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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 provides theoretical background and hands on experiences of a range of modern practical biological and biomedical imaging procedures concerned with the investigation and understanding of 3 dimensional organisation of tissues.

Acting Course Co-ordinators: Dr Derek Scott (ext. 7566) d.scott@abdn.ac.uk & Dr Jenny Gregory j.gregory@abdn.ac.uk

Course Aims & Learning Outcomes

- To gain an understanding of the theoretical background to the development of biological imaging techniques with an emphasis on modern imaging techniques.
- To gain experience of the interpretation of images produced by a range of imaging techniques.
- To gain hands on practical experience of a range of modern imaging techniques.
- To gain an understanding of the information that can, and cannot, be obtained using different biological imaging techniques.

Course Teaching Staff

Course Co-ordinator(s):
Dr Derek Scott (DS) d.scott@abdn.ac.uk & Dr Jenny Gregory (JG), j.gregory@abdn.ac.uk

Other Staff:
Prof Alan Denison (AD), alan.denison@abdn.ac.uk
Mr Kevin Mackenzie (KM), k.s.mackenzie@abdn.ac.uk
Prof Andy Welch (AW), a.welch@abdn.ac.uk
Mr Ron Coutts (RC)
Dr Asha Venkatesh (AV), a.venkatesh@abdn.ac.uk
Dr Flora Groening (FG), f.groening@abdn.ac.uk
Dr Debbie Wilkinson (DW), debbie.wilkinson@abdn.ac.uk
Ms. Lucy Wight (LW) l.wight@abdn.ac.uk
Dr James Hislop (JH) j.hislop@abdn.ac.uk

Assessments & Examinations

The continuous assessment mark for this course is made up as follows:-

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory report</td>
<td>10%</td>
</tr>
<tr>
<td>Problem solving presentation</td>
<td>5%</td>
</tr>
<tr>
<td>Problem solving report</td>
<td>5%</td>
</tr>
<tr>
<td>Case Study</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>30%</strong></td>
</tr>
<tr>
<td>Final exam mark</td>
<td>70%</td>
</tr>
<tr>
<td>Overall total marks</td>
<td>100%</td>
</tr>
</tbody>
</table>
Students are expected to attend all lectures, laboratory classes and other elements of the course, and to complete all class exercises by the stated deadlines. Marks will be deducted where deadlines fail to be met without a legitimate reason e.g. sickness accompanied by a medical certificate. It is imperative that any reasonable excuses for the late handing in of work are made to the course organisers (Dr D Scott), before the deadline date. Failure to submit work on time with no legitimate cause may result in deduction of marks or withdrawal from the course.

The course will be assessed by continual assessment and by a 1.5 hour written examination held in April/May. The continuous assessment contributes 30% to the final mark and the written exam will contribute 70%. The overall performance of the student will be expressed as a grade awarded on the common grading scale (CGS).

The resit examination is held in June/July. The continuous assessment mark will also be included at a student’s second and any subsequent diets of examination. It is therefore imperative that students apply the same effort to their continuous assessment exercises as their exam preparation. Failure to submit this work without due cause can severely hamper the overall mark for the course.

**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 and 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 Mrs Jenna Reynolds (j.reynolds@abdn.ac.uk) in the School Office (based in the IMS, 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)
- 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 semester during the summer vacation), coursework will be kept until the end of Freshers’ Week, during the new academic year. After that point, unclaimed student work will be securely destroyed.

Course Reading List
There is no single recommended textbook that covers all the material in the course. The lecturers responsible for each section of the course will provide detailed guidance to enable students to follow up topics of particular interest. All lecture slides will be available through My Aberdeen and they contain the key information students are expected to know for the examination.

Lecture Synopsis

Lecture 1. Introduction, Imaging Timeline – Dr Derek Scott & Dr Jenny Gregory

Overview of course. Overview of the history of the discovery and use of imaging techniques in the investigation and recording of biological studies.

Lecture 2. Basics of microscopy, histology and tissue preparation – Dr Derek Scott

Basic principles of microscopy. Principles of tissue preparation for histology. Illustrations of the use of different staining techniques to enhance the information that can be obtained about the organisation of cells and tissues.

Lecture 3. Special staining methods: histochemistry and immunocytochemistry – Mr Kevin Mackenzie/Dr D Scott

The differences between histology and histochemistry. The use of antibodies, labelled with fluorochromes or enzymes to detect specific structures in cells or tissues. Expression of labelled
proteins to probe the molecular identity of cells and their content. This lecture will contain several interactive elements and some groupwork.

**Lecture 4. Confocal Microscopy - Dr James Hislop**

The principles of confocal microscopy and the different types of information that can be derived using this technique will be considered. The difference between “wide-field” fluorescence microscopy and confocal microscopy will be detailed. The different types of lasers and fluorophores that can be used will also be discussed.

**Lecture 5. Transmission and Scanning Electron Microscopy – Dr Debbie Wilkinson/Mr Kevin MacKenzie**

The different types of electron microscope will be described and the range of detail that can be uncovered beyond the resolution of light microscopy will be explored. The lecture is followed by a visit to the Facility in the IMS.

