Programme Specification 2009

MSc in Infection and Immunity

Entry Level
A BSc honours degree (minimum 2.2) in a biological science, or equivalent, in a related scientific discipline or several years appropriate experience. Students for whom English is not their first language are required to perform to the requisite standard in the Test of English as a Foreign Language (TOEFL) or English Language Test Score (IELTS).

Aims and Objectives
i) To respond to an international need for research scientists with an understanding of immunology and infectious disease who have the skills and experience to apply a molecular approach to the study of Infectious Disease.
ii) To prepare graduates for employment as scientists either by direct entry or by further study.
iii) To give students a direct experience of research during an eight-month project placement within a departmental research laboratory.
iv) To provide a positive learning environment where students can actively participate in their own academic development and allow them to develop their research skills.
v) To assist and further the career development opportunities in the area of Infectious Disease.

Course Overview
The MSc in Infection and Immunity, which started in September 2007, evolved as a response to the Internationally recognised and growing research expertise that has been established in the Department of Infection, Immunity and Inflammation (III). The Department of III was formed in 2003 following a decision to reorganise the existing Departments and Divisions of the School Medicine. As a result we have been able to bring together key expertise from both basic science and medicine in a highly productive way – creating a large and increasing number of PhD studentships. The MSc course was established in order to underpin and feed into this structure.

The MSc in Infection and Immunity is a 12 month full-time course designed to provide detailed training both in the theory and practical techniques involved in studying the interactions between pathogenic organisms and the immune system. An 8-month laboratory project placement either in industry or in a research laboratory within the University of Leicester is an integral part of the course. The course is designed to give relevant knowledge and skills to students in the broad area of Microbiology and Immunology and the close involvement of the Department of III researchers, industrial partners and NHS collaborators will ensure the suitability of this course for future employment of graduates in academic research, the pharmaceutical and biotechnology industry as well as in health care.

The MSc in Infection and Immunity is, to some extent, integrated into the 3 established MSc programs currently run from the Faculty of Medicine and Biological Sciences – Molecular Genetics, Cancer Cell and Molecular Biology and Pathology and Toxicology. Core practical and taught components of the Biomedical Sciences MSc Programme constitute an important part of the Semester 1 Teaching Programme and, in addition, modules covering Microbiology and Immunology offered on this course benefit students studying aspects of the other 3 MSc courses. As the Core Teaching Programme for the already established courses is heavily committed during Semester 1 we have taken this
into account when scheduling our own taught modules. MSc I&I students will study core introductory lectures along with the other MSc students for the first 2 weeks of the course as part of module MB7301 (see later) and are free to attend any of the core lectures (held on Mondays in the first semester) as they wish, when there are no timetable clashes. In addition the first 2 practical sessions (module MB7304 – see later) related to gene cloning are also core sessions shared by the other MSc students.

By the end of the degree students should be able to:

i) Have core knowledge of the make up and complex interactive elements that provide effective immunity.

ii) Have an understanding of pathogenic organisms and the pathogenesis of infective disease.

iii) Understand the principles by which pathogenic organisms can subvert the immune response.

iv) Introduce advanced understanding of molecular mechanisms underlying infection and immunity.

v) Utilise their own research skills to design experiments, demonstrate knowledge of molecular techniques, analyse data and be able to critically review the scientific literature.

vi) Have competency in laboratory methods related to infection and immunity, including the application of statistical methods.

vii) Use transferable skills in oral presentations, report writing and the use of information technology.

