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SUMMARY OF INFORMATION ON EACH COURSE

1.	Name of Course	Bioinformatics Algorithms I	
2.	Course Code	HPB2031	
3.	Status of Course [Applies to (cohort)]	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 14
		Date of Current Version :	May 15
6.	Pre-Requisite	HPB2021 Bioinformatics Programming II	
7.	Name(s) of academic/teaching staff	Ali AfzalianMand Mohammed Rajihuzzaman Teo Poh Nee	
8.	Semester and Year offered	Trimester 2, Year 2	

9. Objective of the course in the programme :
1. To introduce the concept of algorithm development in bioinformatics.
2. To enable the students to make simple changes to an existing algorithm.
3. To enable the students to appreciate the dynamic nature of biological data and the consequent requirement of dynamic algorithm development.
4. To appreciate the divergence of biological data and the consequent requirement for innovative algorithm development.

To enable the student to write simple and innovative algorithms that solve complex biological data analysis problems.

10. Justification for including the course in the programme :
The subject provides specific knowledge required for bioinformatics students to learn advanced aspects in bioinformatics algorithm.

11. Course Learning Outcomes :

		Domain	Level
LO1	Explain the underlying statistical principles in algorithm development	Cognitive	Level 2
LO2	Apply industrially standard algorithms to meet the current requirements	Cognitive	Level 3
LO3	Identify the assumptions involved in developing an algorithm and changing the assumptions to suit different scenarios	Cognitive	Level 4
LO4	Develop simple and innovative algorithms under different biological data analysis contexts	Cognitive	Level 5

12. Mapping of Learning Outcomes to Programme Outcomes :

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

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13. Assessment Methods and Types :

Method and Type	Description/Details	Percentage
Final Exam		40%
Quizzes	Written quizzes	30%
Lab Test		10%
Assignment	Report & Presentation	10%
Lab Report		10%

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

Assessment Components	%	LO1	LO2	LO3	LO4
Final Exam	40	44.5	44.5		
Quizzes	30	33.3	33.3	50	75
Lab Tests	10	11.1	11.1	16.6	
Assignment	10	11.1	11.1	16.7	
Lab Reports	10			16.7	25

15. Details of Course

Topics	Mode of Delivery	
	Lec	Lab
1. Computational approaches in Bioinformatics Biodata and Tools Definition and Scope Biological Data Types and Formats Biological Datasets and Databases and accompanying tools	4	2
2. Algorithms in Genomics I PhilGreen Phred/Phrap/Consed Pairwise sequence alignment Smith-Waterman Needleman-Wunsch	5	2
3. Algorithms in Genomics II Multiple Sequence Alignment Substitution matrices : BLOSUM & PAM Basic Local Alignment Search Tool (BLAST) FASTA	5	4

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	4. Phylogeny and Prediction Basic concept Methods-maximum pasimony, distance method, maximum likelihood approach, evolutionary model. Reliability of prediction Phylogenetic Analysis - ClustalW	6	4
	5. Protein-Protein Interaction Protein function as interactions Detection methods Structure-and-sequence-based predictions	2	2
	6. Pathway modeling KEGG (metabolic pathway, regulatory pathway) DBS. Eco-cyc-prokaryote pathway modeling. Biocyc-eukaryote pathway modeling Genetic networks Biochemical pathways Pathway tools	6	6
	Total	28	20
	Laboratory		
	Lab 1: Introduction to Biological Databases Lab 2: Sequence alignment: Smith Waterman, Needlemann & Wunsch with default parameters. Lab 3: Sequence alignment with BLOSUM Lab 4: BLAST and FASTA Lab 5 - 6: Phylogenetic algorithms Lab 7: K-means clustering Lab 8 -10: Introduction to pathway analysis with VANTED		

	Total Student Learning Time (SLT)	Face to Face / Guided Learning	Independent Learning
	Lecture	28	28
	Tutorials	-	-
	Laboratory/Practical	20	10
	Labtest	1	2
	Assignment	-	10
	Quizzes	4 times	4
	Final Exam	2	15
	Sub Total	51	69
	Total SLT	120	
16.	Credit Value	3	

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17. Reading Materials :

Textbooks

A First Course in Systems Biology, Bessant C, Oakley D, Shadforth I, ISBN-13: 978-0199658565 ISBN-10: 0199658560. Oxford University Press. 2012

Genome Annotation (Chapman & Hall/CRC Mathematical and Computational Biology), Soh J, Gordon P, Sensen C, ISBN-13: 978-1439841174 ISBN-10: 1439841179. Chapman and Hall/CRC. 2012

Reference Material (including 'Statutes' for Law)

Building Bioinformatics Solutions 2nd edition, Bessant C, Oakley D, Shadforth I, ISBN-13: 978-0199658565. Oxford University Press. 2014

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
ABC1234	Learning Outcome 1			
	Learning Outcome 2			
	Learning Outcome 3			
	Learning Outcome 4			
DEF5678	Learning Outcome 1			
	Learning Outcome 2			
	Learning Outcome 3			
	Learning Outcome 4			

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

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