Course Syllabus

Department Magister of Biotechnology
Faculty of Biotechnology
Atma Jaya Catholic University of Indonesia

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<table>
<tr><td>Course designation</td><td><u>Advanced Microbiology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1st Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Prof. Dr Diana E Waturangi</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>3 * 170 min</td><td>16</td><td>136 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (3-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 601</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Able to apply advanced microbiology science to benefit themselves and the community in their daily lives
2. Able to analyze interactions between microorganisms and apply them
3. Able to analyze virulence mechanisms of various pathogenic microorganisms
4. Mastering the concept of the body's immune response to the attack of various pathogenic microorganisms</td></tr>
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<table>
<tr><td>Content</td><td><u>Course Description:</u>
Students will gain knowledge about microbiology at an advanced level with an emphasis on diseases and various environmental factors, both water, soil, and air that contribute to the onset of diseases. It is also about the mechanism of infection of various pathogens and how the immune system works against such attacks. Students also get information about how bacteria interact and work together to cause disease in humans</td></tr>
<tr><td>Examination forms</td><td>✓ Written test
Oral test
Performance test (practical)
✓ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>35%</td></tr><tr><td>Assignment/Quiz 1</td><td>30%</td></tr><tr><td>Final Exam</td><td>35%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>-</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Advanced Biochemistry</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1st Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Prof. Dr. Ir. Maggy T. Suhartono</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
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</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (3-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 603</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Understand the unique character of membranes and be able to extract several important functions (S5,S9, KU1, KU2, KK2, P1, P2)
2. Understand the concept of proteins and their functions (S5, S9, KU1, KU3, P1, P2)
3. Can explain the structure and characteristics of various amino acids (S5, S9, KU1, KU3, P1, P2)
4. Can mention the primary, secondary, tertiary and quaternary structures of proteins and explain the principles of protein analysis (S9, KU1, KU3, KU9, P1, P2, P3, P6, P9)
5. Understand protein analysis and extraction and purification (S9, KU1, KU3, KU9, P1, P2, P3, P6, P9)
6. Memahami karakteristik, peranan dan kinetika enzim (S9, KU1, KU3, KU9, P1, P2, P3, P6, P9)
7. Understanding ATP-producing reactions, glycolysis, Krebs cycle, electron transport and beta oxidation, metabolic disorders and their impact on health (S9, KU1, KU3, KU4, P1, P2, P3, P5)
8. Describe the application of biotechnology to protein engineering (S9, KU1, KU3, KU4, P1, P2, P3, P5)</td></tr>
</table>

<table>
<tr><td></td><td>9. Can mention the structure of DNA, RNA, and enzymes/proteins involved as well as replication, transcription and translation mechanisms (S3, S9, KU1, KU3, KU4, KU9, P1, P2, P4, P6)
10. Understand the principles of biochemistry in the new era of biotech genetic engineering and bioinformatics (S3, S9, KU1, KU3, KU4, KU9, P1, P2, P4, P6)</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
This course discusses the continuation of basic biochemistry with the topic of molecular structure and membrane function for transport, where the signaling process begins. Discussion of amino acids and their role in protein function. The structure of the primary, secondary, tertiary, and quaternary proteins and various protein purification and analysis techniques. Discussion of enzymes includes catalytic mechanisms, quantum principles of biology in enzyme reactions, analysis of various kinetic parameters and enzyme inhibitors. The principle of metabolism, the enzymatic reactions that produce energy and those that use energy as well as their regulation and interrelationships. Biochemistry of DNA and RNA nucleic acids, replication, transcription, gene expression and their regulation. Biochemistry applications for molecular biology research and analysis</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>40%</td></tr><tr><td>Assignment/Quiz 1</td><td>10%</td></tr><tr><td>Assignment/Quiz 2</td><td>10%</td></tr><tr><td>Final Exam</td><td>40%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Lehninger A. 2000. Principles of Biochemistry. Terjemahan ke dalam bahasa Indonesia oleh Maggy Thenawidjaja. Jilid 1, 2, 3. Jakarta: Penerbit Erlangga.
Thenawidjaja Maggy, Debbie S Retnoningrum dan Wangsa Tirt Ismaya. 20117. Protein. Serial Biokimia Mudah dan Menggugah. Penerbit Gramedia. Jakarta 241 hal.</td></tr>
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	Voet D, Voet JG, Pratt CW. 2002. *Fundamentals of Biochemistry*. 2002. John Wiley and Sons. Garrelt RH, Grishman CM. 1999. *Biochemistry*. Saunders College Publishing.

