Updated on 30 October 2021

MODULE HANDBOOK

Bachelor Programme in Biology

Universitas Brawijaya
Building Up Noble Future

MALANG-INDONESIA 2021

TABLE OF CONTENT

INTENDED LEARNING OUTCOMES (ILOs)

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.

ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development.

ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective.

ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety.

ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.

ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.

ILO 7. Have a capacity for teamwork with respecting biodiversity.

ILO 8. Able to understand and has basic entrepreneurship characters relevant to biology.

COMPULSORY COURSES

Module Handbook
General Biology

<table>
<tr><td>Module Name:</td><td colspan="4">General Biology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB61001</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">1st semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Sutiman B. Sumitro, S.U., D.Sc.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Sutiman B. Sumitro, SU., DSc.
2. Dr. Suharjono, MS.
3. Dr. Endang Arisoesilaningsih, M.S.
4. Prof. Dr. Ir. Estri Laras Arumaningtyas, MSc.St.
5. Dr. Jati Batoro, M.Si
6. Dr. Sri Widyarti, M.Si.
7. Drs. Sofy Permana, M.Sc, D.Sc.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Compulsory</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">2.8</td><td>40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">-</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the basic science supporting Biology and success life skills (ILO 2) CLO 2. Understand the structure, function and organization of life (ILO 2). CLO 3. Skilled in using appropriate methods to solve simple problems in the field of biology (ILO 2) CLO 4. Able to communicate in Indonesian and English (ILO 6).
Content	1. Overview on Biology 2. The concept of modern biology and the relevance of learning biology today 3. Widening of competencies, role challenges and success of Biology graduates in the global era 4. The role of biology in nutrigenomics 5. