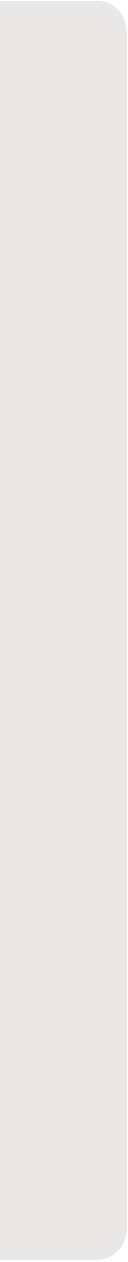
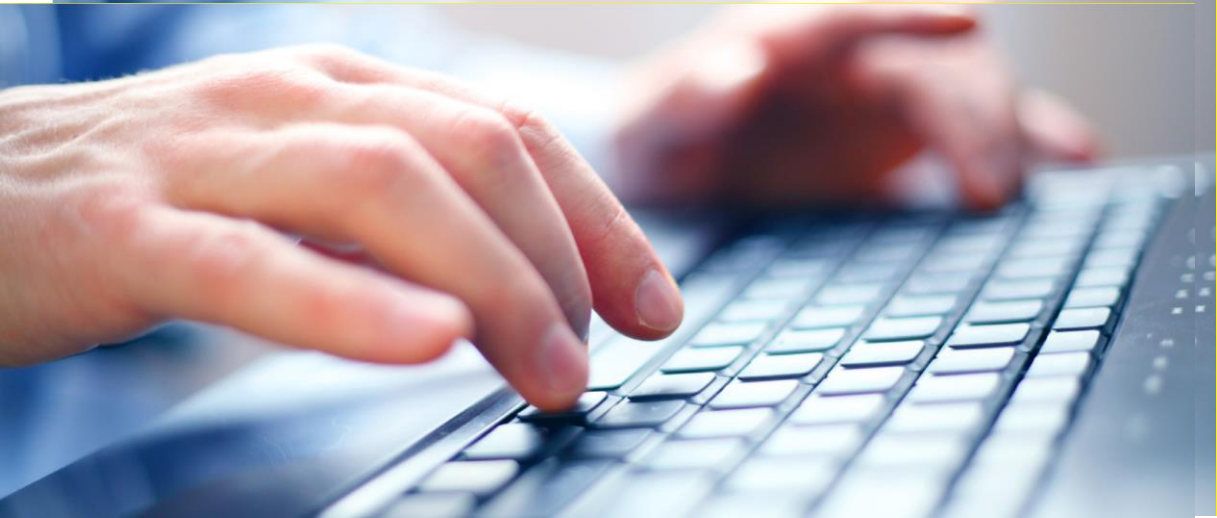


PART III  
COMPUTER  
& HEALTH  
INFORMATICS







## VISION AND MISSION

Department of Computer and health informatics, National University - Sudan strives towards developing standards of academic excellence and practical application capabilities of competent use of communication technology tools in healthcare field .

Graduates from this programme were expected to occupy important positions in private and public health systems, and contribute in administrating, planning and providing solutions to all the problems related to design and implementation of health informatics systems

The Different parts of this programme aim to produce innovative and morally responsible, critical thinking professionals are committed to meet the technical and health and developmental needs of all communities Sudan and the rest of the world, appropriately and effectively. Programmed teach students continue lifelong learning also. The faculty aims to be the most outstanding of its kind, as evidenced by the quality of places, up-to-date management and governance, education and job- oriented research to produce very high quality of graduates in the ethical and professional lives and scientific contribution

## ENTRANCE REQUIREMENTS

A student interested in joining the Faculty of Computer and Health Informatics, has to:

