National University

الجامعة الوطنية ـ السودان

National University Sudan

FACULTY OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

Undergraduate & Graduate

PROSPECTUS

National University - Sudan

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Welcome

Note from The President of NUSU

[www.nu.edu.sd]

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This is the 5th Edition of the PROSPECTUS of the National University-Sudan (NUSU). In this document registered students will find information about the mission, vision and values of NUSU, and all programme details and activities. This edition includes both UNDERGRADUATE and GRADUATE course outlines. NUSU aims at high-class education in medical, technological and social sciences. This is reflected in this comprehensive outline. It describes the basis of NUSU's educational philosophies, programme objectives including the characteristics of the graduate, strategies and methods, degree structure, semester duration and credit hour load, and brief outline of content. This represent a narrow window into the complex organization of NUSU. More information on the rationale of modules, behavioural objectives, and assessment can be found in the curriculum of each Faculty. The calendars, year plans and timetables are issued for each semester with the exact dates for teaching sessions, other learning opportunities, assessment, feedback, and holidays.

NUSU is now 19 years old. It is still developing, and trying to set traditions of availing all activities in its publications, that may remain relevant for 3-4 years, before new editions are issued. The councils and committees of NUSU, while compiling this, are drawing their experience from lo-

cal and worldwide, up-to-date educational practices. Concurrently, other documents (Student Manual, Staff Handbook, Induction packages, and policies and procedures) are re-written and updated, in view of the emerging concerns about student welfare, environment, students with special needs, and virtual online educational resources.

There is a strong focus on synergy between modern education, developmental needs, and employment market requirements. This has laid down a wide area of maneuvers in the choice of specific disciplines and modules. In each discipline, a detailed career advice has been added in this edition to show students the opportunities available if they choose to be employed or opt to start their own business to employ others.

The reputability of NUSU has attracted students from about 25 countries and all continents. This representation requires quality of premises and services, as well as understanding of diversity, inclusiveness, and considerations for non-discrimination in the educational activities and campus life. International students and the Sudanese students whose families are living outside Sudan, receive special induction, supervision, and directives by the Deanship of Student Affairs, and regular courses shown in this prospectus as Sudanese Studies.

It is my pleasure to invite all qualified students to join NUSU's exciting new and innovative educational programmes. Students, parents, and sponsors are welcome to visit the campus. They will receive guidance from the HELP DESK at the Main Gate. They will be escorted to buildings and connected with the leadership of the university or faculties. Our primary target is to create guest satisfaction. Your comments and feedback are important for us to continue improvement to meet our goals.

Last, but not least, we would like to invite our higher education colleagues, inside and outside the Sudan, to read this publication. Our special request: please have a critical look at this and show us our faults. You may suggest means of correcting them, and tell others about the positive and bright spots of this attempt. Your advice will be highly appreciated.

Prof. Qurashi M. Ali PhD, MD, FRCPE
President, National University, Sudan

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ACKNOWLEGEMENTS

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Worldwide, the overall innovations and their modifications stem from the efforts of Professor Bashir Hamad. Every page of our documents could not be finalized, or brought to fruition, without his fatherly approval and comments or traces of his educational spirit. His direct and indirect contributions to the curriculum of this University and continuous encouragement are gratefully acknowledged, particularly those related to educational strategies, instruction, and evaluation. The following have reviewed and reorganized the final versions of this prospectus: Prof. A/Rahman Eltom MD,PhD, Prof. A Rahman Biri MD FRCP, Prof. Elthami Abdul Mageed PhD, (medicine), Hassan M. Ali PhD, Dr. Ahmed Abusham PhD and Dr. Salah Ibrahim PhD, and Dr. Fatma Mukhtar MSc. (pharmacy), Dr. Kamal Khalil MD.Dr. Elfatih A Mageed MD (physiotherapy), Dr. M. A. Siddiq PhD. Prof. Awad Haj Ali PhD. (computer and health informatics program), Prof. Ibrahim Ghandor and Dr. Abdalla Darous, Dr. Enas Badawi PhD, Dr. Arif Affan (dentistry), Prof. Sayda H. Elsafi MD, PhD and Dr. Nihal Mirza MD, Dr. M. Sirelkhatim, Dr. M. Abdelgadir, Dr. Maha Magoub (medical laboratory sciences), Dr.Abdel Moneim Saeed PhD, Dr. M. A. Elsheikh PhD Dr. Elsir Ali Saeed PhD, Dr. M. Elfadil PhD, Prof.Maha Esmeal (imaging technology), Prof. Awatif Ahmed PhD, and Ms. Fatma Bhruddin MSc, Dr. Sumia Ibrahim PhD (nursing and midwifery), Prof. Salih Faghiri PhD, Prof. Omer Elmagli PhD, and Prof. Hassan Kamal PhD, Dr. M. A. Osman, Dr. Mutaz Suliman, Dr. A Azim Almahal PhD, and Prof. A Gadir M. Ahmed PhD (management sciences). The contributions of Dr. Nadir Hasanain {Engineering) , Prof. A Latif Elboni and Dr. Ibrahim Mirghani (International Relations) are outstanding.The list, of those who, knowingly or unknowingly, contributed curricular details or ideas registered in Editor's memory or documents, is exhaustive. Our thanks are to the following professors: A/Hameed Lutfi, M.Y. Sukkar, Elbagir Ali El Faki, Amir El Mubarak, Omar Abdul Aziz, Othman Taha, Othman Khalafalla, Ali Habbour, Omar A. Mirghani, Awadelseed Mustafa, Mubarak Majzoub, M. Awadalla Salih, Hafiz El Shazali, Jaafar M. Malik, Othman Hamour, Ali Karar, A/Alla A/Wahid, El Tayeb Abdul Rahman, Eisa Othman El Amin, Mamoun Homeida, Hassan M. Ahmed, Ali Abdul Rahman Barri, Ibrahim M. A/Rahim, Ahmed A. Muhammadani, Mukhtar El-Khatim, A/Rahman A/Hafeez, Sayed M. Ahmed, Awad A/Rahman El-Awad, M. Elamin El-Sharif, Kamal Zaki, A/Rahman El-Tom, Ghazi Salahuddin, Bakri Osman Saeed, Mohyddin Majzoub, Jamal Suleiman, Abbas ElKarib, ElGamri ElRadi, Salah M. Omer, Majid Mustafa, Muzamil Hassan A/Qadir, M. A/Rahim A/AAl, Khalid Musa, Bakri Musa Abdul Karim, Tahir Othman Ali, Omar Siddiq, Fathel Rahman Ahmed Ali, A.Moneim Sahal, Omar Habbal, Mickell Seefldt, Ara Tekian, Margaret Uguroglu, Saleh A. Al Damegh, Zeinel Ab-

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Most of the "Dentistry Curriculum" has been adapted, with permission, from experts all over the world, mainly deans and heads of departments in the Sudanese dental colleges, and institution in dental sciences. The outstanding effort of professors Ibrahim Ghandour, Yahya Eltayeb, Ibrahim Elkamil, Osman Elgindi, Ahmed Suliman, Abbas Ghariballa, Nadia A. Yahia, Elnur Ibrahim and the improvements made by Enas Badawi, Eman Khair, and Suha A/Gadir is gratefully acknowledged.

The Engineering curriculum has been designed by committees headed by Dr. Nadir Hasanain as dean and head of civil department, and valuable contributions by Prof. Seifeldin Sadig. The International Relations and diplomatic studies curriculum has been written first by Dr. Ibrahim Mirghani and has been edited and adapted to the national requirements by Prof. A Latif Albouni and Bakri A/Karim.

The whole idea could not have seen the light without the encouragement of the Investors' Corporation and Board of Trustees of the National University, who spend days every week responding to routine and emerging issues of financing. On their behalf, I would like to thank the genius and friendly contribution of Mr. Zahir Twahry for his artistic preparation of the 3rd and 4th editions and other NUSU publications. The final editing of most of the undergraduate manuscripts has been skillfully and patiently carried out by Prof. A Rahman Osman Beeri Former Secretary of Academic Affairs. The graduate prospectus has been compiled by Prof. M. M. A. Abulnur, Dean of Graduate Studies and Scientific Research, and Dr. M. Abd Al Kader and Dr. Hatem Al Rufaai.

WHAT IS THE NATIONAL UNIVERSITY?

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1. MISSION, VISION AND VALUES

The **VISION** of the National University is to be a world-class leading provider of private higher education in the Sudan, in the aspects of elegance of environment and structures, excellence of curricula and learning strategies, quality of management systems, commitment of investors and employees to customer satisfaction (students, relatives, and regulators), distinguished graduates in academic achievements, general ethical standards, and concern with professionalism and original research production.

The **MISSION** is to: (1) constantly strive to provide efficient and best-in-class professionals, in their specialties, (2) meet and exceed our customer needs and expectations, and (3) stay ahead of the competition by creating safe and rewarding workplace facilities and innovating new quality output, services, and relationships in transparent, honest, and fair business.

The **VALUES** are : (1) obligations to treat the public and one another with personal and professional integrity, consideration, and mutual respect, (2) commitment to honesty, truthfulness, respect for human dignity, and professional ethical behaviour, (3) fair treatment of all citizens and employees, with no discrimination on the basis of morphology or ideology (4) promotion of democratic values, hard work, perseverance, commitment to success, accepting responsibility and accountability for one's conduct and obligations, and (5) creating and maintaining a respected reputation and positive image in the community as a trusted partner through excellent care of the individual and family, and responsibility towards the community and environmental problems and concerns.