Course Teaching and Assessment

Approaches to Teaching

The course utilises various methods of teaching in order to cater for the broad spectrum of student abilities and experience. There are traditional receptive learning sessions (e.g. lectures and introductions to practicals) but, in addition, these are accompanied by tutorials, which extract more student involvement and hence enhance the learning experience of the students. Practicals are based on problem-based learning approaches and theoretical knowledge, along with experimental skills and are developed in a laboratory setting. These are accompanied by data handling sessions which help with enhancing analytical learning techniques. In order to prepare the students for assessment of their progress we utilise mock exams, peer assessment and active Discussion Board involvement using the University of Leicester Blackboard site. Peer-review of teaching and the use of feedback forms after every module are utilised to assist the teaching team in appraising the quality of the teaching provided. In addition, Personal Tutors are assigned to each student at the start of the course to provide pastoral care.
Approaches to assessment
We utilise a varied approach to assessment which allows students to demonstrate their knowledge base depending on their own particular strengths. Modules are assessed by essays, short written reports, presentations, congress reports, posters and exams, including both multiple choice and short answer questions. All work are second marked, and mediated where necessary. Students are normally given a viva voce examination by the external examiner especially when on borderline marks and are assessed in accordance with Scheme B as outlined by the Board of Graduate Studies in ‘Assessment for Postgraduate Awards’.

Summary of course structure and assessment
The course comprises lectures, tutorials, practical projects and an extended eight-month research project placement.

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<tr>
<th>Achievement aims</th>
<th>Teaching Methods</th>
<th>Assessment</th>
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<tr>
<td>Learning and Understanding</td>
<td>Lectures, tutorials, poster presentations, laboratory based practicals, extended research project.</td>
<td>Module examinations, short written reports, practical write-ups, presentations, dissertation, tutorial performance, option topic essay.</td>
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<td>Core understanding of the key elements involved in inducing and maintaining an effective immune response to infection.</td>
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<td>Core knowledge of the organisms involved in infectious disease and the mechanisms they employ to evade immune recognition.</td>
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<td>An understanding of more advanced research topics covering clinically important diseases.</td>
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<td>Techniques</td>
<td>Laboratory classes, laboratory project supervision, practical demonstrations and supervision, lectures.</td>
<td>Practical reports, project progress and final report, course examinations.</td>
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<td>Practical competence of key experimental methods, competent use of standard and specialized equipment, knowledge of safety procedures and safety assessment.</td>
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<tr>
<td>Critical analysis</td>
<td>Tutorials, laboratory based practicals and project supervision.</td>
<td>Examinations, short written reports, practical write-ups, oral presentations and project dissertation.</td>
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<td>Ability to critical appraise results in the context of the published literature.</td>
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<td>Managing and reflecting on the development of learning skills</td>
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<tr>
<td>Study skills, information management, developing specialization and interests, project management.</td>
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<tr>
<td>Tutorials, library and IT skills, study skills support, advanced topic lectures, project supervision.</td>
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<tr>
<td>Regular feedback from supervisory staff, tutorial performance, peer marking, IT assessment and course work, Advanced Module topic essays, project assessments.</td>
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<tr>
<th>Research skills</th>
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<tr>
<td>Literature review, experimental design, essential laboratory methods, data analysis, statistics.</td>
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<tr>
<td>Tutorials, problem solving, lectures, project supervision.</td>
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<td>Tutorial performance, practical write-ups, project report.</td>
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<tr>
<th>Working relationships</th>
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<td>Project management, organizational skills, time management, working in groups/teams.</td>
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<td>Project supervision, tutorials, group practical classes, pair projects, group problem solving.</td>
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<td>Group assessment, tutorial performance, peer-assessed laboratory reports, project assessment.</td>
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<th>Data presentation</th>
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<td>Analytical and graphical methods, statistics.</td>
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<tr>
<td>Bioinformatics and IT skills, laboratory classes, statistics support, project supervision.</td>
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<tr>
<td>IT and coursework, practical reports, project reports, course examinations.</td>
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<th>Communication skills</th>
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<td>Report writing, presentations, posters.</td>
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<tr>
<td>Tutorials, practical classes, project supervision, peer marking, poster and oral presentations.</td>
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<tr>
<td>Tutorial performance, assessed practical reports, project introduction and report, oral presentations.</td>
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The students, who meet or exceed an average pass mark of 50% for the taught modules of semester 1, will undertake an 8-month period of laboratory work either within the Faculty under the supervision of an academic member of staff or in an Industrial Placement regularly monitored by the course convenors, which will be assessed by a dissertation, lab performance and an oral or poster presentation (120 credits). Before starting the experimental work students will be required to submit (for approval) a document which summarises the background of the work to be undertaken, details the hypothesis to be tested and the experimental methods to be used. Those students, who meet or exceed an average pass mark of 50% for the taught modules of semester 1, and undertake a 60-credit laboratory-based or library-based project, qualify for PGDip. Those students, who meet or exceed an average pass mark of 50% for the taught modules of semester 1, and do not undertake a laboratory-based or library-based project, qualify for PGCert.