<table>
<tr><td>Course designation</td><td><u>Bioinformatics</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1st Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Adi Yulandi, S.Si., MT</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture, Practicum</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>2 * 170 min</td><td>16</td><td>90,7 hour</td></tr>
<tr><td>Practicum</td><td>1 * 170 min</td><td>16</td><td>45,3 hour</td></tr>
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</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (2-1)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 605</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to access molecular biology databases (KU3, KK1, P8)
2. Students are able to do bioinformatics analysis (KU3, KK1, P8)</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
This lecture includes a discussion of the definition and application of bioinformatics, molecular biology data biology databases, molecular biology data sequence comparison, molecular phylogenetic trees, prediction and visualization of protein structures and an introduction to programming for bioinformatics.</td></tr>
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<table>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☑ Performance test (practical)
☐ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
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<tr><td>Reading list</td><td>Selzer PM, Marhofer RJ, Koch O. 2018. Applied Bioinformatics, An Introduction. Ed.ke-2. Swiss: Springer.
Zvelebil MJ, Jeremy OB. 2008. Understanding Bioinformatics. New York: Garland Science, 2008
Yulandi, Adi, et al. “Genomic Sequence of Klebsiella Pneumoniae IIEMP-3, a Vitamin B 12-Producing Strain from Indonesian Tempeh.” Genome Announcements, vol. 4, no. 1, Feb. 2016. Crossref, https://doi.org/10.1128/genomea.01724-15
Yulandi, Adi, Diana Elizabeth Waturangi, Aris Tri Wahyudi, and Antonius Suwanto. “Shotgun Metagenomic Analysis Reveals New Insights on Bacterial Community Profiles in Tempeh,” March 12, 2020. https://doi.org/10.1101/2020.03.12.988444 .</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Molecular Biotechnology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1st Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Antonius Suwanto</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
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<tr><td>Credit points</td><td>Credits: 3 (3-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 607</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
Students are able to understand the importance of variety in life, understand the importance of variety selection in modern biotechnology. Understand the concept of GMOs, microbiomes, and understand the importance of the role of nature and nurture in shaping an individual human and other living things.</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
Providing an understanding of the concept of genetic material and inheritance of traits at the molecular level, genetic variation and the meaning of Genetically Modified Organisms (GMO). Examples of applications in agricultural, food, medical, industrial, and environmental biotechnology are given. In the end, an understanding of the epigenetic and microbiome aspects is given. How to appreciate diversity through understanding the formation of variants in life.</td></tr>
</table>

<table>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
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<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>40%</td></tr><tr><td>Assignment/Mini Project 1</td><td>20%</td></tr><tr><td>Final Exam</td><td>40%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Clark, DP and NJ Pazdernik. 2009. Biotechnology: Applying the genetic revolution. Elsevier, UK.
Henderson, M. 2008. 50 Genetics Idea You Really Need to Know. Quercus Publ. Plc, UK.
Glick, BR and JJ Pasternak. 3rd Ed. 2003. Molecular Biotechnology: Principles and application of recombinant DNA. ASM Press, Washington DC.</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Experimental Method in Biotechnology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>2nd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Ir. Rory A Hutagalung, DEA</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
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<tr><td>Credit points</td><td>Credits: 2 (2-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 602</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Able to design/plan experiments guided by the principles of experimental design in accordance with the treatment design and location design according to the problem (S2, S8, S11, KU1, KK1, P2, P7, and P11).
2. Able to design experiments for a single treatment in accordance with the location design in order to obtain informative data at the lowest cost and be able to analyze the data using statistics, as well as interpret the output in order to draw conclusions (S9, KU1, KK1, P2, and P11).
3. Able to design experiments for dual treatment in accordance with location design in order to obtain informative data at the smallest cost and able to analyze the data using statistics, as well as interpret the output in order to draw conclusions (S9, KU1, KK1, P2, and P11).</td></tr>
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<table>
<tr><td>Content</td><td><u>Course Description:</u>
The experimental method in biotechnology discusses the design of experiments for research in biotechnology, namely the complete steps that need to be taken before the experiment is carried out so that the data that should be needed can be obtained and can be analyzed appropriately so as to produce objective conclusions that apply to the problem being researched.</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:<table><tr><td>Midterm</td><td>35%</td></tr><tr><td>Assignment/Quiz 1</td><td>10%</td></tr><tr><td>Assignment/Quiz 2 (Participant)</td><td>20%</td></tr><tr><td>Final Exam</td><td>35%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Lind DA, Marchal WG, Wathen SA. 2014. Statistical Techniques in Business & Economics. 16th edition. McGraw-Hill International. 830 pp.
Budiarto, E. 2002. Biostatistika untuk Kedokteran dan Kesehatan Masyarakat. Penerbit Buku Kedokteran EGC. Jakarta
Sudjana. 1992. Metoda Statistika. Tarsito. Bandung.
Sugiyono, 2005. Statistika untuk Penelitian. Cetakan kedelapan. C V Alfabeta, Bandung
Walpole, R. E. 1982. Pengantar Statistika. Gramedia Pustaka Utama, Jakarta</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Biotechnology Capita Selecta</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>2nd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Watumesa A. Tan, Ph.D</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
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<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 604</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Describes the various strategies used by pathogenic bacteria to survive and grow in high-level organisms.
2. Synthesize and communicate pathogenicity studies to other students.
3. Explain the various roles of microbes in the environment.
4. Analyze and critique scientific data based on accredited journals.
5. Lead interactive scientific discussions.</td></tr>
</table>

