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Multi Disciplinary Study Courses and the Postgraduate
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UNIVERSITY OF COLOMBO



**POSTGRADUATE INSTITUTE
OF MEDICINE OF SRI LANKA**

**Regulations and Guidelines
for**

MSc in Biomedical Informatics

2009

12(01)

POSTGRADUATE INSTITUTE OF MEDICINE,
UNIVERSITY OF COLOBO, SRI LANKA

MSc Biomedical Informatics
Regulations and Training Programme

In accordance with the decision of the Board of Study in Multidisciplinary Study Courses (MDSC) and the approval of the Board of Management of the PGIM, this Prospectus, Curriculum and Training Programme in Medical Education became effective from 01st November 2008.

2009

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1. Introduction

The Board of Study in MDSC (here in after referred to as the Board) will conduct training programmes and examinations leading to the Master of Science Degree in Biomedical Informatics. This course is conducted in collaboration with the Department of Informatics, University of Oslo, Norway.

Biomedical Informatics is the discipline formed by the intersection of computing, medicine and biology. It reflects the computing revolution that continues to transform medical practice.

The Master of Science program in Biomedical Informatics is aimed at preparing the student in the applications of computer and information technology to support and manage all health care activities ranging from those pertaining to the care of the sick, to health promotion and disease prevention, bioinformatics, medical and health professions education, health sciences research, and management efforts directed toward solution of problems in the delivery of health care, including resource optimization and cost effectiveness. It would serve as the stepping stone for the student in a career in biomedical informatics.

2. Programme Description

2.1. Eligibility Criteria

The minimum entry criteria will be one of the following qualifications:

1. Bachelor of Medicine and Bachelor of Surgery (MBBS) or Equivalent Degree
2. Bachelor of Dental Sciences (BDS) or Equivalent Degree
3. Bachelor of Science Honours Degree (BSc (Honours)) in Computer Science or equivalent Degree
4. Bachelor of Science Honours Degree in any biomedicine related field (e.g. Nursing, Pharmacy, Biology, Physics, Veterinary Sciences)

Those who have the qualifications mentioned in 1 and 2 above should have a Medical Degree registered with the Sri Lanka Medical Council and completed one year of medical experience after internship as at the date of closure of applications. Foreign nationals who seek registration in respect of the selection process should possess a medical degree registrable with the Sri Lanka Medical Council. The registrability will be determined on a case by case basis.

Those who have qualifications mentioned in 3 and 4 above should have completed two years work related experience in a medical or health related work setting which is acceptable to the Board of Study.

Candidates having these minimum qualifications will be allowed to sit for a selection process which tests the candidate's knowledge in basic informatics and health sciences.

2.2. Course delivery

2.2.1. Description

This would be a modular course delivered to a Masters level by an international faculty comprising of staff from the University of Colombo, Sri Lanka; University of Oslo, Norway; and other Universities in Sri Lanka and abroad.

The course is designed to be delivered using a mixture of open and distance learning sessions. Some sessions may be conducted by faculty members located overseas via live video conferencing. Students would have to complete the designated core modules and one elective module. It is anticipated that the student would spend 3600 hours on module work equivalent to 120 credits to complete their Masters [1 credit = 30 working hours]. Credit transfer may be considered on a case by case basis by the Board of Study. Additional hours would be required for assessment. Students would be assessed for each module. Students would need to pass each module in order to be awarded a Masters.

2.2.2. Duration

The course has to be taken as full time for two years.

2.2.3. Assessment

Assessments would be held at the end of each module and will consist of paper based and computer based examinations and evaluation of project reports.

Successful candidate

A successful candidate will be expected to score a minimum of 50% in each of the modules.

3. Course fees

Local candidates	Rs. 100,000/-
Candidates from the SAARC and Viet Nam	US\$ 4,000/-
Other candidates	US\$ 8,000/-

4. Semesters

The module will run in four semesters (total of 120 credits). Semesters 1, 2 and 4 will consist of compulsory modules, and 3 will consist of elective modules.

Semester 1

Module CI – Computers and Information and Communication Technology (30 credits)

Semester 2

Module C2 – Biomedical Informatics (30 Credits)

Semester 3 (Select 1)

Module E1 – Bioinformatics (elective module; 30 credits)

Module E2 – Public Health Informatics
(elective module; 30 credits)

Module E3 – Informatics in Medical Education
(elective module; 30 credits)

Semester 4

Module C3 – Elective attachment and Project (compulsory module; 30 credits)

5. Structure and content description

The modules and content areas covered in each module are listed below:

Module CI – Computers and Information and Communication Technology

1. Historical Developments in Computer and Information Technology
2. Basic maths and computational logic
3. Computer Hardware
4. Computer Operating systems and Application Packages
5. Data communication and networking
6. Systems analysis and design
7. Database Systems
8. Programming
9. Object oriented systems development
10. Internet and the World Wide Web
11. Web Development Techniques
12. Tools for online communication
13. Mobile programming concepts
14. Research Methods and Basic Medical Statistics
15. Introduction to Bioinformatics
16. Introduction to Public Health Informatics
17. Introduction to Informatics in Medical and Health Professional Education
18. Introduction to health sciences (for non medical graduates)

