



BI25M5

Microbes, Infection & Immunity

Course Handbook 2022-2023



**School of Medicine, Medical Sciences &
Nutrition**

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Course Summary

Welcome to the level II course 'Microbes, Infection and Immunity' BI25M5. The course aims to introduce students to the diversity and countless activities of microbes (bacteria, fungi, algae, protozoa and viruses) and to the techniques used to study them. The course also describes the role of microbes in disease, including a comprehensive review of immunology and how the immune system functions in combating infection. The course is delivered through a combination of lectures, practical classes, and assignments.

This manual contains all the information relevant for the course. It is an essential source of reference, and you are expected to familiarise yourself thoroughly with its content. Remember – what you do not know you can find out by asking a lecturer, consulting books in the library or via the internet (from a reliable source!).

Completing this course will equip you with the necessary knowledge and skills to study advanced level courses in biology and related disciplines. The teaching team hope that you enjoy the course and are happy to answer student queries at any stage in the course.

Course Aims & Learning Outcomes

Aims

The aims of the course are to enable students:

- (a) To introduce students to the full range of microbial life and the techniques used to study microorganisms.
- (b) To introduce the diversity of microbial life (including metabolic diversity, morphological diversity, and ecological diversity).
- (c) To illustrate the important role of microbes in the environment and in industry.
- (d) To explore pathogenic microbes, their interaction with the body and their immune system responses.
- (e) To develop student's basic microbiology laboratory skills.

Learning Outcomes

The knowledge subject-specific learning outcomes are such that, at the end of the course, students should be able to:

- Appreciate the activities for good or ill of microbes in the living world.
- Explain the concept of prokaryotic and eukaryotic cells, using bacteria and yeast cells for examples.
- Understand the physiological requirements for microbial growth and cultivation.
- Describe the different nutritional classes of microorganisms to illustrate microbial diversity.
- Describe the basic biology of selected eukaryotic microbes.
- Understand the essential role of microbes in the environment and food industry.
- Describe the structure and replication of viruses.
- Explain cells of the immune system, focusing on the body's response to invading microorganisms.

The ability subject-specific learning outcomes are such that, at the end of the course, students should be able:

- to perform a variety of basic microbiological techniques.
- to record, analyse and interpret experimental data.
- to demonstrate an awareness of safety issues pertinent to working in a biology laboratory.

During the course students will also develop skills in data interpretation, communication as well as interpersonal and team-working skills. These represent 'transferable skills' that will benefit students across a range of disciplines. Graduate employers welcome 'transferable skills' acquired during a degree programme, skills such as communication, numeracy, use of IT, group work and time management. It is important that you keep a record of experiences that contribute to your skills and knowledge.

The aims of the course will be achieved through a combination of lectures, laboratory classes and assignments as well as formative online multiple-choice question exercises.

Course Teaching Staff

Course Co-ordinator:

Dr Frank Ward (FW) f.j.ward@abdn.ac.uk

Other Staff:

Prof Ian Stansfield

Dr Petra Louis

Dr Indrani Mukhopadhyia

Professor Carol Munro

Dr Pietro Marini

Dr Karen Scott

Dr Ian Gould

Prof Pieter van West

Dr Rasha Abu-Eid

Assessments & Examinations

The course is assessed by two means, which are course work and the end of course examination. The coursework represents 30% of the total mark and is made up of marks from four laboratory reports. The end of course examination contributes 70% of the total mark. Further details will be provided at the introductory lecture and as a course announcement.

Examination

Multiple choice questions (MCQs) will be used for the format of the end of course exam. MCQs will be used to test your knowledge and understanding of material covered in both practicals and lectures.

Class Representatives

We value students' opinions regarding enhancing the quality of teaching and its delivery; therefore, in conjunction with the Students' Association we support the Class Representative system.

In the School of Medicine, Medical Sciences & Nutrition we operate a system of course representatives, who are elected from within each course. Any student registered within a course that wishes to represent a given group of students can stand for election as a class representative. You will be informed when the elections for class representative will take place.

What will it involve?