2. DOCUMENTS

The legal documents of the University include: (1) the University Charter, (2) Academic Regulations (3) Rules of Activity and Conduct (4) Study Fees' Regulations, (5) Employment Regulations, (6) National Employment Penalty Regulations, (7) Contracts and Salary Scale, (8) Job Descriptions, (9) Staff Handbook, (10) Students' Manual, (11) Quality Manual, (12) Teaching, Learning and Assessment Policy, (13) Prospectus and Curricula, (14) Organizational Chart, (15) Committee Structure, (16) Logbooks of students' skills and activities, (17) Year Plans, (18) Academic Calendars, (19) Programme Evaluation Forms, (20) Portfolio of Architectural and Structural Designs of Buildings, (21) External Examiners' Appointment, Reporting and Response documents and (22) numerous policies and procedures in areas of quality, safety, and non-discrimination.

3. BOARD OF TRUSTEES

The Board of Trustees (BOT) is formed according to the Charter to include the investors, the academicians, the representative of the Ministry of Higher Education, and public figures of interest in education or eminent individuals involved in social accountability issues of universities. The current BOT is chaired by Dr. Taha Eltayeb A. Elimam, and includes in its membership: Prof. Qurashi M. Ali, Dr. Amin O. Sidahmed, Dr. M. Sirelkatim Ali, Prof. A-Rahman Osman Beeri, Prof. Osama A-rahman Elamin, Eng. M. Awadelkarim Elgasim, Dr. Saad Subahi, Dr. Elhadi Bakheet, Eng. Yousif A. Yousif, Prof. A-Moneim Algousi, Dr. Ismail Qurashi, Prof. Hassan M. Ali, Deans of faculties, and representatives appointed by the Ministry of Higher Education and approved by the President of the Sudan.

4. RIGHTS

4.1 GENDER RIGHTS

Throughout this manual (and the webpage) every effort has been made to use he/she, his/her, him/her. It may not be possible to assure that this fair use has been consistent. Any such unintended mistake should be taken to mean both sexes. Females have been addressed in situations of special concerns, in gender-specific issues, mainly out of respect for their specialized roles.

4.2 EXCLUSION OF LIABILITY AND DISCLAIMER

Throughout this manual (and the webpage) every effort has been made to ensure that expert, accurate, and up-to-date guidance has been included. The administrative and academic authority continuously updates the NUSU data and academic regulations to satisfy the emerging needs, more quickly than publications would reflect. Approved changes are shown at the official noticeboards of the University. Accordingly, neither the Ministry of Higher Education, nor the NUSU administration, shall be liable to any person or entity with respect to any loss or damage caused or alleged to be caused by the information contained or omitted from this manual (or the webpage).

4.3 COPYRIGHTS

a. The curriculum timetable and course details resemble many of those (or may contain parts) in other colleges in which the "President of NUSU" has been the main or essential member in the bodies responsible for curriculum design and evaluation. In many institutions he has been one of the driving forces for innovation. These institutions include: University of Gezira (Sudan), Sultan Qaboos University (Oman), Omdurman Islamic University, Alzaeim Al-Azhari University, University of Medical Science and Technology, African International University, National Ribat University, Al-Razi University (Sudan), and Al Qassim University (Saudi Arabia). Major innovations have been added to improve on the experience of the above institutions. This manual (and the webpage), in addition to comprehensive compilations in each program document (to be given to each student) is an entity of its own. Therefore, the total set of details, which is not available in any other institution so far, may not be

copied or published without written permission from the National University- Sudan.

b. The teaching material available in the webpage, and other published material in the University notes, is original and should not be reproduced for commercial use, in any form without written permission of the National University- Sudan. Non-profitable teaching purposes are allowed. Our teachers and colleagues, who are mentioned in the "Acknowledgements", are free to use this material because it is all from them, we could not single out what is ours from theirs.

5. ENTRANCE REQUIREMENTS

A. Applications must be through the Ministry of Higher Education (Sudan) Admission Directorate, based on passing a fresh Sudan (or equivalent) School Certificate or equivalent qualification (please see relevant booklets provided at that office). Older 5-10 years' School Certificates may be considered, if vacancies are there, and details are approved by the Admission Office. The newly introduced online application dismiss disqualified applicants automatically.

B. Direct applications are welcome, but will be entered online by the University to the Admission Directorate for approval.

C. International applications will be processed similarly, but candidates are advised to follow the application procedure in the webpage, and wait for a response, before arriving in the Sudan. The NUSU Administration takes 5 working days (after receipt of application) to finalize acceptance. Electronic communication is preferred. For security reasons. A student who is granted acceptance by the NUSU will NOT be allowed by the Ministry of Internal Affairs to transfer to any other university after arrival, except after studying and passing, at least, one academic year..

D. Mature students qualified with a previous health science professional degree may be considered. In this case early application is recommended (6 months before national intake in September every year), because of the time it may take for the approval of the School Certificate by Ministries of General Education and Higher Education, Sudan.

E. Final decision on acceptance depends on the results of an interview to confirm if the student has the aptitude to join a specialty, and is free from physical and psychological inabilities that are not compatible with the responsibilities of a specific or hardship profession. But individuals with special needs are welcome and will find NUSU a conducive environment of values against discrimination.

F. Transfer NUSU from other universities may be considered for enrollment in Semesters 2, 3, 4 or 5 only, based on the approval of the General Directorate of Admission in the Ministry of Higher Education.

6. STAFF AND RECRUITMENT

Academic and administrative staff interested in joining the National University-Sudan, may show their intention by filling the e-recruitment form included in the webpage. A response will be sent

by e-mail within 48 hours, and further instructions will follow. Appointment of academic staff is based on academic excellence in the areas of research and teaching. Academic applicants with no research records or grants will not be considered for full-time positions in this university. Full- and part-time staff list may be looked up in Academic Staff section of the webpage.

Applicants interested in joining other private educational institutions in the Sudan can reach them through our web-page. The employment conditions and salary scale are not (currently) available in this manual or website.

7. LOCATION AND MAPS

A. The Country: The best advantage of this National University is that it is located in Sudan, an Afro-Arab country with rich human and natural life resources. The inhabitants are either Arabs or Africans.. The Sudan educational institutions are known, worldwide, for their academic excellence, ethical heritage and professional teaching perfection. A Sudanese national, wherever he/she may be is unique in considerateness, courtesy, and hospitality. In almost 80% of the country, it is the safest in the world. A single lady can jog in Khartoum, or any other city, in the middle of the night unbothered. Sudanese abide voluntarily by strong moral codes and respect for females as foreigners. The media-nourished concepts of North-South or West-East conflicts have largely exaggerated the reality. The color of people has no significance in this country, maybe the only country in the world where color has never and can never be a real cause of conflict. Media are prototyping other countries' dilemmas on a local setup that has got some developmental problems. It is interesting that the Arabs in this country are mainly non-white, and the non-Arabs are not necessarily black, contrary to what the media have publicized. The luckiest person in the world, any moment, is the one who has been received by a Sudanese host.

Prot Sudan

Khartoum

B. The City: The capital is Khartoum, a city made up of three cities striding the White Nile, Blue Nile as they join to form the River Nile. This has given it unique panoramic landscapes and scenery. There are about 4-6 million inhabitants, mostly in traditional houses, known for their spacious yards. Khartoum city is the official capital crowded with governmental offices, ministries, embassies and international organizations. There are some affluent districts where the price of a house may be as expensive as in New York or Tokyo, and other areas of modest housing. Therefore students have a wide range of choice. Transportation used to be a problem, now it is quite easy, but still, students are advised to find accommodation as near as possible to the University premises.

C. Premises and Environment : (See map). The National University permanent building is located in the Eastern part of Khartoum called Al Raqi District, near the Khartoum-Medani Highway, in an affluent newly established residential area. This region has an interlacing and frequent network of transport, yet the wide roads give no impression of crowdedness, or noise pollution. This accessibility is an invaluable asset for an educational institution. The University block, a purpose-built structure, assumes a masterpiece of architectural innovation (see pictures). The National University is open to students and staff for 18 hours on weekdays and 6 hours on weekends. The library, self-directed learning facilities are available for registered students and staff. Limited access to research laboratories is allowed for certain students who are involved in staff's research projects. Certain sport facilities (Basket- ball and volleyball) are within the premises. In-door recreational facilities are available in the Cafeteria. The source of pride for the University is the design of its beautiful, environmentally friendly, and durable facilities that support its mission. Students and employees are expected to respect and work towards achieving that. Directives from them to their visitors are very important to maintain and improve the level of standards of perfection we intend to reach. There are few similar, or near, buildings of excellence of space and quality, so far, in higher education institutions in the Sudan.

   A 10-floor teaching hospital building stands next to the main University block and accommodates over 300 beds with full tertiary care facilities. A 5-floor building accommodate the Faculty of Engineering. NUSU owns a 35000 M2 area in Albagair Suburban Area, in which a new campus is being built. It includes a rural hospital.

8. PROGRAMME FEES

A list of tuition fees is published by the MHESR every year. Private institutions keep updating such list, but a student accepted in one particular academic year will NOT be charged with the fees published for fresh students. Fees cover teaching and administrative activities of the University including laboratories and in-campus training. Accommodation and food subsidies are NOT included. Transportation to and from the University or off-campus training sites is NOT included, but the University tries to provide that for selected activities. Additional fees are variable for compensations of absence or failure. Students pay for all courses Training outside the campus and examinations [substitute or supplementary], scheduled in the Summer or Holidays, based on the credit hour load of the courses. Fees for such compensations are usually not published in Academic Calendar, but requested by students or their sponsors.

Background

The Faculty of Computer Science and Information Technology at the National University of Sudan (NUSU-CS IT) strives to be a leading centre of excellence in education and research in the field of computer science and information technology at both the national and international levels.

The college focuses on producing competent and innovative graduates in the field of computer science and information technology through distinguished educational programmes supported by scientific research and innovation. The college is committed to advancing scientific research in the field of computer science and information technology, developing technology, and contributing to the progress of society.

The college emphasises the importance of critical thinking, lifelong learning, and strong partnerships with academic and industrial institutions. The college upholds core values such as integrity, innovation, and respect, and seeks to maintain its leading role in advancing information technology in society.

Since 2015, NUSU has been accredited by the British Accreditation Council (BAC). These accreditations have enhanced the institution's international reputation and standing. To date, three cohorts have graduated.

Our Vision

The Faculty of Computer Science and Information Technology at the National University of Sudan (NUSU-CSIT) aims to establish itself as a premier centre of excellence in computer science and information technology education and research, both nationally and internationally. Its goal is to provide innovative, knowledge-based education and training in computer science and information technology that encourages critical thinking, creativity, and cultivates skilled and innovative IT professionals. The college is dedicated to promoting high-quality research in computer science and information technology and forging lasting collaborations with com-

munities, industry organisations, and academic partners to advance technology, innovation, and sustainable development.

Our Mission

The College of Computer Science and Information Technology at the National University of Sudan (NUSU-CSIT) is committed to fostering academic excellence, advancing scientific research in computer science and information technology, and promoting social responsibility within a student-centered educational environment. The college seeks to develop competent and innovative IT programmers dedicated to lifelong learning and knowledge-based practice. Graduates are expected to be innovative, critical thinkers who can respond to the technological needs of diverse communities and are equipped to tackle local, regional, and global technical challenges. In partnership with IT systems and the broader community, the college aims to make meaningful contributions to improving and developing information technology and promoting sustainable technological solutions.

Our Values

The core values of the College of Computer Science and Information Technology at the National University of Sudan (NUSU-CSIT) include:

- A commitment to addressing community technology challenges and providing solutions with effectiveness and responsibility.
- Upholding honesty, truthfulness, and respect for user data privacy and rights in all actions.
- Ensuring fair treatment for all people and staff, without discrimination based on ethnicity, appearance, religion, or ideology.
- Promoting democratic principles, hard work, perseverance, dedication to success, and accepting responsibility and accountability for one's conduct and obligations.
- Maintaining a reputable and positive community image as a trusted partner by providing innovative and secure technical solutions, while being prepared for accountability

Our Objectives:

- To graduate practitioners holding a Bachelor's degree in Computer Science and Information Technology, who possess strong technical skills and a community-oriented approach, along with ethical and professional commitments.
- To enhance scientific research in the field of computer science and information technology by leveraging the university's facilities and communication capabilities.
- To contribute to community development by providing technical services through its institutions and collaborating organisations, thereby supporting overall societal well-being.

- To participate in the design and implementation of technical programmes and projects by utilising the expertise of its specialists and consultants.
- To promote continuous education by organising local and international courses, workshops, and conferences aimed at improving the skills and efficiency of IT professionals.
- To ensure the availability of essential equipment and software to elevate the quality of IT services, through partnerships with relevant government agencies and organisations.

Departments

The faculty of Computer Science and Information Technology consists of two main departments:

Department of Computer Science

Focuses on studying the theoretical foundations and programming aspects of computer science.

Department of Information Technology

Focuses on studying computer applications, networks, and information systems.

These departments work together to provide comprehensive and integrated technical education, aiming to graduate specialists in computer science and information technology who are capable of facing technical challenges in society.

Administration

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Faculty Dean

Dr. Hiba omer ali

Deputy Dean

Mrs. Laila

Registrar

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First Year - Semester One

#	Course Title	Code	Credit Hours
1	Computer Applications	COM-111	3
2	Principles of Information Systems	INF-112	3
3	English for Specific Purpose I	HMS113	3
4	Calculus I	MAT114	3
5	Introduction to Computer Science	COM115	3
6	Discrete Mathematics	MAT116	3
7	Principles of Economic	HMS117	3
			21

First Year - Semester Two

#	Course Title	Code	Credit Hours
1	File Management	COM121	3
2	Introduction to Databases	COM122	3
3	Computer Maintenance	INF124	2
4	English for Specific Purpose II	HMS123	3
5	Principles of Accounting	HMS125	3
6	Principles of Programming	COM126	3
7	Algebra and Geometry	MAT127	3
8	Calculus II	MAT128	3
			23

Second Year-Semester Three

#	Course Title	Code	Credit Hours
1	Digital Systems	COM211	3
2	Programming Methods (1)	COM212	3
3	Differential Equations	MAT213	3
4	Multimedia	INT214	3
5	Database Concepts	COM215	3
6	Statistics & Probabilities (1)	MAT216	3
7	System Analysis & Design (1)	SYS217	3
8	Numeric Computation (1)	MAT218	3
			24

Second Year-Semester Four

#	Course Title	Code	Credit Hours
1	Computer architecture and organization	COM221	3
2	Human - Computer Interaction	INT222	3
3	Statistics & Probabilities (2)	SYS223	3
4	Database Programming	COM224	3
5	Algorithms and Data Structure	COM225	3
6	Numeric Computation (2)	MAT226	3
7	Operational Research	MAT227	3
8	Internet Technology	INT228	3
			24

Third Year- Semester Five

#	Course Title	Code	Credit Hours
1	Programming Methods (2) (OOP)	COM311	3
2	Computer Networks and Communications	INT312	3
3	Database Applications	SYS313	3
4	Software Engineering (1)	SWE314	3
5	Visual Programming	COM315	3
6	Algorithms Analysis and Design	COM316	3
7	Compilers Design	COM317	3
			21

Third Year- Semester Six

#	Course Title	Code	Credit Hours
1	Software Engineering (2)	SWE321	3
2	Operating Systems Concepts	COM322	3
3	Open Source Software & Technologies	INT323	3
4	Research Methodology	HMS324	3
5	Computer Graphics and Visualization	COM325	3
6	Data Mining	COM326	3
7	E-commerce	INT327	3
			21

Fourth Year - Semester Seven

#	Course Title	Code	Credit Hours
1	Information Security	INT411	3
2	Parallel and Distributed Computing	COM412	3
3	IT Project Management	INT413	3
4	Artificial Intelligence	COM414	3
5	Simulation and Modeling	COM415	3
6	Elective (1)	COM416	3
			18

Fourth Year - Semester Eight :

#	Course Title	Code	Credit Hours
1	Mobile Device Programming Technologies	INT421	3
2	Professional Ethics	HMS422	2
3	Elective (2)	HSC423	3
4	Elective (3)	HSC424	3
5	Graduation Project	COM425	6
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Course Outline

Detailed behavioral objectives, skills, assignments and problems are listed in each course book. The lists are too extensive to be included below Courses in the curriculum timetable not outlined below are included in other programmed, or in the original document with the program coordinator.

Semester One

Title	Code	Semester/Duration	Credits
Calculus -1	MAT114	1/Longitudinal	3(2,2,0)

This introductory calculus course covers differentiation and integration of functions of one variable, with applications. Topics include: Concepts of Function, Limits and Continuity, Differentiation Rules, Application to Graphing, Rates, Approximations, and Extremum Problems, The Fundamental Theorem of Calculus, Applications to differentiation

Title	Code	Semester/Duration	Credits
Introduction to computer science	COM115	Longitudinal/1	(2,0,3)3

The course provides students with a broad foundation in computer science. Topics include:

introduction to digital technology, historical review; logic gates; binary, octal, and hexadecimal systems; computer architecture and basic components, internal and external interfaces, types of removable media; introduction to operating systems; programming Paradigms, basic programming concepts; concept of algorithm, representation, correctness and performance of algorithms; introduction to objects. The course equips students with basic problem solving skills and prepares them for taking the programming sequence subjects and other computer science disciplines.

Title	Code	Semester/Duration	Credits
Discrete Mathematics	MAT116	Longitudinal/1	(2,2,0)3

Propositional Logic, Predicate Logic and Quantification, Methods of Proof, Sets and Functions, Arithmetic Algorithms, Growth of Functions, Computational Complexity of Algorithms, Integer properties and Matrices, Mathematical Induction, Recursion, Sequences and Summations, Program Correctness, Graphs and its Applications, Trees and its Applications, Languages and Grammars, Finite-State Machines, Automata and Language Recognition, Turing Machines

Title	Code	Semester/Duration	Credits
Principles of Economics	HMS117	Longitudinal/1	(3,0,0)3

The course topics: Language of Economics, Types of Economies and Economic Systems and

Institutions, The Graph – Tool of the Economist: A Math Review, Production Possibility Frontiers – Opportunity Costs and Efficiency, The Market Economy – Supply and Demand Consumer and Producer Surplus, Elasticity of Supply and Demand, Individual Choice: The Theory Behind Demand, Theory of the Firm: Supply Production, and Costs, Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly, and Strategic Pricing, Wage and Interest Determination, The Government in the Economy

Semester Two

Title	Code	Semester/Duration	Credits
Principles of Accounting	HMS125	Longitudinal/2	(2,2,0)3

Course Orientation: Overview of classroom policies and expectation, Introduction to Accounting and Business, Analysing Transactions, The Adjusting Process, Completing the Accounting Cycle, Accounting for Merchandising Businesses, Nature of Merchandising Business, Financial Statement s for a Merchandising Business, Merchandising Transactions, The Adjusting and Closing Process, The Periodic Inventory System, Inventories, Control of Inventory, Inventory Cost Flow Assumptions, Inventory Costing Methods,Reporting Merchandise Inventory in the Financial Statements, Estimating Inventory Cost, Cash, Bank Reconciliation and Petty Cash.

Title	Code	Semester/Duration	Credits
Principles of Programming	COM126	Longitudinal/2	(2,0,3)3

- Computer structure and Algorithms (Computer structure. Low and high languages, Compiling, running and debugging)
- The components of JAVA language (Types in JAVA, variables, assignment and conditional statements)
- Loop statements (The FOR statement, the WHILE statement, the DO-WHILE statement and casting)
- Arrays (Arrays declaration , multidimensional arrays, Class String and string methods.)
- Methods in Java (Principles of procedural programming. Top-down design of a program, modulation, passing parameters to method, static methods)
- Sorting and searching algorithms (Selection sort, insertion sort, bubble sort,Searching methods)
- Recursion 1 (Recurrence as an alternative to iteration. Different kinds of recursion)
- Recursion 2 (Recursion and arrays Towers of Hanoi problem)
- Principles of object-oriented programming(OOP) (Class definition: attributes and methods, Constructors (copy, default), Setter and Getter methods, references to object, encapsulation)

- Inheritance (Creating subclasses, overriding methods, class hierarchies)
- Collections, composite objects, self referential objects (Dynamic data structures:stack, linked lists, two way linked list)
- Advanced Input /Output: Streams and Files (Basic file manipulations in JAVA)
- Review (Review on the whole material following above)

Title	Code	Semester/Duration	Credits
Linear Algebra and Geometry	MAT127	Longitudinal/2	(2,2,0)3

This course cover: Linear equations and matrices,Vector spaces, Linear transformations.Inner products, orthogonalisation and projections, *QR* factorisations, reactions.Determinants. Eigen values and eigenvectors. Orthogonal transformations. Symmetric matrices and quadratic forms, canonical forms for conics and quadrics, principal axes, diagonalisation of a quadratic form by completing the square and Sylvester's Law of Inertia. The Cayley-Hamilton Theorem. Jordan forms. Functions of matrices, Systems of ordinary differential equations.

Title	Code	Semester/Duration	Credits
Calculus-2	MAT128	Longitudinal/2	(2,2,0)3

This introductory calculus course covers integration of functions of one variable, with applications. Topics include:

- Concepts of Integration,
- Definite and Indefinite Integration
- The Fundamental Theorem of Calculus
- Applications to Geometry: Area, Volume, and Arc Length
- Applications to Science: Average Values, Work, and Probability
- Techniques of Integration
- Approximation of Definite Integrals, Improper Integrals, and L'Hôspital's Rule

Semester Three

Title	Code	Semester/Duration	Credits
Digital Systems	COM211	Longitudinal/3	(2,2,0)3

This course introduces students to the basic concepts of digital systems, including analysis and design. Both combinational and sequential logic will be covered. Students will gain experience with several levels of digital systems, from simple logic circuits to hardware description language and interface programming in C.

The following topics will be covered:

Number systems, Boolean algebra, Binary arithmetic, Logic gates, Programmable logic, Combinational logic and building blocks, Synchronous sequential circuit design, Latches, flip-flops, registers and counters , State machines, Verilog and C programming

Title	Code	Semester/Duration	Credits
Programming Methods	COM212	Longitudinal/3	(2,0,3)3

- Review of control structure, functions, and primitive data type
- Arrays, Multi-dimensional arrays, More about methods, Exceptions, Recursion, Classes & Objects, Inner classes. I/O techniques in java, File and other related classes(streams). Strings, String processing and data representing in memory

Title	Code	Semester/Duration	Credits
Differential Equations	MAT213	Longitudinal/3	(2,2,0)3

- First-Order Differential Equations
- Separable Equations & Applications
- Linear Equations & Applications
- Second-Order Differential Equations
- Introduction
- General Solutions
- Homogeneous Equations
- Free Mechanical Vibrations
- Nonhomogeneous Equations
- Forced Mechanical Vibrations
- The Laplace Transform
- Laplace Transform & Its Inverse
- Transforms of Derivatives and IVPs
- Shifting Theorems
- Discontinuous Inputs

Title	Code	Semester/Duration	Credits
Multimedia	INT214	3/Longitudinal	3(2,0,3)

Topics include Fundamentals of multimedia, media and data streams, sound/audio, image, graphics, video and animation, Topics in data compression including coding requirements, source, entropy, and hybrid coding, JPEG, H.261, MPEG, MP3 and etc, Computer technology issues such as communication architecture, multimedia workstations, cache systems, storage systems and optical storage, Multimedia operating system issues such as real-time operation,

resource management, process management, file systems, and Multimedia networking, Multimedia synchronization, presentation requirements, reference model, and synchronization techniques, Multimedia database issues such as data organization, indexing and retrieval, Multimedia applications including digital libraries, system software, toolkits, conferencing paradigms, structured interaction support, and examples from video/audio/graphics conferencing, Latest Web technologies.

Title	Code	Semester/Duration	Credits
Database Concepts	COM215	Longitudinal/3	(2,0,3)3

This course covers database design and the use of databases in applications, with a short introduction to the internals of relational database engines. It includes extensive coverage of the relational model, relational algebra, and SQL. The course also features database design and relational design principles based on dependencies and normal forms. Many additional key database topics from the design and application-building perspective are also covered, including indexes, views, transactions, and integrity constraints. Systems such as MapReduce framework and key-value stores will also be covered. There will be a programming project, which explores database design and management in web applications by utilizing appropriate features of SQL.

Title	Code	Semester/Duration	Credits
Statistics and Probabilities	MAT216	3/Longitudinal	3(2,2,0)

Exploring Univariate Data:

- Types of data, Mean and Median
- Standard Deviation and Variance, Range, IQR and Finding Outliers
- Graphs and Describing Distributions

Introduction to Probability:

- Counting Techniques, Combinations and Permutations
- Sets and Venn Diagrams
- Basic Probability Models
- General Probability Rules

Discrete Distributions :

- Random Variables
- Binomial Distributions
- Geometric Distributions

Continuous Distributions :

- Density Curves, The Normal Distribution
- Standard Normal Calculations
- Sampling Distribution of x and ˆp

Bivariate Data :

- Scatter Plots, Correlation
- The Least Squares Regression Line, Residuals
- Non-Linear Models
- Relations in Categorical Data

Title	Code	Semester/Duration	Credits
System Analysis and Design-1	SYS217	Longitudinal/3	(2,2,0)3

This module introduces the students to the concepts and skills of system analysis and design. It includes expanded coverage of data flow diagrams, data dictionary, and process specifications.

- System Analysis Fundamentals
- Information requirements analysis
- The analysis process
- The essentials of design
- Software engineering and implementation

Title	Code	Semester/Duration	Credits
Numeric Computation -1	MAT218	Longitudinal/3	(2,2,0)3

Introduction

Motivation and applications.

Computation and Error Analysis

Accuracy and precision; Truncation and round-off errors; Binary Number System;Error propagation.

Linear Systems and Equations

Matrix representation; Cramer's rule;

Gauss Elimination; Matrix Inversion; LU

Decomposition; Iterative Methods;

Relaxation Methods; Eigen Values.

Algebraic Equations

Bracketing methods: Bisection, Reguli-

Falsi; Open methods: Secant, Fixed point

iteration, Newton-Raphson; Multivariate Newton's method.

Regression and Curve Fitting

Linear regression; Least squares; Total Least Squares; Interpolation; Newton's Difference Formulae; Cubic Splines

Semester Four

Title	Code	Semester/Duration	Credits
Computer Architecture	COM221	4/Longitudinal	3(2,0,3)

Introduction, History

Logical circuits

- Boolean algebra;Combinational circuits;Fundamental and additional logical gates; Karnaugh maps;Decoders;Multiplexors;Adders; Number representation; ALU; Latches; Sequential analysis;Registers;

Processors

- Registers sets; ISA;Control unit; Modern architectures.

Title	Code	Semester/Duration	Credits
Human-Computer Interaction	INT222	Longitudinal/4	(2,0,3)3

- What is Interaction Design?
- Understanding and conceptualising interaction
- Understanding users
- The process of Interaction Design
- Establishing requirements
- Prototyping
- Evaluation
- Observing users
- Emerging Trends
- Student Group Presentations
-

Title	Code	Semester/Duration	Credits
System Analysis and Design-2	SYS223	Longitudinal/4	(2,2,0)3

Fundamental knowledge, methods and skills needed to analyze and design computer-based systems, the role of the systems analyst, the techniques employed and relationships that need to be maintained, utilization of the structured software development life cycle approach, process modeling, information modeling, system architecture modeling, Object-Oriented modeling using UML. A project is given that covers analysis and design phases of a relatively data-oriented business case with emphasis on data modeling (ER diagrams), process modeling (DFDs), and architectural system design issues (DD, HIPO, IPO.

Title	Code	Semester/Duration	Credits
Database Programming	COM224	Longitudinal/4	(2,0,3)3

Data/Information & Processing; File based systems; Data Processing Modes; Types of Databases; Components of DBMS; History and objectives of the development of DBMS; Types of data models; Roles in the database environment; Database Architecture; Relational Algebra & Relational Calculus; Terminology of Relational Model; Associations/Relationships; Types of Keys; Data Integrity; Views; Indexes; Design & Administration; Database system development life cycle; Phases and types of database design; Data Administration & Database Administration; ER-Modeling using UML; Normalization; Handling Problematic & Redundant data; Functional Dependencies; Transitive Dependencies; Identifying Normal Forms; Writing SQL Commands; Creating & Indexing the Tables; Formatting Query Results into Reports; Usage of SQL-Plus.

Title	Code	Semester/Duration	Credits
Data Structures and Algorithms	COM225	Longitudinal/4	(2,0,3)3

Introduction to Data Structures and Algorithms, Arrays, Sorting Algorithms, Searching Algorithms, Stacks, Stacks Applications, Queues Priorities Queues, Linked List, Double Linked List, Stacks and Queues Applications using Linked List, Introduction to Tree, Binary Tree.

Title	Code	Semester/Duration	Credits
Numeric Computation -2	MAT226	4/Longitudinal	3(2,2,0)

Introduction

Numerical Differentiation

Numerical differentiation; higher order formulae.

Integration and Integral Equations

Trapezoidal rules; Simpson's rules; Quadrature.

ODEs: Initial Value Problems

Euler's methods; Runge-Kutta methods;

Predictor-corrector methods; Adaptive step size; Stiff ODEs.

ODEs: Boundary Value Problems

Shooting method; Finite differences;

Over/Under Relaxation (SOR).

PDEs

Introduction to Partial Differential Equations.

