SYLLABUS:

Date / Revision	23 May 2015 / 02 May 2017 / PP
Faculty	Life Sciences (LS)
Study Programs	Chemical Engineering (CHE), Food Technology (FTE)

SUBJECT: Microbiology

1 Basic Information

1.01	**Subject Name**	**Microbiology**
1.02	**Semester**	3
1.03	**Level**	*1*
1.04	**SKS**	3
1.05	**Mandatory / Curriculum**	*D-02*
1.06	**Subject Code**	MIBI
1.07	**Subject Code**	MIBI
1.08	**Year**	2017 (7)
1.09	**Quality Control**	Final Test, OFSE, see evaluation
1.10	**Limitations**	Min 12 and Max 32 students in one class
1.11	**Combined with**	Food Technology and Chemical Engineering
1.12	**Pre-requisite**	Chemistry, Biology
1.13	**Responsible**	Tutun Nugraha PhD
1.14	**Revision**	-

2 Description of Subject

Microbiology is a specialized area of biology that deals with tiny life forms that are not readily observed without magnification. Microbiology is one of the largest and most complex of the biological sciences because it integrates subject matter from many diverse disciplines. Microbiologists study every aspect of microbes—their genetics, their physiology, characteristics that may be harmful or beneficial, the ways they interact with the environment, the ways they interact with other organisms, and their uses in industry and agriculture.

Course contents: humans and the microbial world, microscopy and cell structure, dynamics of microbial growth, control of microbial growth, microbial metabolism: fueling cell growth, the blueprint of life, from dna to protein, identifying and classifying microorganisms, the diversity of bacteria and archaea, the eukaryotic members of the microbial world, viruses, viroids and prions, epidemiology, microbial ecology, environmental microbiology: treatment of water, wastes, and polluted habitats, applied and industrial microbiology.

PO Box 150, BSD CPA 15330
Tel. +62 85212318000
info@iuli.ac.id
www.iuli.ac.id
IULI – Eco Campus, The Breeze
Jl. BSD Grand Boulevard
BSD City 15345
Island of Java

3 Objectives

This course serves as one of the capstone of the curriculum in which students will learn to aply practically all knowledge that have learned since the beginning of the program. Students will select a type of products and they will design the process that is required to economically produce the products chosen. Technological consideration, marketing, economical as well environmental consideration will be applied in the project.

4 Competency

After having the course, students are expected to:

a) Apply the engineering principles that they have learned previously to an engineering designs situations
b) Select a project and learn the literature background information relevant to the projects to ensure proper design
c) Perform engineering calculations to aid in the design of the project
d) Look for new information to support the design and the calculations as related to the requirement of the project (constants fo equations, chemical reactions if relevant, quality objectives, market targets)
e) Evaluate the economic feasibility of the projects
f) Write technical report at the end of the project and present this project and defend the content of their own project
g) Consider environmental feasibilityof the projects

5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers to build the projects;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.
- Writing assignments/preseantations

6 Evaluation

5.1	**Absence maximum**	25%
5.2	**Participation in Discussion**	-
5.3	**Homework / Classwork**	20
5.4	**Presentation /Simulation**	-
5.5	**Daily Quiz**	20
5.6	**Final Examination**	60 Points
	Total	100 Points

PO Box 150, BSD CPA 15330
Tel. +62 85212318000
info@iuli.ac.id
www.iuli.ac.id
IULI – Eco Campus, The Breeze
Jl. BSD Grand Boulevard
BSD City 15345
Island of Java

7 Text Book and Reference

1	**Main Text Book:** a)Text Book: D. Anderson, S. Salm, D. Allen, E. Nester. 2012. Nester's Microbiology: A Human Perspective 8th edition. McGraw Hill.
2	**Supplemental Textbooks:** b) K.P. Talaro and B. Chess. 2012. Foundations in microbiology 8th edition. McGraw Hill.

