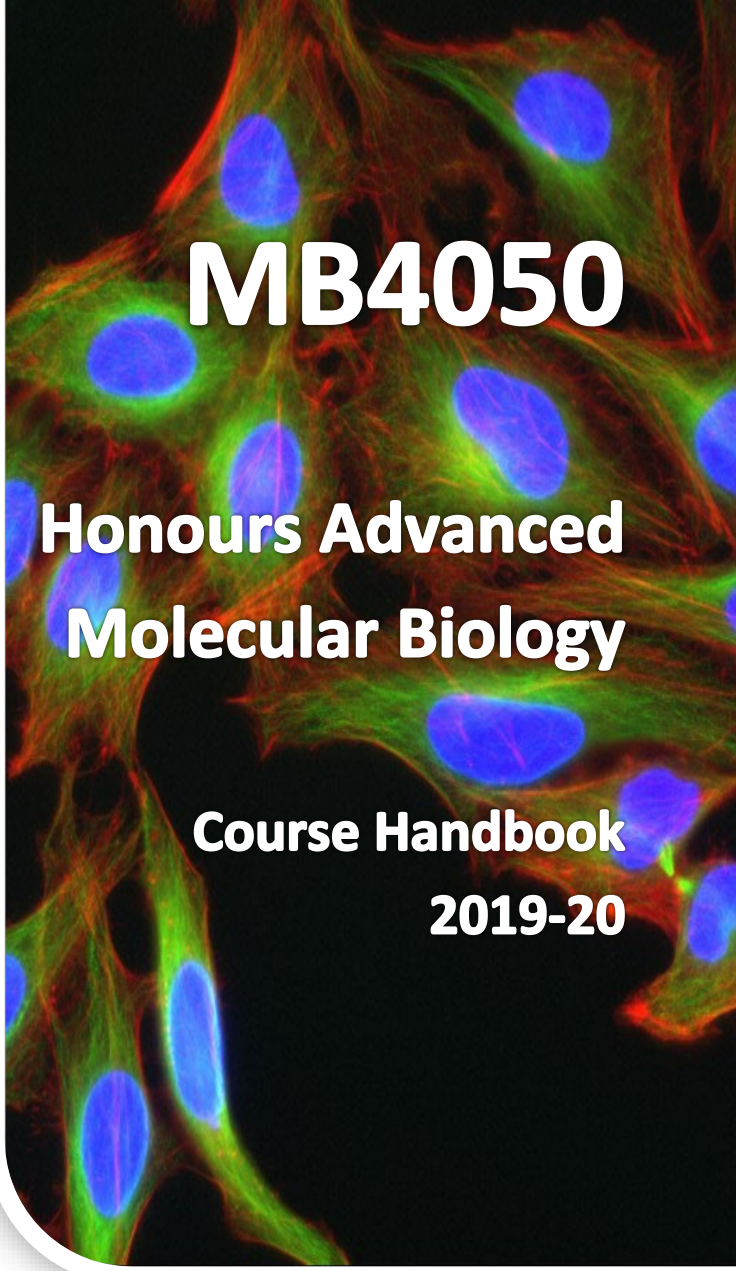
School of Medicine, Medical Sciences & Nutrition



MB4050

Honours Advanced Molecular Biology

Course Handbook

2019-20

1495 UNIVERSITY OF ABERDEEN

Contents

Cover image:

Confocal micrograph of fluorescently labelled HeLa cells.

Nuclei are labelled in blue, tubulin in green and actin fibres in red.

Courtesy of:

Kevin Mackenzie
Microscopy and Histology Core Facility
Institute of Medical Sciences
University of Aberdeen
http://www.abdn.ac.uk/ims/microscopy-histology

Course Summary

This course covers four main areas of advanced research-led molecular biology:

- Genome Organisation and Analysis
- Evolution of Protein Structure and Function
- Control of Gene Expression
- The Dynamic Cell

The course also teaches you about the scientific methods and discoveries that lie behind the above topics and covers detailed examples from the current scientific literature.

Course Aims & Learning Outcomes

The general aims of the course are to enable students:

- to establish a knowledge of aspects of advanced molecular and cell biology, including protein structure and function, the regulation of gene expression, genome organisation and analysis, and fundamental cellular processes at single-cell and multicellular level.
- to establish a knowledge at advanced level of specific aspects of biochemistry, microbiology, immunology or genetics appropriate to the degree course being studied.

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

- describe the current state of understanding of molecular genetics, in the context of genome structure and evolution, using data emerging from the microbial and eukaryote genome sequencing projects; understand methods and approaches being used to understand function of novel genes.
- understand major principles that determine the three-dimensional structure of proteins, evolution of proteins, how evolution has shaped protein structure and function, the contribution of structure to function, and the physical and chemical constraints on protein structure and function.
- describe the processes and mechanisms determining bacterial, yeast and animal gene expression (using specific examples), ranging from transcription regulation to mRNA degradation. Students will be aware of the role of control of gene expression in the context of differentiation, development and the adaptation to changes in the environment.
- understand at the molecular level fundamental processes that occur within the mammalian cell, with emphasis on the regulation of the actin cytoskeleton dynamics, vesicular transport, and nuclear import and export pathways.

Course Teaching Staff

Course Co-ordinator(s):

Dr John Barrow (**j.barrow@abdn.ac.uk**)

Other Staff:

Dr Max Baldassarre (**massimiliano.baldassarre@abdn.ac.uk**)
Prof Anne Donaldson (**a.d.donaldson@abdn.ac.uk**)
Dr Berndt Müller (**b.mueller@abdn.ac.uk**)
Dr Jonathan Pettitt (**j.pettitt@abdn.ac.uk**)
Dr Alexander Lorenz (**a.lorenz@abdn.ac.uk**)
Prof Iain McEwan (**iain.mcewan@abdn.ac.uk**)
Prof Ian Stansfield (**i.stansfield@abdn.ac.uk**)
Dr Sam Miller (**sam.miller@abdn.ac.uk**)
Dr James Hislop (**james.hislop@abdn.ac.uk**)
Dr Obinna Ubah (**obinna.ubah@abdn.ac.uk**)
Dr Virtu Solano (**mariavirtudes.solanocollado@abdn.ac.uk**)

Assessments & Examinations

This course is assessed via a written examination (worth 70% of the overall course grade) in the May exam diet and one piece of continuous assessment (worth 30% of the overall course grade).

The continuous assessment associated with this course is detailed below, with two other pieces of work being associated with your other "Option" course and the "Core" course.

It is vital that the deadlines for your continuous assessments are adhered to. Submit an incomplete piece of work rather than miss a deadline. Work not submitted on time will not be accepted unless accompanied by either a medical certificate or a written explanation justifying this.

A complete submission of your work consists of:

- uploading an electronic copy of the work via MyAberdeen before 12 NOON on the deadline date.

The deadlines for all three pieces of work are:

- **Core course Research Perspective: 12 NOON, Monday 30th September.**
- Option 1 course Research Tutorial Spotlight: 12 NOON, Monday 4th November.
- Option 2 course Essay: 12 NOON, Monday 2nd December.

Research Perspective

This piece of work is intended to provide a quick update to the reader on one research article aligned to your chosen Option 1 course from the field of biochemistry, genetics, immunology or microbiology. The work should give additional insight on the topic, highlighting broader implications for the field that have not already been provided by the original paper.

You are writing for a wide but scientifically trained audience, not only for readers in your own field. You can assume that your audience is competent in the basic language of the subject but may require explanation or definition of technical terms, concepts, and assumptions specific to your topic. Avoid jargon, but do not oversimplify or cut corners: be accurate and precise throughout.

As a guide and good example of this kind of article, see the Nature *News and Views* articles at the following link.

www.nature.com/nature/articles?type=news-and-views

You are welcome to use subheadings to structure the work as you see fit, but the following should be included on a title page.

- *Title* (8 words maximum)
- *Chosen Article* – A reference of your chosen research paper written in a standard reference format (as below)
- *Keywords* (at least 2 and a maximum of 6)
- *Abstract* (50 words maximum) – Please provide a short teaser to set the scene and introduce the main take home-message of the article. Must not include reference citations
- *Name*
- *Student ID*
- *Word Count*

Word count for your Research Perspective is **1,000 words** and you can use a maximum of two figures/tables. The word limit does not include text in tables, figure legends, abstract, or references.

You must choose one of the following research articles, dependent on which Option 1 course you are taking.

BC4014	Kriebs, A., Jordan, S. D., Soto, E., Henriksson, E., Sandate, C. R., Vaughan, M. E., Chan, A. B., Duglan, D., Papp, S. J., Huber, A.-L., Afetian, M. E., Yu, R. T., Zhao, X., Downes, M., Evans, R. M. and Lamia, K. A. (2017) 'Circadian repressors CRY1 and CRY2 broadly interact with nuclear receptors and modulate transcriptional activity.', *Proceedings of the National Academy of Sciences of the United States*

of America. National Academy of Sciences, 114(33), pp. 8776–8781. doi: 10.1073/pnas.1704955114.

GN4010 Botthof, J. G., Bielczyk-Maczyńska, E., Ferreira, L. and Cvejic, A. (2017) 'Loss of the homologous recombination gene rad51 leads to Fanconi anemia-like symptoms in zebrafish.', *Proceedings of the National Academy of Sciences of the United States of America*. National Academy of Sciences, 114(22), pp. E4452–E4461. doi: 10.1073/pnas.1620631114.

MC4014 Djoko, K. Y., Phan, M.-D., Peters, K. M., Walker, M. J., Schembri, M. A. and McEwan, A. G. (2017) 'Interplay between tolerance mechanisms to copper and acid stress in Escherichia coli.', *Proceedings of the National Academy of Sciences of the United States of America*. National Academy of Sciences, 114(26), pp. 6818–6823. doi: 10.1073/pnas.1620232114.

Scientific Writing

Writing is an important scientific skill. Its function in the Honours courses is to provide you with training in finding, reading, analysing and communicating scientific ideas. Although it is usually necessary to start your reading from reviews that provide an expert overview of a topic, it is critical to your development that you read a significant number of original papers that describe the experiments underpinning key scientific advances. Central to these skills is the development of the ability to judge the important points made in a paper and what are the central pieces of evidence that support those points. Finally, it is important for all graduates to have a working knowledge of the key experimental procedures and techniques that generate the data that we use to test hypotheses.

Word Limit: Adhering to a word limit (excluding figure legends, tables and the reference list) requires you to be disciplined in the preparation of the piece of work; being able to write to a required length is a very useful skill, so we expect you to stay within the limit set. Your computer will give you a word count; this must be included at the end of the work submitted. **We reserve the right to return work exceeding the word count for shortening. Submissions returned for shortening must be re-submitted within 24 h**. Having to resubmit your work again will delay marking and subsequent feedback.

Assessment: The continuous assessment for Honours will be assessed by two members of staff, using criteria that will be published in MyAberdeen alongside the submission links for each piece of work. This assessment is not open to negotiation, although if asked, the markers will clarify any points of constructive criticism. Please use the assessment criteria as a guide and read them with care; the notes on scientific writing also give you guidance on what we judge to be important in a well-written piece of work. If you have particular doubts about your ability to write scientifically, either in terms of organising material or in the mechanics

of good scientific writing, seek help from a member of staff or the Honours Coordinators during the first term. Do not wait until your first assignment is causing you anxiety.

All submissions should make reference to the latest literature on the subject you have chosen. While you may be guided through an unfamiliar subject area by reference to a review, **your work should specifically not paraphrase the review article**, but should be a synthesis of your own views of the subject, **written in your own words** arrived at by reading of the **original research papers** from resources such as Web of Science/Medline/PubMed/Google Scholar. This will give insight into *how* information is derived (one criteria assessed) as well as helping in preparation for the Data Analysis exam at the end of the year, where understanding of a research paper is tested.

Avoiding Plagiarism

The definition of Plagiarism is the use, without adequate acknowledgement, of the intellectual work of another person in work submitted for assessment. A student cannot be found to have committed plagiarism where it can be shown that the student has taken all reasonable care to avoid representing the work of others as his or her own.

The instruction given above to write assignments **in your own words** and not to copy whole sentences from articles is crucially important to avoid plagiarism.

The University views this offence extremely seriously indeed; it can have dire consequences, including the awarding of no higher than a pass degree.

Continuous assessment assignments and your thesis are all submitted as electronic copies via MyAberdeen so they can be checked for originality. The programme will detect passages of text copied from other sources, and also if sentences from various text sources were used throughout the text, both indicators of plagiarism. MyAberdeen accepts most common formats, but it is advised that you submit your work as **PDF** files to avoid problems with re-formatting of figures and/or text during the submission process. Any evidence of copying from other sources that is detected in your final submissions will be brought to the attention of the Head of School, who will investigate and determine whether cheating has occurred and take the appropriate action.

