MASTER OF SCIENCE IN HEALTH INFORMATICS

1. INTRODUCTION

Information and Communication Technology (ICT) Systems play a crucial role in all aspects of modern life and influence the performance of all service sectors. This course will appeal to graduates who wish to pursue a career in a range of ICT-related industries such as ICT for healthcare sector in the public and private organisations. The mission of the School is to improve electronic healthcare delivery systems by educating individuals to be effective developers, users and managers of health information resources; processes, and solutions – by advancing health informatics knowledge through research; and by providing a consultative service to the healthcare community. The School's view of health informatics encompasses clinical, sociological, epidemiological, administrative, legal, eHealth and economic perspectives. Health is seen from a community perspective and encompasses the full range of services including health promotion and disease prevention, home care, community health and occupational health, physicians' services, institutional acute care, rehabilitation and extended care. As health information is increasingly being processed by computers and transmitted by communications technology, the School's programs have a significant technological component to help the country realized its Vision 2030 and beyond. This course allows students to opt for either project or thesis option. This conversion course is mainly for none computer science graduates.

2. OBJECTIVES

The overall objective of the programme is to prepare broadly-educated individuals with a thorough understanding of the principles of health information resource management and of the complexity of the healthcare systems, to work in both private and public informatics sector of the economy. The specific objectives of the programme are:

(a) To train graduates with the ability to apply information technology management knowledge in healthcare industry,

(b) To motivate graduates to acquire knowledge and skills required to discover and implement innovative solutions to existing and emerging problems in healthcare sector;

(c) To equip students with the capability to use a problem-solving approach to develop concrete technologies and policies in line with local healthcare requirements.

(d) To train students who are capable to understand the change and the management of change, particularly as it pertains to the introduction and enhancement of ICT in healthcare sector,

(e) To equip students with skills needed to understand the ethical and sociological implications of ICT in healthcare industry.

3. ADMISSION REQUIREMENTS

To qualify for admission into the Master Degree candidates shall be:

(a) Holders of at least an upper second class honours degree in Bioinformatics or Medical related fields from Jaramogi Oginga Odinga University of Science and Technology or any other recognized University

(b) Holders of a lower second class honors degree of Jaramogi Oginga Odinga University of Science and Technology or any other recognized University and a Postgraduate Diploma in Bioinformatics or related field from any other recognized University, or two years work experience,

In addition to the above, applicants must meet the specific requirements of the Masters programme as approved by the Senate.

4. COURSE STRUCTURE AND DURATION

The MSc course shall normally take two years covering 4 semesters offered by unit method.

Courses shall be offered in units. A course unit is defined as that part of a semester subject described by coherent syllabus and taught normally over a period of a semester. It is designated as a total of 42 hours of study in a semester. For this purpose, one 1-hour lecture is equivalent 2-hours tutorial or 3-hours practical or any combination as may be approved by the Board of the School of Informatics and Innovative Systems.

Part-time students shall be allowed to take not less than 50% of the courses prescribed for the year.

All course units will be taught for a total of 42 contact hours, including examinations except project work which will take 480 hours of practical work and project writing.

5. EXAMINATIONS REGULATIONS

Jaramogi Oginga Odinga University of Science and Technology Examinations rules and regulation shall apply.

6. COURSE DISTRIBUTION

One semester shall comprise minimum of four (4) units and a maximum of six (6) units.

YEAR ONE: SEMESTER ONE

Course Code	**Course Title**	**Contact Hours**			**Weight (Units)**
		Lecture	**Practical**	**Total**	
ICH 5111	Fundamental of Computer Systems	28	14	42	1C
ICH 5112	ICT Systems Design and Management	28	14	42	1C
ICH 5113	Health Policy and Management	28	14	42	1C
ICH 5114	Database and Information Systems	28	14	42	1C
HMP 5114	Biostatistics	28	14	42	1C
HMP 5115	Research Methods	28	14	42	1C
Total		**168**	**84**	**252**	**6**

YEAR ONE: SEMESTER TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICH 5121	Medical Imaging Processing	28	14	42	1C
ICH 5122	Health Systems Data Analysis	28	14	42	1C
ICH 5123	Clinical Decisions Support Systems	28	14	42	1C
ICH 5124	Evaluation in e-Health	28	14	42	1C
ICH 5125	Electronic Health Record	28	14	42	1C
HPS 5123	Health Management Information Systems	28	14	42	1C
Total		**182**	**70**	**252**	**6**