**Lecture 6. Image Analysis - Dr Jenny Gregory**

Computer based image analysis is now a powerful and quick tool for the analysis of images, including biological images. Some early image analysis routines will be described but the majority of the session will be “hands-on”, making use of a web-based software image analysis package to help you analyse a couple of different types of image for yourself.

**Lecture 7. 3D visualisation - Dr Flora Groening**

Virtual 3D modelling and 3D printing are becoming increasingly popular in Biomedical Sciences. This session will provide a brief history of 3D visualisation, from the early beginnings to current high-resolution 3D computer modelling, and give an introduction to the techniques used to create 3D images. The session will also include a demo of historic and state-of-the-art modern 3D images used in Anatomy teaching.

**Lecture 8. MRI/CT/Clinical radiology - Prof Alan Denison**

The development of MRI and CT scanning techniques will be described and their advantages (disadvantages), over the more traditional X-ray, in clinical applications will be considered.

**Lecture 9. PET - Prof Andy Welch**

How PET scanning works will be explained and some applications in clinical medicine and biological research will be discussed.

**Lecture 10. Ultrasound - Dr Angus Thompson**

The origins of ultrasound technology will be reviewed. Its use in both the clinical and research environments will be explored followed by a hands-on session exploring the benefits and limitations of the technology.
Practical/Lab/Tutorial Work

The practical work required in this course may present difficulties to students with special educational needs. For such students, alternative arrangements will be made. Any student with special needs should make these known to the Course Co-ordinator when registering for the class, and should then also discuss their needs with the Medical Sciences Disabilities Co-ordinator, to ensure that they have the best possible outcome.

A detailed protocol for each activity, and any related report writing, will be provided at each session.

The following laboratory/course activities will be organised:

**Week 26 Tuesday 10-5 practical classroom, Polwarth Building, Teaching room 2:054**

In this practical you will carry out basic histological and (immuno) histochemical procedures. You will be required to answer some questions about the staining methods you apply and can make full use of on-line information to do this. This short report will form part of your continuous assessment for this course (10\%). Preparing this report will start during the practical and most of you will manage to complete a portion of this on the day. Final submission is by 12 noon Friday Week 28 and will occur electronically via MyAberdeen.

Clinical Imaging Tutorial

You will either attend a tutor-led plenary discussion about clinical imaging, having been given material to study beforehand. Students must attend and are expected to be fully prepared for this exercise. Students must also fully participate in the tutorial.

Imaging Problem Solving Exercise

You will work in pairs and are given a biomedical problem that can be investigated using imaging techniques. You consider which techniques might be applicable to investigating the problem and research the methodologies. You will prepare a 10 minute presentation to be given the week after, and you write an individual report. This exercise is intended to make you think about everything you have learned in the course and improve your scientific writing. Your report will be submitted online via MyAberdeen. Further detailed instructions will be provided via MyAberdeen during the course.

This report will form part of your continuous assessment for this course (5\%)

Problem Solving Exercise Presentations

Each group will give their presentations (10 min per group/5 min questions). This presentation will form part of your continuous assessment for this course (5\%).
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 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's Infohub webpage or by visiting the Infohub.

The information included in the institutional area for 2016/17 includes the following:

- Absence
- Academic Appeals & Complaints
- Assessment (Common Grading Scale)
- Codes of Practice on Student Discipline (Academic and Non-Academic)
- Class Certificates
- Recording of Lectures
- Exam Results
- Transcripts
- MyAberdeen
- TurnitinUK
- Feedback
- Communication
- Aberdeen Graduate Attributes
- The Co-Curriculum
# Medical Sciences Common Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade Point</th>
<th>% Mark</th>
<th>Category</th>
<th>Honours Class</th>
<th>Description</th>
</tr>
</thead>
</table>
| A1    | 22          | 90-100 | 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          | 85-89  |            |               |                                                                                            |
| A3    | 20          | 80-84  |            |               |                                                                                            |
| A4    | 19          | 75-79  |            |               |                                                                                            |
| A5    | 18          | 70-74  |            |               |                                                                                            |
| B1    | 17          | 67-69  | 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          | 64-66  |            |               |                                                                                            |
| B3    | 15          | 60-63  |            |               |                                                                                            |
| C1    | 14          | 57-59  | 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          | 54-56  |            |               |                                                                                            |
| C3    | 12          | 50-53  |            |               |                                                                                            |
| D1    | 11          | 47-49  | 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          | 44-46  |            |               |                                                                                            |
| D3    | 9           | 40-43  |            |               |                                                                                            |
| E1    | 8           | 37-39  | 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           | 34-36  |            |               |                                                                                            |
| E3    | 6           | 30-33  |            |               |                                                                                            |
| F1    | 5           | 26-29  | Clear Fail | Not used for Honours | • Contains major errors or misconceptions  
• Poor presentation |
| F2    | 4           | 21-25  |            |               |                                                                                            |
| F3    | 3           | 16-20  |            |               |                                                                                            |
| G1    | 2           | 11-15  | Clear Fail/Abysmal | - | • Token or no submission |
| G2    | 1           | 1-10   |            |               |                                                                                            |
| G3    | 0           | 0      |            |               |                                                                                            |
# AN3503 Course Timetable: 2016-2017

