هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Bioinformatics**
Course Code:	**BIOC1403**
Program:	**Bachelor of Science in Biochemistry & Bachelor of Science in Biology**
Department:	**Biochemistry**
College:	**Faculty of Science**
Institution:	**University of Tabuk**
Version:	
Last Revision Date:	**8 October 2023**

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A. General information about the course:

1. Course Identification

1. Credit hours:					
3 credit hours (2 Theoretical +1 Practical)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐ Track	☐ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered:					
(Level 7/4th year)					
4. Course general Description:					
The course aims to provide deep understanding application of computational approaches to model, predict, and explain biological function at the biochemical and molecular levels. It aims also to merge biochemical molecular biology data with computer science (In silico-application of computer science in molecular biology). It will also discuss the application of biochemical bioinformatics tools, RNA, DNA and protein databases will also be covered. It will also provide experience in biochemistry of genomics and proteomics analyses, comparison of sequences, BLAST Search, phylogeny, and phylogeny tree construction. Biochemical diagnostic and drug design tools will also be covered.					
5. Pre-requirements for this course (if any)**:**					
For Biochemistry program BIOC1310, For Biology program BIO1309					
6. Co-requirements for this course (if any)**:**					
NA					
7. Course Main Objective(s):					
1. To introduce students to the fundamental principles and concepts of bioinformatics, including sequence analysis, structural biology, and genome analysis. 2. To provide students with the necessary computational skills and tools required to analyze biological data and solve bioinformatics-related problems. 3. To familiarize students with commonly used bioinformatics databases and resources, such as GenBank, UniProt, and the Protein Data Bank (PDB), and teach them how to effectively retrieve and analyze data from these sources.					

4. To develop students' proficiency in bioinformatics software and programming languages commonly used in the field, such as Python and R, for tasks such as data manipulation, visualization, and statistical analysis.
5. To enhance students' understanding of the application of bioinformatics in various areas of biochemistry, such as protein structure prediction, drug design, and functional genomics, and to encourage critical thinking and problem-solving skills in these domains.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid ● Traditional classroom ● E-learning		
4	Distance learning		
5	Practical		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Define the basic terms, databases, and principles of biochemical Bioinformatics	K1	Lecture and self-learning	Participation - exams - assignment
1.2	Describe biochemical bioinformatics databases and various bioinformatics tools for data processing.	K3	Lecture, self-learning and Group discussion	Participation - exams - assignment
2.0	**Skills**			
2.1	Employ different biochemical bioinformatics tools to analyze DNA and protein sequences.	S1	Lecture and Active-learning -Group discussion	Participation - exam - assignment- Report
2.2	Analyze biochemical RNA, DNA and protein sequences from databases and other online resources.	S2	Lecture and self-learning - Project	Participation - exam - assignment- Report-project
2.3	Communicate effectively with his/her instuctoer and colleagues in issues related to bioinformatics.	S3	Lecture and Active-learning -Group- discussion	participation, project ،Report
2.4	Evaluate various biochemical bioinformatics tools used in phylogeny trees construction.	S4	Lecture and self-learning	Exams-report
3.0	**Values, autonomy, and responsibility**			
3.1	Demonstrate commitment to professional and academic values in accordance with the ethical standards in the field of biochemical bioinformatics either cooperatively or independently.	V1	Lectures- self-learning -lab- project	Presentation - Participation - assignment-lab report-project

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction, Review of biochemical bases of DNA replication, transcription, and translation,	2
2.	Genome organization.	2
3	Introduction to biochemical DNA and protein databases, data storage, file formats, information retrieval.	2
4	Biochemical database queries, sequence retrieval	2
5	Creation of restriction endonuclease maps. Sequence alignment, Local alignment, Global alignment	2
6	Multiple alignments	2
7	Genetic distances, Distance-based phylogenies	2
8	Phylogenetic tree construction.	2
9	Consensus sequences, Finding genes and open reading frames in DNA sequences.	2
10	Microarrays,	2
11	Transcriptome	2
12	Drug design	2
13	Bioinformatics databases of transcriptomics and proteomics	2
14	Prediction of the biochemical structure proteins and their function.	2
15	Comparative genomics on biochemical bases	2
	Practical topics	
1	Biochemical DNA databases	2
2	Sequence alignment, Local alignment,	2
3	Global alignment, Multiple alignments.	2
4	Database queries, sequence retrieval,	2
5	Creation of restriction endonuclease maps.	2
6	Phylogeny tree construction.	2
7	Consensus sequences	2
8	Finding genes and open reading frames in DNA sequences	2
9	The biochemical transcriptome	2
10	Drug design	2
11	The bioinformatic databases of proteomics and amino acids sequence	2
12	Phylogenetic tree construction.	2
13	The bioinformatics databases and tools for prediction of protein structure and function.	2
14	Next generation sequencing	2
15	Final Practical exam	2
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz	during semester	10%
2.	Class Participation	during semester	5%
3.	Mid-term exam	8	20%
5.	Lab (Report + lab Exam)	15	25%
6.	Final exam	17	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Computation in BioInformatics: Multidisciplinary Applications. S. Balamurugan (Editor), Anand T. Krishnan (Editor), Dinesh Goyal (Editor), Balakumar Chandrasekaran (Editor), Boomi Pandi (Editor). 2021. ISBN: 978-1-119-65471-1, Wiley.
Supportive References	Bioinformatics: Methods and Applications, 2013 by: S. C. Rastogi, SKU 508348Publishing Ref 9788120347854.
Electronic Materials	https://www.ncbi.nlm.nih.gov/ https://swissmodel.expasy.org/docs/help
Other Learning Materials	All bioinformatics databases

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, Computer laboratories,
Technology equipment (projector, smart board, software)	Data show, Internet, Bioinformatics software.
Other equipment (depending on the nature of the specialty)	Computer lab.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect (Survey)
Effectiveness of Students assessment	Students Course coordinator	Indirect (Survey) Direct (Report)
Quality of learning resources	Students Faculty members	Indirect (Survey) Indirect (Survey)
The extent to which CLOs have been achieved	Students Program Leaders	Indirect (Survey) Direct (Annual report)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**PROGRAMS AND PLANS COMMITTEE**
REFERENCE NO.	
DATE	**8 OCTOBER 2023**