PROJECT OPTION TRACK
YEAR TWO: SEMESTER ONE

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICH 5211	Network and System Security	28	14	42	1C
ICH 5212	Telemedicine in Action	28	14	42	1C
ICH 5213	Epidemiology in Health Services Management	28	14	42	1C
ICH 5214	E-health and Telecare Systems	28	14	42	1C
	Electives (Any 2 Electives)*				

***ELECTIVES: Any 2 Electives**

Group One Electives:

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICH 5215	Healthcare Quality Improvement	28	14	42	1E
ICH 5216	Patient Care Information Systems	28	14	42	1E
ICH 5217	Information Assurance in Healthcare	28	14	42	1E
HPS 5126	Healthcare Financing	42	0	42	1E

Group Two Electives:

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICH 5218	Security Policies, Standards, and Compliance Strategies	28	14	42	1E
ICH 5219	Web Information Systems	28	14	42	1E
ICH 5231	Multimedia Information Systems	28	14	42	1E
ICH 5232	Information Technology Law, Ethics and Society	28	14	42	1E

YEAR TWO: SEMESTER TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICH 5221	Project	0	480	480	1C

RESEARCH/THESIS OPTION TRACK

YEAR TWO: SEMESTER ONE & TWO

Course Code	Course Title	Contact Hours			Weight (Units)
		Lecture	Practical	Total	
ICH 5311	Research/Thesis	0	960	960	6C

7. COURSE DESCRIPTION

YEAR ONE: SEMESTER ONE

ICH 5111 Fundamentals of Computer Systems (42 hrs)

Fundamental principles of computer operating systems, process execution, scheduling, memory management, concurrent processes, distributed processing, deadlock, security, and related topics. Current microcomputer, mid-range computer, and mainframe operating systems. Overview of hypervirtualization and high performance computing (HPC).

ICH 5112 ICT Systems Design and Management (42 hrs)

ICT Systems Design concepts; advanced emerging technologies and the associated market, business development and infrastructure networking skills using information technologies in innovative ways, such as wired and wireless local area networks, mobile phone networks. Satellite networks, data, and voice, and video services, security and management, etc. Selected topics: Design, implementation and deployment of internet exchanges in developing countries; Design and implementation of internet support for Mobile Response´ emergency GSM-container deployed in disaster areas. Business case studies: integrated services in national healthcare disaster management networks. ICT Management; Principles of Computing: computer programming and systems modelling. ICT Project Management in Healthcare; project management techniques and tools using. Security Management: tools and techniques available to secure and manage, networks, security policies, firewalls, an information system. Computer Law: knowledge of the legal and regulatory framework within which healthcare information

systems must operate. Project: design, implementation and evaluation of an ICT system and ICT application in healthcare.

ICH 5113 Health Policy and Management (42 Hrs)

Fundamental concepts of management information systems; current and developing health and business information systems of interest to managers in health services organizations; healthcare information system architecture; security and privacy issues; uses of healthcare information for clinical, strategic analysis and decision support; techniques required to develop and evaluate an information system request for proposal; and thoughts on the future of healthcare information systems including community health systems and web-based access to health information. Focus on: current information and issues regarding the latest technology applications.

ICH 5114 Database and Information Systems (42 Hrs)

Relational database management: database design, database creation, database maintenance, firm creation, report creation, data models, query languages, concurrency. Physical data organizations and database security, backup and recovery procedure, and database administration. Instruction in application development and programming using a representative database management package.

HMP 5114 Biostatistics (42 Hrs)

Introduction, statistical concepts and analytical methods as applied to data encountered in biotechnology and biomedical sciences: basic concepts of experimental design, quantitative analysis of data, and statistical inferences. Probability theory and distributions; population parameters and their sample estimates; descriptive statistics for central tendency and dispersion; hypothesis testing and confidence intervals for means, variances, and proportions; the chi-square statistic; categorical data analysis; linear correlation and regression model; analysis of variance; and nonparametric methods.

HMP 5115 RESEARCH METHODS (42 Hrs)

Introductory research methodology in health sciences: conceptualization and use of quantitative and qualitative approaches to answer a research question or explore the rationale in human behavior in health-related issues. Research process: formulating research questions; understanding sampling methods and processes; and understanding various quantitative and qualitative research designs, general methodological principles, and major issues of research in health sciences.

