MULTIMEDIA UNIVERSITY®

SUMMARY OF INFORMATION ON EACH COURSE

1.	Name of Course	Introduction to Molecular Biology
2.	Course Code	HMB 2011
3.	Status of Course	Specialisation core for B. Sc (Hons) Bioinformatics
4.	MQF Level/Stage	Bachelor – MQF Level 6
5.	Version (State the date of the Senate approval – history of previous and current approval date)	Date of previous version : June 2012 Date of current version: April 2014
6.	Pre-Requisite	HBC1011 Biochemistry I HCB1011 Cell Biology
7.	Name(s) of academic/teaching staff	Ong Chia Sui Amelia Kassim
8.	Semester and Year offered	Trimester 1, Year 3

9. Objective of the course in the programme :
1. To teach students the biology of cells at the level of the molecule with focus on genomic structure and function.
2. To introduce students to the basis and pathogenic effects of disruption of gene function.
3. To introduce students to the potential use of this knowledge for scientific and clinical studies.
4. To provide practical information and training in the techniques used for the handling and manipulation of nucleic acid.
5. To familiarize the student with the organization and operation of a basic molecular laboratory.

10. Justification for including the course in the programme :
This subject provides fundamental knowledge required for bioinformatics students in understanding the molecular basis of biological activities.

11. Course Learning Outcomes :

		Domain	Level
LO1	Grasp and state the biology of cells at the molecular level.	Cognitive	Level 2
LO2	Comprehend the principles of molecular biology techniques.	Cognitive	Level 2
LO3	Explain the application of molecular biology techniques for experimental studies and in diagnostics.	Cognitive	Level 5
LO4	Apply the techniques learned as tools for molecular studies.	Cognitive	Level 3

12. Mapping of Learning Outcomes to Programme Outcomes :

Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
LO1		X							
LO2		X							
LO3	X	X							
LO4	X	X							

13. Assessment Methods and Types :

Method and Type	Description/Details	Percentage

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	Final Exam	Written exam	50%
	Tests (Quizzes and Midterm test)	Written tests and quizzes	30%
	Assignment	Presentation	10%
	Lab Reports	Written report	10%

14. Mapping of assessment components to learning outcomes (LOs)

Assessment Components	%	LO1	LO2	LO3	LO4
Final Exam	50	55.6	50	50	
Tests (Quiz and Midterm test)	30	33.3	30	30	
Assignment	10	11.1	10	10	
Lab Reports	10		10	10	100

15. Details of Course

	Topics	Mode of Delivery		
		Lec	Tut	lab
1	Proteins: The End Product of Gene Expression • One-gene : One-enzyme hypothesis • One-gene : One-protein/One-gene : One-polypeptide	1	-	-
2	Regulation of Gene Expression in Bacteria and Phages • Lactose metabolism in *E.coli* • The *ara* regulatory protein • Tryptophan operon in *E.coli* • Genetic regulation in phage lambda • Phage transcription during lysis	3	1	-
3	Regulation of Gene Expression in Eukaryotes • Regulatory Elements : Promoters, Enhancers • Transcription factors • Genomic alterations and gene expression: DNA methylation, Gene amplification • Posttranscriptional regulation of gene expression • Posttranslational regulation	3	1	-
4	Genetic Recombination • Homologous recombination • Conservative site-specific recombination • Transposition	2	-	-

	5	DNA damage and repair • Random versus adaptive mutations • Classification of mutations • Detection of mutations • Molecular basis of mutations: Base substitution, Frameshift mutations, Deamination, Oxidative damage, Alkylation damage, Damage caused by ultraviolet radiation and ionizing radiation • Case studies of mutations in humans • Repair of DNA: Repair by direct reversal, Base excision repair, Nucleotide excision repair, Post replication repair, Proofreading and mismatch repair, SOS response • Repair deficient disorders	3	1	-
	6	Recombinant DNA Technology • Restriction enzyme • Vectors • Cloning DNA in *E.coli* • Cloning DNA in eukaryotic hosts • Constructing DNA libraries • Identifying cloned sequences • Analysis of cloned sequences • Transferring DNA in Eukaryotes	2	-	3
	7	Applications of Recombinant DNA Technology • Mapping human gene • Diagnosing and screening • Knockout mice • Gene therapy • DNA fingerprinting • Genome analysis • Biotechnology	2	1	-
	8	Introduction to Genomics • DNA sequencing on a genomic scale • Functional genomics, proteomics, and bioinformatics	2	-	-

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	9	Basic Molecular Techniques • Safety in the molecular biology laboratory • General laboratory methods and use of equipment • Nucleic acid extraction and purification • *In vitro* amplification techniques • Restriction enzymes and electrophoresis techniques • Hybridization techniques • Principles of DNA sequencing techniques 1 • Principles of DNA sequencing techniques 2	8	-	15
		Total	**26**	**4**	**18**
		Laboratory			
		Lab 1 • Laboratory safety • Measurement, micropipetting • Proper usage and care of equipment • Calibration • Preparation of reagents			
		Lab 2 Preparation of nucleic acid from cells • Extraction and purification • Detection and quantification			
		Lab 3 • *In vitro* amplification of DNA and primer design			
		Lab 4 • Restriction enzyme digestion • Agarose gel electrophoresis			
		Lab 5 • DNA cloning			
		Lab 6 • DNA Sequencing data analysis			

Total Student Learning Time (SLT)	Face to Face / Guided Learning	Independent Learning
Lecture	26	26
Tutorials	4	4
Laboratory/Practical	18	9
Presentation	-	10

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	Assignment	-	-
	Mid Term Test	1	3
	Final Exam	2	15
	Sub Total	51	69
	Total SLT	**120**	
16.	Credit Value	**3**	
17.	Reading Materials :		
	Textbooks		
	James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, & Richard Losick. (2014). Molecular Biology of the Gene, 7th Edition. Pearson Education Benjamin Cummings.		
	Reference Material (including 'Statutes' for Law)		
	Robert F. Weaver (2012) Molecular Biology. 5th Edition. McGraw-Hill Higher Education.		

Appendix (to be compiled when submitting the complete syllabus for the programme) :

1. Mission and Vision of the University and Faculty
2. Programme Objectives or Programme Educational Objectives
3. Programme Outcomes (POs)
4. Mapping of POs to the 8 MQF domain
5. Summary of the Bloom's Taxonomy's Domain Coverage in all the Los in the format below :

Subject	Learning Outcomes (please state the learning outcomes)	Bloom's Taxonomy Domain		
		Affective	Cognitive	Psychomotor
HMB2011	Learning Outcome 1		2	
	Learning Outcome 2		2	
	Learning Outcome 3		5	
	Learning Outcome 4		3	

6. Summary of LO to PO measurement
7. Measurement and Tabulation of result for LO achievement
8. Measurement Tabulation of result for PO achievement