Title	Code	Semester/Duration	Credits
Operations Research	MAT227	Longitudinal/4	(2,2,0)3

- Introduction to Operations Research (OR)
- Introduction to Foundation mathematics and statistics
- Linear Programming (LP), LP and allocation of resources, LP definition, Linearity requirement
- Maximization Then Minimization problems.
- Graphical LP Minimization solution, Introduction, Simplex method definition, formulating the Simplex model.
- Linear Programming – Simplex Method for Maximizing.
- Simplex maximizing example for similar limitations, Mixed limitations
- Example containing mixed constraints, Minimization example for similar limitations.
- Sensitivity Analysis: Changes in Objective Function, Changes in RHS, The Transportation Model
- Basic Assumptions.
- Solution Methods:

  Feasible Solution: The Northwest Method, The Lowest Cost Method;

  Optimal Solution: The Stepping Stone Method, Modified; Distribution

  (MODI) Method.
- The Assignment Model:- Basic Assumptions

Title	Code	Semester/Duration	Credits
Internet Technologies	INT228	4/Longitudinal	3(2,0,3)

Introduction to HTML5:Introduction, Editing HTML5,First HTML5 example,W3C html5 val-

idation service, Heading, linking, Images, Special Characters and Horizontal rules, Lists, Tables, Forms, Internal linking, Meta elements, New HTML5 Form input types, input and datalist elements and autocomplete attribute, Page structure elements, Introduction to Cascading Style Sheets: Inline styles, embedded style sheets, Positioning elements, Backgrounds, Elements Dimensions, Box model and text flows, Media types and media queries, Drop down menus, Text Shadows, Rounded corners, Color, Box shadows, Linear Gradients, Radial gradients, Multiple background images, Image Borders, Animation selectors, Transitions and Transformations, Java Script: Introduction to Scripting, Control Statements, Functions, Arrays, Objects, Javascript Event handling: Reviewing the load Event, Event mousemove and the event Object, Rollovers with mouseover and mouseout, Form Processing with focus and blur, More Form Processing with submit and reset, Event Bubbling, More Events Introduction to canvas : Canvas coordinate system, Rectangles, Using paths to draw lines, Drawing arcs and circles, Shadows, Quadratic curve, Bezier curves, Linear gradients, Radial Gradients, Images, image Manipulation, Patterns, Transformations, resizing the canvas to fill the browser, Alpha transparency, Compositing, Save and restore methods, Note on canvas SVG and Canvas 3D, Ajax-Enabled Rich Internet Applications with XML and JSON: Introduction, Rich Internet Applications (RIAs) with Ajax,history of Ajax, "Raw" Ajax Example Using the XMLHttpRequest Object,using XML and the DOM, Creating a Full-Scale Ajax-Enabled Application, Web Servers: Introduction, HTTP transactions, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, Accessing Web Servers, Apache, MySQLand PHP Installation, Microsoft IIS Express and Web Matrix, PHP: Introduction, simple PHP program, converting between data types, arithmetic operators, initializing and manipulating Arrays, String comparision, String Processing with Regular Expressions, Form Processing and Business Logic, Reading from a Database, Using Cookies, Dynamic Content

Semester Five

Title	Code	Semester/Duration	Credits
Object Oriented Programming	COM311	Longitudinal/5	(2,0,3)3

Definition of object oriented, Inheritance, Multiple inheritance, Encapsulation, Polymorphism, Introduction to Interfaces, Dealing with interfaces, Packages, Application cases, Graphical User Interface GUI, GUI Application .

Title	Code	Semester/Duration	Credits
Computer Networks and Communications	INT312	Longitudinal/5	(2,0,3)3

Topics covered Basic concepts of networking, Network topologies, The concept of layered architecture modeling including OSI and the TCP/IP protocol suite. Client-server communications, Physical layer functionalities including signaling, modulation, multiplexing, line coding and synchronization. Transmission media. Network performance measures including throughput, delays are presented, Data vs. signaling rates, channel bandwidth and capacity, Link layer functionalities

including frame synchronization, error detection and control including ARQ, flow control mechanisms including sliding windows, Circuit, packet and virtual circuit switching technologies, Local area network technologies including ETHERNET, Token Rings, Multiple-access schemes such as CSMA/CD, CSMA/CA and Token-passing. MAC addressing. Switched vs. shared ETHERNETs. Performance evaluation, including throughputs and delays. Internetworking devices including repeaters, bridges, switches, routers and gateways. Network layer protocols, including IP, ARP and ICMP. IP addressing schemes. Subnetting, Internet routing including protocols used in the Internet such as RIP, OSPF and BGP, Transport layer protocols including UDP and TCP. Ports and sockets. TCP connection establishment. Error, flow and congestion control in TCP, Applications layer protocols such as HTTP, FTP, DNS, SMTP, TELNET, Network security measures including encryption, authentication, data integrity and firewalls.

Title	Code	Semester/Duration	Credits
Database Applications	SYS313	5/Longitudinal	3(2,0,3)

Covers object-relational database systems and using them in programming and in web applications. Topics include: Object-relational database systems. The relational data model.

The PL-SQL language. SQL queries. Installing and using database systems. Using graphical user interfaces for database management. Programming database systems using database

Middleware. Programming web-based database application using middleware.

Title	Code	Semester/Duration	Credits
Software Engineering I	SWE314	5/Longitudinal	3(2,0,3)

What is software engineering? Software lifecycle and process models, Software engineering tools and programming environments, Overview of software project management, Software requirements specification, Software design, Using APIs, Software verification and validation, and Software evolution. Software engineering tools for modeling such as: Visual Paradigm UML or Rational Rose will be covered in lab extensively covering flow-oriented modeling, behavioral modeling, scenario-base modeling and class modeling.

Title	Code	Semester/Duration	Credits
Visual Programming	COM315	5/Longitudinal	3(2,0,3)

- Course intro, syllabus, Intro to computing
- Program design and implementation
- Essential VB, variables, data types, commenting
- Arithmetic operators and expressions
- Decision Structures (ifs and select case)

- Loops (while, for)
- Loop applications (summation, counting)
- Sub Procedures (val and ref parameters)
- Functions (val and ref parmaters)
- Strings
- Arrays
- More Arrays
- Files
- Databases
- Course overview

Title	Code	Semester/Duration	Credits
Algorithms Analysis and Design	COM316	Longitudinal/5	(2,2,0)3

Introduction, Algorithm definition, Algorithm Analysis, Recurrence Relations, Design & Analysis of Algorithms: Divide and Conquer, Greedy Algorithm, Dynamic Programming, Lower Bound Theory, Sorting and Searching, NP-Complete Problems: Basic Concepts.

Title	Code	Semester/Duration	Credits
Compliers Design	COM317	5/Longitudinal	3(2,2,0)

Specific topics covered in this course include:

- Overview of compilation
- Lexical analysis
- Context-free grammars, top-down and bottom-up parsing, error recovery
- Abstract syntax trees, symbol tables
- Lexical scoping, types (primitive, record, arrays, references), type checking
- Object-oriented type systems, subtyping, interfaces, traits
- Three-address code and other intermediate representations
- Code generation, data representation, memory management, object layout
- Code transformation and optimization , Class hierarchy analysis
- Dataflow analysis , Register allocation
- Run-time systems, just-in-time compilation, garbage collection

Semester Six

Title	Code	Semester/Duration	Credits
Software Engineering II	SWE321	Longitudinal/6	(2,0,3)3

This course covers the software development process, from requirements elicitation and analysis, through specification and design, to implementation, integration, testing, and maintenance (evolution). A variety of concepts, principles, techniques, and tools are presented, encompassing topics such as software processes, project management, people management, software requirements, system models, architectural and detailed design, user interface design, programming practices, verification and validation, and software evolution. Although the emphasis will be on modern approaches some moretraditional software engineering techniques will also be discussed.

Title	Code	Semester/Duration	Credits
Operating Systems	COM322	Longitudinal/6	(2,0,3)3

Overview: Background, Computer-system structures, Operating system structures.

Process Management: Processes and threads, Process synchronization, Deadlocks, CPU scheduling.

Storage Management: Memory management, Virtual memory, File-system interface, File-system implementation

I/O Systems: I/O, Secondary-storage structure.

Distributed Systems: Network and distributed system structures, Distributed file systems, Distributed coordination

Title	Code	Semester/Duration	Credits
Open Source software and technologies	INT 323	6/Longitudinal	3(2,0,3)

- Open Source Software: Definitions and History – Where Open Source is
- Successful – Open Source: The Good, the Bad and the Ugly.
- Five Immediate Open Source Opportunities – Five More Open Source
- Opportunities.
- Open Source Server Applications – Open Source Desktop Applications.
- How Open Source Software is Developed – Managing System Implementation.
- Application Architecture – The Cost of Open Source Systems.

- Exploring the Android API:Perspective and architecture overview,Design philosophy, Anatomy of an Android Application,Application life cycle

Title	Code	Semester/Duration	Credits
Computer Graphics	COM325	6/Longitudinal	3(2,0,3)

- Introduction: History of computer graphics, graphics architectures and software, imaging: pinhole camera, human vision, synthetic camera, modeling vs rendering
- OpenGL: architecture, displaying simple two-dimensional geometric objects, positioning systems, working in a windowed environment
- Color: Color perception, color models (RGB, CMY, HLS), color transformations. Color in OpenGL. RGB and Indexed color.
- Input: working in a network environment, client-server computing; input measure, event, sample and request input, using callbacks, icking.
- Geometric transformations: affine transformations (translation, rotation, scaling, shear), homogeneous coordinates, concatenation, current transformation and matrix stacks.
- Three dimensional graphics: classical three dimensional viewing, specifying views, affine transformation in 3D, projective transformations.
- Ray Tracing.
- Shading: illumination and surface modeling, Phong shading model, polygon shading.
- Rasterization: line drawing via Bresenham's algorithm, clipping, polygonal fill, BitBlt. Introduction to hidden surface removal (z buffer).
- Discrete Techniques: buffers, bitblt, reading and writing bitmaps and pixelmaps, texture mapping,compositing.
- Advanced Topics.