It will involve speaking to your fellow students about the course you represent. This can include any comments that they may have. You will attend a Staff-Student Liaison Committee and you should represent the views and concerns of the students within this meeting. As a representative, you will also be able to contribute to the agenda. You will then feedback to the students after this meeting with any actions that are being taken.

Training

Training for class representatives will be run by the Students Association. Training will take place within each half-session. For more information about the Class representative system visit www.ausa.org.uk or email the VP Education & Employability vped@abdn.ac.uk . Class representatives are also eligible to undertake the STAR (Students Taking Active Roles) Award with further information about this co-curricular award being available at: www.abdn.ac.uk/careers.

Problems with Coursework

If students have difficulties with any part of the course that they cannot cope with alone, they should notify the course coordinator immediately. If the problem relates to the subject matter, general advice would be to contact the member of staff who is teaching that part of the course. Students with registered disabilities should contact the medical sciences office, (medsci@abdn.ac.uk) (based in the Polwarth Building, Foresterhill) to ensure that the appropriate facilities have been made available. Otherwise, you are strongly encouraged to contact any of the following as you see appropriate:

- Course student representatives
- Course co-ordinator
- Convenor of the Medical Sciences Staff/Student Liaison Committee (Professor Gordon McEwan)
- Personal Tutor
- Medical Sciences Disabilities Co-ordinator (Dr Derryck Shewan)

All staff are based at Foresterhill, and we strongly encourage the use of email or telephone the Medical Sciences Office. You may have a wasted journey travelling to Foresterhill only to find staff unavailable.

If a course has been completed and students are no longer on campus (i.e., work from second half session during the summer vacation), coursework will be kept until the end of Fresher's Week, during the new academic year. After that point, unclaimed student work will be securely destroyed.

Course Reading List

The recommended text for this course is:

M.T.Madigan, J. Aiyer, D.H.Buckley, W. Sattley, D.A.Stahl
BROCK BIOLOGY OF MICROORGANISMS
Pearson Education 16th Ed (2021)
ISBN-10: 1292404795
(£56.25 paperback or £43.49 Kindle from Amazon)

The Website for Brock Biology of Microorganisms (16th Edition) is:
<http://www.pearsonhighered.com>

Other Useful Web Sites:

These Web sites are not a substitute for the course textbook, but they do contain a lot of valuable information relevant to your course.

<http://www.accessexcellence.org/RC/VL/GG/>
<http://www.textbookofbacteriology.net/>
<https://www.immunology.org/public-information/bitesized-immunology>

Lecture Synopsis

An Introduction to Microbes – bacteria, archaea, viruses and eukaryotes (Weeks 26-29)

Introduction to Microbiology & Immunology – Dr Frank Ward

The introductory lecture will answer the following questions: What does BI25M5 cover? How is the course taught? Which textbook does the course use? How many practical classes are associated with course? What are the formative and summative assessments for the course? What are the essential requirements to pass the course?

Biology of Microorganisms – Dr Karen Scott

These lectures will describe the basic biology of microbial cells and will focus in addition on those structural elements that are specific to pathogenic bacteria. The topics covered will include: microbial diversity and classification, including cell walls and antibiotics; microbial reproduction and cell division; microbial growth and methods to measure growth (these lectures will explore the way

bacteria and other microorganisms grow and divide in response to different environmental conditions, as well as solutions to the problem of how to reliably estimate bacterial numbers); microbial nutrition, and the diversity of microbial nutritional biochemistry; microbial movement and communication, including motility, flagella and chemotaxis.

Gene Expression & Pathogenesis – Prof Carol Munro

These lectures will provide insights into how genes are expressed in bacteria and how pathogens respond to their environment to cause disease. We will also address how genes are exchanged between bacteria and how this genetic exchange can result in more virulent organisms.

Introduction to Virology – Dr Indrani Mukhopadhy

These lectures will introduce different types of viruses, the diseases they cause, and how they replicate.

Molecular Biology and Microbes (Weeks 29-30)

Biology of Eukaryotic Microorganisms – Prof Pieter van West

Comparison of prokaryotic and eukaryotic microorganisms. Classification of and evolutionary relationship between eukaryotic microorganisms. Organelles that are specific for Eukaryotic microbes. General overview of the different groups (algae, protists, fungi, and Stramenopila). Some species that are medically or economically important will be discussed in detail.