<table>
<tr><td>Content</td><td><u>Course Description:</u>
The microbial world is made up of a wide variety of things. Based on the latest science articles, students will discuss examples of the diversity of microorganisms and their role in various environments, both in terms of pathogenicity and metabolic activity in general. Students will also explore a number of applications related to the diversity of microorganism metabolism.</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☑ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
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<table><tr><td>Midterm</td><td>40%</td></tr><tr><td>Assignment/Quiz 1</td><td>36%</td></tr><tr><td>Assignment/Quiz 2</td><td>12%</td></tr><tr><td>Final Exam</td><td>12%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Bacterial Pathogenesis, by Abigail Salyers and Dixie Whitt.
Mahan, Kristina M., Joseph T. Penrod, Kou-San Ju, Natascia Al Kass, Watumesa A. Tan, Richard Truong, Juanito V. Parales, and Rebecca E. Parales. 2015. Selection for Growth on 3-Nitrotoluene by 2-Nitrotoluene-Utilizing Acidovorax sp. Strain JS42 Identifies Nitroarene Dioxygenases with Altered Specificities. Appl Environ Microbiol 81(1):309-319.
Student-determined accredited scientific journal articles.</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Philosophy of Science</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>2nd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Mikhael Dua</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
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<tr><td>Credit points</td><td>Credits: 2 (2-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 606</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students understand the reasons for studying philosophy of science in the context of studying Biotechnology
2. Students understand and are able to distinguish philosophy from philosophy of science
3. Students are able to explain the rational principles of science and their relevance in science
4. Students are able to define science and are able to explain the biological status of science
5. Students are able to explain the scientific revolution in history and its relevance in the development of science
6. Students are able to explain the basics of scientific knowledge and its relevance to the biology profession
7. Students are able to explain the dynamics of the evolution of science and the relevance of these dynamic properties in the biology profession
8. Students are able to explain the problem of rationality in the scientific revolution and its relevance in the biology profession</td></tr>
</table>

<table>
<tr><td></td><td>9. Students are able to explain and demonstrate the relevance of human values in science in general and in the science and profession of biology</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
This lecture will provide an understanding of the basic concepts of science seen from an analytical approach such as problems, empirical causality, natural laws, theories, concepts and reductions of science. As a continuation, the philosophy of life is specifically discussed, both in terms of ontology and ethics.</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☑ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>30%</td></tr><tr><td>Assignment/Quiz 1</td><td>20%</td></tr><tr><td>Assignment/Quiz 2</td><td>20%</td></tr><tr><td>Final Exam</td><td>30%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Dua, Mikhael. Filsafat Ilmu Pengetahuan, Maumere: Penerbit Ledalero, 2007
Dua, Mikhael, Metode dan Perubahan Pandangan. Jakarta: Penerbit Atma Jaya, 2014
Habermas, Jurgen, The Future of Human Nature. Cambridge: Polity Press, 2003
Jonas, Hans, The Phenomenon of Life, Toward a Philosophical Biology. New York: Harper & Row, Publishers, 1966
Hempel, Carl Gustav, Pengantar Filsafat Ilmu Alam. Yogyakarta: Pustaka Pelajar, 2004</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Special Topics in Biotechnology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>2nd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Prof Dr Diana E Waturangi</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture, Practicum</td></tr>
<tr><td>Workload</td><td>
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<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>2 * 170 min</td><td>16</td><td>90,7 hour</td></tr>
<tr><td>Practicum</td><td>1 * 170 min</td><td>16</td><td>45,3 hour</td></tr>
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</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (2-1)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 608</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Explaining the various microbes of contaminants in food
2. Explain the various microbes that play a role in the food production process
3. Explain some of the dominant microbes of food contaminants both in terms of pathogenicity and prevention</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
This course discusses food-related microbes both as contaminants and microbial applications in the food production process.
Some of the dominant microbes as food contaminants will be discussed separately in more depth both from aspects, pathogenicity, virulence mechanisms, prevention and handling of infections by these microbes.</td></tr>
</table>

