Course Specification
(Bachelor)

Course Title:	**Bioinformatics**
Course Code:	**BIO-1434**
Program:	**Bachelor of Science in Biology.**
Department:	**Biology**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University (IMSIU)**
Version:	*Course Specification Version Number*
Last Revision Date:	*Pick Revision Date.*

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A. Course Identification

1. Credit hours:	3 (2Lectures + 2 Laboratory + 0 Tutorials).
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	Level seven / Fourth Year.
4. Pre-requisites for this course (if any)**:**	Biostatistics STA- 217.
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**	√	70%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**	√	30%

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60
Other Learning Hours*		
1	**Study**	2-4 hrs.
2	**Assignments**	
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others**(specify)	
	Total	2-4 hrs.

***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

Course description: The course is designed to introduce the most important and basic concepts, methods, and tools used in Bioinformatics. Topics include (but not limited to) bioinformatics databases, sequence and structure alignment, protein structure prediction, protein folding, protein-protein interaction. Emphasis will be put on the understanding and utilization of these concepts and algorithms. The objective is to help the students to reach rapidly the frontier of bioinformatics and be able to use the bioinformatics tools to solve the problems on their own research.

2. Course MainObjective

Bioinformatics is an interdisciplinary field that develops methods and software tools for understanding biological data. As an interdisciplinary field of science, bioinformatics combines computer science, statistics, mathematics, and engineering to analyze and interpret biological data.

This course aims to identify the biological sequences data and the analysis of similar DNA sequences and proteins. So, successful completion of the course, the student will be able:

To illustrate bio-data sequences.

To describe similar sequences DNA.

To describe similar protein sequences.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge:**	
1.1	To recognize the study of biological sequences data.	1.1
1.2	To describe the analysis of Similar DNA sequences.	1.1-1.2
2	**Skills:**	
2.1	To create the ability to analyze the biological sequences data.	2.1
2.2	The ability to apply, analyze and compare methods and topics related to microorganisms.	2.1-2.2
2.3	The ability to apply and analyze and compare methods and topics related to bioinformatics for plants and animals.	2.1-2.2
3	**Competence:**	
3.1	To appraise collaborative work skill.	3.1-3.2
3.2	To appraise understanding the views of the other aspects of the temporal, spatial and personality	3.1-3.2
3.3	To manipulate the operation and use of computers and means of modern technology.	3.3

C. Course Content

No	List of Topics	Contact Hours
1	Class Introduction. Bioinformatics: What and why?	2
2	Genomic sequences. Online databases. Intro to sequence alignment.	2
3	Sequence alignment. Scoring Matrices. Pairwise alignment Gaps.	2
4	Database searching; BLAST. Limits of detection, significance.	2
5	Advanced BLAST: PSI-BLAST, Genomic DNA. Find-a-gene project.	2
6	Multiple sequence alignment. Relevance to inferences about evolution.	2
7	Midterm review; molecular phylogeny introduction.	2
8	Molecular phylogeny and evolution.	2
9	mRNA and gene expression introduction. Unigeneric.	2
10	Statistics for differential expression, multiple testing.	2
11	Functional interpretation of array data.	2
12	Characterizing eukaryotic genomes.	2
13	Human variation and disease. Linking genes and disease.	2
14	Sequence variation, phenology, and comparative genomics.	2
15	Personalized medicine. Multiple testing revisited.	2
Total		30

Topic to be covered (laboratories)

Lab No.	Topics	Contact Hours
Lab01	Finding information in online databases.	2
Lab2.3	Pairwise sequence alignment.	4
Lab4.5	BLAST.	4
Lab6.7	Advanced BLAST and find-a-gene help.	4
Lab08	Using online multiple sequence alignment tools.	2
Lab9,10	Molecular phylogeny.	4
Lab11.12	Finding differentially expressed genes.	4
Lab13.14	Interpreting expression variation.	4
Lab 15	General revision.	2

D. Teaching and Assessment

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

Code	Course Learning Outcomes	TeachingStrategies	Assessment Methods
1.0	**Knowledge**		
1.1	To recognize the study of biological sequences data.	• Interactive lecture, discussion and dialogue • Collaborative learning	• Written tests. • Oral tests.
1.2	To describe the analysis of Similar DNA sequences.	Style – Wiki.	• Classroom assignments. • Classroom discussions and contributions.
2.0	**Skills**		
2.1	To create the ability to analyze the biological sequences data.	• Mental focus • Find the collective Problem-solving and decision-making	Performance of written tests.

Code	Course Learning Outcomes	TeachingStrategies	Assessment Methods
2.2	The ability to apply, analyze and compare methods and topics related to microorganisms.	Style - Wiki	Students' projects.
2.3	The ability to apply and analyze and compare methods and topics related to bioinformatics for plants and animals.	Teaching with analogies and the similes.Reciprocal teaching.	Research papers. Identification tests.
3.0	**Competence**		
3.1	To appraise collaborative work skill.	Teaching colleagues.	Evaluation of colleagues.
3.2	To appraise understanding the views of the other aspects of the temporal, spatial and personality	Practical training and the guided discovering.	Class participation.
3.3	To manipulate the operation and use of computers and means of modern technology.	• Default - laboratories • Illustrated presentations	Recording student performance.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm 1	Around 6th -7th week	15%
2	Midterm 2	Around 11th -12th week	15%
3	Quizzes, Attendance, Participation, Home works.	All the semester	10 %
4	Lab reports.	All the semester	5%
5	Lab Exam.	Around 15th week	15 %
6	Final Exam.	Around 15th -16th week	40 %
7	Total		100%

***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:

- By identifying office hours 6 hours a week (be adhered to and attached with the Schedule lectures and declare for the students.
- To communicate and ask questions and inquiries by e-mail to a member of staff teaching through his Web site.
- To provide assistance and guidance to any inquiry or consultation relating to syllabus given,
- Helping students to understand the material and contribute to the academic advising process.

Helping students in the face of any study and academic problems in this course.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Marketa Zvelebil Jeremy Baum Understanding Bioinformatics, Publisher: Garland Science; 1 edition (August 29, 2007), ISBN-10: 0815340249.**

	Teresa Attwood, David Parry-Smith Hal Introduction to Bioinformatics Paperback, 240 pages; March 8, 1999, 1st edition; Prentice. ISBN: 0582327881.
Essential References Materials	Pavel pevezer, Bioinformatics for biologists.1th ed. 2011.ISBN: 13: 978-1107648876. Cynthia Gibas and Per Jambeck. Developing Bioinformatics Computer Skills, (2001).
Electronic Materials	• Genetic Links • Clinical Genetics Site • Genetic and The Internet • Genetic Catalog - Genetics Web Site Searrh Engines • Genetic Disorders & Birth Defects - Sri Lanka Collection • Links, For Gene Therapy.
Other Learning Materials	CDs and Electronic biological programs and genetics Software Mathematical Genetics and Bioinformatics

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Each classroom is equipped with PC and retro projector with a maximum of 30 students. And the laboratory room is equipped with many laboratory instruments with a maximum of 20 students.
Technology Resources (AV, data show, Smart Board, software, etc.)	A computer for display and uses of data with a slide show presentation. High-device "projectors" Lighting. It is assumed that each student has its own computer.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Specific laboratory equipment for this course including posters, models of different experimental animals, dissection instruments, light microscopes, dissection microscopes, microtome instrument, slide preparations, mixer, fluorescent microscopes, ELISA unit for detecting Ag-Ab reactions, molecular instruments like gel electrophoresis, PCR centrifuge, thermal cycler , an illuminator, computers and their connections, centrifuges, incubators, ovens and other glass wares.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
At the end of the course each student will complete an evaluation form which it will be used by the faculty to evaluate the course feedback and the instructor.	Students	Direct
At the end of each semester the course coordinator completes a report, including a summary of student questionnaireresponses appraising progress and identifying	Course coordinator	Direct

Evaluation Areas/Issues	Evaluators	Evaluation Methods
changes that need to be made if necessary.		
Reviewing the course reports submitted at the end of each semester.	Peer Reviewer	Indirect
Follow up of faculty members by specialized committees devoid of bias and criticism.	Specialized committees	Indirect
Checka sample of marking by independent faculty member.	Faculty	Indirect

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

H. Specification Approval Data

Council / Committee	Head of biology department
Reference No.	
Date	November 3rd, 2019