Module C2 – Biomedical Informatics

A. Themes in Biomedical Informatics

1. Biomedical data – their acquisition, storage and use
2. Biomedical decision making – probabilistic clinical reasoning
3. Cognitive science and biomedical informatics

4. Essential concepts for biomedical computing
 5. Systems design and engineering in health care
 6. Standards in biomedical informatics
 7. Natural language and text processing in bioinformatics
 8. Imaging and structural Informatics
 9. Ethics in biomedical informatics
 10. Evaluation and Technology Assessment
- B. Biomedical Informatics Applications
1. Electronic Health Record Systems and data exchange
 2. Management of Information in Health Care Organisations
 3. Consumer health Informatics and Tele-Health
 4. Patient care systems
 5. Patient monitoring systems
 6. Imaging systems in Radiology
 7. Information retrieval and digital libraries
 8. Clinical decisions support systems
 9. Healthcare financing and information technology
 10. The future of computer applications in biomedicine
 11. Introduction to Bioinformatics
 12. Introduction to Public Health Informatics
 13. Introduction to Informatics in Medical and Health Professional Education

Module C3 – Elective attachment and Project

In this module students are expected to spend an elective period attached to one or more approved health care settings locally and/or abroad. The time allocated for this elective is 20 weeks. More than one elective attachment could be undertaken during this period. However, the attachments should not run concurrently. The students will be expected (working individually) to plan, design, develop and implement an informatics project of their choice relevant to one of the settings to which they are attached.

Module E1 – Bioinformatics

- A. Introduction to the Cell
1. Cells and Genomes
 2. Proteins
- B. Basic Genetic Mechanisms
1. DNA and Chromosomes
 2. DNA Replication, Repair, and Recombination
 3. Gene Expression
 4. Cell division
 5. Patterns of Inheritance
 6. Manipulating Chromosomes, Proteins, DNA, and RNA
- C. Biological Databases
1. Sequence Databases
 2. Mapping Databases
 3. Information Retrieval from Biological Databases
 4. Genomic Databases
- D. Analysis at the Nucleotide Level
1. Predictive Methods Using DNA Sequences
 2. Predictive Methods Using RNA Sequences
 3. Sequence Polymorphisms
- E. Analysis at Protein Level
1. Predictive Methods Using Protein Sequences
 2. Protein Structure Prediction and Analysis
 3. Intermolecular Interactions and Biological Pathways
 4. Assessing Pairwise Sequence Similarity
 5. Creation and Analysis of Protein Multiple Sequence Alignments
 6. Sequence Assembly and Finishing Methods

7. Phylogenetic Analysis
8. Computational Approaches in Comparative Genomics
9. Using DNA microarrays to assay gene expression
10. Proteomics and protein identification
11. Using Perl to Facilitate Biological Analysis

Module E2 – Public Health Informatics

- A. The context of Public Health Informatics
 1. Introduction to Public Health Informatics
 2. History and Significance of Information Systems and Public Health
 3. Managing Information to Deliver Value
 4. The government and legislative context of informatics

- B. The science of public health informatics
 1. Information Architecture
 2. Core competencies in Public Health Informatics
 3. Assessing the Value of Information Systems
 4. Managing IT Personnel and Projects
 5. Public Health Informatics and Organisational Change
 6. Privacy, Confidentiality and Security of Public Health
 7. Data standards in Public Health Informatics
 8. Evaluation for Public Health Informatics
 9. Ethics, Information Technology and Public Health

- C. Key Public Health Information Systems
 1. Vital statistics Systems
 2. Morbidity data Systems
 3. Risk factor Information Systems
 4. Toxicology and Environmental Public Health Systems
 5. Knowledge based Public Health Systems

- D. New Challenges, Emerging Systems
 1. New means of data collection
 2. New means of increasing data accessibility
 3. Geographic Information Systems
 4. Immunization Registries
 5. Decision Support and Expert Systems in Public Health
 6. Promoting the Delivery of Preventive Medicine in Primary Care
 7. Disease surveillance/Bio surveillance
 8. Multimedia technologies for public health

- E. Case Studies
 1. Policy issues in Developing Information Systems for Public Health Surveillance
 2. Information Networks for Public Health Officials
 3. Using Informatics to Provide Health Education to the Public
 4. Integrated Public Health Information Systems
 5. Using Information Systems to Improve Capacity
 6. Using Data to Meet Policy Objectives
 7. International Networking
 8. Using Public Health Informatics in Conducting National Surveys
 9. Future developments

Module E3 – Informatics in Medical and Health Professional Education

- A. Teaching and Information Communication Technology
 1. Educational Development: Biological; Cognitive Development; Social Development
 2. Learning Theories: Behavioural Learning; Cognitive Learning; Social Learning; Constructivism; Constructionism