1. Obtain pass mark in in seven subjects including: Arabic language, religious studies, English language, mathematics, physics, chemistry and biology or computer sciences or engineering sciences. International students who have not studied Arabic and religious studies may have more alternative subjects from an approved list of subjects published in the webpage of Ministry of Higher Education.
2. Achieve the percentage in Sudan School Certificate announced every year (International students may have 10% less in the School Certificate scores.
3. Apply electronically through the website of the Admission and Accreditation Office, Ministry of Higher Education, or apply directly in Admission Office in the National University, and pass the health examination, aptitude tests and interview at the Faculty of Computer and Health Informatics.
4. Pay the published fees: 15,000 SDG or US \$ 3000 [international students]

## CAREER ADVICE

A graduate of the Faculty Computer and health informatics able to engage in the section of information and communication systems in any organization that provides services in the following sectors (public health and clinical care, dentistry, pharmacy, nursing, occupational therapy, physical therapy and (bio) medical research). They may chose to work in any positions in the IT or technical department of a hospital or healthcare institutions or technical support in the health industry. A National Service requirement is mandatory, with variable periods of time depending on the location.

## FACULTY OBJECTIVES

In addition to the general message of the faculty and objectives we seek through specialized computer science to achieve the following goals::

1. Emphasize values and ethical heritage of the Sudanese Nation in its curriculum, and follow strategies that lead to strengthening these values, as an important component of the National University philosophy and message.
2. Graduate with The B. Sc. Heath Computing programme (B.Sc.HC), with strong community orientation and ethical components.
3. Contribute to community development through health care informatics system services provided in its own institutions and other institutions co-operating with it, through the following: (a) partnership in designing programmed and plans, and implement whatever is feasible in utilizing the experience of specialists, (b) Contribution in continuous education through short and long term courses, to improve efficiency of the sector workers, and (c) Provision of essential equipments and supplies to improve quality of services, through partnership with the Ministry of Health.
4. Strengthen computer and health informatics research, making use of the University's accessibility and communication privileges.

## Curriculum Objectives

### [Characteristics of the health informatics graduate

A graduate of the National University health informatics Curriculum should be able to:

1. Adopt the strategies of the National University-Sudan and abide by its objectives and rules stated in its charter.
  2. Integrate his/her background knowledge in business management, information systems, computer science and health care and using it effectively
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in any position in Information systems in the health industry.

3. Design, configure and manage health information system and clinical support systems and processes that improve quality, effectiveness and efficiency of health institutions
4. Apply problem-solving skills to priorities for health informatics in order to ensure high quality and safety of health care.
5. Design and maintain all types of medical databases, like electronic health records and other computer networks, internet and multimedia applications in health sector
6. Provide data management and secure data and technical infrastructure of the institution to work with large database systems, and utilize key programming tools, effectively
7. Analyze, diagnose, and resolve technical issues associated with information systems in health care institution.
8. Understand and manage the risks of the use of information technology in the institution
9. Acquire the skills of self-learning, and contribute to availing opportunities for planning and implementing continuous education activities to upgrade his/her own abilities and those of his/her colleagues in the working team.

### EDUCATIONAL STRATEGIES AND METHODS

Emphasis on learning strategies include: (1) Practice plan to purchase basic skills in the applications of communication and information technology in the health sector, (2) learning student-centred, and responsibility maximum in the learning process of students, and (3) based on problem-solving and learning-oriented problem, (4) community-oriented activities of the community and, (5) the integration of basic and community science and practice and training in health institutions (6) and self-peer teaching and assessment, (7) the team approach, (8) and a wide range of optional, (9) continuous assessment, (10) preparation for continuing education.

Department of Health informatics adopt the following methods in the daily programme of activities: (1) (Sessions- learning) based on the solution of problems (2) Seminars and discussions small group (3) Practice in health institutions is essential part of the curriculum (4) Practicing in the computer laboratories is essential part of the curriculum (5) lectures (6) Educational activities, duties and reporting and research activities (according to the nature of the subject) (7) Elective courses.

Study Plan of the program include 166 credit hours Bachelor degree in Computing and Health Informatics (Honor). The program supports a continuous assessment

system that may contain exams, practical applications, tutorials, seminars and tests. The Plan includes research project for graduation of 6 credit hours.