Feedback

As for all elements of continuous assessment, you will be given feedback on the Honours classification your work has attained, with the grading on the University Common Grading Scale (CGS). Feedback is normally given within 3 weeks of submission.

Guide to Writing

Students should refer to "A Guide to Scientific Writing" by David Lindsay (Longman Cheshire) for more general guidance on writing. What follows is not a substitute for reading this book but gives general guidance on writing and on how we assess your work.

PLANNING YOUR WRITING

Think

- What do I know already?
- Where will I find the information needed to develop my views on this issue?
- Where can I find more information?
- What are the best examples to illustrate the points that I want to make?
- How many words do I devote to each example?

Prepare

- Read a mix of reviews and use these to identify the major original scientific papers that have resulted in our current understanding of the topic.
- Read these papers and make notes on: research strategy use to analyse the problem, key experimental procedures that generate the data and critical controls that validate the data.
- Devise a set of themes and ideas for your work using the core information from above.
- Organise evidence under the theme headings: remember that arguments pro and contra are equally important.
- Select illustrations (diagrams/schemes) that reflect the themes and ideas.

Plan

- Place themes in a logical order, and have a clear, and planned, introduction and conclusion.
- Start simply and develop towards more complex arguments.
- Do not hop from one theme to another and then back again.
- Identify the links between themes as a mechanism of ensuring continuity.

Execute

- Write short sentences and keep clauses simple.
- Use appropriate tenses.
- Be consistent in the organisation of sections.
- Have diagrams in front of you when writing about them.
- Support statements with evidence, usually a citation; ensure your citation style is consistent

Complete

- Read over what you have written - can you read it out loud without stumbling?
- Have you answered the question?
- Have you done what you said you would do at the start of the assignment?
- Have you checked it carefully for typographical errors?

Assessment of Written Work

Every piece of work in your Honours year will be assessed using a standardised assessment form. The assessment forms ensure that you get useful feedback on your written work. The Continuous Assessment form covers the following criteria.

Content and Presentation

Each piece of work will be judged on content and also on style of presentation. More marks are given for the content of the work than are given for the presentation. Look at the structure of the feedback form to see what the priorities are in giving marks. However, remember also that a written piece of work must always be more than a collection of facts and ideas. Good presentation is central to clear communication.

Knowledge: It is expected that any piece of work will contain a substantial body of facts gleaned from appropriate original literature, which should be cited within the text (**Citations**). The length of the work and its intended audience will dictate how many facts can be given in support of a given statement.

Analysis: Students are expected to develop their analytical skills. This is most readily demonstrated by use of carefully selected examples, which should show a good **understanding** of the material. Remember that examples may either support or undermine an argument.

Understanding: Students are expected to display a clear grasp of fundamental concepts in the context of the work and their discipline. This is sometimes illustrated by the lack of mistakes about fundamentals of the cell and cellular processes, but it is also expected a student will develop, through their reading, an understanding of the subject area and display this by writing logically about it.

Techniques: Scientific information is derived from experimentation. It is important to understand how information is derived. For example, what technique was used, how was the experiment conducted etc.

Figures: An argument can often be supported by Figures or Tables that present information more effectively than text alone. Figures and Tables should not be an add-on but must be an integral feature of the text and must be described and discussed. A poor or inappropriate figure or table will usually detract from the work. Appropriate figures prepared by hand or

using a drawing programme are preferred to reproductions of complex diagrams from other people's work (if used, make sure you acknowledge the source).

Citations: Papers and reviews used as source material should be cited in the text. Direct quotes should be indicated by quotation marks, **although their use should be kept to a minimum, and they must be referenced (see University Web page on plagiarism)**. Use of the **Harvard style of citation** is essential, and a list of citations should be presented at the end of the work (referencing of EMBO Journal articles is a good example). The reference list does not have to be included in your word count.

In the text a reference should be cited by author and date; e.g. 'Water is known to boil at 100°C (Jones and Brown, 1872; Brown *et al*, 1873) and freeze at…'. Not more than two authors may be cited per reference; if there are more than two authors use *et al*. References should be listed alphabetically according to the initial letter of the surname of the first author. Where the same authors have published more than one paper, list them in the order in which their papers appeared. If necessary use a and b, e.g. 1990a., with the authors' surnames and initials inverted.

