	SB4205

Module Name (Kurdish)	بایۆئینفورماتیک				
Module Name (Arabic)	علم المعلومات الحيوية				
Contact Hours/Week (Theory)	1	Contact Hours/Week (Practical)	2	Self-study Hours/Week	5
Language of Instruction	English	Semester Delivered	6	Credits (ECTS)	6
Module Type	Elective	Version Number	1.0	Version Date	31/1/2025
Prerequisite 1				Code	
Prerequisite 2				Code	
Co-requisite				Code	
Dept. /College	Biology/Science			Code	
Owner Dept. /College	Biology/Science			Code	
Module Coordinator	Asst. Prof. Dr Delveen Ramdan Ibrahim			Email	Delveen.ibrahim @uod.ac

Module Overview

This course is designed to provide students with a comprehensive understanding of bioinformatics, covering both theoretical foundations and practical applications. The course will explore key bioinformatics concepts, methodologies, and computational tools used for the analysis of biological sequences, including DNA, RNA, and proteins.

Students will gain hands-on experience with sequence alignment, database searching, genome, and equipping them with essential skills for modern biological research. Emphasis will be placed on the role of bioinformatics in understanding gene structure, function, and evolution, as well as its applications in areas such as genomics, transcriptomics, and proteomics.

The course will also introduce key software tools, online databases, commonly used in bioinformatics, providing students with practical experience in data analysis and visualization. Prior knowledge of programming is not required but will be beneficial.

Learning Outcomes

Course Outcomes

Upon successful completion of this course, students will be able to:

- Grasp the fundamental concepts and scope of bioinformatics, understanding its significance in biological research.
- Navigate and utilize various genomic and proteomic databases, such as **GenBank** and **Swiss-Prot**.
- Retrieve and analyze biological sequence data using online bioinformatics tools, including **BLAST**.
- Compare and interpret biological sequences to extract meaningful insights regarding function, structure, and evolution.
- Construct and analyze phylogenetic trees to infer evolutionary relationships between organisms.
- Design primers for molecular biology applications, such as PCR and sequencing.

Topics Covered

Week 1: Introduction to bioinformatics
Practical: Biological databases

Week 2: DNA and protein databases (data storage, file formats)
Practical: Navigating the NCBI website (NCBI Taxonomy, NCBI PMC and Pubmed, NCBI gene , NCBI Nucleotide, ….. etc)

Week 3: Sequence types and BLAST search
Practical: Partial sequences alignment (Comparison of sequences using Basic Local Alignment Search Tool (BLAST), Interpretation of BLAST search results)

Week 4: examination

Week 5: Sequence alignments continued, Alignment scores, multiple alignment
Practical: continue sequence alignment (multiple alignment with different tasks)

Week 6: Primer's design
Practical: Tasks on Primer's design

Week 7: Phylogenetic tree (part 1)
Practical: construction of phylogenetic tree based on protein sequence

Week 8: Phylogenetic tree (part 2)
Practical: construction of phylogenetic tree based on DNA or RNA sequence

Week 9: Determination of consensus sequences, and open reading frames in DNA sequences
Practical: using ORfinder to determine the 6 open reading frames for genes

Week 10: Introduction to proteomics
Practical: Prediction of protein structure and function

Week 11: presentation and report discussion

Week 12: Revision by using different tasks

Mode of Delivery

This module is delivered in person and includes classes and lab sessions that the student should attend. Maximum of 10% absence is permitted.

Assessment Methods and Grading

The evaluation of this module is based on the following components:
- **Assignments & Quizzes (Theory):** 4%
- **Mid-Semester Exam (Theory):** 15%
- **Reports & Presentations:** 6%
- **Lab Reports & Quizzes:** 11%
- **Lab Midterm Exam:** 12%
- **Attendance & Class Activities:** 4%
- **Final Exam (Theory and practical):** 50%

Passing Requirements

To successfully pass this module, a student must:
- Complete all course requirements, including assignments, quizzes, and reports.
- Sit for the **final lab exam**.
- Sit for the **final theory exam**.
- Achieve a **total score of 50% or higher** across all graded components.
Failure to meet any of these conditions may result in not passing the module.

Module Reading List and References

- BIOINFORMATICS FOR BEGINNERS by Supratim Choudhuri (2014).
- Applied Bioinformatics An Introduction by P.M. Selzer • R.J. Marhöfer • A. Rohwer (2008).
- Basics of Bioinformatics by Rui Jiang, Xuegong Zhang and Michael Q. Zhang (2013)
- Up to date online available materials.