The impact of Microbes in health, industry and the environment (Weeks 30-33)

Industrial Microbiology – Prof Ian Stansfield

These lectures describe three key areas where micro-organisms are used for industrial purposes. Starting with traditional fermentation of ethanol, acetone and butanol, the topics covered progress to consider the traditional production of antibiotics and the use of synthetic biology to engineer microorganisms to produce anti-malarial drugs. Finally, microbial production of recombinant biologics - therapeutic proteins – will be considered.

Medical Microbiology – Prof Ian Gould

Basic concepts of infection: epidemiology, hygiene, sterilization and disinfection. Principles of diagnosis of infectious disease. The spectrum of tissue damage from commensalism to obligate parasitism. Microbial virulence factors exemplified for specific infectious diseases.

Microbiota of the gut - Dr Petra Louis

These lectures will cover the microbial community that lives within the intestine and how it influences human health. This will include an overview of the microbes present and their activities, as well as strategies to modulate the microbiota to improve health and methods used to analyse this microbial ecosystem.

Microbiology of Food-borne Pathogens – Dr Karen Scott

Introduction outlining key pathogens (e.g. *Salmonella*, *Campylobacter*, verotoxigenic *E. coli* (VTEC), *Listeria* and others) discussing their reservoirs, routes of infection, symptoms and treatment of disease. Phenotypic and genotypic methods of detection and ways to reduce incidences of human infection will be discussed.

The immune system in health and disease (Weeks 33-35)

Introduction to the Immune System – Dr Frank Ward

This lecture will introduce the cells of the immune system and the primary and secondary immune organs, and develop the concepts of immune surveillance, leukocyte recirculation, and leukocyte recruitment during inflammation.

The Innate Immune System - Dr Pietro Marini

These lectures will describe the “first line of defence” against infection. 1) Phagocytes that ingest and kill microbes, induction of inflammation via cytokines, complement and acute phase proteins. Role of Mast cells and eosinophils in combating parasites and natural killer cells in detecting virally infected cells. 2) Macrophage expression of receptors involved in non-self-recognition: pattern recognition receptors, mannose receptor, Toll-like receptors, CD14 and scavenger receptors. Concept of how these receptors trigger different intracellular signalling pathways to “tailor” inflammation to the pathogen. Introduce dendritic cells as the interface between innate and adaptive immune responses.

The Adaptive Immune System - Dr Pietro Marini

These lectures will describe the “second line of defence” against infection. 1) How T and B lymphocyte genes generate receptor diversity to recognise specific antigen and introduce the concept of central and peripheral tolerance mechanisms to discriminate self from non-self. Introduce clonal expansion, T cell effector function and B cell antibody production and function. 2) Describe T cell and B cell activation and effector function: Activation of CD4 T helper lymphocytes by exogenous (bacterial) antigens processed and presented via MHC Class II pathway, activation of CD8 cytotoxic T cells by endogenous (viral) antigens. Introduce T and B cell co-operation to eliminate infection and the concept of “immunological memory”.

Regulation of the Immune System - Dr Frank Ward

These lectures will describe how the immune system is controlled to “switch off” unnecessary or damaging inflammation and maintain homeostasis, and how disease can occur when things go wrong. 1) Interaction between cellular and humoral components of the immune response, complement and antibodies, co-stimulation, activation induced cell death, immunological memory, T cell suppression, Th1/Th2 balance and T regulatory cells. 2) Control of the immune system, immunologic tolerance and autoimmunity, MHC and disease susceptibility, hypersensitivity diseases, vaccines.

Evasion of the Immune System - Dr Rasha Abu-Eid

These lectures will describe how man and microbes can co-exist, how microbes evade detection by the immune system and how epidemics occur. 1) Mechanisms of immune subversion by stealth, sabotage or exploitation and how individual pathogens deploy these strategies. Effects on antigen processing and presentation pathways, disruption of chemokine receptors and leukocyte trafficking, secretion of decoy molecules, invasions and superantigens. 2) Specific examples: HIV, measles, TB, Chlamydia and parasitic protozoa. Information on Third year course.

