

MD9A7-20 Frontier Techniques in Biomedical Research

23/24

Department

Warwick Medical School

Level

Taught Postgraduate Level

Module leader

Meera Unnikrishnan

Credit value

20

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

The multidisciplinary and collaborative approaches to research have become central components of biomedical sciences. With this, technologies (e.g.; genome editing, cell therapy or imaging techniques, etc.) that combine both life and physical sciences are developing rapidly. The understanding of these techniques and how to use them to address biomedical questions is an essential employability skill to acquire. The module therefore intends to expose students to cutting edge scientific techniques and methodologies that are the interface of biology, engineering, chemistry and computer sciences; and develop students' knowledge of their applications. The module will combine seminars, tutorials and lectures and/or lab exercise and will be delivered by various experts academic or industrial partners. Each topic will include an interactive component (e.g.; journal club) to discuss scientific implications in a particular research area. Students' learning will additionally be supported by TEL materials with formative quizzes or short reports to submit.

Module aims

1. Equip students with advanced knowledge and understanding of state-of the art methodologies and techniques in biomedical research
2. To develop students' ability to apply suitable cutting-edge methodologies to address research questions in biomedical science.

3. To develop students' own research interests by providing opportunities to interact with experts in various research fields, and develop students' awareness of research at Warwick.
4. To develop students' scientific communication skills

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The module content will focus on new technologies in biomedical research, which are developing rapidly. Whilst sessions and topics will be revised periodically for the module to remain up-to-date, the syllabus will address research techniques that are interdisciplinary and will include genetics, proteomics, imaging technologies, cell therapies, tissue engineering, electrophysiology, biosensors, nanotechnologies or techniques in chemical and synthetic biology.

Exemplar sessions:

Next Generation Sequencing and analysis including single-cell sequencing

Genome editing (e.g.; CRISPR)

Omics technologies- genomics, advanced proteomics and metabolomics

Organoids engineering (e.g.; organ-on-a chip)

Cell therapies (e.g.; CAR-T cells and stem cell therapies)

In vivo imaging- MRI, Microtomography, CAT and PET scans

Biomaterial and nanotechnologies

Chemical genetics

Biosensors, microelectronics and bio-signal processing

Data mining in bioinformatics

Additional techniques in microbiology, neurobiology, immunology and reproductive medicine will also be covered.

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate knowledge of state-of-the-art methodologies (frontier techniques) in biomedical research
- Demonstrate critical appraisal of the use of frontier techniques applications in biomedical research and critically analyse biomedical research findings in various fields
- Present current research ideas to a scientific audience
- Prepare reports exploring the use of frontier techniques in a particular field

Interdisciplinary

The module will allow students to learn techniques that are multidisciplinary in nature, connecting biology to chemistry, physics or engineering in order to answer problems in biomedical research or healthcare.

Subject specific skills

1. Acquire current knowledge and awareness of modern research techniques in biomedical science
2. Ability to apply techniques to answer biomedical questions;
3. Critically appraise current techniques in biomedicine
4. Apply knowledge of new techniques to analyze and solve problems

Transferable skills

1. Demonstrate interdisciplinary knowledge
 2. Apply appropriate methodologies and techniques to solve a problem
 3. Adapt to the constant and rapid evolution of biomedical techniques
 4. Understand the multi and interdisciplinary aspects of research in biomedicine.
 5. Understand and appraise the necessity for continuous professional development
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Study

Study time

Type	Required
Lectures	10 sessions of 3 hours (32%)
Seminars	5 sessions of 1 hour (5%)
Tutorials	10 sessions of 2 hours (21%)
Demonstrations	5 sessions of 1 hour (5%)
Practical classes	10 sessions of 1 hour (11%)
Online learning (independent)	8 sessions of 3 hours (26%)
Total	94 hours

Private study description

Students will be encouraged to divide their study time as follow:

50 %: To prepare for session, including studying materials (scientific articles and/or problems) related to the sessions

50%: To prepare and submit formative assessments

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time
Frontier Techniques-Oral presentation	30%	25 hours
To demonstrate understanding and critical thinking of a chosen topic and develop communication skills using appropriate language. Students will prepare a ppt presentation (15 min) and will present it orally to an initiated audience before answering questions (5 min).		
Virtual Poster & Portfolio	70%	50 hours
Students will demonstrate advanced documented learning and reflections (appropriate scientific language and referencing) on one technique and its application(s) in a portfolio of evidence that will include a 5 min narrated virtual poster presentation.		

Feedback on assessment

Standardized rubrics will be used to mark and provide feedback (including individualized feedback) on the oral presentation, the virtual poster presentation and essay (portfolio), in line with WMS assessment criteria (including submission for plagiarism software). Presentations and Posters will be assessed by the Module Lead and a member of WMS staff. Portfolio will be first marked by a session lead and the module lead will moderate marks and feedback. Additional feedback after assessment will be available to students on request. Any student failing an element of assessment will be offered an appointment with the Module Lead for face-to- face feedback.

Availability

Post-requisite modules

If you pass this module, you can take:

- MD979-40 Laboratory Project 1

Courses

This module is Option list A for:

- Year 4 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)