):
 - Indexing
 - Partitioning
 - Multiprocessing
 - Disk management

Assessment:

Course work Test (20%), Take home Assignment (20%)

Final written exam: 60%

References:

1. Thomas Connolly and Carolyn Begg. 2003. *Database Solutions: A Step by Step Guide to Building Databases* (2nd Edition). Publisher: Pearson Addison Wesley.
2. Thomas Connolly and Carolyn Begg. 2002. *Database Systems: A Practical Approach to Design, Implementation, and Management* (3rd Edition). Publisher: Pearson Addison Wesley.
3. Richard T. Watson. *Data management: databases & organizations*, 5th Edition by John Wiley and Sons.
4. Keith Gordon, 2009. *Principles of Data Management: Facilitating Information Sharing*.
5. Keith Gordon, 2007. *Principles of data management: facilitating information sharing*.

BIS 2105 Information Systems Security and Risk Management (3 CU)

Course Description: This course provides an introduction to the fundamental principles and topics of Information Systems Security and Risk Management at the organizational level. Students will learn critical security principles that enable them to plan, develop, and perform security tasks. The course will address hardware, software, processes, communications, applications, and policies and procedures with respect to organizational information systems security and risk management.

Aims:

To:

1. make students understand the fundamental principles of information systems security
2. make students understand the concepts of threat, evaluation of assets, information assets, physical, operational, and information security and how they are related
3. make students understand the need for the careful design of a secure organizational information infrastructure
4. equip students with skills for performing risk analysis and management
5. make students understand both technical and administrative mitigation approaches
6. make students understand the need for a comprehensive security model and its implications for security manager or Chief Security Officer (CSO)
7. equip students with skills for creating and maintaining a comprehensive security model
8. make students understand and apply security technologies
9. make students understand basic cryptography, its implementation considerations, and key management
10. equip students with skills for designing and guiding the development of an organization's security policy
11. equip students with skills for determining appropriate strategies to assure confidentiality, integrity, and availability of information
12. equip students with skills for applying risk management techniques to manage risk, reduce vulnerabilities, threats, and apply appropriate safeguards/ controls.

Learning outcomes:

After successfully completing this course, students should be able to:

- describe the fundamental principles of information systems security
- describe the concepts of threat, evaluation of assets, information assets, physical, operational, and information security, and how they are related
- explain the need for the careful design of a secure organizational information infrastructure
- perform risk analysis and management
- describe both technical and administrative mitigation approaches
- explain the need for a comprehensive security model and its implications for security manager or Chief Security Officer (CSO)
- create and maintain a comprehensive security model
- describe and apply security technologies, basic cryptography and its implementation considerations
- design and guide the development of an organization's security policy
- determine appropriate strategies to assure confidentiality, integrity, and availability of information
- apply risk management techniques to manage risk, reduce vulnerabilities, threats, and apply appropriate safeguards/controls.

Teaching and learning patterns:

- Lectures
- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Teaching and learning patterns:

- Introduction to information security
- Inspection
- Protection
- Detection
- Reaction
- Reflection
- Risk assessment framework
- Security engineering
- Physical aspects
- Security in connected systems and networks
- Policy and management issues

Assessment:

Course work (Tests (20%), Exercises, and Take home assignment (20%))

Final written exam: 60%

References:

1. David Kim and Michael G. Solomon, 2010. *Fundamentals of Information Systems Security*. Publisher Johns & Bartlett Learning.
2. Jill Slay, Andy Koronios, 2006. *Information technology security & risk management*.
3. Evan Wheeler, 2012. *Security Risk Management: Building an Information Security Risk Management Program from the Ground Up*.
4. Derril Gibson, 2010. *Managing Risk in Information Systems* (Information Systems Security & Assurance Series).
5. David Kim, 2010. *Fundamentals of Information Systems Security* (Information Systems Security & Assurance Series).

BIS 2107 Human Computer Interaction (3 CU)

Course Description: Human Computer Interaction is concerned with the man-machine interfaces. Every system equipped with a microprocessor has some kind of user interface for its operation; this is particularly so for those systems that require lots of interaction for normal operation: i.e. computers and computer programs. The Human Computer Interaction, also known as Interfaces course will cover various aspects of the interaction between human operators and computer systems. In the lectures, the underlying principles for the design of computer interfaces will be discussed. In the lectures, the underlying principles for the design of computer interfaces will be discussed. This includes aspects of human perception, cognitive processes and memory but also topics directed more to user interface design, i.e. metaphors, widgets, windowing systems and object orientation will be discussed. In a modern approach of Human Computer Interaction, the user is the pivot of the design trajectory. Design methods are based on this principle and this will be covered in discussion of task analysis, prototyping, evaluation and usability. All topics will be discussed from a number of perspectives including that of the engineer and end-user. A team-based project will enable students apply their knowledge and skills to the full life cycle of an interactive human-computer interface.

Aims:

1. To identify and describe HCI concepts/terminology/issues used in the design and evaluation of interactive computing systems
2. To relate cognitive engineering concepts and principles to the design and evaluation of interactive computing systems
3. To design human-centered software, consciously incorporating and applying the HCI principles to the design process
4. To evaluate the effectiveness of a piece of software in the light of the usability principles discussed in the course

5. To think deeply about users' needs and distinguish the differences between system-centered design and human-centered design.

Learning outcomes:

- Students will gain an overview of Human Computer Interaction (HCI), with an understanding of user interface design in general, and alternatives to traditional “keyboard and mouse” computing
- Become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans;
- Be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation;
- Appreciate the importance of a design and evaluation methodology that begins with and maintains a focus on the user;
- Be familiar with a variety of both conventional and non-traditional user interface paradigms, the latter including virtual and augmented reality, mobile and wearable computing, and ubiquitous computing;
- And understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems.
- Finally, working in small groups on a product design from start to finish will provide students with invaluable team-work experience

Teaching and learning patterns:

This course will be both lecture- and project-based. Students will work in teams of 4 to 6 people on a semester-long course project. The project will give students practical experience in several HCI issues. Each team will conceive, design, prototype, and evaluate an interactive software system. Theoretical assigned readings as well as class lectures will provide students with the foundation to work on their projects. The project provides an opportunity to see how theoretical concepts have practical applications. In addition to the practical component of the course, students are expected to study and understand the theoretical principles and concepts.

Indicative content:

- General introduction to HCI
- The human as the central character in interactive/human centered information systems
- The computer & how it influences the nature of interaction and style of the interface
- Interaction (communication between the user and the computer/system)
- Usability paradigms and Principles
- Process of Interactive /human centered information system design
- Hypertext, Multimedia and World wide Web
- Mobile devices
- Evaluation Issues (goals of evaluation, paradigms and methods)

Assessment:

Course work (Tests (20%), summaries of assigned readings; group project (20%))

Final written exam: 60%

References:

1. David Benyon, 2010. *Designing Interactive Systems* (Second Edition). Publisher: Pearson Education Canada.
2. Alan Dix, Janet Finlay, Gregory Abowd & Russell Beale, 2004. *Human-Computer Interaction*. Publisher: Hillsdale, NJ: Prentice Hall, 2004.
3. *Beyond human-computer Interaction Design* by Sharp, Rogers & Preece 2nd edition chapters 12-15
4. *Human Computer Interaction* Free online Book retrieved on 26th Aug. 2010 from <http://www.zainbooks.com/books/computer-sciences/human-computer-interaction.html> Chap.1
5. Donald Norman, 1989. *Design of Everyday things*, Basic Books,

6. Donald M. Baecker, Jonathan Grudin, William A. S. Buxton & Saul Greenberg (eds), 2000 *Readings in Computers and Human Interaction: Toward the Year 2000*, 2nd edition.

BIS 2109 E-Services (4 CU)

Course Description: The concept of E-service (short for electronic service), represents one prominent application of utilizing the use of Information and communication technologies (ICTs) in different application domains such as health, education, government, business. This course introduces students to the concepts and practices of e-services that is, deeds, efforts or performances whose delivery is mediated by information technology

Aims:

- a) Gain a familiarity with the basic concepts, terminology and technology of e-services as applied in governance and health
- b) Develop skills to critically evaluate e-services against current “best practice” principles and standards.
- c) Understand the major state laws, regulations and technologies impacting the evolution of e-government in the developing world.
- d) Be able to apply basic business case and IT management concepts in preparing e-government/health proposals, plans or strategies.

Learning outcomes

Students who undertake this course should be capable of designing and managing programs that aim to extend services to citizens in developing countries. They should be able to identify suitable technologies to deliver such services in order to improve on efficiency and effectiveness of services provided by government and the private sector.

