Module Handbook of Introductory to Synthetic Biology

Module designation	This course is an elective course aimed for students of the Agricultural Microbiology study program, Faculty of Agriculture. This course introduces the basic bio brick, Boolean logic, metabolic pathways, engineering metabolic pathways, and their applications in biotechnology. Topics covered include the engineering of metabolic pathways to increase the desired end product.
Semester(s) in which the module is taught	Third/Fifth Semester
Person responsible for the module	M. Saifur Rohman, S.P., M.Eng., M.Si., Ph. D.
Language	Bahasa Indonesia/Indonesian Language
Relation to curriculum	*Elective 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/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	*Biology of Microorganisms, Agricultural Biotechnology, Microbial Genetics, Enzymology, Microbial Physiology*

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 select, utilize and manage the potential of microbes and microbiomes to build industrial and agricultural systems* *Course Learning Outcomes (CLO):* *CLO1: Students are able to explain the fundamental principles in synthetic biolog.* *CLO2: Students are able to explain the basics of biobricks, Boolean logic, as well as metabolic pathway engineering in living organisms.* *CLO3: Students are able to practice circuit design, metabolic pathways, and perform metabolic pathway engineering*
Content	1. *Introduction: Contract lectures, terminology and history of synthetic biology (1 meeting)* 2. *Bio brick (1 meeting)* 3. *Boolean Logic (1 meeting)* 4. *Circuit design (1 meeting)* 5. *Biological Pathways (1 meeting)* 6. *Biological Pathway Engineering (1 meeting)* 7. *Tools of biological pathway engineering (1 meeting)* 8. *Bacterial Chassis (1 meeting)* 9. *Genome Refactoring (2 meetings)* 10. *Application of Synthetic Biology (2 meetings)* 11. *Bioremediation Technology (2 meetings)*
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. *Synthetic Biology: Parts, Devices and Application (Christine Smolke, Sang Yup Lee, Jens Nielsen, and Gregory Stephanopoulos); Year 2018* 2. *Synthetic Biology; Tools and Application (Huimin Zhao (Eds.)); Year 2013* 3. *Bio Builder: Synthetic Biology in the Lab (Natalie Kuldell, Rachel Bernstein, Karen Ingram, Kathryn M. Hart); Year 2015* 4. *System Biology: Constraint-based Reconstruction and Analysis (Bernhard palsson); Year 2015* 5. *Biochemistry Fourth Edision (Donald Voet/ Judith G. Voet); Year 2010* 6. *Bacterial Physiology and Metabolism (Byung Hong Kim and eoffrey Michael Gadd) Year 2012* *Additional References:* *Video tutorial circuit assembly and bio brick on YouTube*