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UNIVERSITY OF  
**ABERDEEN**

BM4009- Staying Alive, Adaption  
in Physiological Systems  
Course Handbook 2023-2024



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## Course Summary

The aims of the course are to provide advanced knowledge and understanding of the physiological adaptations of major body systems. Specifically we will examine how physiological systems maintain normal body function and study how these systems adapt to changing conditions under different circumstances, such as disease and exercise.

## Course Aims & Learning Outcomes

The physiology of adaptation consists of complex interactions involving several major physiological systems. In order to truly understand physiological adaptation, you must first study individual systems and how they regulate normal body function.

This course considers major systems and their role in physiological adaptation. This includes:

- 1) Skeletal muscle and the way in which it responds and adapts during exercise to maintain strength and endurance.
- 2) The skeleton and bone integrity which provides structural support in normal conditions but adapts to changing environments.
- 3) Understand how normal body function is maintained by blood flow and regulation of the cardiovascular system, and how this adapts to different conditions.
- 4) Glucose metabolism and the adaptations involved, particularly in diabetes.
- 5) The adaptations which occur during the development of sepsis.

Additionally, disease greatly affects the ability of the body to adapt. The effects of different pathological conditions will be discussed for each physiological system examined.

## Course Teaching Staff

### Course Co-ordinator(s):

Professor Graeme Nixon (GFN) [g.f.nixon@abdn.ac.uk](mailto:g.f.nixon@abdn.ac.uk)

Dr Jenny Gregory (JG), [j.gregory@abdn.ac.uk](mailto:j.gregory@abdn.ac.uk)

### Other Staff:

Prof Alison Jenkinson (AJ), [a.jenkinson@abdn.ac.uk](mailto:a.jenkinson@abdn.ac.uk)

Dr Nimesh Mody (NM), [n.mody@abdn.ac.uk](mailto:n.mody@abdn.ac.uk)

Dr Michael Scholz (MES), [m.e.scholz@abdn.ac.uk](mailto:m.e.scholz@abdn.ac.uk)

Prof Derek Scott (DS), [d.scott@abdn.ac.uk](mailto:d.scott@abdn.ac.uk)

Dr Virtu Solano (VS), [mariavirtudes.solanocollado@abdn.ac.uk](mailto:mariavirtudes.solanocollado@abdn.ac.uk)

## Assessments & Examinations

Students are expected to access all lectures, interactive online tutorial and assessment sessions, and to complete all class exercises by stated deadlines. Students are also expected to attend laboratory classes as scheduled. The minimum performance acceptable for the granting of a class certificate is evidence of engagement with, at least, 50% of the lectures, tutorial sessions and lab classes, and presentation of all set course work. Failure to achieve this may result in your class certificate being withheld. The course assessment consists of:

- 1) **Continuous assessment** - will comprise **30%** of the total.
  - a) The **practical exam** which is part of the **OSPE** will also contribute **20%** towards final course mark.
  - b) The **Problem Solving** exercise will be marked and contribute **10%**.

- 2) **Examination** - this will take place in the summer diet, May/June. It will take the form of an **essay-based examination**, which will comprise **70%** of the assessment for BM4009. It will be a 2-hour exam in which 2 essays are attempted from a choice of 4.

## **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 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](http://www.ausa.org.uk) or email the VP Education & Employability [vped@abdn.ac.uk](mailto: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](http://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](mailto: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

A number of general textbooks are useful. More specific references will be given to you at the time of the lectures.

Astrand P.O. & Rodahl, K, Dahl H, Stromme S - Textbook of Work Physiology-4th Edition: Physiological Basis of Exercise, 2003, ISBN: 0736001409, Publishers: Human Kinetics

Levick J.R. – An introduction to Cardiovascular Physiology (4th Edition), 2003, ISBN 0340809213, Publishers: Hodder Arnold

## Lecture Synopsis

### **Diabetic adaptations 1 & 2 - Dr Nimesh Mody**

This set of lectures concentrates on causes and consequences of the development of insulin resistance and diabetes mellitus. We discuss how the body normally regulates glucose homeostasis under fed and fasting conditions, with specific emphasis on the pancreatic b-cells and insulin secretion. We also discuss the role of adipose tissue, muscle, liver and the brain and the cross-talk between the tissues under normal physiological and pathophysiological conditions. We also discuss the signalling pathways thought to play a role in the development of insulin resistance and how these converge to impact different tissues in the body.

