Undergraduate Diploma in Biomedical Informatics

BSc Biomedical Informatics

MSci Biomedical Informatics

Programme Specification

A. NATURE OF THE AWARD

Awarding Institution: St George's University of London (SGUL)

Programme Accredited by: NHS Centre for Health and Social Care Health Informatics Qualification Management Board (HIQMB). If approval is granted this will allow students to be awarded NHS Professional Awards in Information Management & Technology (Health),(IM&T), specifically, the Certificate and Diploma to be awarded.

To be sought from the British Computer Society (BCS) the Institute of Healthcare Records and Information Management (IHRIM) and the Chartered Institute of Library and Information Professionals (CILIP),

Final Award(s): MSci(Hons); BSc (Hons)

Intermediate Award(s): **Undergraduate Diploma**

Subject: Biomedical Informatics

FHEQ Level: MSci: M; BSc (Honours): 3/H

JACs code: B900

QAA Benchmark Statement(s): Biomedical Sciences; Computing

Minimum/Maximum Period of Registration:

Full-time MSci -	4 years to 7 years;
Sandwich MSci -	5 years to 8 years.
Full-time BSc -	3 years to 6 years
Sandwich BSc -	4 years to 7 years

Teaching departments Computing, Information Systems and Mathematics, KU
Division of Community Health Sciences, SGUL
Computer Science Department RHUL

Location: St George's University of London

Date Specification Produced/Revised: May 2006

B. FEATURES

1. Modes of Delivery

The course is offered in the following alternative patterns:

MSci full-time or sandwich;
BSc full-time or sandwich;

Students will have the option of joining the course to complete a BSc in three years or an MSci in four. Both courses have the option of a work placement between years two and three. The initial course design will be an MSci with a three year exit point with a BSc. The fourth year would allow in-depth study of an area selected by the student such as bioinformatics, primary care informatics, or clinical data management. Alternatively, the student may combine modules from different areas. Students will be encouraged to take a work placement between years two and three; if this is not feasible then they will be strongly encouraged to consider summer break work-placements.

C. EDUCATIONAL AIMS

The main aims of the BSc(Honours) are:

- to provide all students with an in-depth knowledge and understanding of the core areas of Biomedical Informatics;
- to introduce students to health service strategy and the importance of an associated effective information strategy, and the use of Information Systems to achieve its aims;
- to enable students to develop their independent learning skills using primary and secondary data sources;
- to enable students to develop subject related practical skills;
- to provide students with an opportunity to develop their written and oral communication skills;
- to prepare students for graduate employment and for study for a higher degree, by developing, inter alia, their intellectual, problem-solving, teamwork and analytical skills;
- to enable students to be aware of the ethical and legal context of their work.

Additionally, for those following the MSci programme:

- to enable students to acquire the skills and methodologies for undertaking an original research project. These include modern literature searching techniques, critical analysis, data analysis and report production and presentation.
- to provide students with the opportunity to plan, execute and report on a scientific research project in an area of Biomedical Informatics
- to provide students with an opportunity to study one area of Biomedical Informatics in much greater depth than would be available on the BSc programme.

Additionally, for those students doing the sandwich programme or work experience:

- to give them the opportunity to work in an area related to their studies, enhancing from their own experience, their knowledge of work and careers in Biomedical Informatics.

D. LEARNING OUTCOMES (OBJECTIVES)

1. **Knowledge and Understanding**

On completion, students will have a good knowledge and understanding of:

- the nature and role of Biomedical Informatics;
- the core areas of Biomedical Informatics. (identified as the eight subject areas in section E below).
- the use of a variety of general and specific software applications in Biomedical Informatics;
- the ethical and legal issues relevant to Biomedical Informatics;
- topics of current interest in Biomedical Informatics.

Additionally, for those students following the MSci programme:

- the skills and methodologies for undertaking an original research project (under supervision)
- a wider area of Biomedical Informatics, as covered in the final year

2. Cognitive (thinking) Skills

On completion students will be able to:

- critically analyse and appraise primary and secondary data sources;
- solve complex problems;
- demonstrate the ability to be independent and autonomous learners;
- assemble data from a variety of sources and discern and establish connections.

Additionally, for those following the MSci programme students will be able to:

- plan, execute and report on an individual research project
- review and evaluate other people's work in the subject area.

3. **Practical Skills**

On completion, all students will be able to:

- undertake tasks in Biomedical Informatics applying appropriate approaches and with regard to the ethical and legal issues;
- plan, conduct and report on complex tasks in Biomedical Informatics;
- use a range of software applications, choosing appropriately for the task in hand.