## TIMETABLE

The B. Sc. Computer and Health Informatics programmes (B.Sc.HC) requires four years (8 semesters) divided into three phases: all are based at the main campus of the College with one or two days off campus in visits to relevant institutions and training facilities. The programme schedule therefore involves considerable commitment from students to be on time at the respective sites specified in their daily timetables. Each student should have a functioning e-mail address for last moment changes, a frequent incident in field training programmed

STRUCTURE OF HEALTH COMPUTING CURRICULUM (Curriculum phases and timetable)

### Phases

The programme is of four years' (8 semesters'), The academic year consists of two semesters and students are evaluated according to the Academic rules of the National University. Study Plan of the program include 166 credit hours (CHs) Bachelor degree in Computing and Health Informatics (Honor). The Plan includes research project for graduation of 6 credit hours.

Phase 1: Introductory courses and University requirements      Semesters 1-2

Phase 2: Health computing and management sciences      Semesters 3-4

Phase 3: Practical training      Semesters 1-8

### Semester 1 [ 21 CHs- 18 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Islamic studies	ISLAM-111	Longit.	3	--	-	3
2	Arabic language	ARAB-112	Longit.	3	-	-	3
3	English language	ENG-113	Longit.	3	-	-	3
4	Calculus (1)	MAT114	Longit.	2	2	0	3
5	Introduction to Computer Science	COM115	Longit.	2	-	3	3
6	Discrete Mathematics	MAT116	Longit	2	2	-	3
7	Principles of Economic	ME-STAT-117	Longit	2	2	-	3
			<b>18</b>	<b>17</b>	<b>6</b>	<b>3</b>	<b>21</b>

## Semester 2 [ 23 CHs- 17 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Islamic studies	ISLAM-121	Longit.	3	--	-	3
2	Arabic language	ARAB-122	Longit.	3	-	-	3
3	English language	ENG-123	Longit.	3	-	-	3
4	Sudanese studies	HMS124	Longit	2	-	-	2
5	Principles of Accounting	HMS125	Longit	2	2	-	3
6	Principles of Programming	COM126	Longit	2	-	3	3
7	Algebra and Geometry	MAT127	Longit	2	2	-	3
8	Calculus (2)	MAT128	Longit	2	2	-	3
			17	19	6	3	23

## Semester 3 [ 24 CHs- 18 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Disease classification and causes	HSC-211	Longit.	3	-	-	3
2	Programming Methods	COM-212	Longit.	2	-	3	3
3	Medical Terminology	HSC-213	Longit.	3	-	-	3
4	Health policies and Planning	HSC-214	Longit.	3	-	-	3
5	Database Concepts (HealthcareDatabase)	COM-215	Longit.	2	-	3	3
6	Statistics & Probabilities(1)	MAT-216	Longit.	2	2	-	3
7	System Analysis & Design(1) (Healthcare Information Systems)	SYS-217	Longit.	2	2	-	3
8	Foundation of Health Information Management	HIM-218	Longit.	2	2	-	3
				19	6	6	24

**Semester 4 [ 24 CHs- 17 weeks]**

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Computer architecture and organization (Hardware for health Computing)	COM-221	Longit.	2	-	3	3
2	Human - Computer interaction	INT-222	Longit.	2	-	3	3
3	Statistics & Probabilities(2)	SYS-223	Longit.	2	2	-	3
4	Database programming (Health Databases)	COM-224	Longit	2	-	3	3
5	Algorithms and Data Structure	COM-225	Longit	2	-	3	3
6	Medical and computer Ethics	HSC-226	Longit	2	2	-	3
7	Biostatistics and Computing	STAT- 227	Longit	2	2	-	3
8	Internet Technology	INT-228	Longit	2	-	3	3
			17	16	6	15	24

