UNIVERSITI TEKNOLOGI MARA

BMS544: MOLECULAR BIOTECHNOLOGY

Course Name (English)	MOLECULAR BIOTECHNOLOGY APPROVED
Course Code	BMS544
MQF Credit	3
Course Description	This course will discuss the use of molecular biology techniques to improve or make possible the production of various useful products using microbial, plant and mammalian cell systems. It begins with an overview of biotechnology, followed by the use and impact of biotechnology in keys areas affecting human life. The subject matter then focus on specific applications of recombinant DNA techniques for the production of useful products. This will provide the students with sufficient basic knowledge to understand more specialised use of molecular methods in areas of microbial, plant, environmental, animal, and medical.
Transferable Skills	Lab experiments Scientific writing and discussion
Teaching Methodologies	Lectures, Lab Work, Practical Classes
CLO	CLO1 1. Describe the fundamentals concepts of biotechnology (PO1-C2). CLO2 2. Describe the use of recombinant DNA technology and protein expression as biotechnology tools (PO3-C3). CLO3 3. Discuss the techniques and application in major area of biotechnology such as microbial, plant, environmental, animal, and medical. (PO3-C4). CLO4 4. Perform laboratory experiments in the use of molecular biology in biotechnology and present the results and the limitations of the techniques learned in this course (PO2-P5).
Pre-Requisite Courses	No course recommendations

Topics
1. 1.0 Introduction to Biotechnology 1.1) 1.1 A Brief History of Biotechnology 1.2) 1.2 Products of Modern Biotechnology 1.3) 1.3 Ethics and Biotechnology
2. 2.0 Types of biotechnology 2.1) 2.1 Microbial biotechnology 2.2) 2.2 Medical biotechnology 2.3) 2.3 Agricultural biotechnology 2.4) 2.4 Environmental biotechnology 2.5) 2.5 Animal biotechnology 2.6) 2.6 Forensic biotechnology 2.7) 2.7 Aquatic biotechnology
3. 3.0 Recombinant DNA Technology and Protein Expression 3.1) 3.1 Introduction to recombinant DNA technology 3.2) 3.2 Types and features of vectors 3.3) 3.3 DNA libraries 3.4) 3.4 System used in protein expression 3.5) 3.5 E. coli as host in protein production

4. 4.0 Microbial Biotechnology
4.1) 4.1 Food products
4.2) 4.2 Therapeutic proteins – Insulin
4.3) 4.3 Therapeutic proteins – Antibiotics
4.4) 4.4 Therapeutic proteins – Vaccine
4.5) 4.5 Sequencing of Microbial genomes
4.6) 4.6 Metagenomic Studies

5. 5.0 Plant Biotechnology
5.1) 5.1 Overview of Plant Transgenics
5.2) • Conventional breeding and hybridization
5.3) 5.2 Plant Transgenesis
5.4) • Protoplast fusions
5.5) • Leaf fragment technique
5.6) • Gene guns
5.7) • Chloroplast engineering
5.8) • Antisense technology
5.9) 5.3 Practical Applications
5.10) • Vaccine for plants
5.11) • Genetic pesticides
5.12) • Herbicide resistance
5.13) • Enhanced nutrition

6. 6.0 Animal Biotechnology
6.1) 6.1 Overview – Use of Animals in Research
6.2) 6.2 Types of animals used in research
6.3) 6.3 Animal Cloning
6.4) • Embryo splitting
6.5) • Nuclear transfer
6.6) 6.4 Animal Transgenesis
6.7) • Retrovirus-mediated transgenics
6.8) • Pronuclear microinjection
6.9) • Embryonic stem cell method
6.10) • Sperm mediated transfer
6.11) 6.5 Animal as bioreactors
6.12) • Biological products from transgenic animals

7. 7.0 Environmental Biotechnology
7.1) 7.1 Overview of bioremediation
7.2) • Chemicals pollutants in the environment
7.3) 7.2 Fundamental reaction in bioremediation
7.4) • Oxidation and reduction reaction
7.5) • Aerobic and anaerobic digestion
7.6) 7.3 Strategies in bioremediation
7.7) • Nutrient enrichment
7.8) • Bioaugmentation
7.9) • Phytoremediation
7.10) 7.4 Application of genetically engineered strains for bioremediation
7.11) • Petroleum degradation
7.12) • Removal of heavy metals
7.13) 7.5 Case studies in bioremediation

8. 8.0 Medical Biotechnology
8.1) 8.1 Production of monoclonal antibodies
8.2) 8.2 Gene Therapy
8.3) • Strategies of gene therapy
8.4) • Vectors for gene delivery
8.5) • Gene silencing
8.6) 8.3 Application of gene therapy
8.7) • Severe Combined Immunodeficiency
8.8) • Cystic Fibrosis

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Assignment	10%	CLO3
Practical	Lab Test	10%	CLO4
Test	Test 1	10%	CLO1 , CLO2
Test	Test 2	10%	CLO3
Written Report	Lab report	10%	CLO4

Reading List

Recommended Text

- **William J. Thieman and Michael A. Palladino 2014, *Introduction to Biotechnology*, Pearson Education Essex, England**

Reference Book Resources

- **Reinhard Renneberg and Arnold L. Demain. 2008, *Biotechnology for Beginner*, Academic Press London, UK**
- **David P. Clark and Nanette J. Pazdernik 2015, *Biotechnology*, 2nd Ed., Academic Cell Update Edition. AP Cell Press, 2015 Oxford, UK**
- **Bernard R. Glick and Jack J. Pasternak. 2010, *Molecular Biotechnology*, ASM Press USA**

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

Other References: This Course does not have any other resources