Title	Code	Semester/Duration	Credits
Scientific Research Methodologies	HMS324	6/Longitudinal	3(2,2,0)

Research Techniques: Basic research and applied research, Data collection techniques, sampling techniques; Data processing; Research Methods: Subject selection, Subject restriction, Reference collection; Definition of the problem or the subject in details, Definition of solution techniques or analysis methods, Researching and performing practical works, Results; Reporting: Page set up, Sentence structure, Headings, Abbreviation formats, Figure and table formats, Table of references format. Computer application using SPSS is required.

Title	Code	Semester/Duration	Credits
Data Mining	COM326	6/Longitudinal	3(2,2,0)

Introduction to data mining (DM)

Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process .

Data Pre-processing

Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy.

Concept Description and Association Rule Mining

What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining

Classification and Prediction

What is classification and prediction? – Issues regarding Classification and prediction:

Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network

Prediction methods: Linear and nonlinear regression, Logistic Regression

Introduction of tools such as DB Miner /WEKA/DTREG DM Tools

Title	*Code*	*Semester/Duration*	*Credits*
E-Commerce	INT327	6/Longitudinal	3(2,2,0)

This course focuses on electronic commerce applications, technologies, and tools which are used to conduct business on the World Wide Web. It reviews foundations of e-commerce, its infrastructure, current business models in business-to-customers (B2C) and business-to-business (B2B) transactions, security and quality assurance, web site design strategies, payment systems, and various issues—Internet marketing, legal, regulatory, technological, social, and ethical--which relate to electronic business, systems development issues, electronic data interchange, web-based marketing, e-supply chains, e-procurement, emarketplace, customer relationship management, and web-enabling mobile. A major part of the course will be devoted to hands-on practices covering client-side (front-end) and server-side (back-end) applications in web-based business information systems. Essentials of contemporary programming tools for e-commerce development such as HTML, XML, ASP (VB/JavaScript) ... will be explored.

E-Business case studies are used to demonstrate the advantages and the challenges related to integrating ecommerce applications.

Semester Seven

Title	Code	Semester/Duration	Credits
Information security	INT411	7/Longitudinal	3(2,2,0)

Topics include Foundations: security mindset, essential concepts (policy, CIA, etc), Software security: vulnerabilities and protections, malware, program analysis, Practical cryptography: encryption, authentication, hashing, symmetric and asymmetric crypto Networks: wired and wireless networks, protocols, attacks and countermeasures, Applications and special topics: databases, web apps, privacy and anonymity, voting, public policy.

Title	Code	Semester/Duration	Credits
Parallel and Distributed Com-puting	COM412	7/Longitudinal	3(2,2,0)

PART I: Synchronous Parallel Models and Algorithms

- Overview of parallel models and analysis of parallel algorithms.
- Combinational Circuits, Parallel computation using circuits.
- The PRAM Model and several PRAM Algorithms will becdiscussed.
- Interconnection Network Models such as linear arrays, 2D meshes, hyper cubes.
- Models Using Buses including a reconfi
- gurable mesh and a linear array with optimal buses.
- The locally developed MSIMD model called MASC.
- Asynchronous Parallel Models including SPMD, BSP and LogP.

PART I I: Distributed Algorithms

- Introduction, locality-sensitivity, distributed network models
- Broadcast, convergecast, downcast, upcast
- Tree constructions
- Synchronizers
- Vertex coloring, maximal independent sets, message routing
- Locality-preserving representations
- Applications of locality-preserving representations

Title	Code	Semester/Duration	Credits
IT Project Management	INT413	Longitudinal/7	(2,2,0)3

Introduction to project management concepts, tools, and techniques; project integration management; project planning, scope management, scheduling, budget control, human resource management, communication management, risk analysis and management, project quality management, and procurement management. MS-Project will be demonstrated and used as a tool for creating project management documents.

Title	Code	Semester/Duration	Credits
Artificial Intelligence	COM414	7/Longitudinal	3(2,0,3)

An introduction to the basic principles, techniques, and applications of Artificial Intelligence. Coverage includes knowledge representation, logic, inference, problem solving, search algorithms, game theory, perception, learning, planning, and agent design. Students will experience programming in AI language tools. Potential areas of further exploration include expert systems, neural networks, fuzzy logic, robotics, natural language processing, and computer vision.

Title	Code	Semester/Duration	Credits
Simulation and Modeling	COM415	7/Longitudinal	3(2,0,3)

1. Introduction: Course Logistics, Definitions of Modelling and Simulation, When to apply these techniques, Applications, Terminology & Components , Discrete vs. Continuous time and Process flow in simulation study.
2. Simulation Examples: Queuing systems , Communications networks
3. General Principles: Event -driven simulation, World Views, List processing.
4. Simulation software: History,Selection process, Simulation in High Level Language (C, C++, Pascal, Fortran), Simulation packages (Matlab/Simulink), Interpreted vs. compiled simulators, Future trends
5. Statistical models: Terminology and Concepts, Useful Statistical Models, Distributions.
6. Queuing models: Characteristics, Performance Measures, Steady-State Behavior, Networks of Queues.
7. Random Number Generation: Properties of Random Numbers, Generation of Pseudo-Random Numbers, Testing for Randomness, Pitfalls.

Semester Eight

Title	Code	Semester/Duration	Credits
Mobile Device Programming technologies	COM421	Longitudinal/8	(2,0,3)3

- Introduction to Mobile Computing,
- Mobile Platforms & Architectures,
- Mobile Java – J2ME,
- Android Operating System: It is Architecture and its Programming Implementation using Eclipse, JDK and SDK.
- iOS Operating System,
- Symbian S60 OS-Windows Phone 7,
- Wireless Telecommunication,
- Wireless Networks,
- Mobile Security,
- Mobile Databases,
- Mobile Multimedia Services,
- Emerging Mobile Technologies

Title	Code	Semester/Duration	Credits
Computer Ethics	HMS422	8/Longitudinal	2(2,0,0)

This course introduces students to the topics of information technology ethics including: definitions, rules & policies of computer ethics, hacking, viruses, Internet ethics, freedom of expression on the Internet, computer professionals and social responsibilities, software copyright, intellectual property, software piracy, cyber law and privacy & security of computerized information.

Topics:

An Overview of Ethics, Ethics for IT Workers and IT Users, Computer and Internet Crime, Privacy, Intellectual Property, The Impact of Information Technology on Productivity and Quality of Life,

Title	Code	Semester/Duration	Credits
Graduation Project	COM425	8/Longitudinal	6(0,0,18)

Students will identify an actual Computer related business problem and apply research principles and procedures to reach a solution. This includes development of a proposal, problem formulation as well as data collection and analysis culminating in a presentation of all steps used in the research process.

An applied detailed research on a subject in a related field should by conducted by the student as a prerequisite for graduation. Research structure and set up are supposed to strictly follow the scientific research methods and techniques in terms of: Definition of the problem or the subject in details, Definition of solution techniques or analysis methods, Researching and performing practical works, Results; Reporting: Page set up, Sentence structure, Headings, Abbreviation formats, Figure and table formats, Table of references format.

ELECTIVE COURSES

Elective courses determine by the Faculty Management according to the strategic plan.

Title	Code	Semester/Duration	Credits
Open Source Operating Systems	COM4xx	Longitudinal	3(2,0,3)

The course covers Partitioning of hard-drives , Slackware OS Setup, Basic Linux Commands, Network Connectivity, Dual booting w/other O.S., Adding packages sets, Adding partitions, Adding more swap space, Opening User Accounts, Setting up Groups, Setting Permissions on Files & Directories, Groups and Permissions Exercise{graded}, Setting up Telnet Server, Using SSH, Setting up a PROFTPD server, Setting up a VSFTPD server, Configuring TCP forwarding, Starting the Apache Web Server, Default server web site, User's web sites, Executing CGI scripts, Virtual Hosting, Protecting directories with hatches, Installing Apache from Scratch, Configuring an SSL Server.

Title	Code	Semester/Duration	Credits
Knowledge Management	COM4xx	Longitudinal	3(2,0,3)

The course covers Principles of Knowledge Management (Overview, Knowledge Management Solutions, etc.), Knowledge Management Technologies (Artificial Intelligence, Digital Libraries, Repositories, etc.), Knowledge Management Systems (Knowledge Discovery Systems, Knowledge Capture Systems, Knowledge Sharing Systems, Knowledge Application Systems, etc.)

Title	Code	Semester/Duration	Credits
Genetic Algorithms	COM4xx	Longitudinal	3(2,0,3)

Basic concepts: representation, objective & evaluation functions, local vs global optima Traditional methods: hill climbing, simulated annealing, branch and bound Evolutionary approaches: Population-based Search: genetic algorithms and evolutionary computation, genetic programming, niching , crowding methods, island models, and co-evolution.

Title	Code	Semester/Duration	Credits
Expert Systems	COM4xx	Longitudinal	3(2,0,3)

Introduction to Expert Systems, Knowledge Acquisition, Knowledge Representation, Expert System Tools, LISP, CLIPS, Expert System Implementation, Expert System Testing

Title	Code	Semester/Duration	Credits
Computer Network Programming	COM4xx	Longitudinal	3(2,0,3)

Networking basics, protocol basics, Internet protocols, and socket programming. This is a project-oriented course. Students will be required to design and implement a layered protocol stack.

Title	Code	Semester/Duration	Credits
Decision Support Systems	COM4xx	Longitudinal	3(2,0,3)

Introduction to DSS, Expectations and DSS, Decision Making, Exploring the Range of DSS research, Knowledge Management, Project Proposals, Model Oriented DSS, Visualization-oriented DSS, Business intelligence and data warehousing, DSS user interfaces, New trends in DSS.