References should include, in the following order:

authors' names; year; article or chapter title; editors (books only); journal or book title; name and address of publisher (books only); volume number and inclusive page numbers.

The name of each journal should be abbreviated according to the World List of Scientific Periodicals (see an EMBO J. paper for reference) and italicised. References should therefore be listed as follows:

Tugendreich, S., Bassett, D.E., Jr, McKusick,V.A., Boguski, M.S. and Hieter, P. (1994) Genes conserved in yeast and humans. *Hum. Mol. Genet*., 3, 1509-1517.

Gehring, W. (1994) A history of the homeobox. In Duboule, D. (ed.), Guidebook to the Homeobox Genes. Oxford University Press, Oxford, UK, pp. 1-10.

Lewin, B. (1994) Genes V. Oxford University Press, Oxford, UK.

Structure: A good piece of writing will be clearly structured by division into appropriate sections, including an **introduction**, which provides a clear and concise statement of the issue to be discussed, and a **conclusion,** which briefly sums up the issues discussed.

Introduction: a clear and brief introduction of the topic of the work that describes the specific areas questions or issues that the reader should focus on.

Viewpoint: Students should form a view on the subject about which they are writing and should be able to support their views with balanced use of appropriate examples. A balanced piece of work will consider the relative strengths of the arguments for and against a particular point of view.

Conclusions: this section is used to pull the main themes of the work together and to briefly state the principal outcome of the analysis that you have performed. It should leave the reader with a clear impression of what you think about the subject matter presented.

Sentence construction, spelling, grammar: Students are expected to spell correctly and to follow the basic rules of grammar. Short, clear sentences are preferable to complex, tortuous, rambling constructions. You should be able to pick up the eight-clear grammatical, punctuation and spelling errors in the sentence that follows. If you can't, then revise your grammar/spelling rules. "It's clear to the company that their commercial targeted young people of the same age as Johns friends who were clearly able to receive its message."

Organisation: A written assignment is easier to read if it is attractively set out on the page (wide margins, double spaced, font size $\geq$12) with a logical progression and structure.

Specific comments: This section is provided for the staff to make comments that amplify the box assessments in the top half of the form.

Note that computer failure is not accepted as a reason for late submission - it is good practice to maintain at least two copies of computer files.

Sample Assessment/Feedback MyAberdeen Rubric

	Levels of Achievement				
Criteria	1st Class	2.1 Class	2.2 Class	3rd Class	Bare Pass
CONTENT	Excellent demonstration of knowledge and understanding, grasp of fundamental concepts, selective use of arguments.				Little or no relevant content, superficial knowledge, lack of grasp of fundamentals, arguments not relevant.
TECHNICAL INSIGHT	Clear recognition of how information was derived.				Lacking insight and a demonstration of how information was derived.
STRUCTURE	Clear logical structure with and meaningful introduction, main text and conclusion sections, clearly argued.				Poorly structured, confused order of topics, poorly focused.
FIGURES	Well integrated with text, with appropriate legend, clearly illustrated.				Not appropriate, poorly integrated, legends irrelevant or missing, untidy, poorly labelled.
REFERENCING	Good use of a range of references.				Citations lacking or erroneous, format inconsistent.
PRESENTATION	Visually attractive, well-organised, legible.				Untidy, badly organised, illegible.
SENTENCE CONSTRUCTION, SPELLING AND GRAMMAR	Sentence construction good, readability high, spelling and grammar correct.				Sentence construction poor, incoherent, many errors.

Class Representatives

We value students' opinions in regard to 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 Medical Sciences, 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 Mrs Jenna Reynolds (**medsci@abdn.ac.uk**) in the Medical Sciences Office (based in the Polwarth Building, Foresterhill), or Mrs Sheila Jones (**s.jones@abdn.ac.uk**) in the Old Aberdeen office associated with the teaching laboratories, 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 (Prof Gordon McEwan)
- Adviser of studies
- SMS 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.

Course Reading List

This course does not have recommended textbooks as you are expected to read the primary research literature, so no specific course texts will be recommended. That said, your previous texts from third year would be useful for basic and fundamental knowledge.