3. Individual Differences: Intelligence; Learning Styles; Prior Knowledge
 4. Learning Domains: Concepts; Decision Making; Problem Solving; Reasoning
 5. Organisational Culture
 6. Assessment and Evaluation
 7. Special Needs
 8. Academic Writing
 9. Virtual Learning Environments: Virtual Classrooms; Work Environment; Distance Education; Life Long Learning; Blended Learning.
 10. Reflection.
- B. Technologies for Learning
1. Embedding relevant pedagogical theories in different technological artefacts
 2. Integrating pedagogically inspired technical artefacts into teaching and learning
 3. On-line environments for learning and learning communities
 4. Learning technologies : Robotics, WebQuests, Simulations, Constructionist learning tools
 5. Web 2.0 technologies; Wikis; PhP; Pod casting.
 6. Mobile learning
- C. Multimedia for Learning
1. Instructional designing for health education
 2. Principles of multimedia design for learning
 3. Web Authoring using Macromedia
 4. Multimedia authoring using Macromedia Flash
 5. Necessity and practicalities of universal design and accessibility
 6. Educational video production for self phased learning and public health communication

6. Recommended Text Books

The following are the core-text books recommended for the course:

1. Introduction To Computer Information Systems by Geoffrey Steinberg and Kamaljeet Sanghera, 2008.
2. Biomedical Informatics: Computer Applications in Health Care and Biomedicine (Health Informatics) by Edward H. Shortliffe and James J. Cimino, 2006.
3. Medical Informatics: Practical Guide for the Healthcare Professional 2007 by Robert Hoyt, Melanie Sutton, and Ann Yoshihashi, 2007
4. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins by Andreas D. Baxeavanis and B. F. Francis Ouellette, 2004.
5. Public Health Informatics and Information Systems by D.A. Ross, A.R. Hinman, K. Saarlans, and W.H. Foege, 2002. Examination format and the marking scheme for M Sc in Biomedical Informatics

Selection Examination:

60 Multiple Choice Questions with 5 options in each question. All multiple choice questions are True/False type and mark allocation is 0 to +5.

Total duration of the paper: 3 Hours.

Format: Supervised on line (web based) examination.

The selection test will cover following topics:

General Information & Communication Technology

General Health Sciences

Pass mark: Minimum 50 %

Selection of candidates: On merit to fill the available training slots

Course Assessments:

The course comprise of 04 semesters. Each semester comprises of a module which runs for 20 weeks duration. There are 03 compulsory modules (C1, C2 and C3) and 03 elective modules (E1, E2 and E3). Each trainee can opt for one of the elective module, E1, E2 or E3.

Semester 01 – Module C1

Semester 02 – Module C2

Semester 03 – Module E1, E2 or E3

Semester 04 – Module C3

C1, C2, E1, E2 and E3 are taught modules, whereas C3 is based on an individual research project.

Trainee must complete all 03 compulsory modules (C1, C2 and C3) with one of the elective module (E1, E2 or E3) for the successful completion of the course.

Assessment Components for Module C1 and C2:

The trainees would be assessed during the modules using group project work and at the end of the module using a structured essay papers.

Module Work

Group work (An individual report based on assigned group work to be submitted once every four weeks. A total of 5 reports per module to be submitted during the 20 week period of each module).

End of module examination

SEQ paper (6 SEQs, 90 minutes duration) in each module

Marking Scheme

Module work: 50 marks

5 Project reports carry 10 marks each, which will be added up to a total of 50 marks.

SEQ paper: 50 marks

Minimum in each component (each project report and the SEQ paper) is 40%.

Pass mark: 50% of the total aggregate.

Assessment components for Module C3 :

The trainees are expected to produce a project report/dissertation which will be marked and defended at a viva voce examination

Project report/dissertation (word limit: 10,000 words)

Viva (20 minutes/panel of 2 examiners)

Marking Scheme

Project report/dissertation 50 marks

VIVA 50 marks

Minimum in each component (dissertation and viva) is 40%.

Pass mark : 50% of the total aggregate.

Assessment components for Module E1, E2 or E3:

The trainees would be assessed during the module using group project work and at the end of the module using a structured essay paper.

Module Work

Group work (An individual report based on assigned group work to be submitted once every four weeks. A total of 5 reports to be submitted during the 20 week period).

End of module examination

SEQ paper (6 SEQs, 90 minutes duration)

Marking Scheme

Module work: 50 marks

5 Project reports carry 10 marks each, which will be added up to a total of 50 marks.

SEQ paper: 50 marks

Minimum in each component (each project report and the SEQ paper) is 40%.

Pass mark: 50% of the total aggregate

Pass/fail criteria

A trainee would have to obtain 50% in each of the modules to be considered to have passed the module. Those failing will be given the opportunity to obtain the required mark at a subsequent examination or resubmission of report/dissertation for a maximum total of 4 attempts per module.

A trainee has to pass all three core modules and the elective module to be awarded the Master of Science in Biomedical Informatics.