MD1A1-15 Foundational Laboratory Skills & Computing Skills

23/24

Department
Warwick Medical School
Level
Undergraduate Level 1
Module leader
Andrew Bowman
Credit value
15
Module duration
4 weeks
Assessment
20% coursework, 80% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

MD1A1-15 - Foundational Laboratory Skills & Computing Skills. The module aims to equip students with essential core skills in molecular biology and scientific computing. This will function to bring students up to speed with the course philosophy and prepare them for the main modules that will follow.

Module web page

Module aims

The purpose of this module is for the students to learn basic coding theory, understand data structure and handling and the associated mathematics principles behind these. This will be contrasted with data flow in biological systems, and the principles of molecular biology. Principle techniques learnt in the classroom will be reinforced in the laboratory session, which will see the students introduced to a modern, working molecular biology lab.

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.

Block 1: Foundational Computing Skills

Lecture 1 & 2: Variables in Python.
Lecture 3 & 4: NumPy Arrays.
Lecture 5 & 6: Loops and Control Structures.
Lecture 7 & 8: Script Debugging; Data Input, Data Output.
Lecture 9 & 10: Plotting and Elementary Fitting.
Lecture 11 & 12: Writing Function. Random Processes.
Lecture 13 & 14: Image Processing.

Block 2: Introduction to Molecular Biology

Lecture 1: Structure and coding capacity of DNA.
Lecture 2: How DNA replicates.
Lecture 3: Techniques for analysing & manipulating DNA.
Lecture 4: Transcribing DNA. The flow if information in molecular biology.
Lecture 5: Translating mRNA. Ribosomes, transfer RNAs.
Lecture 6: Techniques for analysing and detecting proteins.

Lab 1: Isolating DNA.
Lab 2: Purifying protein I.
Lab 3: Purifying protein II.
Lab 4: TEV cleavage assay.
Lab 5: Analysis of cleavage restrictions.
Lab 6: Measuring gel densitometry.

Learning outcomes

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

- Use coding techniques to process data from experiments in molecular cell biology and relevant physical sciences.
- Demonstrate experimental skills in basic molecular cell biology and relevant physical sciences.
- Explain the principles of information flow in molecular biology from DNA to RNA to protein.
- Explain how DNA can be manipulated to produce recombinant organisms.
- Operate safely within a laboratory environment.
- Demonstrate relevant writing / reporting / collaborative working skills including the ability to succinctly summarise scientific information.
- Accurately record experimental data in a laboratory setting.

Indicative reading list

J. M. Kinder and P. Nelson, “A Student’s Guide to Python for Physical Modeling”, Princeton University Press (September 22, 2015).
Molecular Biology of the Cell (6th ed.). Bruce Alberts et al. 2014

Molecular Cell Biology (8th ed.). Harvey Lodish et al. 2016
Cold Spring Harbour Protocols Molecular Biology - http://cshprotocols.cshlp.org/site/Taxonomy/molecular_biology_l1.xhtml

Interdisciplinary

Students will learn to solve scientific problems in molecular biology by integrating concepts from computing and contrasting them with the information flow in biological systems.

Subject specific skills

Demonstrate the ability to accurately summarise a scientific experiment. Estimate quantitative solutions to scientific problems. Outline the principles of the major techniques of modern molecular biology.

Transferable skills

Demonstrate relevant writing / reporting / collaborative working skills including the ability to succinctly summarise scientific information. Demonstrate competency in writing python scripts to solve basic computing problems.

Study

Study time

Type	Required
Lectures	12 sessions of 1 hour (8%)
Tutorials	12 sessions of 1 hour (8%)
Practical classes	12 sessions of 3 hours (24%)
Private study	41 hours (27%)
Assessment	49 hours (33%)
Total	150 hours

Private study description

31 hours of self-directed study

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 D1

	Weighting	Study time
Assessment of laboratory skills	20%	36 hours
Assessing the proficiency in laboratory techniques, observing good laboratory practice, engagement and contribution to group experiments.		
Written examination	80%	13 hours
A written examination consisting of short answer questions encompassing topics covered in the lecture and practical sessions.		

Feedback on assessment

Laboratory reports - submission annotated and returned, general comments/'what was good'/'what could be improved' alongside marking rubric.

Assessment of laboratory skills - at the end of each two-week laboratory session, block leads will provide comments on proficiency, Good Laboratory Practice (GLP) and engagement/group contribution that arise. Due to the volume of feedback, stock phrases will be provided to the block leads, which may be amended or expanded at the lead's discretion. Further verbal feedback will be given to students on request.
In terms of practicalities, following GLP, executing the laboratory protocol, attaining proficiency in techniques taught and engaging/contributing to group activities (where required) will be based at 62 on the 20-point University scale. Exceptional attainment/contributions will grade higher, whereas disengagement, not observing GLP, and an unwillingness to acquire lab proficiency will score lower. Marks will not take into account whether a student achieved a desired experimental result or not. The block lead will work with the laboratory technician in observing and recording these across the cohort. Feedback will be provided biweekly at the end of each block.

Past exam papers for MD1A1

Availability

Courses

This module is Core for:

- Year 1 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)