Teaching & Learning patterns

The course covers material that is relatively new and evolving. Students should be given novel articles to read and write an essay on their finding by exploring a thematic area. As much as possible practical projects in health and governance should be studied in order to derive relevance to local scenarios.

Indicative content

- Introduction to e-services
- Challenges and opportunities for ICTs in developing countries
- Information Technology for e-Government Applications
 - Communications over the Internet: Telecommunications and Internet Protocols
 - Communication over mobile networks
 - Techniques and Tools for Transactions and Data Exchange
 - GIS Applications
- E-Governance systems
 - Growth and ICTs
 - Education and ICTs
 - Health and ICTs
- E-Health Systems
 - Mobile Applications for Health Professionals
 - Mobile data collection systems
- Privacy and Security Issues
 - Information security management
 - Computer surveillance
 - Data mining
- Concepts in IT Management for Governments and Non-profits
 - Organizational structures in e-government
 - Uganda’s e-government plans/strategies
 - Introduction to enterprise architecture
 - Trends in outsourcing
 - Use of open source applications in government
- o) Study on model ICT for development projects

Assessment

Course work (Tests (20%) and take home assignment (20%))

Final written exam: 60%

References

1. *M-health: Emerging Mobile Health Systems* by Istepanian, Robert; Laxminarayan, Swamy; Pattichis, Constantinos S.
2. Garson, G. David, 2006. *Public Information Technology and E-Governance: Managing the Virtual State*. Boston: Jones & Bartlett.
3. Joseph Tan., , 2005. *E-Health Care Information Systems: An Introduction for Students and Professionals*.
4. Pam Whitten PhD (Editor), David Cook PhD (Editor), Jonathan D. Linkous (Foreword), 2004. *Understanding Health Communication Technologies* (Jossey-Bass Public Health).
5. G. David Garson, 2006. *Public Information Technology and E-Governance: Managing the Virtual State*.

CSC 1107 Structured Programming (3CU)

Course Description

The course is to create a strong base in the principles and practice of functional programming. A high level programming language like C is to be used. Students are to cover both theoretical principles and hands on practical skills. The main concepts to cover include program structure, data structures, syntactical and semantic correctness, planning and segmentation in programming as well as working with files.

Aims

The aims of the course are to provide the student with:

- Comprehensive knowledge about structured oriented programming;
- Knowledge in planning and organization of programming projects;
- Knowledge and techniques of evaluating syntactic and semantic correctness of a computer program;
- Strong practical basis in programming.

Teaching and Learning pattern

The course will be taught with a big practical component. Students will be expected to have one supervised practical sessions per week. They will so be given several programming assignments some of which will be marked and contribute to the coursework scores.

Indicative content

- Program structure
- Variables and Operators
- Conditional statements
- Looping statements
- Arrays and strings
- Functions
- Advanced data types
- Pointers
- Dynamic memory allocation and dynamic structures
- Working with files
- GUI

Assessment method

Assessment will be in form of at least one (practical) assignment and one test (40%), a practical exam - (30%) and a final written examination (30%)

References

1. *C Programming Language* by Brian W. Kernighan, Dennis M. Ritchie; Prentice Hall, 2000.

2. *C: A Reference Manual* (5th Edition) by Samuel P. Harrison; Prentice Hall, 2002.
3. Kjell Bäckman. *Structured Programming with C++*, 2008.
4. Joan K. Hughes (1986). *PL/I Structured Programming* [Paperback]
5. Ole-Johan Dahl, Edsger Wybe Dijkstra, Charles Antony Richard Hoare. *Structured programming*, 2010.

BIT 2111 Web Systems and Technologies I (4 CU)

Course Description: This course introduces students to web application development fundamentals. It provides a good understanding of the basic Internet technologies such as DNS, email services, LDAP and the HTTP protocol; Web application standards and standard bodies; web development approaches and architectures; HTML editors; website authoring tools such as FrontPage and/or Dream weaver. The course also emphasizes hands on experience using mark-up languages such as HTML and XML, client side languages such as CSS and JavaScript.

Aims:

- Provide an understanding of the basics of the Internet, how it originated, how it works.
- Provide an understanding of web development approaches and architectures
- Provide a basic understanding of Internet related technologies and introductory skills in Web applications mainly focusing on client side languages.
- Provide an understanding of how to develop and maintain Web applications.

Learning Outcomes:

On completion of this course unit, the students will be able to:

- Demonstrate understanding of the basic Internet technology concepts and standards
- Demonstrate understanding of the web development approaches and architectures
- Have essential skills for website development and management;
- Develop a prototype of an interactive static website.

Teaching and Learning Pattern:

In this course a combination of lectures and Practicals will be used.

Indicative Content:

- Basic Internet technologies such as DNS, email services, LDAP and the HTTP protocol
- Web application standards and standard bodies,
- HTML editors
- Website authoring tools such as FrontPage and/or Dream weaver
- web development approaches and architectures
- Web mark-up languages such as XML, HTML
- Client side languages such as CSS and JavaScript

Assessment method:

The students shall be evaluated through the coursework (40%) consisting of Individual Assignment, Tests, a practical group project, and a final examination (60%)

References:

1. Paul J. Deitel and Harvey M. Deitel, 2007. *Internet & World Wide Web: How to Program*, 4th Edition. Publisher: Prentice Hall.
2. Alex Homer, Chris Ullman & Steve Wright Wrox, 1998. *Instant HTML Programmer's Reference*.
3. 2003. *Web application architecture - principals, protocols and practices*. Publisher: John Wiley & Sons Ltd.

4. H.M. Deitel, P.J. Deitel & T.R. Nieto, 2000. *Internet & World Wide Web – How to Program*. Publisher: Prentice Hall.
5. H.M. Deitel, P.J. Deitel, T.R. Nieto, T.M. Lin & P. Sadhu, 2000. *XML – How to Program*. Publisher: Prentice Hall.
6. Website: W3Schools: www.W3C.com

6.4 Semester 4

BIS 2208 Information Systems Architecture (3 CU)

Course description: This course unit helps a student to understand principles and procedures that need to be considered before and during the development of information systems that effectively support business operations that enhance service delivery in various types of communities and societies. These principles and procedures are orchestrated in what can be termed as Information Systems Architectures (ISAs).

Aims:

This course unit aims at helping students to properly comprehend the coherent and integral role of ICTs in (dynamic) organization environments. Principles and procedures taught in the course unit help the student to move from the traditional view of seeing IT and business processes as two separate entities in organizations, to viewing them as entities that should be coherent and integral for organizations to be agile and transparent in their operations.

Learning outcomes:

At the end of this course unit, a student should be able to apply the principles and procedures taught in the course unit to design or create a Business Architecture and an Information Systems Architecture (i.e. data architecture and applications architecture) for any organization.

Teaching and learning patterns:

- Lectures
- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Indicative content:

- Understanding the relevance of architectures in general (and information systems architecture in particular) in planning organization transformations or strategy implementations
- Understanding the relationship between business architectures, data architectures, and application architectures. This also emphasizes that Information Systems architectures comprise data architectures and application architectures
- Understanding principles and procedures that need to be considered when developing business architectures and information systems architectures (i.e. data architectures and application architectures)
- Validating models of business architectures and information systems architectures

Assessment:

- Two Tests: 20%
- Mini Survey Project on applying concepts of business statistics in a real business environment: 20%
- Examination: 60%

References:

1. Scott A. Bernard, 2005. *An Introduction to Enterprise Architecture – Linking Business and Technology* (2nd edition). Publisher: Author House, Indiana.

2. Stephen H. Spewak, 1992. *Enterprise Architecture Planning: Developing a Blue Print for Data, Applications, and Technology*. Publisher: John Wiley and Sons Inc, New York.
3. Jeanne W. Ross, Peter Weill and David Robertson, 2006. *Enterprise Architecture as Strategy – Creating a Foundation for Business Execution*. Publisher: Harvard Business School Press, Boston.
4. Mark Lankhorst et al., 2005. *Enterprise Architecture at Work: Modelling, Communication, and Analysis*. Publisher: Springer.
5. Martin Op't Land, Erik Proper, Maarten Waage, Jeroen Cloo, and Claudia Steghuis, 2008. *Enterprise Architecture – Creating Value by Informed Governance*. Publisher: Springer.
6. Terry Blevins, John Spencer and The Open Group Architecture Forum, 2002. *Manager's Guide to Business Scenarios*. Publisher: The Open Group, San Francisco.
7. The Open Group Architecture Forum (TOGAF), 2009. *The Open Group Architecture Framework Version 9*. Publisher: Van Haren Publishing, Zaltbommel.
8. Jan Dietz. 2008. *Architecture: Building Strategy into Design*. Netherlands Architecture Forum, Academic Service — SDU, The Hague (2008). ISBN 9789012580861.

BIS 2206 Information Systems Project Management (4 CU)

Course description: This course discusses the processes, methods, techniques and tools that organizations use to manage their information systems projects. The course covers a systematic methodology for initiating, planning, executing, controlling, and closing projects. This course assumes that project management in the modern organization is a complex team based activity, where various types of technologies (including project management software as well as software to support group collaboration) are an inherent part of the project management process. This course also acknowledges that project management involves both the use of resources from within the firm, as well as contracted from outside the organization.

Aims:

To:

- equip students with skills for initiating, specifying, and prioritizing information systems projects and determining various aspects of feasibility of these projects
- make students understand the foundations of project management, including its definition, scope, and the need for project management in the modern organization
- make students understand the phases of the project management lifecycle
- equip students with skills for managing project teams, including the fundamentals of leadership and team motivation
- equip students with skills for managing project communication, both internal to the team, and external to other project stakeholders
- equip students with skills for initiating projects, including project selection and defining project scope
- equip students with skills for managing project schedules with appropriate techniques and tools
- equip students with skills for managing project resources, including human resources, capital equipment, and time
- equip students with skills for managing project quality, including the identification of the threats to project quality, techniques for measuring project quality, and the techniques for ensuring project quality is achieved
- equip students with skills for managing project risk, including the identification of project risk, and the techniques for ensuring project risk is controlled
- equip students with skills for managing the project procurement process, including understanding external acquisition and outsourcing, as well as the steps for managing external procurement
- equip students with skills for managing project execution, including monitoring project progress and managing project change, and appropriately documenting and communicating project status
- equip students with skills for controlling projects through information tracking and cost and change control
- equip students with skills for closing projects, including administrative, personnel, and contractual closure
- make students understand the mechanisms for dealing with legal issues in complex project contexts

- make students appreciate ethnic cultural differences in working with global teams either internal to organizations or by engaging offshore outsourcers.

Learning outcomes:

After successful completion of this course, students should be able to:

- initiate, specify, and prioritize information systems projects and determine various aspects of feasibility of these projects
- describe the foundations of project management, including its definition, scope, and the need for project management in the modern organization
- describe the phases of the project management lifecycle
- manage project teams, including having the fundamentals of leadership and team motivation
- initiate projects, including project selection and defining project scope
- manage project schedules with appropriate techniques and tools; project resources, including human resources, capital equipment, and time; project quality, including the identification of the threats to project quality, techniques for measuring project quality, and the techniques for ensuring project quality is achieved; project risk, including the identification of project risk, and the techniques for ensuring project risk is controlled; project procurement process, including understanding external acquisition and outsourcing, as well as the steps for managing external procurement; project execution, including monitoring project progress and managing project change, and appropriately documenting and communicating project status
- describe the mechanisms for dealing with legal issues in complex project contexts
- appreciate ethnic cultural differences in working with global teams either internal to organizations or by engaging offshore outsourcers.

Teaching and learning patterns:

- Lectures
- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Indicative content:

- Introduction to Project Management
- The Project Management Lifecycle
- Managing Project Teams
- Managing Project Communication
- Project Initiation and Planning
- Managing Project Scope
- Managing Project Scheduling
- Managing Project Resources
- Managing Project Quality
- Managing Project Risk
- Managing Project Procurement
- Project Execution, Control and Closure
- Managing Project Control and Closure

Assessment:

Course work (Tests (20%), take home assignment and mini project (20%))

Final written exam: 60%

References:

1. John J. McManus and A.T. Wood-Harper, 2003. *Information Systems Project Management: Methods, Tools and Techniques*. Illustrated Edition. Publisher: Prentice Hall. ISBN: 0273646990, 9780273646990.

2. Mark A. Fuller, Joseph S. Valacich, and Joey F. George, 2008. *Information Systems Project Management: A Process and Team Approach*. Illustrated Edition. Publisher: Prentice Hall.
3. James Cadle and Donald Yeates, 2008. *Project Management for Information Systems*, 5th Edition. Publisher; Prentice Hall.
4. David Louis Olson, 2004. *Introduction to Information Systems Project Management*, 2nd Edition. Publisher: McGraw Hill.

BIS 2207 Applications Development (4 CU)

Course description: In this course, Students will learn the basic concepts of program design, data structures, programming, problem solving, programming logic, and fundamental design techniques for event-driven programs. A fourth generation programming language like Vb.net is recommended. Program development will incorporate the program development life cycle: gathering requirements, designing a solution, implementing a solution in a programming language, and testing the completed application.

Aims:

The aim of this course is to introduce the students to the fundamental concepts and models of application development so that they can understand the key processes related to building functioning applications and appreciate the complexity of application development

Learning Outcomes:

After successful completion of this course, students should be able to:

1. Use primitive data types and data structures offered by the development environment
2. Choose an appropriate data structure for modeling simple business problems
3. Understand basic programming concepts
4. Write simple applications that relate to a specific domain
5. Design, implement, test, and debug a program that uses each of the following fundamental programming constructs: basic computation, simple I/O, standard Conditional and iterative structures and the definition of functions.
6. Test applications with sample data
7. Apply core program control structures

Indicative content:

- Overview and history of programming languages
- Program design
- Software Development lifecycle
- Prototyping / Agile development
- Modular design
- Object Oriented a Design
- Event driven design
- Techniques for modeling program structures
- Coding in a fourth generation language e.g. VB.net
- Input /Output (I/O) design
- Data structures
- Database access
- Application integration
- Unit testing, Usability Testing

Teaching and learning patterns:

This is a very practical course. Students will be required to have 2 lecture hours and 2 lab hours every week where demonstrations of the concepts learned and tutorials will be conducted.

Assessment:

Students will be required to come up with a simple business application and test the concepts learned during the course. This will be an individual course work. The course work can be divided into three deliverables of program design, implementation and testing with each deliverable contributing to the final coursework. In addition Students will undertake tests and an exam.

References:

1. Jeffrey A. Hoffer, Joey George and Joe Valacich, 2010. *Modern Systems Analysis and Design* (6th Edition), Publisher: Addison Wesley.
2. O'Reilly - 2003 - *Programming Visual Basic .NET*, Second Edition
3. Sams - 2003 - *Sams Teach Yourself Visual Studio .NET in 21 Days*
4. Roger Pressman, *Software Engineering: A Practitioner's Approach, 7/e*

BIT 2207 Research Methodology (3 CU)

Course description: This course unit enables students to learn and apply principles of conducting scientific research, or undertaking a systematic research study.

Aims:

To enable the student to relate data gathering techniques and principles taught in Systems Analysis and Design (and software engineering or other course units in his/her Programme) to his/her final year research project.

Learning outcomes:

A student who has undertaken this course unit will be able to successfully undertake a research project. He/she will be able to:

1. Identify a significant research problem, identify the aims of a research project that can solve the identified problem, and properly conduct a literature study of work associated with his/her research problem.
2. Select appropriate research methods to be used in his/her project, and select appropriate data collection techniques that are to be used when gathering required data for the project.
3. Select appropriate data analysis techniques that are to be used when processing collected data. Student should be able to interpret data analysis results.
4. Produce a research proposal that is detailed to the level of a specifications document, whereby it provides a blue print showing how the research project in semester 6 of the program will be carried out or implemented in order to achieve the research results. Student should also give ways that he/she plans to undertake in order to evaluate and validate the tool or results obtained from the research/project.

Teaching and learning patterns:

- Lectures
- Assignments to be done in groups
- Class discussions to be conducted with the aim of guiding students to properly apply research concepts such that they can develop a specification document.

Indicative content:

The course unit is divided into five parts.

- **Part I covers introductory concepts of research.** E.g. what is research, understanding the research process, how to formulate a research problem, how to formulate research questions, how to formulate research objectives, how to define scope, how to conduct literature review on a given research problem domain or solution domain etc. Output of part I is section one and section two of a research/project proposal.
- **Part II covers research methods.** A student learns the various quantitative and qualitative research methods. A student also learns the data gathering techniques. Output of part II is section three of a research proposal.
- **Part III covers is the practical application of concepts from parts I and II.** In this part, the student is expected to execute the data collection tasks associated with his/her project. If the project will involve conducting an exploratory

survey, the student goes to the target respondents to collect data. If the project is about developing a tool for some organization, the student goes out to the organization to collect relevant information. Thereafter, documents his or her findings from the field and prepares a specification document of the tool that is to be developed. Alternatively, if the research project was to involve an exploratory survey but not tool development, the student is expected to draw out a clear data analysis plan.

