

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

### **Module Leader**

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

### **Lecturers**

Prof. G Micklem, Dr S Bakshi

### **Lab Leader**

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

### **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://teaching20-21.eng.cam.ac.uk/content/form-conduct-examinations>

