

FACULTY OF
COMPUTER
& HEALTH
INFORMATICS





VISION AND MISSION

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

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

The Different parts of this programme aim to produce innovative and morally responsible, critical thinking and professionals are committed to meet the technical and health and developmental needs of all communities in Sudan and the rest of the world, appropriately and effectively. Programmed teach students how to learn and to continue lifelong learning also. The faculty aims to be the most outstanding of its kind, as evidenced by the high quality of places, up-to-date management and governance, education and job- oriented research, to produce a 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 though 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: 8,000 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

The objectives of the National University Faculty of Computer and health informatics are to:

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 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.
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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.

Faculty 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

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') duration divided into three phases, comprising about 160 CHs. A semester is 18-20 weeks in Phase 1 and 2, and 22-24 weeks in Phase 3.

<u>Phase 1: Introductory courses and University requirements</u>	<u>Semesters 1</u>
<u>Phase 2: Health computing sciences</u>	<u>Semesters 2-4</u>
<u>Phase 3: Practical training</u>	<u>Semesters 5-8</u>

Semester 1 [19 CHs- 18 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Islamic studies	ISLAM-111	Longit.	2	--	-	2
2	Arabic language	ARAB-112	Longit.	2	-	-	2
3	English language	ENG-113	Longit.	2	-	-	2
4	Introduction to medicine and medical education	ME-EDU-114	3	2	-	-	2
5	Physics for medical equipments and investigations	ME-PHYS-115	2	2	-	-	2
6	Computer science-1	ME-COMP-116	3	1	-	1	2
7	Biostatistics	ME-STAT-117	2	2	-	-	2
8	Basic biochemistry	ME-BIOC-118	3	2	-	1	3
9	Behavioural science	ME-BEHAV-119	3	2	-	-	2
			16	17	-	2	19

Examinations (2 weeks)

Repeat courses or examinations for late comers and failures.

Semester 2 [17 CHs- 217weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Islamic studies	ISLAM-121	Longit.	2	--	-	2
2	Arabic language	ARAB-122	Longit.	2	-	-	2
3	English language	ENG-123	Longit.	2	-	-	2
4	Computer science-2	ME-COMP-124	3	1	-	1	2
5	Computer hardware-1	HC-COMP 125	4	2	-	1	3
6	Physics-2 (Electricity and capacitance)	HC-PHYS-126	4	2	-	1	3
7	Computer hardware-2	HC-COMP-127	4	2	-	1	3
			15	13	-	4	17

Examinations (2 weeks)

Repeat courses or examinations for late comers and failures.

SUMMAR 1 AND ELECTIVES.

1. Write 1500 words on a current issues in IT security 2 CHs,
2. Repeat courses or examinations for late comers and failures.

Semester 3 [22 CHs- 18 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Biostatistics and Computing -2	HC-STAT-211	Longit.	2	--	1	3
2	Disease classification and causes	HC-DIS 212	5	3	-	1	4
3	Advanced computing-1(Operating Systems)	HC-COMP 213	Longit.	3	-	1	4
4	Health information systems-1 (System Analysis and Design)	HC-HSYS 214	Longit.	3	-	1	4
5	Physics-3 (Electronic)	HC-PHYS-215	3	2	-	1	3
6	Calculus-1	HC-CALC-216	6	4	-	-	4
			16	17	-	5	22

Examinations (1 week)

Semester 4 [20 CHs- 17 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Communications and networks-1 (Introduction)	HC-NET 221	Longit.	2	--	1	3
2	Advanced computing-2 (Data Base Management and Programming)	HC-COMP 222	Longit.	2	-	1	3
3	Basic Epidemiology	HC-EPID 223	Longit.	2	-	1	3
4	Medical and Computer Ethics-1	ME-ETHIC 225	2	2	-	-	2
5	Biostatistics and Computing -2	STAT-226	3	2	-	-	2
6	Calculus-2	HC-CALC-226	6	3	-	1	4
7	Physics-4 (Radiations Equipments)	HC-PHYS-215	3	3	-	-	3
			16	16	-	4	20

Examination of longitudinal courses (+re-sits) 1 week)

Repeat courses or examinations for late comers and failures.

