Module Handbook of Basic of Bioinformatics

Module designation	The Basic of Bioinformatics is a course that studies various tools and methods in processing bioinformatics data and is intended for students of the Agricultural Microbiology study program, Faculty of Agriculture. This course will study database biology, alignment methods, whole genome sequence and DNA sequence analysis, protein structure alignment, X-ray crystallographic principles, 16s rRNA amplicon analysis, and functional gene sequences. After studying this course, students are expected to have a complete understanding of the basics of bioinformatics and its applications, both in advanced courses and for research related to the field of agricultural microbiology.
Semester(s) in which the module is taught	Fifth Semester
Person responsible for the module	Ir. Jaka Widada, M.P., Ph.D.
Language	Bahasa Indonesia/Indonesian Language
Relation to curriculum	*Compulsory Course*
Teaching methods	Lecture are conducted in the class with 30-40 students. In every meeting, there will be delivered interactive lecture and discussion. In some topics there will be quizzes, individual and/or group assignment. Details: 1. Lectures 2. Assignment (Individual and Group) 3. Discussion 4. Midterm 5. Final Exam
Workload (incl. contact hours, self-study hours)	- Lectures = 2 SKS x 50 minutes x 16 meetings = 1.600 minutes = 26,67 hours = 26,67 hours/27,1 hours = 0,98 ECTS - Assignment = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes = 32 hours = 32 hours/27,1 hours = 1,18 ECTS - Self Study = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes = 32 hours = 32 hours/27,1 hours = 1,18 ECTS Total Workload = 3,34 ECTS
Credit points	*2/0 Credit Points*
Required and recommended prerequisites for joining the module	*None*

Module objectives/intended learning outcomes	*Program Learning Outcomes (PLO):* *PLO1: Able to explain theoretical concepts of biology microorganism and develop microbial-based technology to increase plant production and environmental services* *PLO2: Able to describe the latest methodology in the field of microbiology to create environmentally friendly and sustainable agricultural development.* *PLO3: Able to create, retrieve and present data obtained in research, and able to utilize biological data banks.* *Course Learning Outcomes (CLO):* *CLO1: Able to explain the basics of bioinformatics, biological databases, and practice processing biological data obtained from data banks.* *CLO2: Able to operate basic devices used in bioinformatic activities.* *CLO3: Able to give examples of the use of bioinformatics analysis in the field of agricultural microbiology and agriculture in general.*
Content	1. *Introduction to Bioinformatics: Discussion of syllabus, understanding of bioinformatics in general and its use in various fields (1 meeting)* 2. *Biological Databases (1 meeting)* 3. *Pairwise Alignment, Multiple Alignment, and BLAST Primer design (1 meeting)* 4. *Bacterial Whole Genome Sequence Analysis (1 meeting)* 5. *DNA Sequence Assembly and Gene Annotation (1 meeting)* 6. *Materials Reviews for week 1-5 (1 meeting)* 7. *Protein Structure and Principles of X-Ray Crystallography (1 meetings)* 8. *Protein structure alignment (1 meeting)* 9. *Secondary protein structure prediction (1 meeting)* 10. *Phylogenetic analysis of Molecular Sequences Data (1 meeting)* 11. *Data Analysis Sequencing 16s rRNA Amplicon (1 meeting)* 12. *Student seminar (2 meetings)* 13. *Materials Review for week 6-11 (1 meeting)*

Examination forms	High Order Thinking Skills Examination

Grade and Score				
Grade	**Score**	**Grade**	**Score**
A	≥ 85	C+	64,0-66,9
A-	82,0-84,9	C	61,0-63,9
A/B	79,0-81,9	C-	58,0-60,9
B+	76,0-78,9	C/D	55,0-57,9
B	73,0-75,9	D+	52,0-54,9
B-	70,0-72,9	D	49,0-51,9
B/C	67,0-69,9	E	<49

Study and examination requirements	To be able to take the final exams, the minimum of student attendance is 70% out of effective meetings. From 14 meetings, students must take a minimum of 10 meetings to take the exam.
Reading list	*Main References:*

Main References:

1. *Kumar, S. 2014. The Role of Bioinformatics in Agriculture 1st Edition. Apple Academic Press, Canada.*
2. *Osborn, A. M., Smith, C. J. 2005. Molecular Microbial Ecology. Taylor and Francis Group, New York.*
3. *Twyman, R. M. Advanced Molecular Biology: A Concise Reference. Taylor and Francis Group, New York.*
4. *Priyadarshini, A., Pandey, P. 2018. Molecular Biology: Different Facets. Apple Academic Press, Canada*
5. *Lundblad, R. L., F. M. Macdonald. 2018. Handbook of Biochemistry and Molecular Biology. CRC Press, Boca Raton*
6. *Choudhuri, S., D. B. Carlson. 2009. Genomics: Fundamentals and Applications. Informa Healthcare, New York.*

Additional References:

1. *Scientific journal references on bioinformatics engineering*
2. *Video tutorials on the use of various bioinformatics analysis tools which can be accessed via YouTube*
3. *Bioinformatics data from GenBank*