- Part III is actually a mini project which involves students identifying project ideas or problems, designing data gathering instruments, using their instruments to collect data from the field, returning from the field and writing a specifications document regarding the software they propose to build.
- However, BIS students have a free choice of either (a) developing a tool that supports a given task or solves some problem, or (b) conducting an exploratory IS-related survey that yields information relevant to the IS community.
- Thus, the output of part III is a mini research project of either a specifications document or a detailed data analysis plan.
 - The system/solution specified in the specifications document will then be implemented in semester 6.
 - The detailed data analysis plan should layout the types of analysis that the student plans to do in order to achieve the research objectives or answer the research questions.
- Part III helps students to develop their project proposals, and then use the taught research methods to gather relevant information from the field, and then write a specifications document or detailed data analysis plan.
- **Part IV covers (A) the evaluation, testing and validation of a developed tool, and (B) data analysis of results from an IS-related exploratory survey.**
 - Under A, part IV specifically answers questions such as how is evaluation, testing, and validating of a developed tool conducted?; what are the evaluation criteria?; what are the validation methods?; what is being tested in the testing phase?
 - Under B, part IV specifically answers questions such as how is data from an exploratory survey analyzed? How is qualitative data analyzed? How is quantitative data analyzed? How are the analysis results interpreted? What conclusions are drawn from the analysis results?
- **Part V covers discussion of results and report writing.** E.g. reporting and discussing research results/findings, how to answer research questions, how to apply the concepts of systems analysis and design (or software engineering) in report writing, how to present evaluation feedback, how to compare findings from other similar studies etc

Assessment:

Tests: 20%, Mini-project: 40%, Final written exam: 40%

References:

1. Graham Birley and Neil Moreland, 1998. *A Practical Guide to Academic Research*. Publisher: Biddles Ltd.
2. Priscilla Salant and Dona A. Dillman, 1994. *How to conduct your own Survey*. Publisher: John Wiley & Sons, Inc. New York.
3. Neil J. Salkind. 2009. *Exploring Research* (7th Edition). Publisher: Pearson International.
4. P. Sam Daniel and Aroma G. Sam. 2011. *Research Methodology*. Publisher: Gyan Publishing House.
5. Briony J Oates. 2005. *Researching Information Systems and Computing*. Illustrated Edition. Publisher: SAGE.

CSC 1214 Object Oriented Programming (4 CU)

Course Description:

This course is to give an in-depth understanding of Object Oriented Programming. It is to cater for Object Oriented Programming practices like inheritance, interfaces, exception handling, action handling, security, software reuse and robustness.

Aims:

The aim of the course is to:

- Improve the skills of the students from a basic level to an advanced level
- Equip students with skills needed to handle non-functional program aspects like robustness and security
- Train students to develop complete computer applications

Teaching and Learning pattern:

This will include lectures, Practicals. And lab assignments

Indicative content:

- The Object-oriented paradigm
- Classes and objects
- Inheritance and visibility modifiers
- Interfaces and abstract classes
- Graphical user interface and action handlers
- Exception handling
- Working with files
- Working with databases
- Sessions and user management

Assessment method:

The assessment will be done by tests (20%) and take home assignments (20%), Practical examination (30%) and written examination (30%)

References:

1. John Lewis and William Loftus, 2011. *Java Software Solutions*, 7th Edition. Publisher: Prentice Hall.
2. Khalid Azim Mughal and Rolf Rasmussen, 2003. *A Programmer's Guide to Java Certification*, 2nd Edition. Publisher: Addison-Wesley Professional.
3. Peter Coad, 1993. *Object-Oriented Programming*.

BIT 2205 System Administration (4 CU)

Course description: This course addresses the requirements of setting up computer systems, maintaining them and ensuring that the users of these systems have access to them, in spite of the activities of users who tend to cause the systems to fail.

Aims:

The course aims to provide students with knowledge and skills in:

- Using Windows and Linux operating systems.
- Performing basic administration under Windows and Linux.
- Designing a network which is logical and efficient.
- Deploying large numbers of machines which can be easily upgraded later.
- Planning and implementing adequate system security.
- Troubleshooting and fixing system errors.

Learning outcomes:

On completion of this course unit, the students will be able to:

- Demonstrate understanding of computer networking, computing models, and basic network services.

- Recognize and describe logical and physical network topologies in terms of the media and network hardware.
- Compare current network technologies in terms of speed, access method, operation, topology, and media.
- Describe basic principles of Unix/Linux multi-user System Administration
- Plan, Install, Maintain and Run a Unix/Linux System as used in a TCP/IP networked environment
- Manage system resources, services and applications
- Write shell scripts to assist management functions
- Perform upgrades, backup, recovery and virus protection operations
- Test and configure services such as DNS, email, and cross platform file sharing

Teaching and learning patterns:

The teaching style will be FACILITATOR with students being broken up into discussion groups after each major topic

Indicative content:

- Introduction to system administration: Discuss an overview of the system administration world; understand key concepts of system administration.
- Operating system concepts: Understand basic concepts that are the foundation of Operating System design, understand the Exodus of Operating Systems
- System Booting and Halting:
- System navigation and understanding (windows and Unix): Paths, architecture, directory structure
- Operating System Installations and Configurations (server and client)
- System Software installation and Management
- Systems Security: Concepts of Security administration key to a systems administrator
- Shell Scripting: Detailed view of shell scripts, Automation of system admin tasks like backup.
- Networking terminologies: Vlan, vsats, hacking tools, protocol analyzers, network monitoring.

Assessment:

Course work (Tests (20%), practical exercises, and take home assignment (20%))

Final written exam: 60%

References:

1. Curt Freeland and Dwight McKay. 2002. *The Complete Systems Administrator*. Publisher: Delmar/Thomson Learning.
2. Mark Burgess, 2004. *Principles of Network and System Administration*. Publisher: John Wiley & Sons Ltd.
3. Aileen Frisch, 2002. *Essential System Administration*, 3rd Edition. Publisher: O'reilly.
4. Aileen Frisch, *Essential System Administration: Tools and Techniques for Linux and Unix Administration*, 3rd Edition, 2002.
5. *Everything Sysadmin: Thoughts, news and views of Limoncelli*, Hogan & Chalup

6.5 Semester 5

BIS 3100 Modeling and Simulation (3 CU)

Course description: This course provides an introduction to system modeling using both computer simulation and mathematical techniques. A range of case studies are examined in the lectures and project exercises. Students will get hands-on training. The application areas considered are wide-ranging, although the emphasis is on the analysis of a variety of modeling paradigms such as queuing and dynamic systems. A simulation language will be utilized and an applied project carried out.

Aims:

To:

- Equip students with basic knowledge about simulation and modeling.
- Equip students with critical thinking and analytical skills
- Equip students with skills of building simulation models

Learning outcomes:

By the end of the course students should be able to:

- Be familiar with a variety of modeling and simulation techniques that are applicable under varying circumstances.
- Gain practical experience in composing models and running simulations under a variety of circumstances and understanding the graphs and behavior of systems
- Understand how a simulation model works and each of the tasks required for a successful simulation project
- Be able to build a models using simple real world system and obtain meaningful performance measures with the help of simulation software.
- Be able to carry out a simulation project successfully.

Teaching and learning patterns:

The course will be taught with a big practical component. Students will be expected to have one hour practical session per week. They will be given field assignments which will be marked and contribute to the coursework scores. Teaching and Learning will be in form of classroom lectures, demonstration and student practical projects

Indicative content:

- Introduction to simulation concepts : simulation, models, benefits of using simulation, application areas, model classifications, types of simulations, benefits and drawbacks of simulation, Pitfalls to successful completion of simulations.
- Introduction to systems- static and dynamic; discrete and continuous, Introduction to Monte Carlo simulation, generation of random numbers using Excel RAND () as well as various distributions such as, Bernoulli, Exponential.
- Discrete Event Simulation (DES): components of DES, overview of Queuing Theory, queuing systems, queuing models, queuing discipline (LIFO, FIFO, SIRO, priority queue), analysis and performance measures of queuing systems, overview of probability distributions (such as Markovian, deterministic) used in queuing models .
- Hand simulation exercises employing single/multi-channel, single/multi-phase server systems
- Simulation Development Life Cycle: problem formulation, system investigation, model formulation, model representation, programming, design of experiments, experimentation, presentation of simulation results, verification and validation.
- Graphical Integration: basic principles and application of graphical integration, constant rates, inflows and outflows, step functions.
- Introduction to dynamic simulation models: Stock and Flow diagrams, STELLA modeling environment. Exercises involving modeling with STELLA, interpretation of graphs, creating user interfaces and them to the models.
- Undertake DES and dynamic simulation field projects.