**Semester 5 [ 18 CHs- 18 weeks]**

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Programming Methods (2)	COM311	Longit.	2	-	3	3
2	Computer Networks and Communications	INT312	Longit.	2	-	3	3
3	Bioinformatics	HSC323	Longit.	2	2	-	3
4	Software Engineering (1)	SWE314	Longit	2	-	3	3
5	Visual Programming	COM315	Longit	2	-	3	3
6	Decision support and Expert Systems	SYS316	Longit	2	2	-	3
			18	12	4	12	18



## Semester 6 [ 21 CHs- 18 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Software Engineering (2)	SWE321	Longit.	2	-	3	3
2	Operating Systems Concepts	COM322	Longit.	2	-	3	3
3	Telemedicine-1 (Internet and web design)	HSC323	Longit.	2	-	3	3
4	Research Methodology (Health System Research)	HMS324	Longit.	2	2	-	3
5	Machine Learning Techniques	HSC325	Longit.	2	-	3	3
6	Data Mining	COM326	Longit.	2	2	-	3
7	E-commerce	INT327	Longit.	2	2	-	3
			18	14	6	12	21

## Semester 7 [ 18 CHs- 18 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Information Security	INT411	Longit.	2	2	-	3
2	PACs System	HSC412	Longit.	2	-	3	3
3	IT Project Management	INT413	Longit.	2	2	-	3
4	Artificial Intelligence	COM414	Longit.	2	-	3	3
5	Simulation and modelling	COM415	Longit.	2	-	3	3
6	Medical Image Processing	COM416	Longit.	2	-	3	3
			18	12	4	12	18

## Semester 8 [ 18 CHs- 20 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Mobile Device Programming Technologies	INT421	Longit.	2	-	3	3
2	Professional Ethics	HMS422	Longit.	2	-	-	2
3	Hospital Management	HSC423	Longit.	2	2	-	3
4	Telemedicine-2 ( Internet Conferencing)	HSC424	Longit.	2	-	3	3
5	Graduation project	COM425	Longit	-	-	18	6
			18	8	2	24	17

## COURSE OUTLINE

Detailed behavioural 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 programme coordinator.

## Phase 1: Semester 1, Preliminary Courses

(University Requirements)

Title	Code	Semester/Duration	Credits
ISLAMIC STUDIES	ISLAM-111+121	1and 2/Longitudinal	4+4

This is a National Requirement compulsory to all Muslim Students, which includes two courses: 111 in Phase 1, and 121 in Phase 2. Their contents are: (1) the recitation of two Suras of the Holy Quran, which introduces a lot of behavioural and ethical issues for mankind as well as for Muslims, (2) the basic sources of religious thought and religious groups, (3) the principles of deriving a religious rule relevant to the medical profession, and (4) review the Fatwa's likely to come as a request from the community to the health team member working in that community, and all problems that may arise from emerging issues that require ethical discussion, that leads to better understanding between individuals in groups, to help living in a peaceful and constructively save environment and society.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
ARABIC LANGUAGE	ARAB-112+122	1and 2/Longitudinal	4+4

This is a National Requirement compulsory to all Arab Speaking Students, which includes two courses: 112 in Phase 1, and 122 in Phase 2. It includes: (1) the basics of Arabic language grammar that would allow students to read and write correctly, (2) pronunciation and punctuation of an Arabic text, (3) summarizing and abridging a lengthy Arabic text, (4) abstracts of Arabic poetry, and (5) principles of translation of scientific text between Arabic and English languages.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
ENGLISH LANGUAGE	ENG-113+114	1and 2/Longitudinal	4+4

The sources of health information in the World are still in English. The Internet navigation to obtain information is basically in English. Some of the patients, attending clinics in Sudan, may only speak English language, especially with open-up of borders with economic development and of globalization. Passing the English language examination is an essential entry requirement to universities in Sudan. The general objectives of this course include: (1) correct pronunciation of medical terms, including those related to health services in the country, (2) correct reading and showing understanding of texts from medical books, (3) expressing one's self in good English describing his daily activities, career ambitions, present problems in health and current attempts at management, and (4) translating some pieces from English to Arabic, and three others from Arabic to English, both sets from medical literature.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Disease Classification And Causes	HSC-211	Longitudinal	3(3,0,0)

