UNIVERSITI TEKNOLOGI MARA

BMS541: METHODS IN MOLECULAR BIOLOGY II

Course Name (English)	METHODS IN MOLECULAR BIOLOGY II APPROVED
Course Code	BMS541
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 fluoresence 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. Practicals will be ran workshop-style for maximal hands-on benefits.
Transferable Skills	Sample preparation, Experimental design, Report writing
Teaching Methodologies	Lectures, Blended Learning, Lab Work, Demonstrations, Practical Classes
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 Prepare scientific reports to present data from laboratory experiments
Pre-Requisite Courses	No course recommendations

Topics
1. 1.0 Gene expression in prokaryotic cells 1.1) 1.1 Promoters 1.2) 1.2 Fusion tags 1.3) 1.3 Expression vectors 1.4) 1.4 Protein solubility, stabilization and secretion 1.5) 1.5 Microbial host systems
2. 2.0 Gene expression in eukaryotic cells 2.1) 2.1 Comparison of prokaryotic vs eukaryotic systems 2.2) 2.2 Yeast system– Saccharomyces cerevisiae 2.3) 2.3 Yeast – Pichia pastoris 2.4) 2.4 Insect Cell expression systems 2.5) 2.5 Baculovirus system 2.6) 2.6 Plant cell systems 2.7) 2.7 Mammalian cell systems
3. 3.0 Mutation detection 3.1) 3.1 Single nucleotide polymorphisms 3.2) 3.2 Other forms of DNA polymorphism 3.3) 3.3 Detection of polymorphism 3.4) 3.4 SSCP, DDGE, TGGE, denaturing HPLC

4. 4.0 Fluorescence and bioluminescence 4.1) 4.1 Introduction to fluorescence 4.2) 4.2 The fluorescence microscope 4.3) 4.3 GFP 4.4) 4.4 FRET 4.5) 4.5 HTRF and other fluorescence techniques 4.6) 4.6 Fluorescence plate reader 4.7) 4.7 Bioluminescence 4.8) 4.8 Applications
5. 5.0 Microarrays 5.1) 5.1 Introduction 5.2) 5.2 Design 5.3) 5.3 Data analysis
6. 6.0 Next generation sequencing 6.1) 6.1 Introduction to genome sequencing 6.2) 6.2 NGS platforms and chemistries 6.3) 6.3 Pyrosequencing, sequencing-by-synthesis, nanopore 6.4) 6.4 Overview of NGS data analysis 6.5) 6.5 Applications – disease association, metagenomics

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Practical	Direct Observation	5%	CLO5
Practical	Online Practical Test	10%	CLO3
Practical	Practical Reports	15%	CLO4
Test	Test	30%	CLO1

Reading List

Recommended Text

- **Brown, T. 2014, *Gene Cloning and DNA Analysis: An Introduction*, 7 Ed., Wiley-Blackwell.**
- **Green MR & Sambrook J 2012, *Molecular Cloning : A laboratory manual*, 4 Ed., Cold Spring Harbor Laboratory Press.**

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

Other References: This Course does not have any other resources