Lecture Synopsis

MODULE 1 - GENOME ORGANISATION AND ANALYSIS

The genome is the primary source of information for building and maintaining an organism. This digital code has now been "determined" for thousands of organisms (the majority of which are prokaryotes or single-celled eukaryotes: **http://tinyurl.com/9gggywv**. The number of sequenced genomes is increasing exponentially, and the recently introduced "next generation" sequencing technologies have dramatically reduced the costs and time required to sequence a genome.

However, despite, the wealth of sequencing information, we still have only a rudimentary understanding of how the data encoded in the genome results in biological form and function.

The aim of this module is to give you an overview of the long-standing problems, and emergent themes and technologies in the field of genome biology; focussing in particular on the model organisms important in the development of genome-wide approaches to the study of biological problems.

MODULE 2 – PROTEINS: STRUCTURE, FUNCTION AND ENGINEERING

Proteins are central to all biological processes and understanding them is essential for all molecular life scientists. This core course will explore current knowledge of protein structure and function. The objective of the course is to give students an appreciation of the relationships between primary sequence and final structure, consequences for function, including interactions, as well as insights into mutations that cause disease and into the evolution of biological systems.

The manipulation of antibodies, and related structures, as a route to new, targeted and efficacious treatments for disease could be considered as one of the great positives to have emerged from the application of protein engineering techniques. In these lectures on Antibodies and Protein Engineering (Dr Obinna Ubah) we will consider initially the antibody protein as a scaffold for manipulation and follow the earlier pioneers efforts to develop immune-therapies. In the second lecture we will discuss why antibodies make up six or the world's top ten selling drugs and speculate where this technology will go next, with particular reference to the application of new protein architectures from sources as diverse as camel and sharks.

The lectures on protein folding and structure (Prof Iain J McEwan) will examine the dynamics of protein folding, with an emphasis on structure-function relationships. The concept of naturally disordered proteins or protein domains will be introduced, and their functional significance discussed. Examples will be chosen to illustrate different aspects of protein folding, in particular induced folding and allosteric regulation. Methods for studying protein conformation and folding will also be discussed, where appropriate.

The objective of these protein structure workshop exercises (Prof Ian Stansfield) is to familiarize students with key concepts regarding the folding and function of proteins. The workshop will consider the importance of amino acid side chains in controlling the interaction of the protein with its environment and with ligands; the conservation of folds among diverse protein sequences; the role of amino acid side chains in catalysis and static versus dynamic views of proteins. Students will be expected to supplement the workshops with extra work at computer terminals.

The membrane protein lectures (Dr Sam Miller) focus on Integral membrane proteins that constitute 20-30% of the protein encoded by most genomes and represent 60-70% of the drug targets utilised in health care. Any understanding of biology requires some knowledge of membrane protein structure and function. The lectures will examine

- The basic structure of different classes of membrane proteins, using the crystallographic database to illustrate the connection between the original "cartoons" used to guide thinking on membrane proteins and the structures of selected examples;
- The use of genetic methods to probe membrane protein structure and function;
- The importance of mutations in membrane proteins in provoking disease.

MODULE 3 – CONTROL OF GENE EXPRESSION

This core module will provide insights into the processes and mechanisms that control gene expression in the context of differentiation, development and the adaptation to changes in the environment, using examples from bacteria, yeast and animal systems. We will provide information about the molecular mechanisms of transcriptional, post-transcriptional and translational control. Specific examples will include transcriptional control networks, post-transcriptional control by alternative splicing and control of mRNA stability. The overall aim of the module is to gain an understanding and appreciation of the complexity of the mechanisms that control gene expression in simple and complex life forms.

MODULE 4 – THE DYNAMIC CELL

This core module will examine the molecular mechanisms of the various fundamental processes that occur within the mammalian cell, with emphasis on the regulation of the actin cytoskeleton dynamics, vesicular transport, and quality control in the secretory system. The module will consider systems at the single-cell and multicellular levels in the context of classical and current scientific literature. We intend to introduce students to landmark studies, which formed the foundation of current scientific questions. The module will use primary scientific literature to illustrate the experimental basis of the different cell biological processes, with emphasis on the experimental design, data analysis, and critical thinking.

University Policies

Students are asked to make themselves familiar with the information on key institutional policies which been made available within MyAberdeen (**https://abdn.blackboard.com/bbcswebdav/institution/Policies**). 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 indicate how seriously the University takes your feedback.

These institutional policies should be read in conjunction with this programme and/or course handbook, in which School and College specific policies are detailed. Further information can be found on the **University[1]s Infohub webpage** or by visiting the Infohub.