Title	Code	Semester/Duration	Credits
Advanced Computer Network management	COM4xx	Longitudinal	3(2,0,3)

The course covers Switching : Switch performance measures, Time and space switches, Modular switch design Packet switch and distributed Buffer, Optical N/W : DWDM., High -speed Networks, IP forwarding Architectures, Overlay Model-CLIP, LANE, RSVP, Virtual Private Networks (VPN), MPLS support for VPN ,Network Management ,Case study : HP-Open View, Inter-vehicular communications andGPS, Network Monitoring and Tuning, Troubleshooting.

Title	Code	Semester/Duration	Credits
Advanced Databases	COM4xx	Longitudinal	3(2,0,3)

Introduction, Concepts and Definitions, Normalization Techniques , Data Mining and Data warehouse, Transaction Processing ,Concurrency Control, Distributed Databases, Database Security, Temporal database.

Title	Code	Semester/Duration	Credits
Modern Trends in Computer Science	COM4xx	Longitudinal	3(2,0,3)

The course topics will be tailored according to the emphasis of the course selected.

Title	Code	Semester/Duration	Credits
Advanced Algorithms	COM4xx	Longitudinal	3(2,0,3)

combinatorial algorithms (set cover, steiner tree and TSP, multiway cut, knapsack, minimum makespan scheduling), LP-Based algorithms (LP Duality, set cover via dual fitting, LP rounding techniques, sparsest cut, facility location, semidefinite programming and max-cut) and other topics including approximation algorithms based on algorithmic game theory, hardness of approximation and open problems.

Title	Code	Semester/Duration	Credits
Cryptography	COM4xx	Longitudinal	3(2,0,3)

Basic Security Concepts ,Basic Cryptography, Hash functions, Secret Key Cryptography , Public Key, Cryptography , Authentication ,Trusted Intermediaries ,Real-time Communication Security, Miscellaneous .

First Year - Semester One

#	Course Title	Code	Credit Hours
1	Computer Applications	COM-111	3
2	Principles of Information Systems	INF-112	3
3	English for Specific Purpose I	ENG-113	3
4	Calculus I	MAT114	3
5	Introduction to Information Technology	INT 115	3
6	Discrete Mathematics	MAT116	3
7	Principles of Economic	HMS117	3
8	Principles of Management	HMS118	3
			24

First Year - Semester Two

#	Course Title	Code	Credit Hours
1	Computer Maintenance	INF-121	2
2	Computer Implementation in Business	INF-122	3
3	Calculus II	MAT124	3
4	English for Specific Purpose II	ENG-123	3
5	Principles of Accounting	HMS125	3
6	Principles of Programming	COM126	3
7	Computer Equipment and Environments	COM127	3
8	Linear Algebra and Geometry	MAT128	3
			23

Second Year - Semester Three :

#	Course Title	Code	Credit Hours
1	Digital Systems	COM211	3
2	Programming Methods	COM212	3
3	System analysis and design	SYS213	3
4	Multimedia Systems	INT214	3
5	Database Concepts	COM215	3
6	Statistics & Probability	MAT216	3
7	Management information systems	SYS217	3
8	Differential Equations	MAT218	3
			24

Second Year - Semester Four :

#	Course Title	Code	Credit Hours
1	Communication Skills	HMS221	3
2	Human - Computer Interaction	INT222	3
3	Economic and Forecasting Models	HMS223	3
4	Database Programming	COM224	3
5	Algorithms and Data Structure	COM225	3
6	Applied Statistic	MAT226	3
7	Operational Research	MAT227	3
			21

Third Year - Semester Five

#	Course Title	Code	Credit Hours
1	Database Applications	SYS311	3
2	Computer Networks and Communications	INT312	3
3	Software Project Management	INT313	3
4	Software Engineering (1)	SWE 314	3
5	Visual Programming	COM315	3
6	Decision support and Expert Systems	SYS316	3
7	Internet Technology (1)	INT317	3
			21

Third Year - Semester Six :

#	Course Title	Code	Credit Hours
1	Software Engineering (2)	SWE321	3
2	Operating Systems Concepts	COM322	3
3	Network Security	INT323	3
4	Research Methodology	HMS324	3
5	Internet Technology (2)	INT325	3
6	Data Mining	INT326	3
7	E-commerce	INT327	3
			21

Fourth Year - Semester Seven :

#	Course Title	Code	Credit Hours
1	Information Security	INT411	3
2	Web Systems and Applications	INT412	3
3	Open Source Software & Technologies	INT413	3
4	Simulation and Modeling	COM414	3
5	Elective (1)	INT415	3
6	Elective (2)	INT416	3
			18

Fourth Year - Semester Eight

#	Course Title	Code	Credit Hours
1	Cloud Computing	INT421	3
2	Mobile Device Programming Technologies	INT422	3
3	Professional Ethics	HMS423	2
4	Elective (3)	INT424	3
5	Elective (4)	INT425	3
6	Graduation Project	INT426	6
			20

Course Outline

Detailed behavioral objectives, skills, assignments and problems are listed in each course book. The lists are too extensive to be included below Courses in the curriculum timetable not outlined below are included in other programmed, or in the original document with the program coordinator.

Semester One

Title	*Code*	*Semester/Duration*	*Credits*
Introduction to Information Technology	INT115	1/ Longitudinal	3(2,0,3)

The course provides students with a broad foundation in computer science. Topics include:

introduction to digital technology, historical review; logic gates; binary, octal, and hexadecimal systems; computer architecture and basic components, internal and external interfaces, types of removable media; introduction to operating systems; programming paradigms, basic

programming concepts; concept of algorithm, representation, correctness and performance of algorithms; introduction to objects. The course equips students with basic problem solving skills and prepares them for taking the programming sequence subjects and other computer science disciplines.

Title	Code	Semester/Duration	Credits
Principles of Management	HMS118	1/ Longitudinal	3(3,0,0)

I. Introduction

Definition of management, The role of managers, The evolution of management

The origins of management, Scientific management, Human relations management, Operations, information, systems, and contingency management

II. Organizational Environments and Cultures

External environments, Internal environments, Ethics and social responsibility

III. Management Functions

A. Planning

(Strategic planning, Tactical planning, Operational planning)

B. Organizing

(Corporate- level strategies, Industry -level strategies,Firm - level strategies, Managing human resource systems)

C. Leading

(Motivation, Leadership styles, Managing communications)

D. Controlling

(The control process, Control methods, Managing information, Managing service and manufacturing operations).

Semester Two

Title	Code	Semester/Duration	Credits
Computer equipment and environment	COM127	1/ Longitudinal	3(2,0,3)

Topic include: workplace health and safety procedures, computer work environment, manual handling techniques for ICT equipment, demonstrate safe use of a PC, pack/unpack and fit static sensitive devices, duties of employers and employees, legal requirement for the use and disposal of hazardous substances, health and safety responsibilities of employees, safety factors to be considered while using a PC, diagnosis failures of ICT equipment, Apply preventative maintenance to ICT systems

Semester Three

Title	Code	Semester/Duration	Credits
Management Information Systems	SYS213	3/ Longitudinal	3(3,0,0)

Topics include concept of Information Systems: Elements of Information Systems, Classifications of Information Systems; Information Systems in Business Management: End User Information Systems, Office Automation Systems, Electronic Communication Systems, Teleconference Systems, Electronic Printing Systems, Process of Image Systems; Business Information Systems: Marketing Information System, Production Information System, Human Resource Information System, Accounting Information System, Financial Information System; Decision Support Systems: Models of Decision Support Systems, Executive Information System, Artificial Intelligence and Expert Systems; Global Dimensions: Global Data, Security and Ethic Problems in Information Systems, Computer Crime.

Semester Four

Title	Code	Semester/Duration	Credits
Communication Skills	HMS221	4/Longitudinal	3(2,2,0)

Communication paradigms, perceptual processes, personal and professional relationships, description of communication, components of communication process, functions and types of communication, introduction to empathic communication, difference between empty and sympathy, Process of empathic communication, components, skill of listening, improved of emphatic skill, importance of listening and understanding, organizational communication and communication process in organizations, types of communication in organizations, verbal communication, non-verbal communication, Written communication, preparation of CV. The course also includes materials related to verbal and non-verbal communication, communication technology, and the role communication plays in culture..

Title	Code	Semester/Duration	Credits
Applied Statistics	MAT226	4/Longitudinal	3(2,2,0)

1. Describing data
2. Simple regressions analyses, and how to interpret the results
3. Discrete random variables and probability distribution.
   (a) Expected values
   (b) Variance, covariance
   (c) Some common discrete distributions (binomial distribution, etc)
4. Continuous random variables and probability distributions.
   (a) Expected values
   (b) Variance, covariance

(c) Normal distribution.

5. Hypothesis testing

Semester Five

Title	Code	Semester/Duration	Credits
Software Project Management	INT313	5/Longitudinal	3(2,0,3)

Pre-requist Courses:

Introduction to project management concepts, tools, and techniques; project integration management; project planning, scope management, scheduling, budget control, human resource management, communication management, risk analysis and management, project quality management, and procurement management. MS-Project will be demonstrated and used as a tool for creating project management documents.

