

## **Engineering Tripos Part IIA, 3G1: Introduction to Molecular Bioengineering, 2018-19**

### **Module Leader**

[Dr G Micklem](#) [1]

### **Lecturers**

Dr G Micklem, Dr J Ajioka, Dr D Dikicioglu

### **Lab Leader**

[Dr G Micklem](#) [1]

### **Timing and Structure**

Michaelmas term. 16 lectures, 1 laboratory class. This is an intensive introductory level undergraduate course targeted at third year Engineering students. This course will be delivered through lectures and a laboratory class.

### **Aims**

The aims of the course are to:

- Provide a basic grounding in key aspects of molecular bioscience with an emphasis on biomolecular engineering.

### **Objectives**

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

- To understand the potential of engineering living systems
- To understand key common features of living systems
- To have a basic understanding of cellular metabolism and examples of metabolic engineering
- To understand the basics of gene control and expression, concentrating on systems more commonly used in biotechnology
- To have basic knowledge of what is feasible with genetic engineering, the key underlying technology and case studies
- To understand the impact of the latest methods of genome sequencing, genome analysis, and genome-scale experimental methods including perturbation studies
- To have been introduced to the emerging field of synthetic biology that aims to rationally engineer biological systems
- Through the lab, to have direct experience of some basic experimental techniques

### **Content**

This course will introduce those elements of molecular biology that are relevant to further study in bioscience and engineering applications.

- Common features of living systems
- Cellular structure and metabolism
- Metabolic engineering
- Key experimental methods
- Genetic Engineering
- Genome sequencing, genomics and key computational methods
- Synthetic Biology

The structure of the course will be as follows.

- Lectures 1-3 - Overview/introduction - why engineer living systems? Life: cells to organisms
- Lectures 4-5 - Central dogma of molecular biology, Gene regulation
- Lectures 6-7 - Genetic engineering I: basic parts, methods and terminology
- Lectures 8-9 - Genetic engineering II: further methods cases studies
- Lectures 10-12 - Cellular metabolism, catabolism/ anabolism, core molecular types, metabolic engineering, principles and case studies
- Lectures 13-15 - Genomics, genome sequencing/annotation/key computational methods, functional studies, gene expression/ regulatory networks, perturbation studies
- Lecture 16 - Synthetic biology

## Coursework

Laboratory Practical

Learning objectives:

- To have had some experience of working in a biology laboratory, including consideration of safety issues.
- To have learned some basic biology laboratory techniques.
- To have gained experience in analysing and interpreting the data produced.

Practical information:

- The lab will run twice, first on Friday 19th October and then on Friday 26th October, in the Department of Plant Sciences Teaching Laboratory:  
<https://map.cam.ac.uk/Department+of+Plant+Sciences#52.202590.0.121337.18> [2]
- This activity involves preliminary work (~1hour) and completing an online test in advance of the lab. The test will be available through Moodle.

Full Technical Report:

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

## Booklists

Please see the [Booklist for Part IIA Courses](#) [3] for references for this module

## Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [4].

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**Links**

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

[2] <https://map.cam.ac.uk/Department+of+Plant+Sciences#52.202590,0.121337,18>

[3] <https://www.vle.cam.ac.uk/mod/book/view.php?id=364091&chapterid=48991>

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