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<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☑ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
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<tr><td>Reading list</td><td>Waturangi 2023. Bakteri Pembentuk Biofilm: Ancaman Bagi Kemanan Pangan</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Seminar</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>4th Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Listya U. Karmawan</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
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<tr><td>Lecture</td><td>1 * 170 min</td><td>-</td><td>-</td></tr>
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</td></tr>
<tr><td>Credit points</td><td>Credits: 1 (1-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 650</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to analyze the data of the research results and present them in the form of tables or graphs (S9, KU1, KU8, KK1)
2. Students are able to prepare seminar papers according to the progress of their research results (KU9, P1)
3. Students are able to present their hypotheses, methodologies, results and discussion of research data as well as answer public questions about their research results (S9, KU9, KK3, P1)</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
The seminar is a presentation of the results of the final project research to the public by every student who has been registered in the Seminar course and meets the administrative requirements as attached to the Technical Instructions for the Implementation of the Seminar (separate document, can be accessed from the https://linktr.ee/seminarS2ftbuajlink). Each seminar presenter/presenter is required to complete at least 70% of the final project research, write a seminar paper, and present the results in a forum attended by a minimum of 10 people. The</td></tr>
</table>

<table>
<tr><td></td><td>seminar was attended by the final project supervisor and guided by the seminar moderator. The presentation time was about 15-20 minutes which was followed by a question and answer session by participants, moderators, and closed with a response session by the supervisor. The assessment of the seminar is carried out by the supervisor and moderator of the seminar based on the writing of the paper, the presentation of the seminar, and the ability to answer questions from the forum.</td></tr>
<tr><td>Examination forms</td><td>☐ Written test
☑ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:<table><tr><td>Midterm (Supervisor score)</td><td>50%</td></tr><tr><td>Final Exam (Moderator score)</td><td>50%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Gunawan AW, Lestari D, Magdalena S, Barus T. 2020. Panduan Penulisan Karya Ilmiah Fakultas Teknobiologi. Jakarta: Unika Atma Jaya.
A variety of trusted primary reference sources with a span of the last 10 years</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Thesis</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>4th Semester</td></tr>
<tr><td>Person responsible for the course</td><td>-</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>6 * 170 min</td><td>-</td><td>-</td></tr>
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*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 6 (6-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MBO 700</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to master advanced biotechnology concepts, principles, and methods and integrate them into scientific research activities.
2. Students are able to design and carry out original and independent research in the field of biotechnology with the right methodological approach.
3. Students are able to identify and formulate complex biotechnology problems and provide innovative research-based solutions.
4. Students are able to communicate research results effectively in the form of scientific writings and academic presentations in accordance with scientific rules and academic ethics.
5. Students uphold the values of research ethics and scientific integrity in every stage of the thesis implementation.</td></tr>
</table>

<table>
<tr><td>Content</td><td><u>Course Description:</u>
This course is the final course in the Master of Biotechnology program which is designed to develop students' independence in designing, implementing, analyzing, and reporting the results of scientific research in the field of biotechnology. Students are required to prepare a thesis based on laboratory research or applied studies that are original, systematic, and based on the latest scientific approaches. This process includes problem formulation, literature review, scientific methodology, data analysis, interpretation of results, and the preparation of scientific reports that meet national and international academic standards.

The thesis will be assessed through seminars and final sessions, as well as publications or other academic outputs. Students are expected to demonstrate critical thinking skills, academic integrity, and depth of mastery of the topic being researched.</td></tr>
<tr><td>Examination forms</td><td>☐ Written test
☑ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>-%</td></tr><tr><td>Assignment/Quiz 1</td><td>-%</td></tr><tr><td>Assignment/Quiz 2</td><td>-%</td></tr><tr><td>Final Exam</td><td>-%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>-</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Food and Industrial Biotechnology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Jimmy Suryadi, Ph.D.</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>3 * 170 min</td><td>16</td><td>136 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (3-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 621</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to analyze the development of food innovation according to the development of the times and relate to applicable food regulations (C4)
2. Students are able to explain the role of biotechnology in food processing and industrial processes (C4)
3. Students are able to conclude the application of biotechnology in improving food quality and safety as well as food authentication, such as CRISPR technology, the use of bacteriophage, and molecular-based detection (C5)
4. Students are able to defer food processing and production technology, as well as delivery systems in the food industry with a variety of raw materials, such as natural ingredients, soybeans, cereals and legumes (C5)</td></tr>
</table>