Additionally, those following the MSci programme will be able to:

- demonstrate a wider range of skills acquired from the larger choice of option modules.

4. Key Skills

On completion of the field students will have acquired transferable skills and will be able to:

a. Communication Skills

- make an effective contribution to group work and discussions;
- deliver an effective oral presentation using appropriate aids;
- select, extract, and disseminate relevant material from appropriate data sources;
- collate material from written and spoken sources;
- provide written materials in a variety of forms that are fit for purpose;
- incorporate into documents aural and visual excerpts;
- be aware of the issues of privacy, security and confidentiality.

b. Numeracy

- collect data from primary and secondary sources;
- record data in an appropriate format;
- evaluate and present data in suitable formats which is fit for purpose;

- select and use appropriate methods to manipulate primary and secondary data;
- be aware of, and handle, issues of selection, accuracy, and uncertainty in the collection and analysis of data;
- be aware of, and handle, ethical issues, including data protection and confidentiality in the collection and analysis of data;
- use statistical techniques to analyse data.

c. Information, Communication and Technology

- use appropriate ICT in presenting text, data, aural and visual material
- find, retrieve, and store information from ICT sources
- use on-line communication systems to send and obtain information
- produce a complex document (e.g. a project report) combining information from a variety of sources, with appropriate referencing and citation
- construct appropriate taxonomies
- use coding and classification systems; and terminologies
- communicate using the Internet
- retrieve scientific literature and conduct database searches.
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d. Teamwork

- manage work within a team;
- review and evaluate progress of groups and collective performance;
- identify ways of improving the performance of groups and individual contribution to groups;.

e. Independent Learning

- have self-awareness in relation to academic and personal development;
- monitor and review their own progress in relation to academic and personal development;
- use research and information handling skills as the basis for further academic work and personal development

The highest calibre graduates will be able to perform the above competently, while all graduates will be able to contribute usefully to a team involved with the above, initially under supervision.

E. STRUCTURE

The course consists of a three/four year taught programme of 24/32 modules. The general level-by-level structure is indicated in Appendix A.

The course is organised as eight subject areas, with four course themes, which will run across all eight areas. The subject areas are introduced and then developed in a continuing strand for each of the first three years, using a spiral model (see section G).
The subject areas are:

1. Health services strategy, information strategy and systems

2. Delivering health and healthcare professions

3. Health, disease and treatment; and their representation in clinical records

4. Evidence based medicine, knowledge and information management

5. Using technology at the point of care, e-Health and telemedicine

6. Clinical data and the computerised medical record

7. Information governance, system architecture security and standards

8. Genetics and bioinformatics: applications to clinical data

The course themes are:

1. Research methods
2. Professionalism in Health Informatics, including ethics
3. Modelling, Implementation and Evaluation
4. Communication and presentation skills

Students on the course will need to have experience of computer applications, and systems, relevant to their future role. Examples of these will range from the Microsoft Office suite through SPSS (Statistical Package for Social Sciences) and SAS (Statistical Analysis System), to SQL and Oracle.

In the fourth year there will be three core modules, three option modules, and a research project equivalent to two modules.

The core modules will be Research Methods for Health Informatics, Evaluation of Health Informatics Interventions, and Clinical Data Analysis/Medical Statistics.
The option modules will generally focus on a single area, such as Bioinformatics, Primary Care Informatics, or Computer Science.

F. REFERENCE POINTS

- The course has been designed to take account of relevant parts of the QAA Subject Benchmark 'Statements in Computing and in Biomedical Sciences'.

- The awards made to students who complete the course or are awarded intermediate qualifications comply fully with the Framework for Higher Education Qualifications.

- All of the procedures associated with the course comply with the QAA Codes of Practice for Higher Education and collaborative provision.

- The course has been designed with regard to the requirements of the Health Informatics Qualification Management Board and of the British Computer Society.

- The collaborating institutions have research groups and knowledge transfer partnerships, whose work has informed the development of the curriculum and will contribute to the teaching.

- the course will incorporate the Professional Awards of the IM&T. The Certificate of the IHCD will be part of the core, while the Diploma will be optional.