SUMMAR 2 AND ELEVTIVE MODULES

1. Research methodology and writing in interne sources on medical information 2 CHs
2. Elective (E232): Visit an institution and write 1500 words on its IT security system 2 CH

Semester 5 [21 CHs- 20 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Communications and networks-2 (Internet)	HC-NET 311	Longit.	3	--	1	4
2	Advanced computing-3 (Object Orient Programming)	HC-COMP 312	Longit.	3	-	1	4
3	Hard ware for health computing	HC-HARD 313	Longit.	3	-	1	4
4	Health information systems-3 (Decision Making and Support system)	HC-HSYS 314	Longit	3	-	1	4
5	Primary health care-1	ME-PHC 315	Longit	1	-	1	2
6	Data Structure-1	HC-COMP 316	Longit	2	-	1	3
			18	15	-	6	21

Examination of longitudinal courses (+re-sits) 1 week

Repeat courses or examinations for late comers and failures.

Semester 6 [20 CHs- 20 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Communications and networks-3 (Security)	HC-NET 321	Longit.	2	--	1	3
2	Advanced computing-4 (Expert System)	HC-COMP 322	Longit.	2	-	1	3
3	Pharmacology and therapeutics-1	HC-PHARM 323	Longit.	2	-	1	3
4	Health policies and planning	HC-HPP 324	Longit.	2	-	-	2
5	Primary health care -2	HC-PHC 325	Longit.	1	-	1	1
6	Telemedicine-1 (Internet and web design)	HC-TELE 326	Longit.	3	-	1	4
7	Data Structure-2	HC-COMP 327	Longit.	3	-	1	4
			18	14	-	6	20

Examinations (2 weeks)

Repeat courses or examinations for late comers and failures.

SUMMAR 3 AND ELECTIVES

1. Training in a health facility (HI-SUM-331)2 CHs Block 2 weeks
2. Elective (E332): A 1000 work essay on a current storage systems1CH

Semester 7 [18 CHs- 20 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	PACs systems-1	HC-MED-411	Longit.	3	--	1	4
2	Telemedicine-2 (Internet and E-health)	HC-TELE-412	Longit.	2	-	-	2
3	Health system research -2	HC-HSR-413	Longit.	2	-	-	2
4	Medical and Computer Ethics-2	HC-ETHIC-414	Longit.	2	-	-	2
5	Hospital rotations -1	HC-HR 415	Longit.	-	-	4	4
6	Advance Computing-5 (Computer Graphic)	HC-COMP 416	Longit.	2	-	2	4
			18	11	-	7	18

Examination of longitudinal courses (+re-sits) 1 week

Semester 8 [18 CHs- 20 weeks]

	Title	Code	Weeks	Units			CH
				Th	Tut	Prac	
1	Hospital rotations-2	HC-HR-421	Longit.	-	--	4	4
2	Pharmacology and therapeutics-2	HC-PHARM-422	Longit.	2	-	2	4
3	Telemedicine-3 (Internet and conferencing)	HC-TELE 423	Longit.	2	-	2	4
4	Hospital management	HC-HM 424	Longit.	2	-	2	4
5	Graduation project	HC-GRAD-425	Longit	-	-	2	2
			18	6	-	12	18

Examinations (2 weeks)

Repeat courses or examinations for late comers and failures.

GRADUATION

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)

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
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.

Most of this content is detailed in the College Notes (NC- 111/05, and (121/06) , the rest is obtained by self-directed learning and written assignments

<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 terns, 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>
INTRODUCTION TO MEDICINE AND MEDICAL EDUCATION	MEDU-114	1/ 3 weeks	2

This is a three-week (2 CHs) block, starting with a simple medical problem that emphasize the meaning and message of health, health care delivery system in the country, the role of the physician in health care, role of other professional and administrative staff, priority health problems, concepts and principles of learning, adult education and learning, student centred and problem-based learning, instructional techniques (lecture, small group etc), student assessment methods, holistic approach, interdisciplinary and partnership concepts, curriculum development, programme evaluation, leadership and professional ethics. Students are divided to groups to spend a week in a health facility, hospital theatre, hospital outpatient, health centre, various directorates and departments of Federal and State Ministries of Health, etc.. Meanwhile students are given discussion sessions on group dynamics and instructional methods, at the end of the course the groups present their field activity using a suitable audiovisual technique. Evaluation assesses the knowledge and attitudes of the students in these three areas: health system, group dynamics and instructional methods.