Practical/Lab/Tutorial Work

Laboratory Work

As part of the course all students will complete the following lab classes and assignments:

1. Identification & Growth of Pathogens
2. Molecular Microbiology
3. Environmental Microbiology
4. Cells of the Immune system

Practicals will generally start with an introductory talk and often a demonstration of techniques. The following points should also be noted regarding laboratory classes:

- Classes are held in Science Teaching Hub (STH), Old Aberdeen.
- Students will be allocated to a group on a Thursday or Friday. Sub-groups will be made to assign your demonstrator and bench place in the lab. Details will be posted on the class notice board as soon as possible.
- Please listen to the introduction (which may be online or pre-recorded) and read the practical protocol before you attend the laboratory class.
- Safety procedures must be strictly followed.
- Attendance will be recorded.
- Practical reports must be handed in online via MyAberdeen. Further details are given in the section "Course Work".
- Assignments must be handed in on time or no grade will be awarded.
- We will endeavour to provide marks and feedback 2-3 weeks after submission deadline but feedback for the final lab work will be after the Spring vacation.

Practical Report Assignment Submission Timetable

Week	Practical Report	Submission date
27/28	Identification & Growth of Pathogens	Thurs 14 th Feb Friday 16 th Feb
30	Molecular Microbiology	Tues 7 th Mar Thurs 9 th Mar
32	Environmental Microbiology	Tues 21 st Mar Thursday 23 rd Mar
34	Cells of the Immune system	Tues 4 th Apr Thurs 6 th Apr

Practical reports that are not submitted by the date specified in the timetable and do not have an agreed extension will not be marked unless you have extenuating circumstances. Do not ask other lecturers, the teaching laboratory staff, your demonstrator or adviser to accept late work. They have no authority to accept it.

If you are unable to meet the deadline for submitting work or if you are absent from a practical, or any other course work, you MUST complete an absence from class form in MyAberdeen.

University Policies

Students are asked to make themselves familiar with the information on key education policies, available [here](#). These policies are relevant to all students and will be useful to you throughout your studies. They contain important information and address issues such as what to do if you are absent, how to raise an appeal or a complaint and how the University will calculate your degree outcome.

These University wide education policies should be read in conjunction with this programme and/or course handbook, in which School specific policies are detailed. These policies are effective immediately, for the 2022/23 academic year. Further information can be found on the [University's Infohub webpage](#) or by visiting the Infohub.

The information included in the institutional area for 2022-23 includes the following:

- Absence
- Appeals & Complaints
- Assessment
- Avoiding Plagiarism
- Communication
- Graduate Attributes
- MyAberdeen
- Student Learning Service (SLS)
- Student Monitoring/Class Certificates
- Student Discipline
- The Co-curriculum

Where to Find the Following Information:

C6/C7- University of Aberdeen Homepage > Students > Academic Life > Monitoring and Progress > Student Monitoring (C6 & C7)

<https://www.abdn.ac.uk/students/academic-life/student-monitoring.php#panel5179>

Absences- To report absences you should use the absence reporting system tool on Student Hub. Once you have successfully completed and sent the absence form you will get an email that your absence request has been accepted. The link below can be used to log onto the Student Hub Website and from there you can record any absences you may have.

Log In - Student Hub (<https://www.abdn.ac.uk/studenthub/loginbdn.ac.uk>)

Submitting an Appeal- University of Aberdeen Homepage > Students > Academic Life > Appeals and Complaints

<https://www.abdn.ac.uk/students/academic-life/appeals-complaints-3380.php#panel2109>

Academic Language & Skills support

For students whose first language is not English, the Language Centre offers support with Academic Writing and Communication Skills.

