

	UNIVERSITAS PADJADJARAN FACULTY OF MATHEMATICS AND NATURAL SCIENCES MASTER PROGRAM IN CHEMISTRY		COURSE CODE: 140120-UND202502033
Module designation	Advanced Bioinformatics		
Semester(s) in which the module is taught	2		
Lecturers	Dr. Shabarni Gaffar; Muhammad Yusuf, Ph.D.		
Medium of instruction	Bahasa Indonesia		
Relation to curriculum	Elective Course		
Teaching methods	Participatory Learning Method (A learning approach in which students actively participate in the learning process—for example, through presentations and discussions—rather than just passively receiving information.		
Workload	Lecture and Discussion : 24 hours Tutorial : 4 hours Assignment : 5 hours Test and Examination : 4 hours Independent Study : 53 hours Total workload : 90 hours		
Credit points	2 (2-0) 2 credit = $2 \times 1.81 \text{ ECTS} = 3.62 \text{ ECTS}$		
Required and recommended prerequisites for joining the module	-		
Module objectives/intended learning outcomes	LO1: Students are able to manage interdisciplinary knowledge and communicate scientific arguments effectively. LO2: Students master theoretical concepts and operational principles related to the isolation, synthesis, and characterization of natural, biological, and non-biological materials, as well as environmental components, using advanced bioinformatics approaches.		
Contents	1. Interdisciplinary Concepts of Bioinformatics and Chemistry; Introduction to Sequence-Based Analysis 2. Sequence Databases (GenBank, UniProt) and Metadata 3. Alignment Algorithms (BLAST, Clustal, MUSCLE) 4. Applications of Sequence Alignment in Natural Product and Environmental Studies 5. Genomic and Proteomic Analysis for Chemical Research 6. Transcriptomic Data and Differential Expression Analysis 7. Sequence-Based Pipelines for Molecular Characterization		

	8. Introduction to Structure-Based Analysis: Protein Structure Concepts 9. Homology Modeling and Structure Validation 10. Binding Site Prediction and Principles of Molecular Docking 11. Protein–Ligand Interaction Analysis Using Computational Tools 12. Case Studies of Structure-Based Approaches in Natural Product Research 13. Integration of Sequence-Based and Structure-Based Approaches into a Unified Pipeline 14. Seminar on Integrative Advanced Bioinformatics Project Results
Examination forms	Written test, assignment, presentation
Study and examination requirements	A minimum of 80% attendance in lectures is required. The final grade will be evaluated based on quizzes (8%), individual assignment (12%), the mid-semester exam (15%), the final exam (15%), class participation (28%), and the project (22%)
Reading lists	1. Dandekar, T. and Kunz, M., 2023. <i>Bioinformatics: An Introductory Textbook</i> . Berlin, Heidelberg: Springer. 2. Sayood, K. and Otu, H.H., 2022. <i>Bioinformatics: A One Semester Course</i> . Cham: Springer.