Most of the content is detailed in the College Notes (NC- 114/05), the rest is achieved by self-directed learning and written assignments

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
PHYSICS FOR MEDICAL EQUIPMENTS AND INVESTIGATIONS	PHYS-115	1/Block 3 weeks	2

The basic principles of general physics are important for understanding certain mechanism that take part in the human body, and also, the technical background of many medical equipments. A medical professional is often confronted with a method of investigation or intervention that is based on simple physical or mechanical process in the human being and he/she has to deal cautiously with the machine and use it correctly considering its proper maintenance and patient's and worker's safety. These include physical chemistry, gas laws, physics of light and sound, and radiation.

Most of the content is detailed in the College Notes (NC- 115/05), the rest is achieved by self-directed learning and written assignments

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
COMPUTER SCIENCE	COMP-116	1/ 3 weeks	2

Most of the textbooks of medicine and allied sciences are available on CDs, in which a large volume of knowledge is saved and easily retrievable. There are many software packages demonstrating methods and

techniques in clinical skills including patient rapport in history taking, clinical examination, investigations and management. Students and teacher can access the internet for the unlimited sources of health information, both at their professional level and public level for health education. Students and future doctors are educators who have to prepare smart documents and presentations for the health team and profession at large. Knowledge of programmed like Word, Excel, and PowerPoint is indispensable for anyone learner or teacher. Computer is important for students both in the developed or developing world, more so for the latter, who might not have inherited voluminous libraries in their colleges and have to utilize the virtual libraries available all over the world. Medical journal as hard copies are difficult to be owned by one institution, now almost all are available on-line for those who can use the computer efficiently. The course is intensive focusing on the basic principles of computer electronics and applications relevant to health science education. This is mainly on the hand-on experience in dealing with famous programmed like DOS, Word, Excel, PowerPoint, Access and Internet Explorer. The use of CDs is stressed covered as well as having e-mails and navigating the internet for health information including how to access medical journals, and communicate with scientists worldwide.

Most of the content is detailed in the College Notes (NC- 116/05), the rest is achieved by self-directed learning and written assignments

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
BIostatISTICS-1	STAT-117	1/ 2 weeks	2

A two-week course basic statistics as applied to health, to include: introduction to statistics, probabilities, data summary, presentation; measurement of central tendency; interpretation of variation (dispersion), population means, normal distribution; confidence interval, frequency distribution, sampling techniques, calculation and interpretation of the concept of confidence interval, the concept of p-value and its interpretation, the normal and skewed frequency distribution of biomedical data, and apply the appropriate test of significance for a given data set and a given research methodology (using t test as an example).

Most of the content is detailed in the College Notes (NC- 117/05), the rest is achieved by self-directed learning and written assignments

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
BASIC BIOCHEMISTRY	BIOCH-118	1/ 3 weeks	3

A three-week block in Semester 1, to include: atomic structure, chemical bonding, chemical reactions, anabolism and catabolism, molecular formulae, solutions and solubility, molarity, molality, normality and molar fraction, acids and bases, buffers, hydrocarbons, isomerism, introduction organic compounds, classification of aliphatic and aromatic hydrocarbons, their properties and reactions; aldehydes and ketones, alcohols, phenols and ethers acids and amines benzenes and their derivatives; carbohydrates, lipids and proteins, vitamins and enzymes and coenzymes, carbohydrates, lipids, proteins, phospholipids, cholesterol, nucleic acids, nitrogen bases, enzymes and co-enzymes.

Most of the content is detailed in the College Notes (NC- 118/05), and in the practical notes. The rest is achieved by self-directed learning and written assignments

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
BEHAVIOURAL SCIENCE	BEHAV-119	1/ 3 weeks	2

A two-week block during Semester 1, to include: (1) introducing psychology, psychoanalysis, defense mechanism manifesting as behaviours, (2) role of stress in the etiology of physical and psychological illness, (3) coping with loss, grief and death, (4) biological basis of behaviour (catecholamines, dopamine, neurotransmitters, neuropeptides), (5) cultural considerations in medical practice, (6) family structure and dynamics in health care, (6) health and illness behaviour, (7) personality, (8) terminology of psychiatric disease, (9) medical bases of substance and drug abuse.

