

1.	Name of Course/Module	Bioinformatics Programming II
2.	Course Code	HPB2029
3.	Status of Subject	Major for B. Sc Bioinformatics
4.	MQF Level/Stage	Bachelor Degree – MQF Level 6
5.	Version (state the date of the last Senate approval)	May 2013
6.	Requirement for Registration	HPB2019 - Bioinformatics Programming I
7.	Name(s) of academic/teaching staff	Dr Henry Lee Seldon Ali Afzalian Mand Teo Poh Nee
8.	Semester and Year offered	Trimester 2 (Gamma level)
9.	Objective of the course/module in the programme :	
	<ol style="list-style-type: none"> 1. To introduce scripting languages commonly used in Bioinformatics 2. To introduce the techniques used for bioinformatics programming 3. To give an introduction to languages that are commonly used in writing bioinformatics software (Python, R). 4. To introduce the libraries, tools and communities of BioPython 	
10.	Learning Outcomes :	
	<p>At the completion of the subject, students should be able to:</p> <p>LO1: Define the concepts of Python and R and their programming approach. (Cognitive, Level 1)</p> <p>LO2: Comprehend Python, BioPython and R basic concepts, data types, variables, methods, and apply them in developing programs. (Cognitive, Level 2)</p> <p>LO3: Analyse sequences from various biological databases using Python and BioPython. (Cognitive, Level 4)</p> <p>LO4: Design a system to analyse sequence fields using Python, BioPython and XML technology. (Psychomotor, Level 6)</p>	
11.	Synopsis:	
	<p>Introduction to programming in bioinformatics with the major emphasis on getting the essentials of PYTHON and R languages. Essentials of Python will include learning about loops, strings and tuples with understanding of lists and dictionaries. Essentials of BioPython will include learning about modules for sequence retrieval from online databases, and for sequence analysis and comparison. Essentials of R will include the basic data types, syntax, etc.</p>	
	<p>Pengenalan kepada pengaturcaraan dalam bioinformatik terutamanya bahasa "PYTHON" dan "R". Asas bahasa Python termasuk pengenalan kepada "loop", "string" dan "tuples" dengan pemahaman kepada senarai and kamus Python. Asas BioPython termasuk mempelajari modul untuk mendapatkan sekuens dari basis data dalam talian dan juga untuk analisis sekuens dan membandingkan sekuens. Asas bahasa R termasuk jenis data asas, sintaks dan sebagainya.</p>	
11.	Mapping of Subject to Programme Outcomes :	
	Programme Outcomes	% of Contribution
	PO1: Apply soft skills in work and career related activities	25.00
	PO7: Demonstrate knowledge and understanding of essential facts, concepts, principles, and theories relating to bioinformatics	37.50

	PO8: Apply principles and knowledge of bioinformatics in relevant areas	37.50	
12.	Assessment Methods and Types :		
	Method and Type	Description/Details	Percentage
	Test		20.00 %
	Tutorial/ Laboratory		20.00%
	Assignment	Report & Presentation	20.00%
	Final Exam		40.00%
13.	Details of Subject		
	Topics	Mode of Delivery	
		Lecture	Tutorial
	Python Essentials I Basic Concepts and Essentials Data Types and Variables Programming Style and Branching Files and Extensions I/O Operations Loops, Strings and Tuples	8	3
	Python Essentials II GUI Development Graphics: Development and Deployment Object Oriented Programming	4	1
	BioPython Basic Concepts and Essentials Data Types and Variables Connections to online databases for data retrieval Modules for sequence analyses and comparisons	8	3
R Language Basic Concepts and Essentials Data Types and Variables Use for statistical analyses Use in data mining	8	3	
	Total	28	10
	Laboratory		

	Lab 01: Running Python Lab 02: Basic Programming in Python Lab 03: OOP in Python Lab 04: Strings and sequences with Python Lab 05: GUI with Python Lab 06: Parsing Database Records with BioPython Lab 07: Sequence Analysis with BioPython Lab 08: Basic Programming in R Lab 09: Statistical analyses with R Lab 10: Data Mining applications with R		
1.	Total Student Learning Time (SLT)	Face to Face (Hour)	Total Guided and Independent Learning
	Lecture	28	28
	Tutorials	10	10
	Laboratory/Practical	10	5
	Presentation		
	Assignment	-	10
	Mid Term Test	1	5
	Final Exam	2	20
	Quizzes		
	Sub Total	51	78
	Total SLT	129/40 = 3.225 → 3	
2.	Credit Value	3	
3.	Reading Materials :		
	Textbook	Reference Materials	
	1. Bioinformatics Programming in Python, a Practical Course for Beginners. Flaig, Ruediger-Marcus. Wiley-VCH, Weinheim ISBN-13: 978-3-527-32094-3. 2008 2. Python Programming for the Absolute Beginner. Michael Dawson. Thomson Course Technology. ISBN 1592000738. 2003.	1. Bioinformatics Biocomputing and Perl. An Introduction to Bioinformatics Computing Skills and Practice. Moorhouse, Michael / Barry, Paul. John Wiley & Sons. ISBN-13: 978-0-470-85331-3. 2004 2. Introduction to Bioinformatics: A Theoretical and Practical Approach. Stephen A. Krawetz, David D. Womble. Humana Press. ISBN-13: 978-1588290649. 2003. 3. The Art of R Programming: A Tour of Statistical Software Design. Norman Matloff. No Starch Press. ISBN-13: 978-1593273842	
4.	Appendix (to be compiled when submitting the complete syllabus for the programme) : 1. Mission and Vision of the University and Faculty 2. Mapping of Programme Objectives to Vision and Mission of Faculty and University 3. Mapping of Programme Outcome to Programme Objectives 4. Programme Objective and Outcomes (Measurement and Descriptions)		