Liverpool John Moores University

Title:	Synthetic Biology and Bioengineering
Status:	Definitive
Code:	**6501YAUBIO** (127889)
Version Start Date:	01-08-2021
Owning School/Faculty:	Pharmacy & Biomolecular Sciences
Teaching School/Faculty:	Pharmacy & Biomolecular Sciences

Team	Leader
Femi Olorunniji	Y

Academic Level:	FHEQ6	**Credit Value:**	20	**Total Delivered Hours:**	98
Total Learning Hours:	200	**Private Study:**	102		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	76
Practical	20

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Exam	34	2
Essay	AS2	Essay based on review of literature on a specific synthetic biology application	33	
Report	AS3	Report based on laboratory work and problem-solving exercises	33	

Aims

The aim of the module is to provide the student with the basic concepts of synthetic biology and a good understanding of the foundational science that underpins synthetic biology, and develop appreciation for the importance of social responsibility in bioengineering. The module will provide knowledge of current concepts and

applications of synthetic biology and bioengineering with emphasis on tackling specific industrial biotechnology, biomedical, agricultural, and environmental challenges.

Learning Outcomes

After completing the module the student should be able to:

1	Explain the core principles of molecular biology and their application in engineering biological systems.
2	Explain how understanding of parts, systems and devices enable the design, build, test, learn model of synthetic biology.
3	Explain the key foundational science that enables modern synthetic biology.
4	Critically discuss how synthetic biology principles are applied in engineering of metabolic pathways.
5	Critically discuss how synthetic biology principles are used in design of biomedical diagnostic and therapeutic applications.
6	Evaluate new developments in the field of synthetic biology that relate to industrial biotechnology via critical appraisal of the literature.
7	Design, model, and test a genetic circuit aimed at addressing an industrial, biomedical, agricultural or environmental problem.
8	Critically discuss how synthetic biology principles are applied in tackling challenges in agriculture such as crop improvement and food security.
9	Evaluate new developments in the field of synthetic biology that relate to potential strategies for combating environmental issues.
10	Evaluate critically how novel research findings in the literature can translate into real world solutions to agricultural and environmental issues.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Exam	1	2	3	
Essay	4	5	6	7
Report	7	8	9	10

Outline Syllabus

The module will include a review of principles of molecular biology that underpins synthetic biology, and basic principles of synthetic biology and bioengineering (parts, devices, systems). Ethical issues in synthetic biology and public engagement, the role of synthetic biology in driving innovations in biotechnology, metabolic pathway engineering and microbial cell factories and minimal cells and synthetic genomes. The module will also cover biomedical applications of synthetic biology, synthetic biology in agriculture and food security, environmental applications and sustainability, and synthetic biology, biotechnology and entrepreneurship.

Learning Activities

The module content will be delivered through lectures and practical activities. Theoretical lectures will provide appropriate subject knowledge to introduce the students to the field of synthetic biology, and applications of synthetic biology in metabolic pathway engineering and biomedicine. The laboratory practical session will demonstrate the steps involved in engineering existing natural systems into developing a genetic circuit that solves an industrial, environmental or agricultural problem.

Notes

The module is designed for students to develop an understanding of how the principles of molecular biology and biochemistry are brought together to allow a better engineering of cellular processes. Students will develop an appreciation of the modular nature of cellular machines and genetic systems. Students will develop an understanding and scope of how foundational knowledge and principles of synthetic biology are applied in specific areas that target real world problems. The focus will be on industrial biotechnology exemplified using metabolic pathway engineering and biomedical applications.