G. TEACHING AND LEARNING STRATEGIES

A significant feature of the teaching will be the use of the principles of Bruner's spiral curriculum, so that in each of the eight subjects, the learning early in the course is reinforced and then extended in complexity in successive cycles. A primary tool will be Scenario Based Learning, seen as a relevant variant of Problem Based Learning.
Teaching will also include formal lectures, workshops, self-directed learning (including computer-based), expert panels, group tasks, guided and independent learning from textbooks, articles and other sources, reflective learning diaries, and visits.

From level to level, students will progressively make use of more primary, research-based sources of information and by the end of their course will have developed skills which enable them to analyze and appraise original sources, assemble data from various sources, solve problems and carry out an individual piece of work from planning, through analysis to design of a solution. The fourth year will extend this to small research projects.

Throughout the course emphasis is placed on developing group work skills, written and oral communication and presentation skills, data handling and analysis skills, a range of ICT skills and independent learning skills.

H. ASSESSMENT STRATEGIES

A wide range of assessment strategies will be used.
These will be designed to demonstrate that students have achieved the learning outcomes, and will include: individual and group tasks in unseen and seen examinations, multiple choice examinations, short answer tests, modified essay questions, practical demonstrations, data interpretation exercises, design exercises, presentations, including posters, essays, reports, literature surveys, project reports, and paper summaries.

Many of the transferable skills developed during the course will be assessed within these various types of assessment (for example, the use of ICT is a normal expectation, while data handling is inherent in many of the activities).
The assessments are a mixture of in-course assessments and end of module summative written assessments, often unseen examinations. Each module carries a final grade, which may include more than one component involving different types of assessment. The contribution of the individual assessments to the module total and the requirements to pass each module will be detailed in the course handbook/module guides.
The formative assessments will often be “hurdle” assessments, that is the student must participate in them in order to pass the module. Two examples will be a group report, in each module, on the scenario based learning and the reflective learning diary.

ASSESSMENT CRITERIA FOR ACADEMIC AND NON COMPETENCY-BASED ASSIGNMENTS

Students at Level H are expected to demonstrate the following:

- a systematic understanding of key aspects of the area, including acquisition of coherent and detailed knowledge, at least some of which is at or informed by, the forefront of defined aspects of a discipline
- an ability to deploy accurately established techniques of analysis and enquiry within a discipline
- conceptual understanding that enables the student to devise and sustain arguments, and/or to solve problems, using ideas and techniques, some of which are at the forefront of a discipline

- the ability to describe and comment upon particular aspects of current research, or equivalent advanced scholarship in the discipline
- an appreciation of the uncertainty, ambiguity and limits of knowledge
- the ability to manage their own learning, and to make use of scholarly reviews and primary sources (e.g. refereed research articles and/or original materials appropriate to the discipline)
- the ability to apply the methods and techniques that they have learned to review, consolidate, extend and apply their knowledge and understanding and to initiate and carry out projects
- the ability to critically evaluate arguments, assumptions, abstract concepts and data (that may be incomplete), to make judgements and to frame appropriate questions to achieve a solution - or identify a range of solutions - to a problem
- the ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences
- the skills necessary for employment requiring the exercise of initiative and personal responsibility, decision-making in complex and unpredictable contexts
- the learning ability needed to undertake appropriate further training of a professional or equivalent nature

Grade	*Mark range*	*Descriptor for examiner-marked elements (to be applied according to the type of assessment being marked)*
A	70-100	**First Class: Outstanding** Work of an exceptional standard which demonstrates evidence of excellent knowledge and outstanding abilities and skills
B	60-69	**Upper Second Class: Very Good Pass** Work of a high standard which demonstrates evidence of good knowledge, abilities and skills
C	50-59	**Lower Second Class: Good Pass** Work of a good standard which demonstrates evidence of acceptable knowledge and reasonable abilities and skills
D	40-49	**Third Class: Pass** Work of an acceptable standard but limited in scope which demonstrates evidence of acceptable knowledge but some limitations in abilities and skills
E	35-39	**Fail** Work which could be improved but has some shortcomings because it demonstrates evidence of only marginally acceptable knowledge and limited abilities and skills
F	30-34	**Clear Fail** Work which could be improved but is unacceptable because it has major shortcomings: poor knowledge, and a poor or seriously flawed level of skills and abilities
U	0-29	**Bad Fail** Work which is unacceptable because it has major shortcomings: little or no knowledge, and little or no level of skills and abilities
N	0	**Uncondoned non-submission**
B	0	**Breach of Confidentiality**

I. ENTRY QUALIFICATIONS

General requirements

Applicants for the BSc/MSci in Biomedical Informatics shall be required to meet the general entrance requirements for St George's (General Regulation 3.1: applicants shall normally be 17 years of age on registration and shall demonstrate proficiency in the use of the English Language) and the minimum entrance criteria is detailed in paragraphs below.