<table>
<tr><td>Content</td><td><u>Course Description:</u>
This course will provide comprehensive and applicable knowledge in the field of food biotechnology to students. The topics taught include the application of food processing technology in the industry, the latest food trends/innovations, food analysis with biotechnology principles, and biotechnology innovations in the food sector. This course approach is carried out through lectures by lecturers according to their respective fields of expertise academically. The students also learn independently to develop the concept of food product development by utilizing innovative food raw materials and processing processes that will be presented in groups at the last meeting of the lecture</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>30%</td></tr><tr><td>Assignment/Quiz 1</td><td>20%</td></tr><tr><td>Assignment/Quiz 2 (Presentation)</td><td>30%</td></tr><tr><td>Final Exam</td><td>20%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Chui M, Evers M, Maryika J, Zheng A, Nisbet T. 2020. The Bio Revolution: Innovations Transforming Economies, Societies, and Our Lives. San Francisco:McKinsey Global Institute.
Lees M [Ed.]. 2003. Food Authenticity and Traceability. Boca Raton: CRC Press.
Mosher M, Trantham K. 2017. Brewing Science: A Multidisciplinary Approach.Switzerland: Springer Nature.</td></tr>
</table>

<table>
<tr><td>Course designation</td><td><u>Environmental Biotechnology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Adi Yulandi, S.Si., M.T</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>3 * 170 min</td><td>16</td><td>136 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (3-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 622</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to design environmental pollution mitigation strategies that are in accordance with the principles and applications of biotechnology in the environmental field</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
The Environmental Biotechnology course discusses the application of biotechnology in addressing environmental problems through topics such as EIA, adaptation of microorganisms to pollutants, heavy metal pollution, and greenhouse gas management. Students will learn bioremediation techniques, the use of biosensors, and biofilters to overcome air and water pollution. This lecture also explores conservation biotechnology, renewable energy, and the contribution of biotechnology to the achievement of the Sustainable Development Goals (SDGs), with a focus on the use of biodegradable plastics.</td></tr>
</table>

<table>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>30%</td></tr><tr><td>Assignment/Quiz 1</td><td>30%</td></tr><tr><td>Final Exam</td><td>40%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>-</td></tr>
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<table>
<tr><td>Course designation</td><td><u>Medical Biotechnology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>-</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>2 * 170 min</td><td>16</td><td>90,7 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 2 (2-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 623</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to understand the theory behind the biotechnological application in medicine
2. Students are able to evaluate advantages and limitations of the applications based on the theory of the application.</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
This course discusses the theory and mechanism of biotechnology application in medicine such as diagnostic tools, drugs, vaccines, and gene therapy. The discussion encompasses the application which has already been deployed in clinical setting as well as in development.</td></tr>
</table>

<table>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>-%</td></tr><tr><td>Assignment/Quiz 1</td><td>-%</td></tr><tr><td>Assignment/Quiz 2</td><td>-%</td></tr><tr><td>Final Exam</td><td>-%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>-</td></tr>
</table>

<table>
<tr><td>Course designation</td><td><u>Business in Biotechnology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Raymond R. Tjandrawinata, PhD, MS, MBA</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
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</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 2 (2-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 624</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Understand the area, structure and cycle of biobusiness
2. Understand the principles of economics to make decisions
3. Understand the definition of strategy, inter organizational aspects of 5 forces and resource base view
4. Understand the financial cycle in business, pricing strategies and investment analysis
5. Understand the biobusiness marketing planning process; including stakeholder involvement
6. Understand the steps from idea to commercialization; critical stage
7. Understand the concept and implementation in the industry, starting from inbound logistics-operation to outbound in order to create the optimal value
8. Understand personal management as a leader in the company
9. Understand human resource issues in the company
10. Understand aspects related to behavioral economics
11. Understanding the nature of patents as an intangible property right for companies</td></tr>
</table>

<table>
<tr><td></td><td>12. Understanding a business case study
13. Implementation of all concepts into a biobusiness model
14. Implementation of all concepts into a biobusiness model</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
Providing business discourse and providing a broad understanding of biobusiness so that students can think about aspects and business planning from ideas to commercial.</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>40%</td></tr><tr><td>Assignment/Quiz 1</td><td>20%</td></tr><tr><td>Final Exam</td><td>40%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>▪ Biobusiness in asia by Gurinder S Shahi, Prentice Hall 2004
▪ Biobusiness – a strategic perspective vol 1 by Gurinder S Shahi, 2005
▪ Inside the tornado by Geoffry A Moore, capstone publishing ltd, 1995
▪ Commercializing technologies by Vijay K Jollie, Harvard business school press 1997
▪ Building global biobrands, Francoise Simon and Philip Kotler, free press, 2003
▪ The innovator’s solution, Clayton M Christensen and Michael E Raynor, HBS press, 2003</td></tr>
</table>