### **In vivo regulation of blood flow 1 & 2 - Professor Graeme Nixon**

Blood flow and blood pressure must constantly adapt to the changing demands of body function, either at rest or during exercise. This requires several physiological mechanisms to detect and produce these changes. These mechanisms will be examined and discussed in the context of different physiological situations.

### **Statistical analysis of data - Professor Derek Scott**

How to approach statistical analyses of scientific data to prove hypotheses will be covered.

### **Angiogenesis - Professor Graeme Nixon**

Angiogenesis is the growth of new blood vessels from existing vessels. The physiological and pathological conditions which lead to angiogenesis will be examined, particularly with respect to muscle growth. The mechanisms which lead to endothelial cell proliferation and migration to form tubules (early stage blood vessels) will also be discussed.



### **Satellite cells 1 & 2 - Dr Michael Scholz**

Importance of satellite cells for the skeletal muscle in relation to characteristic properties of skeletal muscle cells, embryonic myogenesis and formation of satellite cells. Control of satellite cells: lineage determination by myogenic transcription factors and the underlying mechanisms, Growth factors and external control of satellite cells. Importance of satellite cells for repair and maintenance, regenerative capacity. Hypertrophy and satellite cells, Satellite cells and ageing.

### **Free radical physiology 1 & 2 - Professor Alison Jenkinson**

Skeletal muscle damage, the repeated bout effect and free radical activity. Oxidative stress, redox state, adaptations and interventions.

### **Skeletal physiology and adaptation 1 & 2 - Dr Jenny Gregory**

The skeleton supports and facilitates movement, protects vital organs and acts as a reservoir for mineral homeostasis. Bone remodelling is a process that occurs throughout life to repair and renew bones. The balanced activities of bone-resorbing osteoclasts and bone-forming osteoblasts are critical for this process and both cell types respond to hormones that regulate the levels of calcium and phosphate in the body. Mechanical forces drive the cellular processes and helps determine the micro and macrostructure of bone, which in turn are linked to long term bone health (and risk of fracture). In addition, the study of diseases that affect different aspects of the bone remodelling cycle has highlighted many factors that are critical for the formation, function and activity of bone cells.

### **Adaptations in sepsis 1 & 2 – Dr Virtu Solano**

Physiology of host immune and inflammatory responses and the process of resolution will be examined and its adaptation during disease processes. Sepsis is defined as a life threatening dysregulated inflammatory in adaptation to an infection. The pathophysiology of sepsis and highlight novel interventional approaches to attempt to restore homeostasis will be examined.

## **Practical/Lab/Tutorial Work**

### **Laboratory Work**

The practical work for BM4009 will take the form of an Objective Structured Practical Examination (OSPE for short!), which some of you will have experienced before in subjects such as anatomy or medicine. However, this style of assessment at multiple stations during a strict time limit is also similar to the job interviewing methods used by many employers.

Practical sessions, if live and in-person, will be based at the **Science Teaching Hub** on those dates and times shown in the timetable. Attendance will be taken at all practical classes. Practical guidance will be given at each practical class and information about the lab classes will be available on MyAberdeen prior to each class.

The practical coordinator for BM4009 is Prof Derek Scott ([d.scott@abdn.ac.uk](mailto:d.scott@abdn.ac.uk)). The OSPE will contribute 20% towards your final course mark.

For these classes a laboratory coat should be worn at all times in the laboratory. The University and Department safety rules must be adhered to at all times. Students may find it useful to bring a calculator to the laboratories in order that the required calculations can be made.

## Problem Solving Sessions

There will be one Problem Solving session in which you will be given an abstract of a published paper and a set of questions based on the information provided. Interaction with this session is mandatory. In advance of this session, there will be exercises to work through (with answers) on MyAberdeen to help you prepare. In the first part of the problem-solving session you will be given instructions on how to tackle problem solving exam questions in a class tutorial. In the second part of the problem-solving session, you will be given a similar exercise to complete. This assessment will be marked by academic staff and the resulting mark will be used as part of your continuous assessment for the course (contributing 10% of your final mark for BM4009). You will be provided with important feedback at the tutorial session. Everyone must participate in this exercise which is important practice for the problem-solving paper in the final exams in May. Please note, this session may be live and in-person if circumstances permit.

## Discussion Board

We have set up a discussion board on MyAberdeen to help you interact outside the classroom setting where you can discuss the course content. Please note any offensive posts will be removed and irrelevant posts will not contribute to your grade.