School-leaver applicants

School-leaver applicants will normally be expected to have:

5 passes (at grade C or above) at GCSE level including Mathematics and English; and
240 UCAS points at Advanced level including at least two 6-unit awards (equivalent to CCC at A level).

Candidates offering Scottish qualifications should have five Higher level subject (grade C or above) and these should include Mathematics and English (if not taken to Advanced Higher/CSYS) and either 240 UCAS points in Certificates of Sixth Year Study (CSYS) or three Advanced Highers.

Graduate and mature applicants

Preference will be given to applicants who have worked in health and social care professions and interested in changing career direction, including those currently in clerical and support staff roles.

Applications from mature (aged 21 and over) and graduate applicants will be required to have the following qualifications and/or experience:

Graduates will be required to offer a degree at pass or above.
Applicants with A levels (not meeting the requirements in the paragraph for school-leaver applicants) will be required to show relevant and recent experience of work in the health or social care sectors.

Applicants without formal qualifications will be required to show substantial relevant and recent experience of work in the health or social care sectors.

International applicants

EU and other international applicants should offer one of the following:
(i) the qualifications under paragraphs for school leavers or mature students above;
(ii) the Higher Level of the International or European Baccalaureate;
(iii) equivalent qualifications as advised by NARIC.

Applicants offering other qualifications

Applicants offering other qualifications than those previously specified above may be considered as meeting the required minimum equivalent standard subject to provision of documentary evidence of those qualifications.

APL and APEL

Applicants may be considered for admission to the programme with Accreditation of Prior Learning (APL) or Accreditation of Prior Experiential Learning (APEL) for

exemption from specified module credits or admission with advanced standing to year 2 or year 3 of the programme. All such applicants shall also be required to meet the admissions criteria specified in paragraph 2 above.

Applications for AP(E)L should be made in writing to the Assistant Registrar (Undergraduate Admissions) in addition to and at the same time as the application through UCAS. Original evidence of prior qualifications and experience will be required from the applicant, and a decision shall be made by the BSc/MSci Biomedical Informatics Course Committee, with advice taken from the AP(E)L Committee. Applicants for APEL may be required to attend an interview and/or submit a written piece of work or a portfolio detailing their experience.

The Admissions Tutor or another nominated member of staff will act as AP(E)L adviser for the course.

English Language

As outlined above, the standard SGUL requirements for competence in the English language shall apply to both native speakers and international candidates.

Typical entry qualifications set for entrants to the field are:

240 points at A Level, with GCSE in Mathematics and English at Grade C or higher.

J. CAREER OPPORTUNITIES

Graduates from the course will have a variety of opportunities, such as:
Joining graduate entry medical courses
Implementing IT systems in healthcare; including the NHS national programme "Connecting for Health",
Development work in the IT industry
Working in hospital IT departments, which are increasingly evolving to be "health informatics services," as hardware and applications become more centralised
Employment as project managers
Working as health librarians, information and knowledge officers
Working as practice managers in primary care
Employment in primary care trusts and health authorities with clinical data and in service innovation
Work in the pharmaceutical industry: in pure research, in research and development (i.e. the potential for the application of fundamental research in clinical practice), and in clinical trials

K. INDICATORS OF QUALITY

This course is provided in one of the nation's premiere healthcare institutions, working in partnership with two other institutions with expertise in complementary areas. The proposed partnership will utilise the strengths of the three institutions:
St. George's, University of London (SGUL): The opportunity to study clinical data, and how it is recorded first hand through an established network of clinical teachers. SGUL also has a research active primary care informatics group within the Department of Community Health Sciences. This course will initially be based at St. George's.
Kingston University (KU): Has a large computer department. The University is recognised as a high quality teaching institution, consistently scoring highly on the 24 point system. There are large numbers of research and teaching staff with expertise across the breadth of information systems, and information technology courses. Kingston also has a joint healthcare faculty with St. George's.

The Faculty of Computing, Information Systems and Mathematics already runs a clinical data management MSc and statistics and medical statistics joint degrees.

Royal Holloway, University of London (RHUL): Has an internationally recognised information security group, which includes a smart card centre. The university also has a large bio-informatics and computer science research group. The computer sciences department has experience of teaching concepts of proteomics, genetics and pattern recognition techniques to undergraduates.