<table>
<tr><td>Course designation</td><td><u>Advanced Food Technology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Raymond R. Tjandrawinata, PhD</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>2 * 170 min</td><td>16</td><td>90,7 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 2 (2-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 625</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to compare physical, chemical, and nutritional changes as well as the application of food additives that occur during the food processing process (C5)
2. Students are able to compare thermal and non-thermal processes as well as various machines/tools involved in food processing (C5)
3. Students are able to consider the right packaging technology for processed food products (C5)
4. Students are able to analyze current food trends and developments, sensory evaluation methods, and business calculations in the commercialization of food products (C4)
5. Students are able to make an outline of a business plan for their food product innovation (C4)</td></tr>
</table>

<table>
<tr><td>Content</td><td><u>Course Description:</u>
Advanced Food Technology is a non-practicum elective course that discusses food processing technology and its packaging, changes in physical, chemical and nutritional properties during processing, innovations in the food sector, the use of food additives, and techniques and instruments used in the food industry. In addition, students are also equipped with business calculations for the commercialization of food products.</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>35%</td></tr><tr><td>Assignment/Quiz 1</td><td>30%</td></tr><tr><td>Final Exam</td><td>35%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>a. Cheung PCK, Mehta BM [Ed]. 2015. Handbook of Food Chemistry. London: Springer Reference.
b. Lawless HT, Heymann H. 2010. Sensory Evaluation of Food: Principles and Practises. 2nd Ed. New York: Springer.
c. Vaclavik VA, Christian EW. 2014. Essentials of Food Science. 4th Ed. New York: Springer.
d. Artikel jurnal ilmiah: Journal of Food Science, Food, Jurnal Aplikasi dan Teknologi Pangan, Jurnal Gizi dan Pangan, Jurnal Teknologi dan Industri Pangan</td></tr>
</table>

<table>
<tr><td>Course designation</td><td><u>Biochemistry Instrumentation</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Yanti</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>2 * 170 min</td><td>16</td><td>90,7 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 2 (2-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 626</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
Students can understand the concept of biochemical instrumentation and use a variety of instruments directly for various models of biochemical experiments in the laboratory.</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
This course teaches about the principles of using a variety of modern laboratory instrumentation in the field of current biochemical research, especially for the purposes of extraction, isolation, purification, and identification of biomolecular and bioactive compounds including column chromatography, thin-layer chromatography, protein electrophoresis (1D and 2D), and ELISA</td></tr>
</table>

<table>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>35%</td></tr><tr><td>Assignment/Quiz 1</td><td>30%</td></tr><tr><td>Final Exam</td><td>35%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>1. Boyer R. 2009. Biochemistry Laboratory: Modern Theory and Techniques. Benyamin Cummings.
2. Philip W, Kuchel and Gregory D Ralston. 1998. Biochemistry. Schaum’s Outline Series. McGraw-Hill.</td></tr>
</table>

<table>
<tr><td>Course designation</td><td><u>Regulation and Gene Expression</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Irvan Faizal</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>3 * 170 min</td><td>16</td><td>136 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (3-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 627</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to explain the definition of gene expression and regulation and provide examples
2. Students are able to explain the application of gene expression and regulation
3. Students are able to link gene expression and regulation with disease
4. Students are able to explain transcription and post-transcription regulations on eukaryotes
5. Students are able to explain the role of epigenetics, the interaction of bacteriophages and bacteria
6. Students are able to explain the role of expression and regulation for biosynthesis in prokaryotes</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
The Gene Regulation and Expression course explains the theory and principles of gene expression and its regulation in prokaryotes and eukaryotes. In addition, it also explains some examples of its application to biological problems related to gene expression and its relationship to human health.</td></tr>
</table>

<table>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>40%</td></tr><tr><td>Assignment/Quiz 1</td><td>20%</td></tr><tr><td>Final Exam</td><td>40%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Molecular Genetics of Bacteria, 4th edition. 2013. ASM Press
Mechanism of Gene Regulation. 2nd edition. 2016. Springer.</td></tr>
</table>

<table>
<tr><td>Course designation</td><td><u>Nutrigenomics</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Prof. Raymond R. Tjandrawinata, PhD, MS, MBA</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
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<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>2 * 170 min</td><td>16</td><td>90,7 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 2 (2-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 628</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to analyze the effects of nutrigenomics and epigenetics on disease (C4)
2. Students were able to relate the role of fermented foods and gut microbiota to nutrigenomics (C4)
3. Students are able to analyze metabolic pathways (digestion, absorption, transport, and excretion) of water and macronutrients/micronutrients (C4)
4. Students are able to compare instruments/tools in nutrigenomics studies (C5)
5. Students are able to conclude the application of nutrigenomics in improving sports performance, slowing down aging, prevention and control of carbohydrate dysmetabolic diseases and other chronic diseases, improving the quality of pregnancy, and other fields (C5)</td></tr>
</table>