Assessment:

Course work (tests (20%), assignments, and projects (20%))

Final written exam: 60%

References:

1. John A. Sokolowski and Catherine M. Banks. 2011. *Principles of Modeling and Simulation: A Multidisciplinary Approach*. Publisher: John Wiley & Sons. ISBN: 978-0-470-28943-3.

2. John A. Sokolowski and Catherine M. Banks. 2010. *Modeling and Simulation Fundamentals: Theoretical Underpinnings and Practical Domains*. Publisher: John Wiley & Sons. ISBN: 978-0-470-48674-0.
3. Bernard P. Zeigler, Herbert Praehofer, Tag Gon Kim. *Theory of Modeling and Simulation*, Second Edition, 2000.
4. Averill M. Law, W. David Kelton. *Simulation Modeling and Analysis*, 3rd Edition.
5. W. David Kelton, Randall P. Sadowski, David T. Sturrock. *Simulation With Arena*, 4th Edition

BIS 3101 Intelligent Systems (4 CU)

Course description: This course introduces the fundamental concepts and applications of intelligent systems. It introduces various concepts of popular intelligent systems techniques and how they can be applied to provide solutions to specific problems with a focus on information systems. The course also introduces the criteria for measuring the successful application of intelligent systems techniques

Aims:

To:

1. Introduce to students fundamental intelligent systems concepts that establish the foundation of applying intelligent systems to Information Systems related problems
2. Introduce to students popular intelligent systems techniques that are suitable for solving various types of Information systems related problems
3. Make students apply intelligent systems to information systems related problems
4. explore limitations and / or challenges associated with intelligent systems and how to overcome them in the context of information systems applications.

Learning outcomes:

By the end of this course, a student should be able to:

- Explain key concepts associated with intelligent systems and how their application to information systems related problems
- Describe several intelligent systems approaches (e.g. expert systems, neural networks, and genetic algorithms, etc) and their application to information systems related problems
- Develop various applications of intelligent systems
- Evaluate the application of intelligent systems in solving information systems related problems.

Teaching and learning patterns:

- Lectures
- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Indicative content:

- Introduction
- Review of probability and statistical concepts
- Structure of Intelligent systems
- Problem solving strategies:
 - Uninformed problem solving
 - Informed problem solving
- Intelligent systems development Methodologies and Case studies
 - Knowledge Engineering /Intelligent Systems development phases
 - Problem formulation

- Knowledge acquisition
- Knowledge representation and reasoning
- Intelligent systems validation / evaluation
- Expert systems
 - Rule-based expert systems
 - Fuzzy expert systems
 - Frame-based expert systems
- Artificial neural networks

[Different types of Artificial Neural Networks]
- Evolutionary computation
 - Genetic algorithms
 - Genetic programming
 - Evolutionary strategies
- Case-based reasoning
- Intelligent software agents
- Data mining
- Natural language processing
- Hybrid intelligent systems

Assessment:

Course work (Tests (20%), take home assignments, practical exercises (20%))

Final written exam: 60%

References:

1. Michael Negnevitsky. 2011. *Artificial Intelligence: A guide to Intelligent Systems*, 3rd Edition. Publisher: Addison Wesley. ISBN: 140822574
2. Stuart Russell and Peter Norvig. 2009. *Artificial Intelligence: A Modern Approach*, 3rd Edition. Publisher: Prentice Hall. ISBN-10: 0-13-60425907, ISBN-13: 978-0-13-604259-4
3. Richard E. Neapolitan, Xia Jiang, 2012. *Contemporary Artificial Intelligence*.

BIS 3106 Business Process Management (4 CU)

Course description: In this course students will be introduced to key concepts and approaches to business process management and improvement. The main focus of this course is both understanding and designing business processes. Students will learn how to identify, document, model, assess, and improve core business processes. Students will be introduced to process design principles. The way in which information technology can be used to manage, transform, and improve business processes is discussed. Students will be exposed to challenges and approaches to organizational change, domestic and offshore outsourcing, and inter-organizational processes.

Aims:

To

1. equip students with skills for modeling business processes
2. equip students with skills for benchmarking business process performance
3. equip students with skills for assessing business process performance
4. equip students with skills for designing business process improvements
5. make students understand the role and potential of IT to support business process management

6. make students understand the challenges of business process change
7. make students understand how to support business process change
8. make students understand different approaches to business process modeling and improvement
9. make students understand the challenges and risks concerning business process outsourcing
10. equip students with skills for using basic business process modeling tools
11. equip students with skills for simulating simple business processes and using simulation results in business process analysis

Learning outcomes:

After successfully completing this course, students should be able to:

- model business processes
- benchmark business process performance
- assess business process performance
- design business process improvements
- describe the role and potential of IT to support business process management
- describe the challenges of business process change
- describe how to support business process change
- describe different approaches to business process modeling and improvement
- describe the challenges and risks concerning business process outsourcing
- use basic business process modeling tools
- simulate simple business processes and use simulation results in business process analysis

Teaching and learning patterns:

- Lectures
- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Indicative content:

- Overview
- Understanding organizational processes
- Process assessment
- Process improvement
- Using IT for process management and improvement
- Organizational issues in business process management

Assessment:

Course work (Tests (20%), take home assignments, practical exercises (20%))

Final written exam: 60%

References:

1. John Jeston and Johan Nelis, 2008. *Business Process Management*, 2nd Edition. Publisher: Elsevier Ltd. ISBN: 978-0-75-068656-3.
2. Naresh Verma, 2009. *Business Process Management: Profiting from Process*. Publisher: Global India Publications Pvt. Ltd. ISBN: 978-81-907941-7-6.
3. Takayuki Kanda, Hiroshi Ishiguro, 2012. *Business Process Management: Concepts, Languages, Architectures*, 2012.
4. John Jeston, 2008. *Business Process Management*, Second Edition: Practical Guidelines to Successful Implementations.

5. Susan Page, 2010. *The Power of Business Process Improvement: 10 Simple Steps to Increase Effectiveness, Efficiency, and Adaptability*.

BIS 3103 Project in Information Systems I (5 CU)

Course description: This course unit enables students to apply principles of conducting scientific research in their final year research project.

Aim: To enable small groups of students to start working with their supervisor on their final year research project.

Learning outcomes: A group of students will work with their assigned supervisor to apply principles learned in the research methodology course unit to:

- Prepare or develop a proposal for their final year project
- To design data collection tools that will be used in the project
- To investigate and prepare a requirements specification document (for some of the BIS students who propose to develop a tool) or to prepare a data analysis plan for any data gathered using a survey (for some of the BIS students who propose to solve an information gap problems).

Teaching and learning pattern

- No lectures will be conducted; instead students will work with their assigned supervisors to develop proposals for their final year project.

Assessment:

Concept (40%); a complete proposal: 60%

BIS 3108 Information Systems Audit (3 CU)

Course description: IT advances have introduced new risks that require unique internal controls and also have had great influences on auditing. This course will first present an overview of information systems audit (or information technology audit). It will then discuss alternative audit approaches and review the internal control concerns. It will also cover how to use computer assisted audit tools in order to have a hands-on experience.

Aims:

- Examine the business drivers behind the security analysis design process.
- Study key laws that shape the field of information security, as well as computer ethics necessary to better educate those implementing security.
- Study key areas of potential computer risk. An overview of relevant technology and systems issues will also be provided.
- Learn to use computer assisted audit tools in order to have a hands-on experience.

Learning outcomes:

After successful completion of this course, students should be able to:

- Understand the business drivers behind the security analysis design process
- Understand key laws that shape the field of information security, as well as computer ethics necessary to better educate those implementing security

- Understand key areas of potential computer risk and mechanisms to guard against such risks.
- Learn to use computer assisted audit tools in order to have a hands-on experience.

Teaching and learning patterns:

The teaching style will be FACILITATOR with students being broken up into discussion groups after each major topic.

