Course Specifications

Course Title:	**Bioinformatics**
Course Code:	**AI 416**
Program:	**Information and Computer Sciences**
Department:	**Computer Science and Information**
College:	**College of Science AzZulfi**
Institution:	**Majmaah University**

Table of Contents

A. Course Identification

1. Credit hours:3
2. Course type **a.** University ☐ College ☐ Department ☐ Others ☐ **b.** Required ☐ Elective ■
3. Level/year at which this course is offered:
4. Pre-requisites for this course (if any)**:** ICS 211 Algorithms and Data structure & MATH 220 Probability and statistics
5. Co-requisites for this course (if any)**:** **None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	48	80%
2	**Blended**	6	10%
3	**E-learning**	0	0%
4	**Correspondence**	0	0%
5	**Other**	6	10%

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	15
3	**Tutorial**	15
4	**Others** (specify)	-
	Total	60
Other Learning Hours*		
1	**Study**	30
2	**Assignments**	30
3	**Library**	15
4	**Projects/Research Essays/Theses**	15
5	**Others** (specify)	10
	Total	100

***** The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides an introduction to both theoretical and practical aspects of DNA and protein sequence analysis including the searching of DNA, protein and nucleic acid databases using homology-based and pattern-based search algorithms, as well as sequence comparisons and alignments and evolutionary analysis. You will develop skills in interfacing with and retrieving information from sequence and genome databases. Methods of sequence alignment including dynamic programming and the supporting statistical theory are introduced

2. Course Main Objective

Upon successful completion of the course, students will - Outline basic molecular tools involved in DNA analysis (e.g. sequencing) which underpin or support bioinformatics based analysis; - Conduct database analyses at the DNA, RNA and protein level; - Predict molecular structures from genomic information including: promoters, open reading frames (introns, exons), genes and predicted protein structures; - Be able to input data into and, interpret output from, a range of bioinformatics software tools (a focus being on widely available web-based packages); - Analyze gene homology and predict evolutionary relationships; - Show a high level of skill in the use of informatics techniques with an emphasis on the organisation, display and interrogation of complex data; - Understand the limitations of existing techniques

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Acquire knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics	K3-AI
2	**Skills :**	
2.1	Apply existing software effectively to extract information from large databases and to use this information in computer modeling	
2.2	Gain a problem-solving skills, including the ability to develop new algorithms and analysis methods	S3-AI
3	**Competence:**	
3.1	Have an understanding of the intersection of life and information sciences, the core of shared concepts, language and skills the ability to speak the language of structure-function relationships, information theory, gene expression, and database queries	C3-AI

C. Course Content

No	List of Topics	Contact Hours
1	Review of DNA structure and organization	4
2	Bioinformatics: collecting and assessing genome related data. An historical perspective including the development of public databases and related internet resources.	8

3	Review of basic molecular tools that may be used to generate bioinformatics related data (e.g. Southern Analysis, DNA sequencing)	12
4	Database searching (e.g. FASTA and BLAST algorithms)	12
5	Sequence alignment - pairs, multiple sequence alignment and identifying similar sequences including basic statistical approaches (e.g PAM and BLOSUM index)	8
6	Genome analysis including gene prediction and identification	8
8	Protein classification, structure and prediction	8
		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1 …	Acquire knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics	Lectures Lab demonstrations Case studies Individual presentations	Written Exam Homework assignments Class & Lab Activities Quizzes
2.0	**Skills**		
2.1	Apply existing software effectively to extract information from large databases and to use this information in computer modeling	Lectures Lab demonstrations Case studies Individual presentations Brainstorming	Written Exam assignments Lab Activities Quizzes
2.2	Gain a problem-solving skills, including the ability to develop new algorithms and analysis methods		
3.0	**Competence**		
3.1	Have an understanding of the intersection of life and information sciences, the core of shared concepts, language and skills the ability to speak the language of structure-function relationships, information theory, gene expression, and database queries	Small group discussion Whole group discussion Brainstorming Presentation	Written Exam Homework assignments Lab assignments Class Activities Quizzes

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	First written mid-term exam	6	20%
2	Second written mid-term exam	12	20%
3	Class activities, group discussions, Presentation	Every 2 weeks	5%
4	Homework + Assignments	After Every chapter	5%
5	Electronic exam	14	5%

#	Assessment task*	Week Due	Percentage of Total Assessment Score
6	Lab activities	15	5%
7	Final written exam	16	40%
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

- 6-office hours per week in the lecturer schedule.
- The contact with students by e-mail, mobile, office telephone, website and Black Board

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Marketa Zvelebil and Jeremy Baum, UNDERSTANDING BIOINFORMATICS - 1ST EDN. ISBN : 9780815340249, Taylor & Francis, 2009
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom and Labe available at College of science in Zulfi.
Technology Resources (AV, data show, Smart Board, software, etc.)	All resource are available in the halls
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	N\A

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students Reviewers	Questionnaires (course evaluation) filled by the students and electronically organized by the university. Student-faculty and management meetings.
Quality of learning resources	Program Leaders	Direct/indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	