هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TPG-153

Course Specification
(Postgraduate)

Course Title:	Bioinformatics in Biodiversity
Course Code:	BIOD518
Program:	Master's in Biodiversity
Department:	Department of Biology
College:	Faculty of Science
Institution:	University of Tabuk
Version:	2
Last Revision Date:	18/11/1444 H

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A. General information about the course:

1. Course Identificationn:

1. Credit hours: (3 Hours)

2. Course type

A.	☐University	☐College	☒ Department	☐Track
B.	☐ Required		☒ Elective	

3. Level/year at which this course is offered: (Level 3/Second year)

4. Course General Description:

This course helps the students develop skills in the application of computational methods for the analysis of biological data. It provides theoretical and practical background on computational analysis in Genomics and Proteomics; DNA sequencing and fragment assembly, identification of genes in DNA, gene regulation, expression, methods to study genetic diversity, homology and analogy, protein folding, and protein structure. It also provides skills in the search of DNA and protein sequences from different database resources, homology and pattern-based search algorithms, and sequence and evolutionary search comparisons.

5. Pre-requirements for this course (if any)**:**

Terrestrial Biodiversity (BIOD507)

6. Pre-requirements for this course (if any)**:**

None

7. Course Main Objective(s):

- Know up-to-date information in molecular biology and bioinformatics.
- Understand and apply technologies to determine genome structure, and sequences, and find out the structure of the protein.
- Study the structure of genes, genomes, mapping, and DNA sequencing algorithms.
- Measure and analyze biological databases.
- Develop appropriate bioinformatics tools for the management and joining of the next-generation sequencing data to evaluate biodiversity.

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100%
2	E-learning		
3	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	3 Hours/Week
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)……**	
	Total	45

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	Describe basic molecular tools used in DNA analysis, such as sequencing technologies, and their role in supporting bioinformatics-based analysis of biodiversity.	**K2**	- Lectures. - Seminars. - Class discussions. - Problem-solving classes. - Self-learning.	- Written exams (Midterm and Final exams). - Quizzes. - Class discussions.
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2.0	**Skills**			
2.1	Apply bioinformatics tools available at NCBI and EBI to perform basic analyses on biological sequences.	**S1**	- Lectures. - Seminars. - Class discussions. - Problem-solving classes. - Self-learning. - Presentations.	- Written exams (Midterm and Final exams). - Quizzes. - Class discussions. - Presentations.

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			- Case studies.	
2.2	Analyze theoretical approaches and methods used in bioinformatics to assess biological sequences and evaluate their relevance to biodiversity.	**S2**	- Lectures. - Seminars. - Class discussions. - Problem-solving classes. - Self-learning. - Presentations. - Case studies.	- Written exams (Midterm and Final exams). - Quizzes. - Class discussions. - Presentations.
2.3	Evaluate the effectiveness of different bioinformatics approaches for predicting molecular structures and their implications for biodiversity.	**S3**	- Lectures. - Seminars. - Class discussions. - Problem-solving classes. - Self-learning. - Presentations. - Case studies.	- Written exams (Midterm and Final exams). - Quizzes. - Class discussions. Presentations.
2.4	Communicate information on molecular biology methods and bioinformatics techniques effectively in both written and oral formats.	**S5**	- Lectures. - Seminars. - Class discussions. - Problem-solving classes. - Self-learning. - Presentations. - Case studies.	- Written exams (Midterm and Final exams). - Quizzes. - Class discussions. - Presentations.
2....				
3.0	**Values, autonomy, and responsibility**			
3.1	Demonstrate accuracy, transparency, and ethical standards in analyzing consensus sequences, genes, and open reading frames in bioinformatics.	**V1**	- Class discussions. - Presentations. - Case studies.	- Class discussions. - Presentations.
3...				

C. Course Content:

No	List of Topics	Contact Hours
1.	Introduction to bioinformatics.	3
2.	DNA replication, transcription, and translation, Genome Organization, molecular biology methods.	3
3.	Introduction to DNA and protein databases, data storage, file formats, and information retrieval.	3
4.	Collection and assessment of genome-related data.	3
5.	Database queries, sequence retrieval, Creation of restriction endonuclease maps, and Database searching (e.g. FASTA and BLAST algorithms). (Part I).	3
6.	Database queries, sequence retrieval, Creation of restriction endonuclease maps, and Database searching (e.g. FASTA and BLAST algorithms) (Part II).	3
7.	Dot plots, Sequence alignment, Local alignment, Global alignment, Multiple. Alignments.	3
8.	Sequence alignments (continued), Alignment scores, and Statistical significance of database searches. (Part I),	3
9.	Sequence alignments continued Alignment scores, Statistical significance of database searches. (Part II)	3
10.	Genome analysis including gene prediction and identification.	3
11.	Protein classification, structure, and prediction.	3
12.	Phylogenetic relationships, Phylogenetic tree.	3
13.	Microarrays and the transcriptome analysis and applications.	3
14.	Analysis of protein structure, and function.	3
15.	Comparative genomics, Future perspectives of bioinformatics.	3
	Total	45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	Distributed over 3-12 weeks	10
2.	Assignments, Essays, or Reports	Distributed over 14 weeks	15
3.	Individual or group presentation	Distributed over 14	15

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
		weeks	
4.	Midterm Exam	8	20
5.	Final Exam	17	40
	Total		**100**

*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	- Lesk, A. (2019). Introduction to Bioinformatics. 5th edition, pp. 432. Oxford University Academic Press. ISBN: 9780198794141. - Muthuchelian, K. (2016). Bioinformatics, Barcoding and Benefit Sharing in Biodiversity, pp. 401. Educationist Press, a division of Write & Print Publication. ISBN: 9789384649388. - Zvelebil, M. and Baum, J. O. (2008). Understanding Bioinformatics, Garland Science. ISBN 0 81 534024 9. - Xiong, J. (2006). Essential Bioinformatics. Cambridge University Press. ISBN: 9780511806087. - Krane, D. E. and Raymer, M. L. (2011). Fundamental concepts of bioinformatics, 4th edition, Pearson India. ISBN-13: 978-8177587579. - Agostino, M. J. (2013), Practical Bioinformatics, pp. 367. Garland Science. ISBN: 9780815344568..
Supportive References	- *Fundamentals of Bioinformatics.* - *International Journal of Bioinformatics.*
Electronic Materials	- Saudi Digital Library. - UNSEDOC Digital Library. - www.sciencedirect.com
Other Learning Materials	- None.

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	- A sufficient number of classrooms are available to accommodate up to 25 students. - Library.
Technology equipment (Projector, smart board, software)	- Data show projectors and a wireless internet connection are available for students and faculties. - Smart blackboard.

Items	Resources
	- Computer Portable PowerPoint presentations.
Other equipment (Depending on the nature of the specialty)	- None.

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	- Students.	- Direct & Indirect.
Effectiveness of student's assessment	- Course instructors & Course coordinator (Teachers).	- Direct.
Quality of learning resources	- Students	- Indirect.
The extent to which CLOs have been achieved	- Course instructors. - Course coordinator. - Quality Committee.	- Direct & Indirect.
Other		

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

Assessment *Methods* (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**Department of Biology Council**
REFERENCE NO.	**Department Council NO (26)**
DATE	**26/11/1444 H**