Title	Code	Semester/Duration	Credits
Internet Technology-1	INT317	5/Longitudinal	3(2,0,3)

- Introduction to HTML Internet
- HTML color and links ,Hardware and Software ,HTML Tables
- Essentials of Telecommunication HTML Tables
- Web Software HTML Frames
- Establishing a Web Site Photos and Forms
- XML ,Internet Search Tools/CSS
- Cascading Style Sheet Web Structure
- Cascading Style Sheet Web Page Design
- Cascading Style Sheet Web Page Design
- Cascading Style Sheet Security
- Present Project

Semester Six

Title	Code	Semester/Duration	Credits
Network Security	INT323	6/Longitudinal	3(2,0,3)

Basic Security Concepts

- Confidentiality, integrity, availability
- Security policies, security mechanisms, assurance

Basic Cryptography

- Historical background
- Transposition/Substitution, Caesar Cipher
- Introduction to Symmetric crypto primitives, Asymmetric crypto primitives, and

- Hash functions

Secret Key Cryptography

- Data Encryption Standard (DES), Advanced Encryption Standard (AES)
- Encrypting large messages (ECB, CBC, OFB, CFB, CTR), Multiple Encryption DES (EDE)

Public Key Cryptography

- Number theory: Euclidean algorithm, Euler Theorem, Fermat Theorem, Totent, functions, multiplicative and additive inverse
- RSA, Selection of public and private keys

Authentication

- Basic concepts of identification and authentication, Password authentication, Authentication protocols

Trusted Intermediaries

Public Key infrastructures, Certification authorities and key distribution centers, Kerberos
Real-time Communication Security

- IPsec: AH and ESP , IPsec: IKE , SSL/TLS
- Firewall , Auditing and intrusion detection

(Miscellaneous topics (1 lecture

- Assurance and Evaluation of Secure Information Systems
- Database Security (Security requirements in databases, Access control and authorization in databases, Inference control)
- Malicious software
- Administrating Security (Risk Analysis, Security Planning, Organizational Security Policies)

Title	Code	Semester/Duration	Credits
Decision Support Systems	SYS324	Longitudinal/6	(2,2,0)3

The course covers Introduction to DSS, Expectations and DSS, Decision Making, Exploring the Range of DSS research, Knowledge Management, Project Proposals, Model Oriented DSS, Visualization-oriented DSS, Business intelligence and data warehousing, DSS user interfaces, New trends in DSS.

Title	Code	Semester/Duration	Credits
Internet Technologies-2	INT325	Longitudinal/6	(2,0,3)3

Introduction to HTML5:Introduction, Editing HTML5,First HTML5 example,W3C html5 validation service, Heading, linking, Images, Special Characters and Horizontal rules, Lists, Tables, Forms, Internal linking, Meta elements, New HTML5 Form input types, input and datalist elements and autocomplete attribute, Page structure elements, Introduction to Cascading Style Sheets: Inline styles, embedded style sheets, Positioning elements, Backgrounds, Elements Dimensions, Box model and text flows, Media types and media que-

ries, Drop down menus, Text Shadows, Rounded corners, Color, Box shadows, Linear Gradients, Radial gradients, Multiple background images, Image Borders, Animation selectors, Transitions and Transformations, Java Script: Introduction to Scripting, Control Statements, Functions, Arrays, Objects, Javascript Event handling: Reviewing the load Event, Event mouse-move and the event Object, Rollovers with mouseover and mouseout, Form Processing with focus and blur, More Form Processing with submit and reset, Event Bubbling, More Events Introduction to canvas : Canvas coordinate system, Rectangles, Using paths to draw lines, Drawing arcs and circles, Shadows, Quadratic curve, Bezier curves, Linear gradients, Radial Gradients, Images, image Manipulation, Patterns, Transformations, resizing the canvas to fill the browser, Alpha transparency, Compositing, Save and restore methods, Note on canvas SVG and Canvas 3D, Ajax-Enabled Rich Internet Applications with XML and JSON: Introduction, Rich Internet Applications (RIAs) with Ajax,history of Ajax, "Raw" Ajax Example Using the XMLHttpRequest Object,using XML and the DOM, Creating a Full-Scale Ajax-Enabled Application, Web Servers: Introduction, HTTP transactions, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, Accessing Web Servers, Apache, MySQLand PHP Installation, Microsoft IIS Express and Web Matrix, PHP: Introduction, simple PHP program, converting between data types, arithmetic operators, initializing and manipulating Arrays, String comparision, String Processing with Regular Expressions, Form Processing and Business Logic, Reading from a Database, Using Cookies, Dynamic Content

Semester Seven

Title	Code	Semester/Duration	Credits
Web Systems and Applications	INT 412	7/Longitudinal	3(2,0,3)

Part I Basics
Internet and Web Protocols ,Client-Server Architecture ,Web Software
Part II Development Technologies
Active Server Pages,VBscript
Databases,Interfacing with Databases, Web Application Components
Authentication, User Registration
Searching, Uploading content, Emailing
Part III Design Principles
Web Application Design
Performance and Reliability
Web Application Infrastructure

Title	Code	Semester/Duration	Credits
Open Source software and technologies	INT 413	7/Longitudinal	3(2,0,3)

- Open Source Software: Definitions and History – Where Open Source is
- Successful – Open Source: The Good, the Bad and the Ugly.
- Five Immediate Open Source Opportunities – Five More Open Source Opportunities.
- Open Source Server Applications – Open Source Desktop Applications.
- How Open Source Software is Developed – Managing System Implementation.
- Application Architecture – The Cost of Open Source Systems.
- Exploring the Android API: Perspective and architecture overview, Design philosophy, Anatomy of an Android Application, Application life cycle

Semester Eight

Title	Code	Semester/Duration	Credits
Professional Ethics	HMS422	8/Longitudinal	2(2,0,0)

This course introduces students to the topics of information technology ethics including: definitions, rules & policies of computer ethics, hacking, viruses, Internet ethics, freedom of expression on the Internet, computer professionals and social responsibilities, software copyright, intellectual property, software piracy, cyber law and privacy & security of computerized information.

Topics:

An Overview of Ethics, Ethics for IT Workers and IT Users, Computer and Internet Crime, Privacy, Intellectual Property, The Impact of Information Technology on Productivity and Quality of Life,

Title	Code	Semester/Duration	Credits
Cloud Computing	INT423	8/ Longitudinal	3(2,2,0)

Cloud Computing Basics-Overview, Applications, Intranets and the Cloud. Your Organization and Cloud Computing- Benefits, Limitations, Security Concerns. Hardware and Infrastructure- Clients, Security, Network, Services. Software as a Service (Saas)-

Understanding the Multitenant Nature of SaaS Solutions, Understanding SOA. Platform as a Service (PaaS)-IT Evolution Leading to the Cloud, Benefits of Paas Solutions, Disadvantages of Paas Solutions. Infrastructure as a Service (Iaas)-Understanding IaaS, Improving Performance through Load Balancing, System and Storage Redundancy, Utilizing Cloud-Based NAS Devices, Advantages, Server Types. Identity as a Service (IDaaS)- Understanding Single Sign-On (SSO), OpenID, Mobile ID Management. Cloud Storage-Overview, Cloud Storage Providers.

Virtualization-Understanding Virtualization, History, Leveraging Blade Servers, Server

Virtualization, Data Storage Virtualization. Securing the Cloud- General Security Advantages

of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats. Service Oriented Architecture-Understanding SOA, Web Services Are Not Web Pages, Understanding Web Service Performance, Reuse and In-

teroperability. Developing Applications-Google, Microsoft, Cast Iron Cloud, Bungee Connect, Development. Migrating to the Cloud-Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, and Migration. Designing Cloud Based Solutions-System Requirements, Design Is a Give-and-Take Process. Coding Cloud Based Applications-Creating a Simple Yahoo Pipe, Using Google App Engine and creating a Windows Azure Application. Application Scalability-Load-Balancing Process, Designing for Scalability, Capacity Planning Versus Scalability, Scalability and Diminishing Returns and Performance Tuning.

Title	Code	Semester/Duration	Credits
Graduation Project	COM426	Longitudinal/8	(0,0,18)6

Students will identify an actual Information technology related business problem and apply research principles and procedures to reach a solution. This includes development of a proposal, problem formulation as well as data collection and analysis culminating in a presentation of all steps used in the research process.

An applied detailed research on a subject in a related field should by conducted by the student as a prerequisite for graduation. Research structure and set up are supposed to strictly follow the scientific research methods and techniques in terms of: Definition of the problem or the subject in details, Definition of solution techniques or analysis methods, Researching and performing practical works, Results; Reporting: Page set up, Sentence structure, Headings, Abbreviation formats, Figure and table formats.

ELECTIVE COURSES

Elective courses determine by the Faculty Management according to the strategic plan.

Title	Code	Semester/Duration	Credits
Knowledge Management	INT4xx	Longitudinal	3(2,0,3)

The course covers Principles of Knowledge Management (Overview, Knowledge Management Solutions, etc.), Knowledge Management Technologies (Artificial Intelligence, Digital Libraries, Repositories, etc.), Knowledge Management Systems (Knowledge Discovery Systems, Knowledge Capture Systems, Knowledge Sharing Systems, Knowledge Application Systems, etc.)

Title	Code	Semester/Duration	Credits
Expert Systems	INT4xx	Longitudinal	(2,0,3)3

Introduction to Expert Systems, Knowledge Acquisition, Knowledge Representation, Expert System Tools, LISP, CLIPS, Expert System Implementation, Expert System Testing .

Networking basics, protocol basics, Internet protocols, and socket programming. This is a proj-

ect-oriented course. Students will be required to design and implement a layered protocol stack.

Title	Code	Semester/Duration	Credits
Modern Trends in Information Technology	INT4xx	Longitudinal	(2,0,3)3

The contents of this course are depending on what topics will be selected. The topics are selected according to the current and updated computer technologies that can help the student in developing his final project.

Methods of instruction: this course base on seminars and practical work, students develop new project regarding this new technology, discuss the new topics, and present their projects in seminars.

Title	Code	Semester/Duration	Credits
E-Commerce Advanced Technologies	INT4xx	Longitudinal	(2,0,3)3

- Welcome to the course and introduction. B2B issues.
- Enterprise Resource Planning 1,2
- Interorganizational Communication: Supply Chain & Collaborative Commerce
- interorganizational Communication: Marketing & eCRM
- Next steps E-government: G2B, G2G and G2C
- M-Commerce in enterprises, M-Commerce developments.
- Strategies: multiplatform issues for e-commerce
- Strategies: organisational resourcing
- Implementing e-commerce in the enterprise
- E-commerce Futures.

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