Indicative content:

- Introduction to Information Security & Risk Management
- Auditing, Assurance, and Internal Control
- Processes and Procedures for Protection of Information Assets:
 - Evaluate the design, implementation and monitoring of physical access and environmental controls to determine whether information assets are adequately safeguarded.
 - Evaluate the processes and procedures used to store, retrieve, transport and dispose of information assets (e.g., backup media, offsite storage, hard copy/print data, and softcopy media) to determine whether information assets are adequately safeguarded.
 - Defining control objectives, and measuring as well as assessing IT/IS controls
- The Process of Auditing Information Systems
 - Plan specific audits to determine whether information systems are protected, controlled and provide value to the organization.
 - Report audit findings and make recommendations to key stakeholders to communicate results and effect change when necessary.
- Computer Assisted Audit Tools and Technologies (CAATT)
- CAATTs for Data Extraction and Analysis

Assessment: Course work (Tests (20%), practical exercises, and take home assignment (20%))

Final written exam: 60%

References:

1. James A. Hall. *Information Systems Auditing and Assurance*, South Western College Publishing, 1999.
2. Michael E. Whitman and Herbert J. Mattord. *Principles of Information Security*, Thomson Course Technology, 3rd Ed., 2008.
3. Jack, J. Chaplain. *Auditing Information Systems*, 2003.
4. Weber. *Information Systems Control & Audit*, 1999.

BSE 3106 Mobile Networks and Computing (4 CU)

Course Description: This course examines principles, design, implementation, and performance of mobile computing and wireless networking. The aim is to lay a foundation in the student's understanding and skills in mobile computing and wireless networking standards, technologies, application and services. Ideally the course is an integration of Wireless Networking and Mobile Computing. Subjects of study under Mobile Networking will include; Wireless Network technologies (including GSM/GPRS/3G & Wireless LANs), Convergence networks, NextGen, Mobile IP, wireless ATM, Wireless Ad Hoc Networks and Bluetooth. While subjects of discussion under Mobile Computing will include; Mobile Computing Architectures (including SMS/SIM, WAP, I-mode and J2ME/J2EE), mobile OS (e.g., Android) and Mobile Application Development including location-based services.

Aims: The aims of the course include:

- To introduce students to the theory and practice of Mobile networking and computing.
- To facilitate the development of technical skills in mobile application development platforms particularly J2ME and J2EE.
- To enhance students skills in mobile application development using Java and other technologies

- To introduce students to the fundamental concepts in wireless technology and mobile computing including standards, technologies, devices and services
- To use and experiment with new technology and cutting-edge projects
- To understand how networking research is done
- Investigate novel ideas in the area via semester-long skill development projects.

Learning outcomes: On completion of this course, the students will:

- Have gained an understanding of the theory and practical aspects of mobile computing and wireless networking.
- Discuss the considerations in wireless mobile networking architectures
- To design and implement simple wireless and mobile networks using Bluetooth, Wi-Fi among others
- Work with the J2ME and J2EE platforms with minimal difficulty
- Develop simple mobile applications deployable on Java enabled mobile devices
- Discuss the current research directions in mobile and wireless networking
- Demonstrate mastery of development and deployment of secure mobile services.

Teaching and learning patterns:

The course will be delivered in form of lectures, tutorials, lab experimentation, and group assignments

Indicative content: Pre-requisite:

Knowledge in the following (Computer Networking, Programming Principles, and Java)

- Introduction to mobile computing and wireless networking principles
- The Bluetooth and Zigbee short range wireless technologies
- The Wi-Fi Technologies
- Introduction to GSM/GPRS/3G/3GPP
- The Mobile IP technology
- Wireless ATM technology
- Introduction to Mobile application development
- Introduction to J2ME and J2EE platforms
- Understanding mobile computing architectures (I-mode, SMS and WAP)
- Introduction to GSM gateways e.g. Kannel

Assessment method:

Tests (20%) and practical assignment (20%); final examination (60%)

Reference books:

1. Jochen Schiller, 2000. *Mobile Communications*, Addison-Wesley.
2. Mark Beaulieu, 2002. *Wireless Internet Applications & Architectures: Building Professional Wireless Applications Worldwide*, Addison-Wesley,
3. Qusay H. Mahmoud, 2002. *Learning – Wireless Java*, O'Reilly.
4. *Introduction to Mobile Computing in Mobile Computing*, edited by T. Imielinski and H. Korth, Kluwer, Academic Publishers, 1996.
5. John W. Muchow, *Core J2ME, technology & MIDP*, Prentice-Hall, 2002.
6. Subrahmanyam Allamaraju, 2001. *Professional Java Server Programming J2EE 1.3 Edition*, Wrox Press Ltd.
7. Steve Mann, 2000. *Programming Applications with Wireless Application Protocol*, John Wiley & Sons, Inc.
8. Scott B. Guthery and Mary J. Cronin, 2000. *Mobile Application Development with SMS and the SIM toolkit*, McGraw-Hill TELECOM,.
9. Neil Rbodes & Julie McKeenan, 1999. *Palm Programming: The Developer's Guide*, O'Reilly.
10. Mark Hapner, 2002. *Java Message Service API Tutorial and Reference – Messaging for the J2EE Platform*, Sun Microsystems

6.6 Semester 6

BIS 3202 Project in Information Systems II (5 CU)

Course description: This unit of study represents the second semester of a year-long program. Students MUST complete this course unit and Research Methods course in two consecutive semesters.

A group of students develop an Information System that materializes their exploration of a topic of interest. The topic is identified by each student through a project proposal submitted for review and approval by a pool of active instructors in the First Semester.

Aims:

The project enables students to experience real-life involvement in the planning and development of a medium sized team-based project. It utilises a teamwork approach to software engineering and integrates previously learned skills and knowledge relating to Systems Analysis and Design and Application Development. This unit will be facilitated by a course manager and will be based on Final Year project guidelines developed by SCIT, CoCIS. It follows on from Research Methodology course and covers project management, team organisation and communication, implementation, testing, integration, re-use, configuration management, user and system documentation, reporting, milestone and final presentation.

Learning outcomes:

Students who complete this unit of study should be able to:

- Demonstrate an ability to work in a project team environment on a project focussed on one of a variety of topics or problems in information systems
- Demonstrate an ability to analyse, synthesise and construct arguments
- Demonstrate an ability to implement solutions using a range of tools, techniques, methods and other appropriate resources
- Select appropriate tools and techniques in order to find, implement and test software package solutions which can be configured to meet business requirements
- Demonstrate an understanding of the relationship between theory studied in this unit and previous units of study and its practical application in a real life organisational setting
- Demonstrate an understanding of basic concepts of Usability and Human Computer Interaction
- Demonstrate good team work skills such as showing a willingness to present ideas for scrutiny to group members and working professionals; and accept and provide constructive criticism
- Show evidence of self-reliance and time management skills

Research:

Students begin their research phase by first identifying the topic they want to explore in a developed proposal in the first semester. The proposal should articulate a clear research premise and define the framework of investigation, approach, methods and resources. The proposal as such is a preliminary step at exploring the general idea and aim of the project, planning the investigation process and determining its significance to the fields of Information Systems.

Following the approval of the proposal by the committee of advisors, a primary advisor is assigned to each group of students, depending on the student's choice and on the advisor's research interests and capacity to provide guidance on the proposed topic. The advisor's role is to assist in expanding the purview of the student's research before guiding the student into focusing his/her aims.

Process:

The research is dedicated to developing the approved proposal through an in depth exploration of the topic, aided by the following processes and methodologies:

- **Theoretical framework and approach:** Examine the conceptual and theoretical approaches to the topic issue(s). This reflection process should be enriched

by readings into the theories that define the key concepts and problematic surrounding the topic of investigation. Explore the theoretical discussion/debate concerning your topic if there is one; research its roots and origins; examine and understand the different positions in contemporary debate concerning your research. Identifying the research framework and developing a set of questions to be answered are the first steps in the research process. The research question(s) will guide the remainder of the process and will allow you to eventually reach a position within the debate.

- **Case study(ies) analysis:**
 - A critical examination of applied or tested approaches to the subject (empirical research, technical experiments and significant Information Systems based projects). The knowledge and critical assessment of prior work on the subject should help in contextualizing your work and in developing an original take on the subject at hand.
 - A choice of relevant case studies (from the above) and/or topic material artifacts should be analyzed in relation to the theoretical framework and preferred approach. This process would need to be aided by a rigorous data collection (eg. archival material, artifacts, and interviews with user groups and/or actors). Again your methods of data collection need to be relevant to your research questions and approach.
 - You should then design and implement your system based on the findings above, test and evaluate its usefulness.

Assessment: Requirements Specification & design (40%); Implementation and validation (60%)

BIS 3200 Data Warehousing and Business Intelligence (4 CU)

Course description: This course provides an introduction to data and information management technologies that provide decision support capabilities under the broad business intelligence umbrella. The course introduces the student on how companies can build data warehouses and utilize business intelligence for decision-making hence saving money and increasing profit. Several initiatives ranging from supply chain integration to compliance with organizational/government –mandated reporting requirements depend on well-designed data warehouse architecture. Therefore the course introduces you to the main components of a data warehouse for business intelligence applications. This will include how a data warehouse fits into the overall strategy of a complex enterprise, how to develop data models, and data marts that are useful for business intelligence, and how to combine data from disparate sources into a single database that comprises the core of your data warehouse. The course will also explore how to define and specify useful management reports from warehouse data.