YEAR ONE: SEMESTER TWO

ICH 5121 Medical Imaging Processing (42 hrs)

Medical imaging concepts: physical principles of imaging methods in medicine. Medical imaging systems: conventional X-ray, computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicine (PET and SPECT), and ultrasound. Each of these modalities will be introduced from basic physical principles to the process of image formation. Design of computer aided diagnosis systems. Selected topics: algorithms for filtering, edge detection, segmentation, registration and 3D visualization of medical data. The Hands-on labs: involving actual medical imaging devices. Problem solving techniques using real medical imaging tasks by applying the knowledge learned in the class.

ICH 5122 Health Systems Data Analysis (42 hrs)

Fundamentals of database systems; Major health system databases: design and implementation with record linkage; analysis of database to create pictures of system components for strategic planning, ongoing program management, monitoring and evaluation. Case studies: use of basic tools and methods in healthcare system data analysis using real data and real problems.

ICH 5123 Clinical Decisions Support Systems (42 hrs)

Introduction to clinical decision support (CDS) systems and methods: using CDS tools and techniques to make informed decisions within healthcare organization; participate in strategic planning activities. Selected topics: conceptual framework for describing and analyzing CDS, effectiveness of CDS interventions, policies affecting CDS deployments, and health information standards pertinent to CDS initiatives, and best practices.

ICH 5124 Evaluation in e-Health (42 hrs)

Fundamentals of e-health evaluation: understanding of an evaluation process for e-health initiatives; assessing the effectiveness of e-health programs, evaluation design, data collection and analysis, as well as recommendations to assist decision-makers and policy planners. Discuss: e-health sustainability; Business Case to Policy. Focus on: sustainability issues and how e-health applications can be planned in a manner that encourages ultimate integration and routine use. Evaluation of HIV/AID, Malaria and other major diseases and their spread in Kenya.

ICH 5125 Electronic Health Record (42 Hrs)

Introduction; Recent efforts involved in modeling health information and documents. Topics: structured review of the current literature, development of a means for selecting key articles, and development of a structure for findings, including types and classes of health information, methods of health information documentation, and current status of use of XML in health information systems, including a summary of current limitations and challenges.

HPS 5123 Health Management Information Systems (42 Hrs)

Definitions: management information system, data and information; concepts of management information system; data - sources, collection analysis, storage, retrieval; reporting, dissemination, utilization; classification of information; uses of information. Information for hospital administrators: Types of information systems; personnel, financial, facilities and fixed assets; workload and operation; patient care, logistics. Computers and management of information: Existing state of health information systems; conceptual and practical aspects in the analysis, development, and utilization of computer-based information and control systems with emphasis on application to health care environment. Information for facility management: Range and quality and reliability of health and health service data; assessment of the costs and benefits of information systems; access, security and confidentiality; information personnel and training; systems sustainability. Organization of Hospital Information System (HIS); PHC and hospital information systems; integrated information system; Local Area Network (LAN), monitoring and evaluating a hospital information system.

YEAR TWO: SEMESTER ONE

ICH 5211 Network and System Security (42 hrs)

Network and Systems Security: system security services and mechanisms; design and implementation of security strategies for a networked environment. Security threats in the digital world; Security attacks, services and mechanisms; Information warfare model of security; basic cryptographic techniques; data encryption, message confidentiality, message authentication and digital signatures. Network Security: Internet security protocols: IPSec, SSL/TLS, SET; Identification and authentication (Kerboros and the AAA architecture); Security in wireless environment. System Security: Firewalls and intrusion detection; Specific threats on end-systems: viruses, worms, trojan horses. stack overflow, Code signing and software security models. Elements of a secure digital society: Privacy (including anonymity and pseudonymity).

ICH 5212 Telemedicine in Action (42 Hrs)

Telemedicine in action: a case-based approach to telemedicine and its applications in the field. Focus on: contextual cases: clinical; education; administration applications. Interaction with telemedicine experts; review a range of technology-enabled learning tools, participate in technology demonstrations, and engage in exchanges with various telehealth and informatics personnel and experts. Use of online workshop environment using Personal Digital Assistant and Smart Phones in medical practices devices.

ICH 5213 Epidemiology in Health Services Management (42 hrs)

Introduction; principles and methods of epidemiology: the design, implementation and evaluation of epidemiological analyses, and its management in the health and social services, the role of epidemiology in health services planning and policy formulation, health status indicators, outcome measurement and utilization analysis.

ICH 5214 E-health and Telecare Systems (42 Hrs)

Introduction; telemedicine concepts: case-based approach to telemedicine and its applications in the field. Selected contextual cases: clinical; education; administration applications. Review of technology-enabled learning tools, participate in technology demonstrations, and engage in exchanges with various telehealth and health informatics personnel and experts.