This course is an introduction of advanced biomedical terminology. The student should: (1) define the major etiologic classification of diseases [e.g. congenital, inflammatory, neoplastic ..etc, (2) describe the general causes of the disease, (3) identify the major

parts of the body, and the names of systems and organs, (4) outline the terms used in general pathology and basic microbiology, (5) name the common investigations carried out at the laboratory or imaging department, (6) show awareness of the essential drug list.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Health policies and Planning	HSC-214	Longitudinal	3(3,0,0)

This course cover topics in Management processes/roles of public health professionals; health service organizations; policy issues and resource utilization/control; human resources management; public health trends.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Medical Terminology	HSC-213	Longitudinal	3(3,0,0)

This course designed to introduce and familiarize the student with the medical terminology used to describe the structure and functions of the human body. This knowledge provides a foundation for further study in the clinical aspects of the Medical Office Assistant profession. Topics include medical words and phrases and medical abbreviations related to the systems of the human body and disease processes.

Upon completion of this course, the Professional Medical Office Assistant student will be able to correctly spell, define, pronounce, define and relate the chapter materials to their job duties within the Medical Office profession.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Foundation of Health Information Management	HIM-218	Longitudinal	3(2,2,0)

Health Information Management is an undergraduate level course focusing on data management, requirements and standards, classification systems, and reimbursement in relation to healthcare processes. Several areas will be introduced that will provide baseline health informatics knowledge and basic information systems knowledge for anyone working in a health delivery environment or a health related organization. Students will gain hands-on learning in the application of concepts through the use of clinical software.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Biostatistics and Computing	STAT- 227	Longitudinal	3(2,2,0)

This course is an introduction to statistical methods used in the public health, biological, and medical sciences. Topics include descriptive statistics, performance characteristics of diagnostic tests, graphical methods, estimation, hypothesis testing, p-values, confidence intervals, analysis of variance and contingency table analysis, analyses of standard one-sample or two-sample data sets, follow statistical reasoning and read statistical reports with understanding, correlation, linear regression, and clinical trials.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Medical and Computer Ethics	HSC-226	Longitudinal	3(2,2,0)

This course is an introduction to Principles of Ethics and Liability, Ethical Standards, Ethical Decisions and Challenges, Bioethics Issues, Patient Record Requirements, Confidentiality and Informed Consent, Access to Health Information, Specialized Patient Records, Risk Management, Quality Management and Utilization Management, Health-Care Fraud and Abuse, Ethics in the Workplace and Judicial Process of cybercrime.

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## Phase 2 : Semesters 3 - 4, Health Computing Sciences

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Islamic studies (ISLAM-121) - 4 CHs longitudinal (See ISLAM-111).

Arabic language (ARAB-122) - 4 CHs, longitudinal (See ARAB-112)

English language (ENG-123)- 4 CHs longitudinal (see ENG-113)

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Programming Methods (2) (OOP)	COM311	Longitudinal	3(2,0,3)

This course focusing on Definition of object oriented, Inheritance, Multiple inheritance, Encapsulation, Polymorphism, Introduction to Interfaces, Dealing with interfaces, Packages, Application cases, Graphical User Interface and its Applications.

<b>Title</b>	<b>Code</b>	<b>Semester/Duration</b>	<b>Credits</b>
Bioinformatics	HSC323	Longitudinal	3(2,2,0)

The course introduce the most important and basic concepts, methods, and tools used in Bioinformatics. Topics include (but not limited to) bioinformatics databases, sequence and structure alignment, protein structure prediction, protein folding, protein-protein interaction, Monte Carlo simulation, and molecular dynamics. Emphasis will be put on the understanding and utilization of these concepts and algorithms. The objective is to help the students to reach rapidly the frontier of bioinformatics and be able to use the bioinformatics tools to solve the problems on their own research.

