Module Handbook of Agricultural Biotechnology

Module designation	The Agricultural Biotechnology course is a compulsory public course aimed at students of the Faculty of Agriculture. This course covers the basic concepts of biotechnology, methods of microbial recombinant replication, plant breeding biotechnology, environmental biotechnology, and plant protection biotechnology. The course also discusses the safety, regulation and intellectual property rights of genetically engineered and ethically engineered organisms in biotechnology.
Semester(s) in which the module is taught	Fourth Semester
Person responsible for the module	Ir. Donny Widianto, Ph.D.
Language	Bahasa Indonesia/Indonesian Language
Relation to curriculum	*Compulsory Course*
Teaching methods	Lecture are conducted in the class with 80-100 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/30hours = 0,89 ECTS - Assignment = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes = 32 hours = 32 hours/30hours = 1,07 ECTS - Self Study = 2 SKS x 60 minutes x 16 meetings = 1.920 minutes = 32 hours = 32 hours/30hours = 1,07 ECTS - Total Workload = 3,03 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 regarding plant production technology by giving attention to economic and social-humanitarian aspects to achieve quality, sustainable and profitable agriculture.* *PLO2: Able to explain theoretical concepts of biology microorganism and develop microbial-based technology to increase plant production and environmental services.* *PLO3: Able to identify, design, implement, and solve problems that arise in the implementation of agricultural businesses.* *Course Learning Outcomes (CLO):* *CLO1: Students are able to explain the definition of biotechnology, DNA as genetic material, gene structure and expression, as well as the basics of gene cloning.* *CLO2: Students be able to explain about plant protection biotechnology and genetically engineered organisms in terms of safety, regulation and HKI, as well as ethics in biotechnology.* *CLO3: Students be able to explain about most plants in vitro, transgenic plant assembly methods, and plant breeding biotechnology, and explaining the methods of assembly and multiplication of recombinant microbes, and environmental biotechnology.*
Content	1. *Introduction: Definition of biotechnology, history of biotechnology development, and role of biotechnology (1 meeting)* 2. *DNA as genetic material: History of DNA discovery, DNA structure, replication, transcription and translation (1 meeting)* 3. *Gene structure and expression: Genes in prokaryotic cells and eukaryotic cells (1 meetings)* 4. *The Basics of Gene Cloning: definitions of gene cloning, restriction enzymes, vectors, and hosts, isolation, cutting, and selection (1 meeting)* 5. *Method of microbial recombinant assembly (1 meeting)* 6. *Microbial recombinant replication: Fermentation of liquid substrates and fermentation of solid substrates (1 meetings)* 7. *Environmental Biotechnology (1 meetings)* 8. *In-vitro plants regenerations: Definitions, bulk materials, bulk techniques, soma clonal variations, fusion of protoplasts and somatic hybridization. (1 meeting)* 9. *Method of Transgenic Plants Development (1 meeting)* 10. *Plant Breeding Biotechnology (1 meeting)* 11. *Plant Protection Biotechnology (1 meeting)* 12. *Safety, regulation, and intellectual property rights of genetically engineered organisms (1 meeting)* 13. *Ethics in Biotechnology (1 meeting)* 14. *Materials Reviews (1 meeting)*
Examination forms	*High Order Thinking Skills Examination*
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:* 1. *Prasad, B.D. 2018. Plant Biotechnology. Volume 1. Principles, Technique, and Applications. Apple Academic Press.* 2. *Wei-Shou Hu. 2018. Engineering Principles in Biotechnology. Wiley.* 3. *Atul Bhargava, Shilpi Srivastava. 2018. Biotechnology: Recent Trends and Emerging Dimensions. CRC Press; Taylor & Francis.* 4. *Hemant Rawat. 2007. Agricultural Biotechnology. Oxford Book Company.* 5. *Altman, A. 2006. Agricultural Biotechnology. Marcel Dekker, Inc.* 6. *Vincent, C., Goettel, M.S., and Lazarovits, G. 2007. Biological Control: A Global Perspective. CAB International.* 7. *Bannon, G.A. 2007. Biotechnology and Safety Assessment. Elsevier Science, USA.* 8. *Pua, E.C. and Davey, M.R. 2007. Transgenic Crops V. Springer Verlag, Berlin.* 9. *Kesan, J. P. (Eds.). 2007. Agricultural biotechnology and intellectual property: seeds of change. CABI.*