MULTIMEDIA UNIVERSITY®

SUMMARY OF INFORMATION ON EACH COURSE

1.	Name of Course	Parallel Computing
2.	Course Code	HPB3021
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 2014 Date of Current Version : May 2015
6.	Pre-Requisite	TDC1231 Data Communications and Networking
7.	Name(s) of academic/teaching staff	Ali AfzalianMand Mohammed Rajihuzzaman ML Yong
8.	Semester and Year offered	Trimester 2, Year 2

9. Objective of the course in the programme :
1. To give an introduction to the Unix operating system which is commonly used in Bioinformatics
2. To introduce the students to the implementation, management and maintenance of parallel computing systems.
3. To introduce the students to the concepts of parallelizing and distributing computationally intensive algorithms.
4. To enable the students to run distributed algorithms on parallel computing systems.
5. To introduce the theories in grid computing, basic infrastructure and information structure for grid computing.

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

11. Course Learning Outcomes :

		Domain	Level
LO1	Define the concepts, terms and importance of the computer operating system (OS) and of parallel computing	Cognitive	Level 1
LO2	Manipulate files and contents using appropriate OS operators	Cognitive	Level 3
LO3	Design an algorithm for distributed systems on local and remote parallel computing systems	Cognitive	Level 5
LO4	Modify the distributed algorithms on local and remote parallel computing systems.	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	X	
LO2							X	X	X
LO3	X						X	X	X
LO4							X	X	

13. Assessment Methods and Types :

Method and Type	Description/Details	Percentage

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	Final Exam		40
	Quizzes	Written quizzes	30
	Lab Test		10
	Assignment	Report & Presentation	10
	Lab Reports		10

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

Assessment Components	%	LO1	LO2	LO3	LO4
Final Exam	50	44.5	44.5		80
Quizzes	30	33.3	33.3		
Lab Test	10	11.1	11.1		
Assignment	10			50	
Lab Report	10	11.1	11.1	50	20

15. Details of Course

Topics	Mode of Delivery	
	Lec	Lab
1. **Unix Essentials I** Basic Concept and Environment Syntax and Commands Unix File systems and File Management Files and Directories: Creating, Sharing and Protecting	6	3
2. **Unix Essentials II** Standard I/O Operations Creating Pipes and Filters Shell Programming	6	3
3. **Parallel Computing** Introduction, Role of Parallel computing in Bioinformatics Parallel computing concepts Definitions of Parallel and Serial Computing Need of Parallel Computing Seeking concurrency Data clustering Computational Speed	2	2

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	4. **Parallel computer and architectures** Types of parallel computers • SISD, SIMD, MISD & MIMD Multiprocessors Centralized multiprocessors Cache coherence problem in centralized multiprocessors Distributed multiprocessors Cache coherence problem in distributed Multiprocessors Directory based protocol Multi-computers • Asymmetric multi-computers • Symmetrical multi-computers Practical parallel computers Interconnection networks	4	4
	5. **Parallel (MIMD) algorithm design** Task/ Channel model of algorithm design Foster's design methodology • Partitioning • Communication • Agglomeration • Mapping Case studies	4	4
	6. **Introduction to Message Passing Interface** • Parallel programming – Matrix-vector multiplication • Parallel programming – Matrix-Matrix Multiplication • Case study : *Parallelizing Smith Waterman with MPI* • Performance analysis	4	2
	7. **Grid Computing: Overview** History and evolution of grid computing. The applications and environment. The requirements for grid computing environment	2	2
	Total	**28**	**20**

Total Student Learning Time (SLT)	Face to Face / Guided Learning	Independent Learning
Lecture	28	28
Tutorials	-	-
Laboratory/Practical	20	10

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	Assignment	-	10
	Final Exam	2	15
	Quizzes	4 times	4
	Lab tests	1	2
	Sub Total	51	69
	Total SLT	**120**	
16.	Credit Value	**3**	
17.	Reading Materials :		
	Textbooks		
	High-Performance Computational Solutions in Protein Bioinformatics (SpringerBriefs in Computer Science). Mrozek D**.** ISBN-10: 3319069705 ISBN-13: 978-3319069708. Springer 2014.		
	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		

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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