<table>
<tr><td>Content</td><td><u>Course Description:</u>
Nutrition in food is one of the important factors that affect human health. Several studies in the field of biotechnology have proven that the food consumed by humans affects the expression of certain genes. Nutrigenomics is a discipline that studies the influence of nutrients on gene expression. Through this course, students get to know the basic concepts of nutrigenomics, the influence of food on gene expression and regulation, and know the importance of micronutrients and nutraceuticals to prevent disease and health in general.</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>45%</td></tr><tr><td>Assignment/Quiz 1 (Presentation)</td><td>10%</td></tr><tr><td>Final Exam</td><td>45%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Carsten Carlberg, Stine Marie Ulven, and Ferdinand Molnár. Nutrigenomics: How Science Works. Springer Nature, 2020.
Yashwant V. Pathak and Ali M. Ardekani (eds). Nutrigenomics and Nutraceuticals: Clinical Relevance and Disease Prevention. CRC Press, 2018.
Yoshinori Mine, Kazuo Miyashita, and Fereidoon Shahidi. Nutrigenomics and Proteomics in Health and Disease: Food Factors and Gene Interactions. Wiley Blackwell, 2009.
Ramesh C. Ray and Montet Didier. Microorganisms and Fermentation of Traditional Foods. CRC Press, 2014.</td></tr>
</table>

<table>
<tr><td>Course designation</td><td><u>Application of Plant Biotechnology in Industry</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Listya Utami Karmawan</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture, Practicum</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>2 * 170 min</td><td>16</td><td>90,7 hour</td></tr>
<tr><td>Practicum</td><td>1 * 170 min</td><td>16</td><td>45,3 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (2-1)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 629</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Students are able to explain the challenges in agriculture in the 21st century (S7, KU5, KK2, P1)
2. Students are able to distinguish various applications of plant biotechnology aimed at improving human welfare (KU1, KU4, KU5, KK1, KK2, KK3, P1, P2, P3)
3. Students are able to describe various interests and aspects that affect the success of plant biotechnology applications in industry (S5, S7, S9, KU2, KU5, KU6, KK3)</td></tr>
<tr><td>Content</td><td><u>Course Description:</u>
Plant biotechnology, includes a wide range of applications of molecular biology principles, DNA technology and plant tissue culture for plant breeding. Through this lecture, students were introduced to the importance of plant biotechnology to answer the global challenges of the agricultural world in order to meet the increasing needs of food and feed in the midst of a lack of agricultural land. The post-Covid 19 pandemic review for the</td></tr>
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<tr><td></td><td>development of plant biotechnology will also be discussed related to the use of crops related to vaccine molecular farming, basic materials for diagnostic tools, and increasing the role of post-pandemic food security. Various techniques including conventional breeding, genetic modification, marker assisted selection, genome editing, synthetic biology, and bioreactor engineering for the production of secondary metabolites are discussed in this lecture. In addition, it will also be discussed that the application of plant biotechnology in industry can only succeed if it considers various aspects of various stakeholders such as consumers, the government and its policies related to plant breeding, industry, mass media, as well as legal regulations related to patents and intellectual property rights.</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>30%</td></tr><tr><td>Assignment/Practicum</td><td>20%</td></tr><tr><td>Final Exam</td><td>50%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Main
Acquaah, G. (2012). Principles of Plant Genetics and Breeding. Retrieved from https://books.google.co.id/books?id=Si-qaSeNcPIC
Dent, M. (2020). Genetic Technologies in Agriculture 2020-2030: Forecasts, Markets, Technologies. Retrieved from https://www.idtechex.com/en/research report/genetic-engineering-in-agriculture-2021-2031/750
Chrispeels, M. J., Sadava, D. E., & Chrispeels, M. J. (2003). Plants, genes, and crop biotechnology. Boston: Jones and Bartlett Publisher.
Snustad, D. P. (2003). Principles of genetics. New York: Wiley.

Additional:
Abdin, M. Z., Kiran, U., & Ali, A. (2017). Plant Biotechnology: Principles and Applications. Retrieved from https://books.google.co.id/books?id=8z5RDgAAQBAJ</td></tr>
</table>

	Griffiths, A. J. F. (2015). Introduction to genetic analysis. New York: W.H. Freeman. Jones, P., & Sutton, J. M. (1997). Plant molecular biology: essential techniques. Chichester; New York: J. Wiley. Paterson, A. H. (1996). Genome mapping in plants. San Diego, Calif.; Landes: Austin, Texas: Academic Press; Slater, A., Scott, N., & Fowler, M. (2003). Plant biotechnology: the genetic manipulation of plants. Retrieved from https://www.google.co.id/books/edition/Plant_ iotechnology/KlbwDwAAQBAJ?hl=en&gbpv=0

