Subject Module
Department of Agrotechnology
Faculty of Agriculture
University of Islam Malang

Module Handbook

Module Title	Biotechnology of Agriculture
Module Level, if available	Undergraduate, Study Program of Agrotechnology
Subject Code	MKW60628
Headings, if available	-
Subject (MK)	Biotechnology of Agriculture
Semester	5
Course Coordinator	Novi Arfarita, SP, MP, M.Sc, Ph.D
Teaching Team	Dr. Ir. Sunawan, MP
Language of instruction	Indonesian Language/English
Linkages with the Curriculum	Study Program : Agrotechnology Specialization: Agrotechnology Type: Compulsory/~~elective~~
Learning Methods and Duration	1. Lecture: 100 minutes/meeting (14 meetings) 2. Research Based Learning through Laboratory Work, experiment : 170 minutes/meeting (8 meetings) 3. Assigments and Presentation (individual and group)
Student Study Load	1. Lecture: 100 minutes/meeting (14 meetings) 2. Laboratory Work: 170 minutes/meeting (8 meetings) 3. Assignments/quiz/presentation 4. Attendance: 75% of total attendance
Credit Weight	3 credits or 5.1 ECTS
Requirements for Passing the Course	• Attendance >75% • The final score of all the components of the learning evaluation >44 The final score component: • 25% Midterm Exam • 25% Final Exam • 20% Laboratory Work • 20% Assignments/Presentation (individual and group) • 10% Presence
Prerequisite Subjects	Microbiology, Biochemistry, Physiology of Plant
Learning Outcomes	The expected learning outcomes are: 1. Have an attitude of creative and innovative thinking in their work in accordance with professional ethics in the field of agriculture (ILO 1).

	2. Behave according to the professional code of ethics in agriculture based on the preaching of the Islamic faith of Ahlusunnah wal Jama'ah (ILO 2). 3. Have good and deep knowledge in the field of basic agricultural science that supports Agrotechnology (ILO 3). 4. Able to solve problems that arise in the field of agrotechnology and related fields of science (ILO 5). 5. Able to apply agricultural practices based on *Good Agricultural Practices* (ILO 8). 6. Able to manage plant production system (ILO 9). 7. Able to design enterprise opportunities in the field of plant production (ILO 10).
Learning Content	After completing this course students are able to: 1. Acquire knowledge of various approaches to manipulating and increasing the yield of crops, livestock, and microorganisms in a variety of fields. 2. Demonstrated the ability to develop, interpret and critically evaluate modern approaches to scientific study. 3. Know a variety of techniques for manipulation of plants, animals, and microorganisms. 4. Have the ability to communicate about science **The topics include:** **1. Introductions** • Definition • History • Concept • Benefits of Biotechnology **2. Techniques in Biotechnology** • Fermentation • Genetic Analysis • Selection and Breeding • DNA analysis • Cell and Tissue Culture • Genetic Engineering **3. Cell Biology** • Type of cell structure in prokaryotic and eukaryotic • Animal and plant cells. • Function of Cell Organelles. **4. Molecular Genetics** • Location of genetic material • Building blocks of chromosomes. • Building blocks of DNA and RNA **5. Technology of Biofertilizer** • Soil fertility concept • The difference between chemical fertilizers, organic fertilizers and biological fertilizers • Biofertilizer concept • The advantage of using biological fertilizers **6. Types of Biofertilizer** • Group of Biofertilizers based on their nature • Group of Biofertilizers based on function **7. Biofertilizer for Consolidating Soil Aggregates (Producing Exopolysaccharides)** • Soil Aggregation • Factors that influence aggregate stability.

	• Organic agents that can increase the stability of soil aggregates. • Method to observe oil aggregation **8. Environmental Biotechnology** • Biodegradation • Bioremediation • Biotechnology of Environment **9. Genetic Replication** • Replication • Transcription • Translation **10. Protein synthesis** • Definition • Process • The linkage of protein synthesis with genetic material **11. Genetic Engineering Techniques in Plants**. • DNA Extraction • Gene Cloning • Gene Design • Transformation • Backcross Breeding **12. Plant Protection Biotechnology against** • Pest • Plant Diseases **13. Agricultural Waste Biotechnology**. • Compost • Biogas **14. GMO Product Regulations** • Biosafety in food and environment • Ethics
Test Terms and Forms	Examination requirements: A minimum of 75 % attendance to attend the final exam Forms of examination: Essay
Learning Media	Projector and screen, Zoom application, Skype, e-book, WA Group, Practicum Manual, samples from the field and consumer goods for research-based learning.
References	**Main References :** 1. Smith, John E. 2009. Biotechnology Fifth edition. Cambridge. Cambridge University Press. 2. Vallero, Daniel A. 2010. Environmental Biotechnology: A Biosystems Approach. USA. Elsevier Academic Press. 3. Clark, David. 2005. Molecular Biology. USA. Elsevier Academic Press. **Supporting References :** 4. **Arfarita, et.al. 2020.** Utilization of Vermiwash for the Production of Liquid Biofertilizers and Its Effect on Viability of Inoculant Bacteria and Green Bean Germination, *AGRIVITA Journal of Agricultural Science,* 43(1): 1–11. 5. **Arfarita, et.al. 2019**. Effects of seaweed waste on the viability of three bacterial isolates in biological fertilizer liquid formulations to enhance soil aggregation and fertility, *Journal of Degraded and Mining Lands Management*, 6(4), 1889-1895.

	6. **Arfarita, et.al. 2019.** Exploration of indigenous free nitrogen-fixing bacteria from rhizosphere of *Vigna radiata* for agricultural land treatment, *Journal of Degraded and Mining Land Managemen*t, 4(1), 1617-1623. 7. **Arfarita, et.al. 2017.** Isolation of indigenous bacteria of phosphate solubilizing from green bean rhizospheres, *Journal of Degraded and Mining Lands Management*, 4(3),845-851. 8. **Arfarita, et.al. 2016.** Exploration of Indigenous Soil Bacteria Producing-Exopolysaccharides for Stabilizing of Aggregates Land Potential as Biofertilizer, *Journal of Degraded and Mining Lands Management*, 4(1), 697-702. 9. **Arfarita, et.al. 2016.** The Application of Trichoderma viride Strain FRP for Biodegradation of Glyphosate Herbicide in Contaminated Land, *Agrivita Journal of Agricultural Science*, 38(3), 275-281. 10. **Arfarita, et.al.** 2016. Characterization of Protease-Producing Bacteria Isolated from Terasi, *Journal of Biological Researches,* 21(1), 18-23. 11. **Arfarita, et.al. 2015.** Isolasi dan Identifikasi Bakteri Penghasil *Protease* yang Diskrining dari Terasi, El-Hayah, 5(3), 119-122. 12. **Arfarita, et.al. 2014.** Potential use of soil-born fungi isolated from treated soil in Indonesia to degrade glyphosate herbicide. *Journal of Degraded and Mining Lands, Management*, 2(1), 63-68. 13. **Arfarita, et.al. 2014.** The potential use of *Trichoderma viride* strain FRP3 in biodegradation of glyphosate herbicide, *Biotechnology and Biotechnological Equipment*, 27(1), 3518-3521. 14. **Arfarita, et.al. 2011.** Screening of Soil-Born Fungi from Forest Soil Using Glyphosate Herbicide as the Sole Source of Phosphorus. *Journal of Water and Environment Technology*, 9, 391-400.