



UNIVERSITI TEKNOLOGI MARA

BMS557: METHODS IN MOLECULAR BIOLOGY

Course Name (English)	METHODS IN MOLECULAR BIOLOGY APPROVED
Course Code	BMS557
MQF Credit	4
Course Description	This course introduces students to more advanced molecular biology methods for the manipulation of biological molecules. Techniques such as gel electrophoresis, heterologous gene expression, mutagenesis, mutation detection, and fluorescence microscopy. Students will also be introduced to current massively parallel analysis methods such as microarray and next generation sequencing. The content structures are designed to be dynamic and will be changed according to new developments. The course is hands-on in nature, supplemented by lectures and tutorial. This will ensure that students have the necessary skills and understanding to learn more esoteric techniques and to understand the applications of molecular biology in research. Practical will be ran workshop-style for maximal hands-on benefits.
Transferable Skills	At the end of the course, student should be able to describe, understand and applied the advanced molecular biology methods for the manipulation of biological molecules.
Teaching Methodologies	Lectures, Blended Learning, Lab Work, Demonstrations, Web Based Learning
CLO	CLO1 Describe the application of molecular biology techniques for gene analysis and manipulation. CLO2 Illustrate the principles and mechanisms underlying molecular biology methods e.g. gene analysis, sequence analysis and expression analysis; and how they can be applied to solve real world problems. CLO3 Perform laboratory experiments employing basic molecular biology techniques CLO4 Present written reports for laboratory experiments following good scientific writing format standards CLO5 Organize a team of peers to complete a laboratory task
Pre-Requisite Courses	No course recommendations
Topics	
1. 1. RNA techniques 1.1) a. Extraction of RNA 1.2) b. Quantitation and quality 1.3) c. Purification of mRNA 1.4) d. Reverse transcription 1.5) e. cDNA library	
2. 2. Gene expression and function 2.1) a. The transcriptome 2.2) b. Reporter assays 2.3) c. Microarray 2.4) d. Real-time PCR 2.5) e. Digital PCR 2.6) f. RNA-seq	
3. 3. Detection of mutations 3.1) a. Single nucleotide polymorphisms 3.2) b. Detection of polymorphisms 3.3) c. Microarray and haplotypes 3.4) d. Digital PCR 3.5) e. GWAS 3.6) f. Marker assisted selection and QTL	

4. 4. Gene silencing

- 4.1) a. Gene knock-outs
- 4.2) b. RNA inhibition

5. 5. Mutagenesis

- 5.1) a. Random mutagenesis
- 5.2) b. Site-directed mutagenesis
- 5.3) c. Gene editing

6. 6. Fluorescence and bioluminescence

- 6.1) a. Introduction to fluorescence
- 6.2) b. Fluorescence microscope
- 6.3) c. Fluorescence proteins
- 6.4) d. Fluorescence techniques
- 6.5) e. Bioluminescence
- 6.6) f. Applications

7. 7. Next Generation Sequencing

- 7.1) a. sequencing by synthesis
- 7.2) b. Pyrosequencing
- 7.3) c. Ion Torrent
- 7.4) d. SMRT
- 7.5) e. Nanopore Technology
- 7.6) f. Data Analysis
- 7.7) g. Applications

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Practical	Practical Report	15%	CLO5
	Practical	Online Practical Test	15%	CLO3
	Test	Online Test	30%	CLO1

Reading List	Recommended Text
	<ul style="list-style-type: none"> • T. A. Brown 2015, <i>Gene Cloning and DNA Analysis</i>, 7 Ed., John Wiley & Sons [ISBN: 1119072557] • Sandy B. Primrose, Richard Twyman 2013, <i>Principles of Gene Manipulation and Genomics</i>, John Wiley & Sons [ISBN: 1118653882]

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

Other References	
	<ul style="list-style-type: none"> • n/a Watson, J.D., 2014, <i>Molecular biology of the gene</i>, Pearson, Boston • n/a Clark, D.P. & Pazdernik N.J. 2013, <i>Molecular Biology 2nd Ed.</i> , Waltham MA., Academic Press • n/a Weaver R.F. 2012, <i>Molecular Biology 5th Ed.</i>, McGraw Hill, New York. • n/a 4. Carson, S., Miller, H.B., Witherow, D.S. . 2012, <i>Molecular biology techniques : a classroom laboratory manual. 3rd ed</i> , Elsevier/Academic Press, Amsterdam-Boston. • n/a 5. Mely, Y. 2013, <i>Fluorescent methods to study biological membranes.</i> , Springer, Berlin Heidelberg