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Breakdown of Assessment Criteria</th>
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<tr>
<td>MB7301 Molecular Mechanisms</td>
<td>Short essay question 5</td>
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<td>In vitro and in vivo</td>
<td>Exam MCQ 5</td>
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<td>Total 10</td>
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<tr>
<td>MB7032 Infectious Diseases</td>
<td>Basic principles of microbial infection and detailed studies of classical examples</td>
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<td>Exam MCQ 5</td>
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<td>Exam SAQ 5</td>
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<td>Total 10</td>
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<tr>
<td>MB7303 Immunity</td>
<td>Basic principles of the immune response and detailed studies of classical examples</td>
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<td>Exam MCQ 5</td>
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<td>Exam SAQ 5</td>
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<td>Total 10</td>
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**MB7304**  
Data Analysis  
Written reports of set practicals to a defined format to assess key understanding and presentation skills  
Total 10

**MB7305**  
Advanced Topics  
Presentation 5  
Congress report 5  
Essay (3000 words) 10  
Total 20

**Total credits for 1st semester** 60

**2nd Semester**

**MSc Infection and Immunity**

- Project titles offered in November and allocated in early December.  
- A written introduction to the laboratory based project to be submitted by mid-January.  
- Laboratory based project under academic supervision February-June.  
- Assessed poster presentation - June.  
- Written dissertation to be submitted by July.  
- Marks ratified by the examination board - August.

Total credits for research project - 120

**Total credits for MSc course** 180

**PG Diploma**

1–3 months set laboratory/library project - 60 credits

**Total credits for PG Diploma course** 120
Module Specifications MSc Infection and Immunity

Molecular Mechanisms in vitro and in vivo (MB7301)
Credits 10
Semester 1
Contacts: Module Convenor: Dr. Roger James. Contributors: Faculty of Medicine and Biological Sciences MSc Programme Organisers (core lectures), G. Mukamlova, K. Rajakumar, J. Kettley, A. Kadioglu, E. Galyov.
Assessment Arrangements: Examination by MCQ and SAQ (1hr), open book essay (1hr).
Lectures and tutorials: 23
Private study: 52
Total hours: 75
Synopsis: Aspects of this module dealing with mechanistic systems and methodologies will be taken from the MSc core lectures and the module as a whole will provide a basic understanding of prokaryotic infectious disease processes and will outline the use of techniques and cellular processes which span the biological disciplines.
Aims: To provide an overview of the background and methodologies used to study the biology, genetics and molecular processes that underlie both immunology as a whole and in particular microbial infectious disease processes.
Learning objectives: By the end of the module, students should be able to show a clear understanding of the molecular events involved in infectious diseases, such as gene transcription and translation and be familiar with the application of a wide range of methods used to study these fundamental cellular processes in a number of microbiological model systems.
Methods: Lectures
Assessment: MCQ (35%) and SAQ (35%), open book essay on a technique covered in the content (30%).