Academic Writing

- Responding to a writing task: Focusing on the question
- Organising your writing: within & between paragraphs
- Using sources to support your writing (including writing in your own words, and citing & referencing conventions)
- Using academic language
- Critical Thinking
- Proofreading & Editing

Academic Communication Skills

- Developing skills for effective communication in an academic context
- Promoting critical thinking and evaluation
- Giving opportunities to develop confidence in communicating in English
- Developing interactive competence: contributing and responding to seminar discussions
- Useful vocabulary and expressions for taking part in discussions

More information and how to book a place can be found [here](#)

Medical Sciences Common Grading Scale

Grade	Grade Point	% Mark	Category	Honours Class	Description
A1	22	90-100	Excellent	First	<ul style="list-style-type: none"> • Outstanding ability and critical thought • Evidence of extensive reading • Superior understanding • The best performance that can be expected from a student at this level
A2	21	85-89			
A3	20	80-84			
A4	19	75-79			
A5	18	70-74			
B1	17	67-69	Very Good	Upper Second	<ul style="list-style-type: none"> • Able to argue logically and organise answers well • Shows a thorough grasp of concepts • Good use of examples to illustrate points and justify arguments • Evidence of reading and wide appreciation of subject
B2	16	64-66			
B3	15	60-63			
C1	14	57-59	Good	Lower Second	<ul style="list-style-type: none"> • Repetition of lecture notes without evidence of further appreciation of subject • Lacking illustrative examples and originality • Basic level of understanding
C2	13	54-56			
C3	12	50-53			
D1	11	47-49	Pass	Third	<ul style="list-style-type: none"> • Limited ability to argue logically and organise answers • Failure to develop or illustrate points • The minimum level of performance required for a student to be awarded a pass
D2	10	44-46			
D3	9	40-43			
E1	8	37-39	Fail	Fail	<ul style="list-style-type: none"> • Weak presentation • Tendency to irrelevance • Some attempt at an answer but seriously lacking in content and/or ability to organise thoughts
E2	7	34-36			
E3	6	30-33			
F1	5	26-29	Clear Fail	Not used for Honours	<ul style="list-style-type: none"> • Contains major errors or misconceptions • Poor presentation
F2	4	21-25			
F3	3	16-20			
G1	2	11-15	Clear Fail/Abysmal		<ul style="list-style-type: none"> • Token or no submission
G2	1	1-10			
G3	0	0			

Course Timetable BI25M5: 2022-2023

Date	Time	Place	Subject	Session	Staff
An Introduction to Microbes – bacteria, archaea, viruses and eukaryotes					
Week 26					
Mon 23 Jan	13:00-14:00	Auris	Course Introduction	Lecture	FW
Tue 24 Jan	13:00-14:00	105 St Mary's	Biology of Microorganisms (1)	Lecture	KS
Wed 25 Jan					
Thu 26 Jan					
Fri 27 Jan	13:00-14:00	FN3	Biology of Microorganisms (2)	Lecture	KS
Week 27					
Mon 30 Jan	13:00-14:00	Auris	Biology of Microorganisms (3)	Lecture	KS
Tue 31 Jan	13:00-14:00	105 St Mary's	Biology of Microorganisms (4)	Lecture	KS
	15:00-18:00	STH 1.001	Identification & Growth of Pathogens	Practical	tbc
Wed 1 Feb					
Thu 2 Feb	15:00-18:00	STH 1.001	Identification & Growth of Pathogens	Practical	tbc
Fri 3 Feb	13:00-14:00	FN3	Biology of Microorganisms (5)	Lecture	KS
Week 28					
Mon 6 Feb	13:00-14:00	Auris	Gene Expression & Pathogenesis (1)	Lecture	CM
Tue 7 Feb	13:00-14:00	105 St Mary's	Gene Expression & Pathogenesis (2)	Lecture	CM
	15:00-18:00	STH 1.007	Identification & Growth of Pathogens	Practical	tbc
Wed 8 Feb					
Thu 9 Feb	15:00-18:00	STH 1.001	Identification & Growth of Pathogens	Practical	tbc
Fri 10 Feb	13:00-14:00	FN3	Gene Expression & Pathogenesis (3)	Lecture	CM
Week 29					
Mon 13 Feb	13:00-14:00	Auris	Virology (1)	Lecture	IM
Tue 14 Feb	13:00-14:00	105 St Mary's	Virology (2)	Lecture	IM
Wed 15 Feb					
Thu 16 Feb					
Molecular biology and microbes					
Fri 17 Feb	13:00-14:00	FN3	Biology of Eukaryotes (1)	Lecture	PvW
Week 30					
Mon 20 Feb	13:00-14:00	Auris	Biology of Eukaryotes (2)	Lecture	PvW
Tue 21 Feb	13:00-14:00	105 St Mary's	Biology of Eukaryotes (3)	Lecture	PvW
	15:00-18:00	STH 1.007	Molecular Microbiology	Practical	CM
Wed 22 Feb					
Thu 23 Feb	15:00-18:00	STH 1.001	Molecular Microbiology	Practical	CM
The impact of microbes in health, industry and the environment					
Fri 24 Feb	13:00-14:00	FN3	Industrial Microbiology (1)	Lecture	IS
Week 31					
Mon 27 Feb	13:00-14:00	Auris	Industrial Microbiology (2)	Lecture	IS
Tue 28 Feb	13:00-14:00	105 St Mary's	Industrial Microbiology (3)	Lecture	IS
	15:00-18:00	STH 1.001	Molecular Microbiology	Practical	CM
Wed 1 Mar					
Thu 2 Mar	15:00-18:00	STH 1.001	Molecular Microbiology	Practical	CM
Fri 3 Mar	13:00-14:00	FN3	Food-borne Pathogens (1)	Lecture	KS
Week 32					
Mon 6 Mar	13:00-14:00	Auris	Medical Microbiology (1)	Lecture	IG