<table>
<tr><td>Course designation</td><td><u>Pharmaceutical Biotechnology</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Raymond R. Tjandrawinata</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>3 * 170 min</td><td>16</td><td>136 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 3 (3-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 630</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Able to deepen or expand biological science by producing accurate, tested, innovative models/methods/theory development
2. Able to solve science and technology problems related to biological resources or biological environment, through experimental approaches and/or theoretical deductions in an inter or multidisciplinary manner, characterized by the production of works that have the potential to be applied in solving the problems of science and technology
3. Developing the benefits of biological science to be applied to a wider scope</td></tr>
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<tr><td>Content</td><td><u>Course Description:</u>
Provides an understanding of basic pharmacology, pharmacokinetics, pharmacodynamics, drug discovery and development, how drugs based on molecular pharmacology work, clinical and preclinical trial stages, and introduction to new drug discovery, including next-generation drugs that are based on mRNA and DNA technology, for example, vaccines, monoclonal antibodies and recombinant proteins, microbiota therapies and stem cell applications.</td></tr>
<tr><td>Examination forms</td><td>☑ Written test
☐ Oral test
☐ Performance test (practical)
☑ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:
<table><tr><td>Midterm</td><td>42%</td></tr><tr><td>Assignment/Quiz 1</td><td>16%</td></tr><tr><td>Final Exam</td><td>42%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Publication</td></tr>
</table>

<table>
<tr><td>Course designation</td><td><u>Advanced Science Communication</u></td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>Even/Odd Semester</td></tr>
<tr><td>Person responsible for the course</td><td>Watumesa A. Tan</td></tr>
<tr><td>Language</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>Elective Course</td></tr>
<tr><td>Teaching methods</td><td>Lecture</td></tr>
<tr><td>Workload</td><td>
<table>
<tr><th>Type</th><th>Minutes per week*</th><th>Weeks number</th><th>Total hour per semester</th></tr>
<tr><td>Lecture</td><td>2 * 170 min</td><td>16</td><td>90,7 hour</td></tr>
</table>
*Based on Article 19 paragraphs 1, 2, and 4 of Permendikbud No. 3 of 2020)
</td></tr>
<tr><td>Credit points</td><td>Credits: 2 (2-0)</td></tr>
<tr><td>Required and recommended prerequisites for joining the course</td><td>Code: MOP 633</td></tr>
<tr><td>Course objectives/intended learning outcomes</td><td><u>Course Learning Outcomes:</u>
1. Identify the target audience in communicating science (S9, KU1, KU7, KK2, P1)
2. Formulate key messages that are important to the target audience (S9, KU1, KU7, KK2, P1)
3. Relevant complex scientific concepts so that they can be understood by various groups (S9, KU1, KU7, KK2, P1)
4. Make videos related to their research fields or expertise (S9, KU1, KU7, KK2, P1)</td></tr>
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<table>
<tr><td>Content</td><td><u>Course Description:</u>
The science community produces a vast amount of data and discoveries at rapid speed. To promote a more engaging role for science in the public eye, there is a need for scientists to discuss such complex scientific findings in a clear, concise manner with members of the public. More often, students as blossoming scientists gain their communication skills in the academic setting, where the participants are mostly familiar with the focused subject. In contrast, they might find difficulties in explaining their field of study in a simple and relatable way. Through our course, we will attempt to create a bridge that connects the academic community to those outside their immediate field.</td></tr>
<tr><td>Examination forms</td><td>☐ Written test
☐ Oral test
✓ Performance test (practical)
✓ Assignments (papers, projects, portofolios, products)</td></tr>
<tr><td>Study and examination requirements</td><td>Rating Weight:<table><tr><td>Midterm</td><td>25%</td></tr><tr><td>Reflection video</td><td>25%</td></tr><tr><td>Final Exam (TEDx video)</td><td>50%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Reading list</td><td>Simple Writer [Software]. Retrieved from http://www.xkcd.com/simplewriter/
Wisnubrata. 2017. Gemetar setelah minum kopi? Mungkin anda overdosis kafein [in Indonesian]. Retrieved from http://lifestyle.kompas.com/read/2017/09/05/061500420/gemetar-setelah-minum-kopi-mungkin-anda-overdosis-kafein
Yong, E. 2010. Gut bacteria in Japanese people borrowed sushi-digesting genes from ocean bacteria [Blog post]. Retrieved from http://blogs.discovermagazine.com/notrocketscience/2010/04/07/gut-bacteria-in-japanese-people-borrowed-sushi-digesting-genes-from-ocean-bacteria/#.WZ_0w_BXeEc</td></tr>
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