UNIVERSITI TEKNOLOGI MARA

BMS657: SYNTHETIC BIOLOGY

Course Name (English)	SYNTHETIC BIOLOGY APPROVED
Course Code	BMS657
MQF Credit	2
Course Description	Synthetic biology is the application of engineering principles to the design and implementation of biological systems. In synthetic biology,a biological systemis built from DNA parts derived from a range of organisms or synthetic genetic sequences. Synthetic biology is revolutionizing many diverse areas i.e. biotechnology, bioremediation, agriculture and medicine.
Transferable Skills	Gene assembly skills Bioinformatics skills Analytic skills
Teaching Methodologies	Lectures, Discussion, Collaborative Learning
CLO	CLO1 Illustrate the principles, techniques and mechanism of synthetic biology CLO2 Elaborate on the applications of synthetic biology technology CLO3 Integrate ethics and professionalism skills in regards to the merits and hazards posed by synthetic biology CLO4 Demonstrate autonomous learning skills in using online tools and databases to design synthetic biology constructs
Pre-Requisite Courses	No course recommendations

Topics
1. Introduction to the synthetic biology 1.1) 1.1 What is synthetic biology 1.2) 1.2 Advantages and challenges 1.3) 1.3 Historical timeline
2. Basic Engineering concepts 2.1) 2.1 Ordinary Differential equations 2.2) 2.2 Control theory 2.3) 2.3 Electronics 2.4) 2.4 Error theory
3. Bioparts 3.1) 3.1 Promoter 3.2) 3.2 Coding sequence 3.3) 3.3 Ribosome binding site 3.4) 3.4 Terminator 3.5) 3.5 Plasmids
4. Devices 4.1) 4.1 Inverters 4.2) 4.2 Switches 4.3) 4.3 Memory 4.4) 4.4 PoPs and RiPs 4.5) 4.5 Functionality and Modularity
5. Biobricks 5.1) 5.1 What are Biobricks 5.2) 5.2 Standardization 5.3) 5.3 iGEM – the Registry of Standard Biological Parts 5.4) 5.4 Biobricks assembly 5.5) 5.5 Gibson assembly and synthetic genomes

6. Applications of synthetic biology 6.1) 6.1 Metabolic Engineering 6.2) 6.2 Drug Development 6.3) 6.3 Directed evolution 6.4) 6.4 Biological Computing 6.5) 6.5 Gene therapy 6.6) 6.6 Biosensors 6.7) 6.7 Biofuel and biomaterials 6.8) 6.8 Nanotechnology 6.9) 6.9 Case study : Synthesis of Artemisinin in yeast or other examples
7. Ethics and biosafety of synthetic biology 7.1) 7.1 Current regulations 7.2) 7.2 Unintended effects of synthetic biology 7.3) 7.3 Biocontainment strategies 7.4) 7.4 The way forward

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Assignment on designing/ analysis of a synthetic biology project	20%	CLO4
Case Study	Case study on ethical / benefit and risk/ biosafety issues	15%	CLO3
Test	Test 1	15%	CLO1

Reading List

Recommended Text

- **Paul S. Freemont,Geoff Baldwin 2012, *Synthetic Biology*, 1 Ed., World Scientific Publishing Company [ISBN: 9781848168633]**
- **Darren N. Nesbeth 2016, *Synthetic Biology Handbook*, CRC Press [ISBN: 9781466568471]**

Reference Book Resources

- **Huimin Zhao 2013, *Synthetic Biology*, Academic Press [ISBN: 9780123944306]**
- **Natalie Kuldell 2015, *Biobuilder*, O'Reilly Media [ISBN: 9781491904299]**
- **George M. Church,Ed Regis 2014, *Regenesis*, Basic Books [ISBN: 9780465075706]**
- **Alessandro Delfanti 2013, *Biohackers*, Pluto Press [ISBN: 9780745332802]**
- **J Liljeruhm, E Gullberg and A.C. Forster 2014, *Synthetic Biology : A Lab Manual*, 1 Ed., World Scientific Press [ISBN: 9789814579544]**

Article/Paper List: This Course does not have any article/paper resources

Other References: This Course does not have any other resources