<b>Title</b>	<b>Code</b>	<b>Semester/Duration</b>	<b>Credits</b>
Telemedicine-1 (Internet and web design)	HSC323	Longitudinal	3(2,0,3)

This course designed for students interested in becoming skilled searchers of Internet resources and creative designers of web sites. It covers: Internet search tools, search engine architecture, search techniques and strategies. Evaluation of information resources as well as the strengths and limitations of search tools. Analysis of web sites, and application of information architecture to web site design and the principles of user-centred Web design. Hands-on practice in web site creation using HTML and Dynamic HTML, Java scrip and PHP. Use of HTML editors such as Front Page and Dreamweaver and image tools such as Photoshop and Fireworks to add banners, icons and photos to web sites. Use of XML in web applications.

<b>Title</b>	<b>Code</b>	<b>Semester/Duration</b>	<b>Credits</b>
Scientific Research Methodologies	HMS324	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.

<b>Title</b>	<b>Code</b>	<b>Semester/Duration</b>	<b>Credits</b>
Machine Learning Techniques	HMS324	Longitudinal	3(2,2,0)

Machine learning uses interdisciplinary techniques such as statistics, linear algebra, optimization, and computer science to create automated systems that can sift through large volumes of data at high speed to make predictions or decisions without human intervention. Machine learning as a field is now incredibly pervasive, with applications spanning from business intelligence to homeland security, from analyzing biochemical interactions to structural monitoring of aging bridges, and from emissions to astrophysics, etc. This class will familiarize students with a broad cross-section of models and algorithms for machine learning, and prepare students for research or industry application of machine learning techniques.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Information security	INT411	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.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Picture archiving and Communication Systems (PACs)	HSC412	Longitudinal	3(2,0,3)

The Course aims at providing all of the essential skills and knowledge necessary for the successful, planning, implementation and maintenance of a PACS system.

This course also helps prepare students to administrate and maintain Imaging Informatics to achieve saving the time reaching the specialist in and outside the medical institution and keeping software database to retrieve these digital images at any time.

Improving PACS architecture will lead to more integrating the healthcare enterprise and electronic medical records.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Medical Imaging & Image Analysis	COM416	Longitudinal	3(2,0,3)

The aim of the course is to show how to extract, model, and analyse information from medical data and applications to help diagnosis, treatment and monitoring of diseases through computer science. Medical image computing is a highly interdisciplinary field involving not only medicine and computer science but also mathematics, biology, statistics, probability, psychology and other fields. Computer science plays the role of a bridge among these disciplines and is critical in the advancement of medical imaging science.

The course includes topics in medical image analysis: image segmentation, registration,

statistical modeling and applications of computational tools for medicine. It will also include selected topics relating to medical image formation. It will be application oriented.

The course will provide the participants with an up to date background in current state-of-the-art in medical image analysis and imaging.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Computer Ethics	HMS422	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,

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Hospital Management	HSC423	Longitudinal	3(2,2,0)

Hospital management is so essential in presenting high quality medical services to community. The principles and procedures taken in good hospital management leads eventually in the achievement of patients welfare and more medical professionalism.

Mastering these managerial skills will not affect only the improvement of work efficiency but will touch positively patients lives and their treatment processes.

The Course aims at providing all concepts of hospital management covering all related human resources concepts, quality assurance procedures, medical staff management, risk management, emergency rooms management and financial management and planning related to medical and computer ethics.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Telemedicine-2 ( Internet Conferencing)	HSC424	Longitudinal	3(2,0,3)

The Course aims at providing all general concepts of telemedicine focusing specially in internet conferencing concepts and technologies. Web conferencing techniques, file sharing, and online meetings are covered in great details.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
Graduation Project	COM425	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 be 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.

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