Tue 7 Mar	13:00-14:00	105 St Mary's	Medical Microbiology (2)	Lecture	IG
Wed 8 Mar					
Thu 9 Mar					
Fri 10 Mar	13:00-14:00	FN3	Food-borne Pathogens (2)	Lecture	KS
Week 33					
Mon 13 Mar	13:00-14:00	Auris	The microbiome (1)	Lecture	PL
Tue 14 Mar	13:00-14:00	105 St Mary's	The microbiome (2)	Lecture	PL
	15:00-18:00	STH 1.001	Environmental Microbiology	Practical	FW
Wed 15 Mar					
Thu 16 Mar	15:00-18:00	STH 1.001	Environmental Microbiology	Practical	FW
The Immune system in health and disease					
Fri 17 Mar	13:00-14:00	FN3	An overview of Immunity	Lecture	FW
Week 34					
Mon 20 Mar	13:00-14:00	Auris	Innate Immune Responses (1)	Lecture	PM
Tue 21 Mar	13:00-14:00	105 St Mary's	Innate Immune Responses (2)	Lecture	PM
	15:00-18:00	STH 1.007	Cells of the Immune System	Practical	FW
Wed 22 Mar					
Thu 23 Mar	15:00-18:00	STH 1.007	Cells of the Immune System	Practical	FW
Fri 24 Mar	13:00-14:00	FN3	Adaptive immune responses (1)	Lecture	PM
Week 35					
Mon 27 Mar	13:00-14:00	Auris	Adaptive Immune Responses (2)	Lecture	PM
Tue 28 Mar	13:00-14:00	105 St Mary's	Immune regulation	Lecture	FW
Wed 29 Mar					
Thu 30 Mar	15:00-18:00				
Fri 31 Mar	13:00-14:00	FN3	Evading the Immune System	Lecture	RAE

FN3 = Fraser Noble Building 3

“The Auris lecture theatre is in the 23, St Machar’s Drive building at the opposite end of the Cruickshank gardens from the Zoology building, quite near the glasshouses. There is a little sign directing you to the Auris lecture theatre by some steps as you turn the corner to approach the Cruickshank Garden from the glasshouse entrance near the Hub.

The St Mary’s building is on the main OA campus opposite the Elphinstone Road halls and just down from the student union building. It seems like a small building but is larger inside – you should go up the first set of stairs on the right to find room 105 on the first floor.”

Staff:

Dr Frank Ward - FW

Professor Ian Stansfield – IS

Professor Carol Munro – CM

Professor Pieter van West - PvW

Professor Ian Gould – IG

Dr Karen Scott - KS

Dr Rasha Abu-Eid - RAE

Dr Petra Louis - PL

Dr Pietro Marini – PM

Dr Indrani Mukhopadhyya – IM

Campus Maps – Old Aberdeen (St Mary's, Auris LT, Science Teaching Hub and Fraser Noble Building highlighted)

