

1.	Name of Course/Module	Bioinformatics Programming I
2.	Course Code	HPB2019
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	None
7.	Name(s) of academic/teaching staff	Henry Lee Seldon Ali Afzalian Mand
8.	Semester and Year offered	Trimester 1 (Gamma level)
9.	Objective of the course/module in the programme :	
	<ol style="list-style-type: none"> 1. To introduce the techniques used for bioinformatics programming 2. To provide instruction on the techniques and the use of tools for assessing, searching and retrieval of information from biological databases and the submission of new entries 3. To introduce Programming languages (Java) commonly used in Bioinformatics 4. To introduce the Java tools commonly employed for analysis of data retrieved from biological databases with focus on sequence data 	
10.	Learning Outcomes :	
	<p>At the completion of the subject, students should be able to:</p> <p>LO1: Understand the basic concepts of bioinformatics programming, sequence analysis and protein structure prediction (Cognitive, Level 1)</p> <p>LO2: Retrieve and analyse sequences from various biological databases. (Cognitive, Level 4)</p> <p>LO3: Comprehend Java concepts (object-orientation), data types, variables, methods and apply in developing programs. (Cognitive, Level 2)</p> <p>LO4: Design a simple Bioinformatics system using Java and Bio-Java. (Psychomotor, Level 6)</p>	
11.	Synopsis:	
	<p>Introduction to programming in bioinformatics with basic algorithms for sequence analyses. Essentials of the JAVA programming language with emphasis on object oriented programming, networking, GUI development, etc. Application of JAVA and BIO-JAVA to bioinformatics problems such as sequence analyses.</p>	
	<p>Pengenalan kepada pengaturcaraan di dalam bioinformatik dengan algoritma-algoritma asas untuk analisis sekuens. Asas JAVA menekankan tentang jaringan perhubungan, pembangunan GUI, pengaturcaraan berasaskan objek dan sebagainya. Penggunaan JAVA dan BIO-JAVA untuk masalah bioinformatik seperti analisis sekuens.</p>	
12.	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
13.	Assessment Methods and Types :	
	Method and Type	Description/Details
	Test	Percentage
	Tutorial/ Laboratory	20.00%
	Assignment	Report & Presentation
	Final Exam	20.00%
		40.00%
14.	Details of Subject	
	Topics	Mode of Delivery
		Lecture
		Tutorial
	Bioinformatics Programming Basic Concepts Data Types and Formats Assumptions and Realities NCBI Resources EBI Resources	2
	Sequence Analysis Alignment of Sequences-basic principles and approach; algorithms;scoring matrices;gap penalties. Building a Profile Scoring a Sequence Against a Profile. Reverse Complementing Regular Expression Motifs	2
	Protein Structure Prediction Primary, secondary, tertiary structure Amino-acid substitutions	2
	JAVA Essentials I Basic Concepts and Environment Data Types and Variables Programming Styles: Methods and Functional Abstraction Strings, Statements and Control of Flow	6
	JAVA Essentials II Objects and Data Abstraction Object Oriented Programming Methods: Method Invocation, Static Methods Inheritance: Wrappers, Multiple Inheritance instances	6
		1
		2
		1
		2

	Biojava			
	Basic Concepts and Environment Simple implementations Application to Bioinformatics problems like sequence analyses		6	2
	Application in Bioinformatics			
	Basic Concepts. Data Types and Formats. Assumptions and Realities Bioinformatics Scripts. Format Conversion. Parsing Database Records. Internal Representation.		4	2
	Total		28	12
15.	Laboratory			
	Lab 1: Bioinformatics programming problems Lab 2: Sequence analysis 1 Lab 3: Sequence analysis 2 Lab 4: Fundamentals of Java Programming Lab 5: Object and Classes Lab 6: OOP Concept and Implementation Lab 7: Text Processing and Regular Expression Lab 8: GUIs Lab 9: Introduction and Handling of Biological Data - BioJava Lab 10: General BioJava Modules			
16.	Total Student Learning Time (SLT)	Face to Face (Hour)	Total Guided and Independent Learning	
	Lecture	28	28	
	Tutorials	12	12	
	Laboratory/Practical	10	5	
	Presentation	-	-	
	Assignment	-	10	
	Mid Term Test	1	5	
	Final Exam	2	20	
	Quizzes	-	-	
	Sub Total	53	80	
	Total SLT	133/40 = 3.325 => 3		
17.	Credit Value	3		
18.	Reading Materials :			
	Textbook	Reference Materials		

	<p>1. Java by Dissection: The Essentials of Java Programming. 2nd Edition. Charlie McDowell and Ira Pohl, ISBN 141165238X. Lulu Press. 2006</p>	<p>1. Introduction to Bioinformatics: A Theoretical and Practical Approach. Stephen A. Krawetz, David D. Womble. Humana Press. ISBN-13: 978-1588290649. 2003.</p>
<p>19.</p>	<p>Appendix (to be compiled when submitting the complete syllabus for the programme) :</p> <ol style="list-style-type: none"> 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) 	