Version 1 – please note that there are various last minute changes being made and we are still waiting on Central Room Bookings getting back to us about venues/timing. Updates will be posted on MyAberdeen so you have the most up-to-date info and to avoid confusion. Please keep an eye on announcements/emails.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Place</th>
<th>Subject</th>
<th>Session</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week 25</strong></td>
<td></td>
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<tr>
<td>Mon 16 Jan</td>
<td>15:00-17:00</td>
<td>1:154</td>
<td>Introduction to course. Basics of microscopy, histology and tissue preparation</td>
<td>Lecture</td>
<td>DAS/JG</td>
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<tr>
<td>Tue 17 Jan</td>
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<td>Wed 18 Jan</td>
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<td>Thu 19 Jan</td>
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<tr>
<td>Fri 20 Jan</td>
<td>15:00-17:00</td>
<td>1:154</td>
<td>Special staining methods: Histochemistry and immunocytochemistry</td>
<td>Lecture</td>
<td>KM/DS</td>
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<tr>
<td><strong>Week 26</strong></td>
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<tr>
<td>Mon 23 Jan</td>
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<tr>
<td>Tue 24 Jan</td>
<td>10:00-17:00</td>
<td>2:054</td>
<td>Practical – Histology, Histochemistry, Immunostaining</td>
<td>Practical</td>
<td>KM/DW/LW</td>
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<tr>
<td>Wed 25 Jan</td>
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<tr>
<td>Thu 26 Jan</td>
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<tr>
<td>Fri 28 Jan</td>
<td>14:00-16:00</td>
<td>Suttie 210</td>
<td>3D Imaging</td>
<td>Lecture</td>
<td>FG</td>
</tr>
<tr>
<td><strong>Week 27</strong></td>
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<tr>
<td>Mon 30 Jan</td>
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<tr>
<td>Tue 31 Jan</td>
<td>10:00-13:00</td>
<td>1:032/033</td>
<td>Confocal Microscopy</td>
<td>Lecture</td>
<td>JH</td>
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<tr>
<td></td>
<td>14:00-16:00</td>
<td>1:154</td>
<td>Electron microscopy</td>
<td>Lecture</td>
<td>DW/KM</td>
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<tr>
<td>Wed 01 Feb</td>
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<td>Thu 02 Feb</td>
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<tr>
<td>Fri 03 Feb</td>
<td>09:00-11:00</td>
<td>tbc</td>
<td>RI/CT/clinical radiology</td>
<td>Lecture</td>
<td>AD</td>
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<tr>
<td></td>
<td>14:00-17:00</td>
<td>CR2</td>
<td>Image Analysis</td>
<td>Lecture &amp; Practical Work</td>
<td>JG</td>
</tr>
<tr>
<td><strong>Week 28</strong></td>
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<tr>
<td>Mon 06 Feb</td>
<td>14:00-16:00</td>
<td></td>
<td>Prepare reports/case study/other work</td>
<td>Private Study</td>
<td></td>
</tr>
<tr>
<td>Tue 07 Feb</td>
<td>10:00-11:30</td>
<td></td>
<td>Complete course work/reports</td>
<td>Private Study</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11:30-13:00</td>
<td>1:155/56</td>
<td>Prepare Case Study Answers</td>
<td>Private Study</td>
<td></td>
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<tr>
<td></td>
<td>13:00-16:00</td>
<td></td>
<td>Clinical Imaging Tutorial</td>
<td>Tutorial</td>
<td>AV</td>
</tr>
<tr>
<td>Wed 08 Feb</td>
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<tr>
<td>Thu 09 Feb</td>
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<tr>
<td>Fri 10 Feb</td>
<td>14:00-17:00</td>
<td></td>
<td>Prepare talks and problem-solving reports</td>
<td>Group Work/Private Study</td>
<td></td>
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<tr>
<td><strong>Week 29</strong></td>
<td></td>
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<tr>
<td>Mon 13 Feb</td>
<td>14:00-16:00</td>
<td>Suttie 210</td>
<td>Ultrasound</td>
<td>Lecture and Practical</td>
<td>RC</td>
</tr>
<tr>
<td>Tue 14 Feb</td>
<td>10:00-12:00</td>
<td></td>
<td>Prepare talks and problem-solving reports</td>
<td>Group Work/Private Study</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12:00-13:00</td>
<td>1:154</td>
<td>Case Study Assessment Session</td>
<td>Assessment</td>
<td>DS/JG</td>
</tr>
<tr>
<td>Wed 15 Feb</td>
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<tr>
<td>Thu 16 Feb</td>
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</tr>
</tbody>
</table>
Staff

Prof Alan Denison (AD), alan.denison@abdn.ac.uk
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