Infectious Disease (MB7302)
Credits: 10
Contact: Module Convenor: Prof. M. Barer. Contributors: Dr. Mukamolova and Dr Rajakumar
Assessment Arrangements: Examination by MCQ and SAQ (2hrs).
Lectures and tutorials: 20
Private study: 55
Total hours: 75
Synopsis: The module comprises a series of lectures and tutorials dealing mainly with aspects of Medical Microbiology.
Aims: To introduce the study of infective disease addressing core themes in medical microbiology and, selected major global pathogens.
Learning Objectives: Students will first be introduced to the physiology, structure and classification of bacteria and will cover areas such as antimicrobial action and resistance. The principles of diagnostic microbiology will be introduced and the module will also cover biotechnological contributions to the management of infectious disease. In the second part of the module the principles will be explored using particular examples of pathogens including the agents of AIDS, malaria, and tuberculosis and Vibrio cholera.
By the end of the module, students should:
- show competency in the characterisation of medically significant diseases involving microorganisms
- demonstrate an overview of the main laboratory methods used for the diagnosis of infections
- be able to explain basic aspects of anti-microbial strategies

**Method of assessment:** MCQ (50%) and SAQ (50%), performance in tutorials

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**Immunity (MB7303)**

**Credits 10**  
**Semester 1**

**Contact:** Module Convenor: Dr R James; Other contributors: Dr. M. Browning, Dr. R. Wallis, Dr. B. Burke

**Assessment Arrangements:** Examination by MCQ and SAQ (2hrs)

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<thead>
<tr>
<th>Lectures and tutorials</th>
<th>Private study</th>
<th>Total hours</th>
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<td>20</td>
<td>55</td>
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**Synopsis:** The module comprises a series of lectures and tutorials dealing with the details of the fundamental mediators of the immune response and the mechanisms that underlie successful resistance to infection.

**Aims:** To give a detailed overview of the key cells and molecules involved in generating effective immunity and then to relate this knowledge to infection and disease processes.

**Objectives:** By the end of the module students should be able to:
- explain the contribution of different lymphoid organs and subsets of leukocytes in the immune response
- contrast the concepts of pattern recognition vs epitope specificity and the genomic mechanisms underlying these phenomena (i.e. innate versus adaptive immunity)
- understand the role that the complement system plays in developing and effective immune response
- assign exemplary cytokines and chemokines to different stages of inflammation
- understand how immunological repertoires are generated and the mechanisms by which adaptive immunity can generate specific responses to infectious diseases

**Method of assessment:** Exam (MCQ, 50% and SAQ, 50%), performance in tutorials

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**Data Analysis (MB7304)**

**Credits 10**  
**Semester 1**

**Contact:** Module Convenor: Dr B. Burke; Other contributors: Dr. H. Yesilkaya, Dr. Y. Amrani and Dr. M. Browning and demonstrators.

**Assessment Arrangements:** Submission of practical write-ups and related SAQ.

**Total hours:** 75

**Synopsis:** The module comprises six practicals and data handling tutorials embedded in each of the practicals. It covers basic techniques in molecular biology and microbiology and gives insights into protein detection and cell culture.

**Aims:** To prepare the students for the practical and theoretical aspects of their research laboratory project.

**Objectives:** By the end of the module, students should be able to:
- show competence in the theoretical principles behind commonly used microbiological, molecular biological, protein biochemical and cellular techniques
- demonstrate ability to follow a standard protocol taking into account health and safety regulations
- record and document all aspects of individual experiments
- demonstrate ability to handle, analyse and critique data
- appreciate peer assessment as a learning source
Method of assessment: written summaries of experimental background, aims, methods, results (including tables and figures), SAQs, and discussion (both peer and demonstrator/lecturer-assessed).

Advanced Topics in Infection and Immunity (MB7305)
Credits 20
Semester 1
Contact: Module Convenor: Dr C Stover; Other contributors: Dr. M. Clokie, Prof. P. Andrew, Dr. M. Browning, Dr. S. Heaphy, Dr. B. Burke, Prof. M. Barer, Dr. P. Oyston, Dr. A. Kadioglu, Dr. K. Rajakumar, Dr. M. Jobling, Dr. R. Wallis and Dr. A. Bevington.
Assessment Arrangements: 3000 word essay, congress summary and poster presentation.
Lectures and tutorials: 60
Private study: 90
Total hours: 150

Synopsis: This module will run in the second part of Semester 1 (weeks 7-12) and comprises lectures, tutorials and student-led presentations on more advanced subjects within the fields of Infection and Immunity. It builds on the two modules run in weeks 1-6 on Infectious Disease (MB7302) and Immunity (7303) and the Molecular Mechanisms in vitro and in vivo module (MB7001) and offers a guided opportunity to integrate a basic understanding of the subject area with topical and “cutting-edge” knowledge of developments in our understanding of the interaction between pathogenic organisms and the immune system.