Aims:

The aims of this course are to:

- Make students understand the role and operation of data warehouses
- equip students with skills of developing data warehouses
- equip students with skills of maintaining existing data warehouses
- equip students with skills of manipulating data warehouses to generate information for business decision making

Learning outcomes:

After successfully completing this course, students should be able to:

- distinguish between on-line transaction processing (OLTP) and online analytical processing (OLAP), and the relationship between these concepts and business intelligence, data warehousing and data mining
- create a simple data warehouse (“data mart”)
- describe how structured, semi-structured, and unstructured data are all essential elements of enterprise information and knowledge management. In this context, the students will learn the principles of enterprise search
- explain how data warehousing combined with good business intelligence can increase a company’s bottom line

- describe the components of a data warehouse and different forms of business intelligence that can be gleaned from a data warehouse and how that intelligence can be applied toward business decision-making
- develop dimensional models from which key data for critical decision-making can be extracted
- sketch out the process for extracting data from disparate databases and data sources, and then transforming the data for effective integration into a data warehouse
- load extracted and transformed data into the data warehouse
- understand the different kinds of data mining algorithms and how they are applicable in different business case studies

Teaching and learning patterns:

This course is supposed to have only lecture hours. But within the 45 lectures hours, students will be offered a range of experiences that includes:

- Large group lectures
- working with team members in small groups (small group tutorials)
- Assignments
- Oral presentations
- Self-assessment and peer assessment
- Electronic discussion forum.

Indicative content:

Building on the transactional database understanding gained in during the pre-requisite courses, this course will cover topics such as;

- Data warehouse concepts: partitioning, granularity, record of source, and metadata
- Building viable decision support environments.
- Architect development,
- Use of operational data stores, and transactional systems
- Data migration and integration,
- On-line analytic processing
- ROLAP vs MOLAP
- Data mining.

Assessment:

Course work (Tests (20%) and practical exercises (20%))

Final written exam: 60%

References:

1. Paulraj Ponniah, 2011. *Data warehousing fundamentals for IT Professionals*, 2nd Edition. Publisher: John Wiley & Sons..
2. David Haertzen, 2012. *The Analytical Puzzle: Profitable Data Warehousing, Business Intelligence and Analytics*. Publisher: Technics Publications Llc.
3. Arshad Khan, 2011. *Business Intelligence and Data Warehousing Simplified: 500 Questions, Answers, & Tips*. Publisher: International Pub Marketing.
4. David Taniar, 2009. *Progressive Methods in Data Warehousing and Business Intelligence: Concepts and Competitive Analytics*. Illustrated Edition. Publisher: IGI Global Snippet.
5. Roland Bouman, Jos van Dongen: Pentaho Solutions: *Business Intelligence and Data Warehousing with Pentaho and MySQL*, 2009.

BIT 2207 IT Law and Ethics (3 CU)

Course Description: This course focuses on introducing students to salient legal aspects in the field of Information Technology. It aims at creating an understanding of the relevance of law to achievement of a successful career in the Information Technology, understanding the law and its impact on Information Technology as well as providing skills needed to respond to daily work challenges without negatively affecting the IT career demands.

The course primarily focuses on creating an understanding of professionalism and its demands in the field of IT, appreciating professional behavior of the IT specialist in the interaction with IT clients as well as appreciating the ethical conduct of professionals in the IT field of practice. The students will be led to appreciate the practical differences between morality, ethics and legality, with the ultimate aim of equipping students with skills and attitudes that will enable them provide professional service to their clients and the public.

Aims:

- The course aims at providing students with:
- A foundation in ethical, moral and legal issues affecting the role IT professionals play in society.
- The basic background to develop their professional role in the workplace, beyond simply performing technical tasks assigned to them.
- The general framework of the practical ethical and legal arena in which students will be practicing their IT skills in a Ugandan context.

Teaching and learning pattern:

Students will be availed with the above mentioned skills through lectures. However emphasis shall be given to discussions. Research shall be encouraged and at times students shall be required to make presentations after assignments that need to test their good judgment under conflicting moral and legal circumstances. Current IT-related legislation and case law will be taught by direct lectures, supported by directed reading. Assignments with strong formative aspects (requiring self-directed research on a topic) will support each of the sections of the course.

Indicative content:

- The course will cover the following areas;
- Understanding morality, nature of ethics and law
- Professionalism and ethical conduct
- Introduction to law and its relevance to the IT theory and practice.
- Legal regulatory framework on computer use and information.
- Computer use and crime.
- Privacy, human rights, data protection and computer use.
- Understanding contract, employment and other salient legal issues with specific emphasis on restraint of trade clauses and agreements.
- Intellectual property and the national and international legal instruments on invention, innovation and computer development.
- Risk and mitigation of risk by computer specialists through insurance and disclaimers.
- Product liability, negligence and provision of competent, professional and efficient service.
- National and international legal frameworks; specific legislation and case law involving IT issues.
- IP law; Data Protection; Computer misuse; Software Licensing, Transitional data flow; copyright protection; Information as a source of economic power; rights to access computer systems; computer crime; data privacy; establishing national priorities in the technical and social aspects of computing
- Legal and ethical issues in E-commerce and electronic trading

Assessment method: Assessment will be in terms of

Coursework (tests and practical exercises , individual Assignment)	40%
final written examination	60%

References:

1. *Computer Ethics: Integrating Across the Curriculum* by Marion Ben-Jacob, Mercy College, ISBN-13: 9780763778095, ISBN-10: 0763778095, CD-ROM, 2010
2. *Pandora's Box: Social and Professional Issues of the Information Age* by Andrew A. Adams and Rachel McCrindle (Paperback - 14 Dec 2007)
3. David Bainbridge, *Introduction to Computer Law* [Pearson Longman, London 2004]
4. Kizza, J. M. *Ethical and Social Issues in the Informational Age*. 2ND edition. Springer-Verlag, New York, Inc. 2003
5. Quirk, P., Forder, J. *Electronic Commerce and the Law*. 2ND edition. John Wiley & Sons Australia 2003 0-470-80238-3

BIS 3201 Information Systems Strategy, Management, and Acquisition (3 CU)

Course description: This course explores the issues and approaches in managing the information systems function in organizations and how the IS function integrates / supports / enables various types of organizational capabilities. It takes a senior management perspective in exploring the acquisition, development and implementation of plans and policies to achieve efficient and effective information systems. The course addresses issues relating to defining the high-level IS infrastructure and the systems that support the operational, administrative and strategic needs of the organization. The remainder of the course is focused on developing an intellectual framework that will allow leaders of organizations to critically assess existing IS infrastructures and emerging technologies as well as how these enabling technologies might affect organizational strategy. The ideas developed and cultivated in this course are intended to provide an enduring perspective that can help leaders make sense of an increasingly globalized and technology intensive business environment.

Aims:

To

- make students Understand the various functions and activities within the information systems area, including the role of IT management and the CIO, structuring of IS management within an organization, and managing IS professionals within the firm
- make students view an organization through the lens of non-IT senior management in deciding how information systems enable core and supportive business processes as well as those that interface with suppliers and customers
- make students understand the concepts of information economics at the enterprise level
- make students appreciate how IS represents a key source of competitive advantage for firms
- equip students with skills for structuring IS-related activities to maximize the business value of IS within and outside the company
- make students understand existing and emerging information technologies, the functions of IS and its impact on the organizational operations
- equip students with skills for evaluating the issues and challenges associated with successfully and unsuccessfully incorporating IS into a firm
- make students understand how strategic decisions are made concerning acquiring IS resources and capabilities including the ability to evaluate the different sourcing options
- equip students with skills for applying information to the needs of different industries and areas
- make students understand the role of IT control and service management frameworks from the perspective of managing the IS function in an organization.

Learning outcomes:

After successful completion of this course, students should be able to:

- describe the various functions and activities within the information systems area, including the role of IT management and the CIO, structuring of IS management within an organization, and managing IS professionals within the firm
- view an organization through the lens of non-IT senior management in deciding how information systems enable core and supportive business processes as well as those that interface with suppliers and customers

- describe the concepts of information economics at the enterprise level
- appreciate how IS represents a key source of competitive advantage for firms
- structure IS-related activities to maximize the business value of IS within and outside the company
- describe existing and emerging information technologies, the functions of IS and its impact on the organizational operations
- evaluate the issues and challenges associated with successfully and unsuccessfully incorporating IS into a firm
- describe how strategic decisions are made concerning acquiring IS resources and capabilities including the ability to evaluate the different sourcing options
- apply information to the needs of different industries and areas
- describe the role of IT control and service management frameworks from the perspective of managing the IS function in an organization.

