

Engineering Tripos Part IIA, 3G1: Molecular Bioengineering I, 2020-21

Module Leader

[Prof. G Micklem](#) [1]

Lecturers

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Lab Leader

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Timing and Structure

Michaelmas term. 16 lectures, 1 virtual laboratory class. This is an intensive introductory level undergraduate course targeted at third year Engineering students.

Aims

The aims of the course are to:

- To provide a basic grounding in biomolecular engineering along with underpinning molecular biology.
- To increase awareness for the opportunities for bioengineering within modern biology.
- To have enough background knowledge and familiarity with the terminology to be able to play a productive role collaborating with biologists.
- To provide the grounding for a new Part IIB course, Molecular Bioengineering II, that is expected to run for the first time in 2021-2022.

Objectives

As specific objectives, by the end of the course students should be able to:

- An appreciation of the potential of engineering living systems
- An appreciation of the capabilities of applying evolution in a laboratory setting
- Understanding of the fundamental molecules and processes required for gene expression and replication
- Understanding gene structure and regulation in simple organisms
- To have a basic knowledge of what is feasible with genetic engineering, and the underpinning molecular techniques
- Designing synthetic genetic circuits: understanding basic mathematical and molecular biological frameworks
- Designing synthetic genetic circuits: living systems vs cell-free systems
- To understand the latest technologies for genome sequencing, genome analysis, and genome-scale experimental methods
- An appreciation for DNA as a construction material for information storage and other applications

Content

The structure of the course will be as follows.

Lectures 1-5 (GM): Evolution; storage and use of genetic information; DNA amplification; molecular cloning

Lectures 6-11 (SB): Gene expression and regulation; enzyme kinetics; synthetic control circuits

Lectures 12-13 (GM): Genomes, genome sequencing and transcriptomics

Lectures 14-16 (GM): Cell-free systems; expanding the genetic code; DNA for construction and data storage; DNA dynamics

Coursework

Laboratory Practical - we regret that the wet laboratory practical cannot run this year on account of the pandemic.

An online alternative will be provided.

Learning objectives:

- To become familiar with some molecular biological data and appropriate analysis tools.
- To gain some experience in analysing and interpreting the data.

Practical information:

- More information will be available in due course. We expect that we will run the lab as an online interactive session through Zoom: sign up via the [3G1 Moodle](#) [2] site
- Preliminary work (~1hour) and completing an online test in advance of the lab is likely to be necessary and will be worth 1 point. The test will be available through Moodle.

Full Technical Report:

There is no Full Technical Report (FTR) associated with this module.

Booklists

Please refer to the Booklist for Part IIA Courses for references to this module, this can be found on the associated Moodle course.

Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [3].

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Links

[1] <mailto:gm263@cam.ac.uk>

[2] <https://www.vle.cam.ac.uk/course/view.php?id=70641>

[3] <https://teaching.eng.cam.ac.uk/content/form-conduct-examinations>