8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	**Humans and the Microbial World** The dispute over spontaneous generation, microbiology: a human perspective, members of the microbial world **Microscopy and Cell Structure** Microscopes, preparing specimens for light microscopy, morphology of prokaryotic cells	Lecture, Group discusion, tutorial for exercise Chapter 1 and 3 (Nester's Microbiology)	3 × 50 min
2	**Dynamics of Microbial Growth** Principles of microbial growth, microbial growth in nature, microbial growth in laboratory conditions, environmental factors that influence microbial growth, nutritional factors that influence microbial growth, cultivating microorganisms in the laboratory, methods to detect and measure microbial growth	Lecture, Group discusion, tutorial for exercise Chapter 4 (Nester's Microbiology)	3 × 50 min
3	**Control of Microbial Growth** Approaches to control, selecting an antimicrobial procedure, using heat to destroy microorganisms and viruses, using other physical methods to remove or destroy microbes, using chemicals to destroy microorganisms and viruses, preservation of perishable products	Lecture, Group discusion, tutorial for exercise Chapter 5 (Nester's Microbiology)	3 × 50 min
4	**Microbial Metabolism: Fueling Cell Growth** Principles of microbial metabolism, enzymes, the central metabolic pathways, cellular respiration, fermentation, catabolism of organic compounds other than glucose, chemolithotrophs, photosynthesis, carbon fixation, anabolic pathways-synthesizing subunits from precursor molecules	Lecture, Group discusion, tutorial for exercise Chapter 6 (Nester's Microbiology)	3 × 50 min
5	**The Blueprint of Life, from DNA to Protein** Overview, DNA replication, gene expression in bacteria, differences between eukaryotic and prokaryotic gene expression, sensing and responding to environmental fluctuation, bacterial gene regulation, eukaryotic gene regulation, genomics	Lecture, Group discusion, tutorial for exercise Chapter 7 (Nester's Microbiology)	3 × 50 min
6	**Identifying and Classifying Microorganisms** Principles of taxonomy, identification methods based on phenotypes, identification method based on genotype, characterizing strain differences, classifying microorganism	Lecture, Group discusion, tutorial for exercise Chapter 10 (Nester's Microbiology)	3 × 50 min

PO Box 150, BSD CPA 15330
Tel. +62 85212318000
info@iuli.ac.id
www.iuli.ac.id
IULI – Eco Campus, The Breeze
Jl. BSD Grand Boulevard
BSD City 15345
Island of Java

7	**The Diversity of Bacteria and Archaea** Anaerobic chemotrophs, anoxygenic phototrophs, oxygenic phototrophs, aerobic chemolithotrophs, aerobic chemoorganotrophs **The Eukaryotic Members of the Microbial World** Fungi, algae, protozoa, slime molds and water molds, multicellular parasites: helminths, arthropods	Lecture, Group discusion, tutorial for exercise Chapter 11 and 12 (Nester's Microbiology)	3 × 50 min
8	Midterm Break		
9	**Viruses, Viroids and Prions** General characteristics of viruses, bacteriophages, the role of bacteriophages in horizontal gene transfer, bacterial defenses against phages, methods used to study bacteriophages, animal virus replication, categories of animal virus infections, viruses and human tumors, cultivating and quantitating animal viruses, plant viruses, other infectious agents: viroids and prions	Lecture, Group discusion, tutorial for exercise Chapter 13 (Nester's Microbiology)	3 × 50 min
10	**Epidemiology** Basic concepts of epidemiology, chain of infection, factors that influence the epidemiology of diseases, epidemiologic studies, infectious diseases surveillance, emerging infectious diseases, healthcare-associated infections	Lecture, Group discusion, tutorial for exercise Chapter 19 (Nester's Microbiology)	3 × 50 min
11	**Microbial Ecology** Principles of microbial ecology, studying microbial ecology, aquatic habitats, terrestial habitats, biogeochemical cycling and energy flow, mutualistic relationships between microorganisms and eukaryotes	Lecture, Group discusion, tutorial for exercise Chapter 28 (Nester's Microbiology)	3 × 50 min
12	**Environmental Microbiology: Treatment of Water, Wastes, and Polluted Habitats** Microbiology of wastewater treatment, drinking water treatment and testing, microbiology of solid waste treatment, microbiology of bioremediation	Lecture, Group discusion, tutorial for exercise Chapter 29 (Nester's Microbiology)	3 × 50 min
13	**Applied and Industrial Microbiology** Applied microbiology and biotechnology, general concepts in industrial microbiology	Lecture, Group discusion, tutorial for exercise Chapter 27 (Foundations in microbiology)	3 × 50 min
14	**Applied and Industrial Microbiology** The microbiology of food, microbial fermentations in food products from plants	Lecture, Group discusion, tutorial for exercise Chapter 27 (Foundations in microbiology)	3 × 50 min

PO Box 150, BSD CPA 15330
Tel. +62 85212318000
info@iuli.ac.id
www.iuli.ac.id
IULI – Eco Campus, The Breeze
Jl. BSD Grand Boulevard
BSD City 15345
Island of Java

15	**Applied and Industrial Microbiology** Microbial involvement in food-borne diseases	Lecture, Group discusion, tutorial for exercise Chapter 27 (Foundations in microbiology)	3 × 50 min
16, 17	**Final Examination**		

PO Box 150, BSD CPA 15330
Tel. +62 85212318000
info@iuli.ac.id
www.iuli.ac.id
IULI – Eco Campus, The Breeze
Jl. BSD Grand Boulevard
BSD City 15345
Island of Java