Teaching and learning patterns:

- Lectures
- Project-like assignments to be done in groups
- Class discussions about the project-like assignments

Indicative content:

- The IS function
- IS strategic alignment
- Strategic use of information
- Impact of IS on organizational structure and processes
- IS economics
- IS planning
- Role of IS in defining and shaping competition
- Managing the information systems function
- Financing and evaluating the performance of information technology investments and operations
- Acquiring information technology resources and capabilities
- Using IS/IT governance frameworks
- IS risk management

Assessment:

Course work (Tests (20%) and take home assignments (20%))

Final written exam: 60%

References:

1. Steve Clark, 2007. *Information Systems Strategic Management: An integrated approach*, 2nd Edition. Publisher: Routledge.
2. Wendy Robson Strategic, 1996. *Management and Information Systems: An Integrated Approach*, 2nd Edition.
3. Effy Oz, , 2008. *Management Information Systems*, Sixth Edition.
4. Lynda Applegate, Robert Austin, Deborah Soule. *Corporate Information Strategy and Management: Text and Cases*

BIS 3207 Emerging Trends in Information Systems (3 CU)

Learning outcome: By the end of this course, students should have an understanding of the current developments in information systems theory, research and practice.

Indicative content: Topics focusing on emerging technologies e.g. social networks, web 2.0, mobile computing, cloud computing, cybernetics etc. will be discussed.

7. RESOURCES AND INFRASTRUCTURE

The School of Computing and Informatics Technology and specifically the Department of Information Systems have sufficient resources and infrastructure to suitably run the program as further described below.

7.1 Sources of funds

Fees payable by the students will enable the University to sustain the Programme.

7.2 Staff

The Department of Information Systems (see list of staff members in Appendix A) in conjunction with other departments in the School of Computing and Informatics Technology have an adequate number of staff who can competently teach the courses.

7.3 Lecture space

The School of Computing and Informatics Technology is housed in the College of Computing and Information Sciences on 2,500 and 12,000 square meter buildings known as Block A and B, respectively. Block A mainly accommodates offices and a few laboratories, whereas Block B has lecture rooms together with the rest of the general and specialized laboratories. The two buildings sufficiently cater for all the lecture and lab space requirements for all the teaching in the school. Specifically CIT has six lecture theatres each of 400 square meters (600 seat capacity); six small lecture theatres of total area 1200 square meters and 1800 square meters of circulation space where students are able to access other services such wireless Internet services.

7.4 Computer laboratories and software

The CoCIS buildings that house CIT, i.e. Block A and B, have general laboratories (for student practice); teaching laboratories and specialized laboratories, that are shared among the four departments. At present, these laboratories have in total approximately 2000 computers. In Summary, SCIT has got six computer laboratories each of 800 square meters (1000 seat capacity) and six small laboratories of total area 1200 square meters. More lab details can be found on the School website: <http://cit4.mak.ac.ug/timetables>

At the same time, the School has an approximation of 6000 students' which makes the student to computer ration 1:3. This is adequate for the practical components of the curriculum.

In addition to the physical computers, different software is installed for usage by students depending on their focus. Most of the software is available as free distributions for academic purposes. The School and department therefore have (and can access) enough software that can run the practical aspects of the program.

7.5 Library services

Makerere University Library supports the College of Computing and Information Science Library which is located on the First level of Block B Building. The College Library is stocked with up-to-date information resources. The information resources in the College Library have been acquired through purchases made by Makerere University Library and the College of Computing & Information Sciences. In addition to this facility, the University Library provides access to print books, print journals, electronic journal databases, a well-stocked reference section and connections to many remote databases like the Uganda Scholarly Digital Library at <http://dspce3.mak.ac.ug>. The print collection is beefed up by the broad variety of electronic resources provided by the University Library and accessible online at <http://muklib.mak.ac.ug>. Through the Document Delivery Service which is provided by the University Library, users who fail to get access to full-text articles from the available databases can make requests for the articles and these are delivered to them at no cost. Library users can also access the Online Public Access Catalogue (OPAC) to get bibliographic information about the collections found in the College Library at <http://196.43.133.123:8080>.

8. QUALITY ASSURANCE

Several activities will be carried out as quality assurance measures so as to:

- (a) Measure the general extent to which the required skills have been achieved
- (b) Ascertain the implementation of the proposed methodological changes
- (c) Create feedback bench marks for possible future revisions in the curriculum

The following activities will be carried out in the process of monitoring and assuring quality in the program.

8.1 Feedback from enrolled students

In the current setup, each class has one student representative. These representatives are in constant contact with the Head of Department in case there are any quality-related matters in a particular class. This setup is to be maintained.

In addition, at the end of each semester, samples of students from respective classes/years are given questionnaires to respond to several quality-related matters like staff punctuality, delivery mode, course content and the general perceived usefulness of the course unit.

The School of Computing and Informatics Technology has a computerized system that captures and analyzes data collected from the students. With the computerized system:

- (i) Every student is required to assess every lecturer teaching him/her which implies that there is a large sample space.
- (ii) No time is required in the analysis of the results. Staff and School management are able to get the feedback instantly
- (iii) Data is easily archived and therefore the trend of staff performance in the respective areas is easy to determine.

8.2 Class Meetings

The School management makes at least two meetings with every class every semester. In this meeting, general quality issues are addressed. Students are also given a chance to raise any questions that are answered and/or addressed by the department management. This setup will also continue.

8.3 Use of ICT in availing lecture materials

Currently, Makerere University has the Makerere University E-Learning Environment (MUELE) on its intranet which is also accessible anywhere in the world via the following URL: <http://muele.mak.ac.ug>

Students in the Department of Information systems have adequate access to computers. This creates conducive environments for e-learning and blended teaching. All courses in this curriculum will be taught in a blended way. All course materials will be put on MUELE. Staff will, as much as possible, make use of e-learning facilities like discussion forums and drop boxes for assignments. This will increase student activity/participation and reduce staff effort (e.g. staff will not need to dictate notes). This will result in an increase in the material covered and taken in by the students.

8.4 Peer review

Courses Leaders and other members of Staff in the Department will enroll (as students) to all classes taught in the department. Course Leaders will advise fellow staff on the content, depth and presentation of materials for the courses taught. Consequently, for every course, students will access the best material provided on the online platform which is also viewed by all staff in the Department. But the course instructor shall be excluded in this view.

8.5 External examiners' reports

Like it is everywhere in Makerere University, students' exams are reviewed by senior external examiners. This is to bring a 'foreign view' of the quality of the examination. External examiners write reports on their view of the curriculum and examinations. Recommendations for the students about their exams can be implemented immediately or in a longer term. The department makes the maximum possible use of external examiners' reports as a means of assuring quality in the program.

9.0 Appendix 1 Staff List

Name	Qualifications	Position	Specialisation
Patrick Ogao	MSc. PhD	Assoc. Professor	Computer Science
Josephine Nabukenya	Msc, PhD	Senior Lecturer/Dean	Information Systems
Rehema Baguma	Msc, PhD	Senior Lecturer/ Chair	Information Systems
Agnes R. Semwanga	Msc. PhD	Senior Lecturer	Information Systems
Peter Nabende	PhD	Lecturer	Computer Science
Peter Khisa Wakholi	MSc./PhD student-finalist	Lecturer	Information Systems
Mercy Rebecca Amiyo	MSc. PhD	Lecturer	Information Systems
Emily Bagarukayo	MSc., PhD	Lecturer	Information Systems
Agnes Nakakawa	MSc, PhD	Lecturer	Information Systems
Irene Nakiyimba	MSc. PhD Student finalist	Asst. Lecturer	Information Systems
Fiona Ssozi Catherine	MSc. PhD student	Asst. Lecturer	Information Systems
Richard Mayanja	MSc	Asst. Lecturer	Information Systems
Hasifah Namatovu Kasujja	MSc	Asst. Lecturer	Information Systems
Grace Kobusinge	MSc	Asst. Lecturer	Information Systems
Mark Magumba	MSc	Ass. Lecturer	Information Systems
Asio Evelyn Kalenzi	MSc	Assistant Lecturer	Information Systems
Irene Arinaitwe	Msc. student	Teaching Assistant	Information Systems
Katende Jacob	Msc. student	Teaching Assistant	Information Systems