The information included in the institutional area for 2019/20 includes the following:

- Absence
- Appeals & Complaints
- Student Discipline
- Class Certificates
- MyAberdeen
- Originality Checking
- Feedback
- Communication
- Graduate Attributes
- The Co-Curriculum

Medical Sciences Common Grading Scale

Grade	Grade Point	Category	Honours Class	Description
A1	22	Excellent	First	• 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			
A3	20			
A4	19			
A5	18			
B1	17	Very Good	Upper Second	• 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			
B3	15			
C1	14	Good	Lower Second	• Repetition of lecture notes without evidence of further appreciation of subject • Lacking illustrative examples and originality • Basic level of understanding
C2	13			
C3	12			
D1	11	Pass	Third	• 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			
D3	9			
E1	8	Fail	Fail	• Weak presentation • Tendency to irrelevance • Some attempt at an answer but seriously lacking in content and/or ability to organise thoughts
E2	7			
E3	6			
F1	5	Clear Fail	Not used for Honours	• Contains major errors or misconceptions • Poor presentation
F2	4			
F3	3			
G1	2	Clear Fail/ Abysmal	-	• Token or no submission
G2	1			
G3	0			

MB4050 Course Timetable: 2019-2020

Date	Time	Venue	Subject	Session Type	Staff
Week 7					
Mon 9 Sep	10:00-11:00	FLT	Honours Introduction	Lecture	Dr J Barrow/Dr I Crane
	11:00-12:00	FLT	Essay Writing	Lecture	Dr John Barrow
Tue 10 Sep					
Wed 11 Sep					
MODULE 1 - GENOME ORGANISATION AND ANALYSIS					
Thu 12 Sep	09:00-10:00	FLT	NO LECTURE – FREE STUDY!		
	10:00-11:00	FLT	The Dynamic Genome - Gene Birth I	Lecture	Dr J Pettitt
	12:00-13:00	FLT	The Dynamic Genome - Gene Birth II	Lecture	Dr J Pettitt
Fri 13 Sep	10:00-11:00	Auditorium	The Dynamic Genome: Gene Death	Lecture	Prof A Donaldson
	11:00-12:00	Auditorium	Elements of Chromosomes: DNA Replication and Origins of replication	Lecture	Prof A Donaldson
Week 8					
Mon 16 Sep					
Tue 17 Sep					
Wed 18 Sep	11:00-12:00	FLT	Elements of Chromosomes: Telomeres	Lecture	Prof A Donaldson
Thu 19 Sep	13:00-14:00	1:143/144	Genome Integrity I: DNA Repair	Lecture	Dr A Lorenz
	14:00-15:00	1:143/144	Genome Integrity II: DNA double-strand break (DSB) repair: Non-homologous End Joining & Homologous Recombination	Lecture	Dr A Lorenz
Fri 20 Sep					
Week 9					
Mon 23 Sep	09:00-10:00	FLT	Genome Integrity III: Meiosis	Lecture	Dr A Lorenz
	10:00-11:00	FLT	Yeast Genomes 1	Lecture	Prof A Donaldson
Tue 24 Sep					
Wed 25 Sep	11:00-12:00	012 LT Suttie	Yeast Genomes 2	Lecture	Prof A Donaldson
Thu 26 Sep	10:00-11:00	FLT	Yeast Genomes 3	Lecture	Prof A Donaldson
	11:00-12:00	FLT	The Dynamic Genome: Non-coding RNA	Lecture	Prof A Donaldson
	13:00-14:00	FLT	The Dynamic Genome: The trouble with Transposons	Lecture	Prof A Donaldson
Fri 27 Sep					
Week 10					
Mon 30 Sep	10:00-11:00	FLT	The Dynamic Genome: Junk DNA	Lecture	Prof A Donaldson
MODULE 2 – PROTEINS: STRUCTURE, FUNCTION AND ENGINEERING					
	11:00-12:00	FLT	Antibodies and Protein Engineering 1	Lecture	Dr O Ubah
Tue 1 Oct					
Wed 2 Oct					
Thu 3 Oct	10:00-11:00	012 LT Suttie	Antibodies and Protein Engineering 2	Lecture	Dr O Ubah
	11:00-12:00	012 LT Suttie	Protein Folding and Function 1	Lecture	Prof IJ McEwan
	13:00-14:00	FLT	Protein Folding and Function 2	Lecture	Prof IJ McEwan
Fri 4 Oct					
Week 11					
Mon 7 Oct	09:00-10:00	012 LT Suttie	Protein Folding and Function 3	Lecture	Prof IJ McEwan