Most of the content is detailed in the College Notes (NC- 119/06), the rest is achieved by self-directed learning and written assignments

Phase 2 : Semesters 2 - 4, Health Computing Sciences

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>
ELECTRICITY AND CAPACITANCE	HC-PHYS-126	1/ 4 weeks	3

This course provides instruction in understanding and designing direct current and alternating-current electrical circuits. Topics include voltage, current, resistance, Ohm's Law, Coulomb's law, Kirchoff's laws, Gauss's law and electric flux, magnetism's relationship with electricity, inductance and capacitance, and multi-phase electrical systems.

Basic Electricity Theory introduces students to the concepts involved with direct current and alternating-current circuitry, on both conceptual and quantitative levels. Students will be involved in interpreting existing direct-current circuits and be asked to calculate voltages, currents and resistances. Inductance and capacitance calculations will be performed on a variety of alternating-current circuits

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
COMPUTER HARDWARE-1 & 2	HC-COMP-125 and 127	1/ 4 weeks	3

This course is mainly a continuous practical where students review the components of the computer, identify the function of each, dismantle disconnect and reconnect these components. The tutor creates drills by removing or disabling some components and asks the students to diagnose the defect and work towards its solution.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
BIostatISTICS AND COMPUTING-1	HC-STAT-211	3/ 2 weeks	2

This course teaches methods and terminologies of descriptive and inferential statistics. Students who complete this course will be able to conduct their own analyses of standard one-sample or two-sample data sets, follow

statistical reasoning and read statistical reports with understanding. Introductory topics in linear regression, analysis of variance and contingency table analysis will also be covered.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
DISEASE CLASSIFICATION AND CAUSES	HC-DIS-212	3/5 weeks	4

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>
OPERATING SYSTEMS	HC-COMP 213	Longitudinal	4

This course teaches the fundamentals of operating systems. The following topics are studied in detail: virtual memory, kernel and user mode, system calls, threads, context switches, interrupts, interprocess communication, coordination of concurrent activities, and the interface between software and hardware. Most importantly, the interactions between these concepts are examined.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
HEALTH INFORMATION SYSTEM-1	HC-COMP 214	Longitudinal	4

This course is the most important in this program. The career of this graduate is to work on and with the health information system (HIS). Thorough understanding of the terminology and classification of the HIS requires spending sometime in the relevant departments in the Ministry of Health, and see how the data is collected and compiled. The student should also be aware of the internet sources of the HIS, and he/she has to design protocols for better organization and computation of the data collected.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
SYSTEM ANALYSIS AND DESIGN	HC-HSYS 214	Longitudinal	4

This course is grounded in the traditional methods of systems analysis and design. However, the course also introduces data centred and object oriented analysis and design approaches.

The course requires development of a working system using a software development tool as part of a team project. However, the focus of the course is on the analysis and design methodologies rather than on the tool.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
ELECTRONICS	HC-PHYS-215	1/Block 3 weeks	4

This course provides undergraduate students with both a basic and practical understanding of electricity and electronics. The emphasis is on applications rather than theory. Consequently there is a strong hands-on

component to the subject to enable students to gain practical experience. Topics covered in the subject include :DC and AC circuits, Diodes, transistors, operational amplifier, Analog and digital electronics. Detectors and transducers, Electronic control, Signal processing and noise.

The focus of the subject is the understanding the critical issues involved in assembling and using an array of electronic equipment to carry out various missions. Thus, there is more emphasis on the application as opposed to design. The breadth of topics covered in 6.071 makes this a good choice for those intending to take only one subject in electronics.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
CALCULUS-1	HC-CALC-216	1/Block 6 weeks	4

The course will cover ordinary differential equations: Linear equations of the second order where the coefficients are functions of the independent variable; Ordinary points; Singular points; Regular singular points; Solution in series; polynomials – their linear independence and recurrence relations. Introduction to Difference equations: Complementary functions and particular solutions.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
COMMUNICATIONS AND NETWORKS (1, 2 & 3)	HC-NET 221	Longitudinal	4