Aims: The module has two clear aims: firstly to further the understanding of how immunology and bacteriology/parasitology apply to acute problems of public and world health and, secondly, to assist the student in presenting an informed opinion on some of these complex problems and issues.

Objectives: By the end of the module, students should be able to:
- have a clear concept of mucosal tolerance, immune privilege and the role of chronic inflammation in the immunopathogenesis of microbiological based diseases as well as the development of cancer
- contrast cellular and humoral mediators of both acute and chronic inflammation
- evaluate different types of vaccines and the immune responses they elicit
- describe the pathogenic mechanisms involved in infectious diseases of pandemic importance
- contrast the immune response to bacteria, viruses and prions
- outline the importance of pathogenicity islands
- discuss the genetic evidence for natural selection of pathogen resistance alleles in humans
- describe examples of alleles conferring resistance to different human pathogens and explain their distribution in modern populations
- evaluate the importance of phages in infection and disease management
- delineate the mechanisms bacteria employ to evade the host’s immune response
- classify immune deficiencies on the basis of defined mechanistic evidence

Method of assessment: Poster presentation (25%), congress report (25%) and 3000 word essay (50%), performance in tutorials and on blackboard
Research Laboratory Project (MB7306)
120 credits
Semester 2
Contact: Dr. R. James, Dr. C. Stover; Other contributors: all lab heads across the Department, at the three hospital sites and Industrial Partners.

Synopsis: This module comprises an eight-month research project placement within the Department of Infection, Immunity and Inflammation or a research laboratory with an industrial partner. The student may choose a research project from a pool of submitted outlines after meeting with the respective laboratory staff.

Aims: To provide the student with a suitable project that is consistent with the course design, that is focused on research areas concerned with infection and immunity. To outline an investigative approach to on-the-bench experimental problem solving.

Objectives: By the end of the module, students should be able to:
- present a written synopsis of the background to a research project;
- show understanding of the design of experiments, including the importance and nature of controls;
- analyse data;
- logically develop a string of different experimental approaches;
- prepare a sound summary;
- extract from the project the contents for a presentation.

Method of assessment: The student will be given an opportunity to present their work prior to the final examination (10%). The final write-up on the project will be assessed in accordance with the regulations by 2 assessors – Laboratory performance (20%), Dissertation (70%). Progress review by convenors.

Diploma Level Research Project (MB7307)
60 credits
Semester 2
Contact: Dr. James, Dr. Stover
Other contributors: all Lab Heads across the Department.

Synopsis: The module comprises a period between 1-3 months of either a short laboratory-based or library-based research project.

Aims: The aims of the Diploma-level laboratory or Library-based project are to give the students some experience of research work including appropriate background reading, obtaining and analysing experimental results and the preparation of the dissertation. The aims of the Diploma-level library-based project are to give students experience in the extraction, assimilation and evaluation of information on a specific topic from appropriate sources and the preparation of a dissertation.

Objectives: By the end of the module, students should be able to:
- demonstrate experience of a placement in a research laboratory, perform background research relevant to a project, execute experiments, analyse data and prepare a scientific report (laboratory-based);
- conduct an in-depth study to answer a specific question, undertake literature searches independently, assimilate information from a range of sources and prepare their own synthesis of this information, analyse critically and prepare a scientific report (library-based).
**Method of assessment:** The final dissertation on the project will be assessed in accordance with the regulations by 2 assessors and the student will be given an opportunity to present their work prior to the final examination. Progress review by convenors.