	10:00-11:00	012 LT Suttie	Protein Folding and Function 4	Lecture	Prof IJ McEwan
Tue 8 Oct					
Wed 9 Oct					
Thu 10 Oct	13:00-14:00	FLT	Proteins – Folds and Function	Lecture	Prof Stansfield
Fri 11 Oct					
Week 12					
Mon 14 Oct	10:00-11:00	FLT	Protein Folding and Function 5	Lecture	Prof IJ McEwan
	11:00-12:00	FLT	Membrane proteins 1	Lecture	Dr S Miller
Tue 15 Oct					
Wed 16 Oct					
Thu 17 Oct	11:00-12:00	Auditorium	Membrane proteins 2	Lecture	Dr S Miller
	13:00-14:00	FLT	Membrane proteins 3	Lecture	Dr S Miller
Fri 18 Oct					
Week 13					
MODULE 3 – CONTROL OF GENE EXPRESSION					
Mon 21 Oct	09:00-10:00	FLT	Gene expression and chromatin structure and Gene expression 1	Lecture	Dr B Müller
	10:00-11:00	FLT	Gene expression and chromatin structure and Gene expression 2	Lecture	Dr B Müller
Tue 22 Oct					
Wed 23 Oct					
Thu 24 Oct	11:00-12:00	Auditorium	RNA processing (1)	Lecture	Dr B Müller
	12:00-13:00	FLT	RNA processing (2)	Lecture	Dr B Müller
	14:00-15:00	FLT	RNA processing (3)	Lecture	Dr B Müller
Fri 25 Oct					
Week 14					
Mon 28 Oct	12:00-13:00	FLT	RNA stability and translation (1)	Lecture	Dr B Müller
	13:00-14:00	FLT	RNA stability and translation (2)	Lecture	Dr B Müller
Tue 29 Oct					
Wed 30 Oct					
Thu 31 Oct	10:00-11:00	012 LT Suttie	Gene Expression - Regulatory Networks	Lecture	Prof IJ McEwan
	11:00-12:00	012 LT Suttie	Myogenesis I	Lecture	Prof IJ McEwan
	13:00-14:00	FLT	Myogenesis II	Lecture	Prof IJ McEwan
Fri 1 Nov					
Week 15					
Mon 4 Nov	11:00-12:00	012 LT Suttie	Prokaryotic gene expression (1)	Lecture	Dr S Miller
Tue 5 Nov					
Wed 6 Nov					
Thu 7 Nov	10:00-11:00	FLT	Prokaryotic gene expression (2)	Lecture	Dr S Miller
	13:00-14:00	FLT	Prokaryotic gene expression (3)	Lecture	Dr S Miller
Fri 8 Nov					
Week 16					
Mon 11 Nov	10:00-11:00	FLT	Prokaryotic gene expression (4)	Lecture	Dr S Miller
Tue 12 Nov					
Wed 13 Nov					
MODULE 4 – THE DYNAMIC CELL					
Thu 14 Nov					

Fri 15 Nov					
Week 17					
Mon 18 Nov	10:00-11:00	FLT	Cytoskeletal organisation	Lecture	Dr M Baldassarre
Tue 19 Nov					
Wed 20 Nov	09:00-10:00	FLT	Actin polymerisation	Lecture	Dr M Baldassarre
	10:00-11:00	FLT	Cytoskeleton in adhesion and migration	Lecture	Dr M Baldassarre
	13:00-14:00	FLT	Mechanotransduction	Lecture	Dr M Baldassarre
Thu 21 Nov	09:00-10:00	FLT	Exploring cytoskeletal function by host-pathogen interaction	Lecture	Dr V Solano
	12:00-13:00	FLT	Mechanisms of Endocytosis	Lecture	Dr J Hislop
	15:00-16:00	FLT	Endocytic Sorting 1 - Recycling	Lecture	Dr J Hislop
	16:00-17:00	FLT	Endocytic Sorting 2 - Ubiquitination and Lysosomal Transport	Lecture	Dr J Hislop
Fri 22 Nov					