

Module Details	
Module Title	Imaging
Module Code	CFS7028-B
Academic Year	2023/4
Credits	20
School	School of Chemistry and Biosciences
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Interactive Learning Objects	11
Lectures	27
Practical Classes or Workshops	14
Directed Study	148

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 2

Module Aims
<p>This module will provide you with specialist knowledge in the principles and application of microscopy, including light microscopy, wide-field fluorescence and confocal laser scanning microscopy, scanning electron microscopy and transmission electron microscopy, atomic force microscopy, super-resolution microscopy and medical imaging. The chemistry and physics of fluorescent stains, lasers and time-resolved techniques will be examined as important tools of advanced imaging techniques. Case studies related to major scientific breakthroughs and recent advances in instrument capabilities are also presented.</p> <p>The specialist knowledge from understanding how to capture quality scientific images will then be built on by exposure to computational image processing and analysis, utilising freely available software (ImageJ, SPSS). This will enable the development of skills to extract the most relevant and key experimental data analysis from images.</p>

Outline Syllabus

Understanding resolution
Nature of Light (physics of optics/lenses, polarisation)
Chemistry of dyes
Microscope components
Sample preparation and analysis using microscopy techniques
Light Microscopy
Wide-field fluorescence and confocal laser scanning microscopy
Electron microscopy (scanning electron microscopy / transmission electron microscopy)
Atomic force microscopy
Super-resolution microscopy
Time-resolved techniques
Medical imaging
Use of stains in biological imaging
Interpretation, processing and analysis of imaging data
Use of processing and analysis software such as Adobe Photoshop and ImageJ
Statistical analysis

Learning Outcomes

Outcome Number	Description
01	Evaluate and apply knowledge and understanding of the science of wide range of powerful research microscopes and medical imaging techniques, including analysis, capabilities and limitations.
02	Describe major advances in the subject area.
03	Analyse, interpret and critically review experimental data generated with some of the techniques.
04	Identify poor quality analytical results and suggest/apply remedial action.
05	Understand the most appropriate microscopical instrument for a wide range of materials.
06	Apply skills in problem solving and written communication.

Learning, Teaching and Assessment Strategy

This module will be presented as a series of lectures and computer labs. The lectures will describe the science of microscopical and medical imaging techniques used predominantly in research covering the fundamentals and recent developments. The lectures will include case studies enabling you to think across your own discipline and explore other fields. Formative progress tests will be used to revise previous content with feedback and questions from students. The assessments will be used to assess your learning and to enable you to demonstrate your problem-solving and interpretation skills.

It is a requirement of the Institution of Engineering and Technology (IET) that students MUST achieve a mark of at least 30% in assessment components weighted above 30% IN ADDITION to achieving a mark of at least 40% in the module overall. This requirement applies ONLY to students on IET accredited programmes, which is the BDA occurrence/version of the module.

Assessment 001 - Closed-book examination as a summative assessment of all the LOs

Assessment 002 - Image processing report will cover LO3, 4 and 6 with a focus on image processing and analysis.

Assessment 003 - Practical examination of LO 3 to assess understanding of physical chemistry, bioimaging and interactions.

Mode of Assessment

Type	Method	Description	Weighting
Summative	Examination - Closed Book	A formal closed book exam covering the taught syllabus. Short questions followed by longer essay type qns (2 Hrs)	30%
Summative	Coursework - Written	Image Process Report	50%
Summative	Examination - practical/laboratory	Assessment of ability to analyse and interpret bioimaging and interactions using computational methods.	20%

Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.