ICH 5215 Healthcare Quality Improvement (42 hrs)

Healthcare quality improvement concepts: methodology for Continuous Quality Improvement, Total Quality Management (TQM) and Quality Assurance (QA) in healthcare. Case studies and team work: on a quality improvement project related to healthcare work environments; standards and best practices.

ICH 5216 Patient Care Information Systems (42 hrs)

Patient Care Information Systems: concepts, methodologies and techniques available to support patient care processes using information technology. Focus on: review of factual and patient information systems, signal and pattern processing applications, decision support, simulation, education and training applications.

ICH 5217 Information Assurance in Healthcare (42 Hrs)

Advances in Information Assurance and the concepts of information security: CIA, risks, threats, Security concepts and models applicable vulnerabilities and countermeasures. Risk assessment and the identification of to healthcare infrastructure. business critical processes in healthcare. Threat assessment and relevant System security Security standards and codes of practice; countermeasures; Physical (hardware) security and Software access controls. policies, cryptography. Organisational aspects of information security in healthcare sector.

ICH 5218 Security Policies, Standards, and Compliance Strategies - (42 hrs)

Advances in security management principles: defining security requirements, planning and documenting security policies, asset identification and control, system access control and Internet security. Security techniques to formulate, administer, audit, manage and evaluate network security policies and standards based on best practices and standards e.g., ISO 17799/27001, Payment Card Industry (PCI) Data Security Standard, Sarbanes-Oxley (SOX) Act for corporate financial accountability, HIPPA for healthcare industry accountability; GLBA for privacy and security of non-public information; best practices for security auditing (COBIT) and the protection of private information. Best practices to implement IT Infrastructure Library (ITIL) for service delivery support and management. NIST and KEBS security policies and standards.

ICH 5219 Web Information Systems (42 hrs)

Concepts & fundamentals of web-based Information Systems (WIS): HTML, XHTML, CSS, JavaScript, Java Servlet, Java Server Page, client-server database applications on the internet, and XML data exchange and modeling, application component integration over the Web, and Web Mining for intelligent web-based applications. Latest and advanced technologies for developing WIS: AJAX, Web Security mechanisms, Web Search, Web Service and current trends in WIS. Concepts and skills for building sophisticated database-driven Web Information Systems (WIS). Client and server-side technologies and advanced topics such as AJAX, JSON, and Web 2.0 and other related web programming tools.

ICH 5231 Multimedia Information Systems (42 Hrs)

Multimedia information systems concepts, evolution of multimedia information systems, media and supporting device commonly associated, image databases, techniques for presenting visual

information, video databases, multimodels, audio databases, text databases, and multimedia information systems architecture. Designing and deploying multimedia information systems infrastructure. Topics: organizing multimedia content, physical storage and retrieval of multimedia data, Content-based Search and retrieval, creating and delivering networked and multimedia presentations, and current research directions in this area.

ICH 5232 Information Technology Law, Ethics and Society (42 hrs)

Review of International and Kenyan laws, legislation and legal issues relevant to information systems security profession in healthcare. Social and ethical computer use: major social and ethical issues in computer science, impact of computers on society, and professional computer ethics. Impact of computers: applications, benefits, digital copyright, privacy, computer crime, constitutional issues, risks of computer failure, issues related to ethical hacking and penetration testing. Cloud computing: policy, security and privacy of data. Evaluating reliability of computer models, trade and communications in the global village, computers in the workplace.

HPS 5126 Healthcare Financing (42 hrs)

An examination of concepts related to health care financing: budget preparation, cost benefit analysis, managed care, and on developing an understanding of reimbursement systems. Concepts and practices of healthcare finance and healthcare financial management: practical understanding of basic healthcare financial issues, financial reporting and analysis, and provider payment structures. Accounting and control system: revenue- generation and management, ways and methods of forecasting, issues of revenue generation. Evaluating healthcare financing mechanism; bridging the resource gap; broad policy options in health care financing. Government budgetary processes: Cash management; constitutional and legal aspects of the budget and financial control. Health insurance and revolving funds. Case studies in health care financing and health reforms.

ICH 5221 Project (480 hrs)

Each student will conduct his or her research with the approval and under the direction of the designated Departmental Course Coordinator. Prerequisites: Successful completion of all core Health Informatics project option courses.

ICH 5311 Research/Thesis (960 hrs)

Submission of the final research proposal: data collection and analysis; submission of progress reports to the supervisor(s); preparation of progress seminars; thesis preparation; submission of

thesis; correction and final submission of thesis. Prerequisites: Successful completion of all core Health Informatics thesis option courses.