This extensive course is divided into three parts and is taken mainly by undergraduates, and explores ideas involving signals, systems and probabilistic models in the context of communication, control and signal processing applications. The treatment involves aspects of analysis, synthesis, and optimization. Topics covered differ somewhat from semester to semester, but typically include: networking, random processes, correlations, spectral densities, state-space modeling, multirate processing, signal estimation and detection.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
DATA BASE MANAGEMENT AND PROGRAMMING	HC-COMP 222	Longitudinal	4

This course relies on primary readings from the database community to introduce graduate students to the foundations of database systems, focusing on basics such as the relational algebra and data model, schema normalization, query optimization, and transactions. Topics related to the engineering and design of database systems, including: data models; database and schema design; schema normalization and integrity constraints; query processing; query optimization and cost estimation; transactions; recovery; concurrency control; isolation and consistency; distributed, parallel, and heterogeneous databases; adaptive databases and trigger systems.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
BIOSTATISTIC AND COMPUTING -2	STAT-226	1/Block 3 weeks	2

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, correlation, linear regression, and clinical trials.

Phase 3: Semesters 5-8,

Practical Training

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
COMMUNICATIONS AND NETWORKS (INTERNET)	HC-NET 311	Longitudinal	4

The goal of the course is to acquire knowledge about currently existing communication protocols, at all protocol levels, and to learn how to build distributed applications in the Internet.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
DECISION MAKING AND SUPPORT SYSTEMS	HC-HSYS 314	Longitudinal	4

A study of the decision process, including the gathering, analysis and application of data. Decision Support Systems (DSS) represents a point of view on the role of the computer in the decision-making process. Decision support implies the use of computers to do: assist managers in their decision processes; support rather, than replace managerial judgment; and improve effectiveness of decision making rather than just its efficiency. The course covers the tools, techniques, and theory of DSS and how they can be used to improve the quality of management decisions.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
DATA STRUCTURE-1	HC-COMP 316	Longitudinal	4

Data structure is an essential area of study for computer scientists and for anyone who will ever undertake any serious programming task. This course deals with the fundamentals of organizing and manipulating data efficiently using clean conceptual models. Students study many of the important conceptual data types, their realization through implementation, and analysis of their efficiency. Implementations in this course are carried out in the Java programming language, but the principles are more generally applicable to most modern programming environments.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
COMMUNICATIONS AND NETWORKS (SECURITY)	HC-NET 321	Longitudinal	4

This course is concerned with the protection of data transferred over commercial information networks, including computer and telecommunications networks. After an initial brief study of current networking concepts, a variety of generic security technologies relevant to networks are studied, including user identification techniques, authentication protocols and key distribution mechanisms. This leads naturally to consideration of security solutions for a variety of types of practical networks, including LANs, WANs, proprietary computer networks, mobile networks and electronic mail.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
EXPERT SYSTEM	HC-COMP 322	Longitudinal	4

An overview of the purpose, structure, and applications of expert systems. Topics covered will include expert systems technology, knowledge engineering, applications of expert systems, expert systems development, and the future of expert systems.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
TELEMEDICINE -1 (INTERNET AND WEB DESIGN)	HC-TELE 326	Longitudinal	4

This course is 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. 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.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
INTERNET AND E-HEALTH	HC-TELE-412	Longitudinal	4

Introduces health/medical information systems with emphasis on systems analysis and design to support managerial and clinical communications and decision making. Explores trends and innovations in information technology and systems, focusing on the managerial oversight of health/medical information systems. Explore contemporary management strategies for information system personnel.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
COMOUTER GRAPHICS	HC-COMP 416	Longitudinal	4

This course offers an introduction to computer graphics hardware, algorithms, and software. Topics include: line generators, affine transformations, line and polygon clipping, splines, interactive techniques, perspective projection, solid modeling, hidden surface algorithms, lighting models, shading, and animation. Substantial programming experience is required. This course is worth 6 Engineering Design Points.

<i>Title</i>	<i>Code</i>	<i>Semester/Duration</i>	<i>Credits</i>
INTERNET AND CONFERENCING	HC-TELE 423	Longitudinal	4

Techniques and approaches to understand broad issues about the future (with a focus on environmental topics as examples). Uses computer conferencing and Internet with significant student discussion and opportunities for team approaches and reporting.