## 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 2023/24 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 2023-24 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"> <li>• Outstanding ability and critical thought</li> <li>• Evidence of extensive reading</li> <li>• Superior understanding</li> <li>• The best performance that can be expected from a student at this level</li> </ul>
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"> <li>• Able to argue logically and organise answers well</li> <li>• Shows a thorough grasp of concepts</li> <li>• Good use of examples to illustrate points and justify arguments</li> <li>• Evidence of reading and wide appreciation of subject</li> </ul>
B2	16	64-66			
B3	15	60-63			
C1	14	57-59	Good	Lower Second	<ul style="list-style-type: none"> <li>• Repetition of lecture notes without evidence of further appreciation of subject</li> <li>• Lacking illustrative examples and originality</li> <li>• Basic level of understanding</li> </ul>
C2	13	54-56			
C3	12	50-53			
D1	11	47-49	Pass	Third	<ul style="list-style-type: none"> <li>• Limited ability to argue logically and organise answers</li> <li>• Failure to develop or illustrate points</li> <li>• The minimum level of performance required for a student to be awarded a pass</li> </ul>
D2	10	44-46			
D3	9	40-43			
E1	8	37-39	Fail	Fail	<ul style="list-style-type: none"> <li>• Weak presentation</li> <li>• Tendency to irrelevance</li> <li>• Some attempt at an answer but seriously lacking in content and/or ability to organise thoughts</li> </ul>
E2	7	34-36			
E3	6	30-33			
F1	5	26-29	Clear Fail	Not used for Honours	<ul style="list-style-type: none"> <li>• Contains major errors or misconceptions</li> <li>• Poor presentation</li> </ul>
F2	4	21-25			
F3	3	16-20			
G1	2	11-15	Clear Fail/Abysmal		<ul style="list-style-type: none"> <li>• Token or no submission</li> </ul>
G2	1	1-10			
G3	0	0			

## Course Timetable BM4009 – 2023-2024

Date	Time	Place	Subject	Session	Staff
<b>Week 8</b>					
Mon 18 Sep	10:00-11:00	Polwarth 1.032/033	Course Introduction	Lecture	JSG
Tue 19 Sep					
Wed 20 Sep	12:00-13:00	Biomedical Physics Lecture Theatre	Skeletal Physiology and adaptations 1	Lecture	JSG
Thu 21 Sep	09:00-18:00	STH 1.007	Practical: Introduction to the physiology OSPE	Practical	DS, AJ, JSG
Fri 22 Sep	10:00-11:00	Polwarth 1.032/033	Skeletal Physiology and adaptations 2	Lecture	JSG
<b>Week 9</b>					
Mon 25 Sep	10:00-11:00	Polwarth 1.032/033	Adaptation in sepsis 1	Lecture	VS
Tue 26 Sep					
Wed 27 Sep	12:00-13:00	Biomedical Physics Lecture Theatre	Adaptation in sepsis 2	Lecture	VS
Thu 28 Sep					
Fri 29 Sep	11:00-12:00	Polwarth 1.032/033	Statistical analysis of data	Lecture	DS
<b>Week 10</b>					
Mon 2 Oct	10:00-11:00	Polwarth 1.032/033	Diabetic adaptations 1	Lecture	NM
Tue 3 Oct					
Wed 4 Oct	12:00-13:00	Biomedical Physics Lecture Theatre	Diabetic adaptations 2	Lecture	NM
Thu 5 Oct	09:00-18:00	STH 1.007	Practical: physiology OSPE	Practical	DS, AJ, JSG
Fri 6 Oct	10:00-11:00	Polwarth 1.032/033	Satellite cells 1	Lecture	MES
<b>Week 11</b>					
Mon 9 Oct	10:00-11:00	Polwarth 1.032/033	Satellite cells 2	Lecture	MES
Tue 10 Oct					
Wed 11 Oct	12:00-13:00	Biomedical Physics Lecture Theatre	Angiogenesis	Lecture	GFN
Thu 12 Oct	10:00-12:00	Medical Physics D2	Physiology Problem Solving	Workshop	GFN
Fri 13 Oct	11:00-12:00	Suttie Centre 218 Training room	Free radical physiology 1	Lecture	AJ
<b>Week 12</b>					
Mon 16 Oct	10:00-11:00	Suttie Centre 218 Training room	Free radical physiology 2	Lecture	AJ

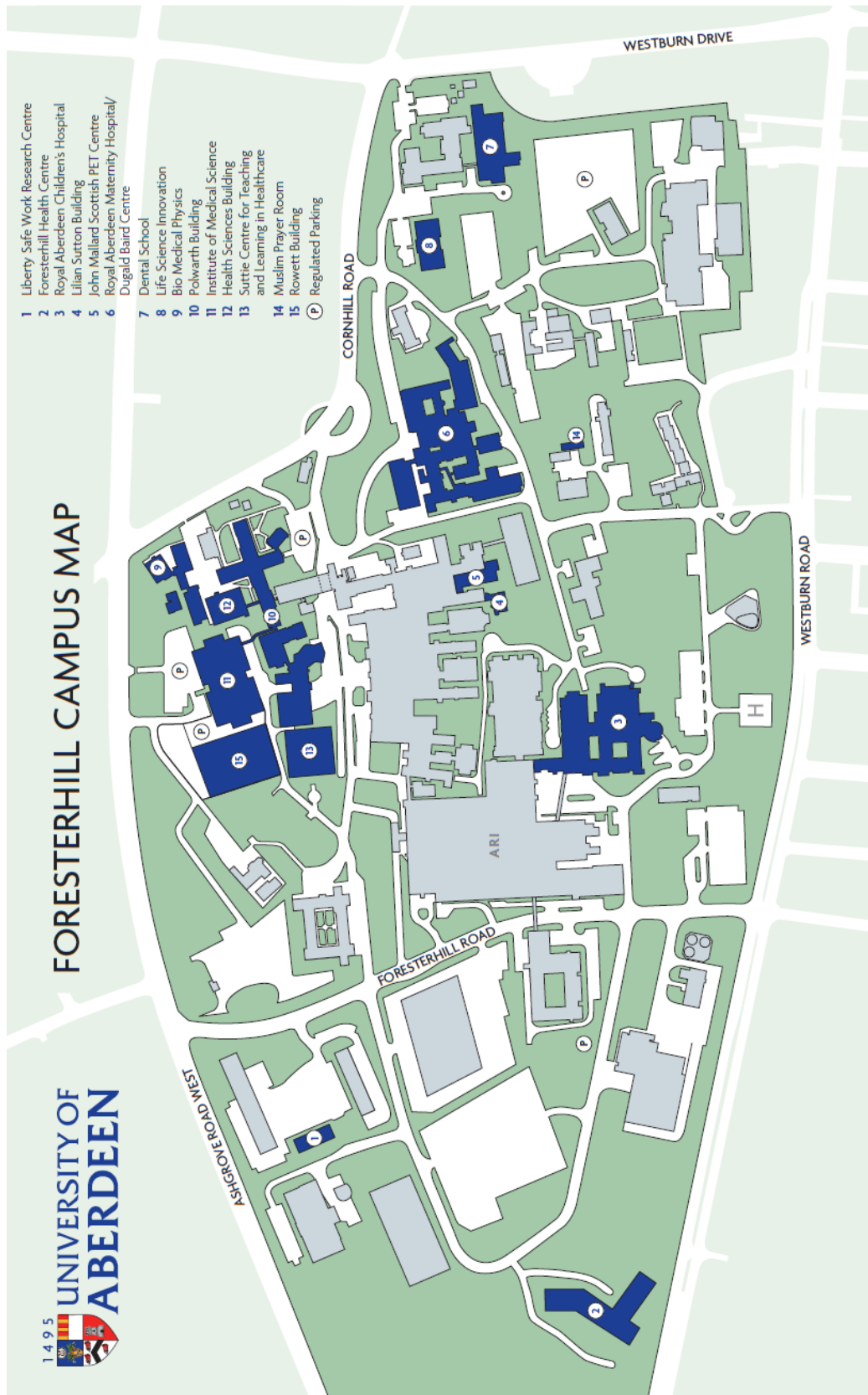
<b>Tue 17 Oct</b>					
	<b>12:00-13:00</b>	<b>Biomedical Physics Lecture Theatre</b>	<b>In vivo adaptation of blood flow 1</b>		<b>GFN</b>
<b>Wed 18 Oct</b>				<b>Lecture</b>	
<b>Thu 19 Oct</b>	<b>17:00</b>	<b>Online</b>	<b>Physiology Problem Solving deadline</b>		
<b>Fri 20 Oct</b>	<b>10:00-11:00</b>	<b>Polwarth 1.032/033</b>	<b>In vivo adaptation of blood flow 2</b>	<b>Lecture</b>	<b>GFN</b>

### Staff

**Prof Graeme Nixon (GFN), Co-coordinator**  
**Dr Jenny Gregory (JSG), Co-coordinator**  
**Prof Alison Jenkinson (AJ)**  
**Dr Nimesh Mody (NM)**

**Dr Michael Scholz (MES)**  
**Prof Derek Scott (DS)**  
**Dr Virtu Solano (VS)**

# Campus Maps - Foresterhill







# POLWARTH BUILDING

## Ground floor

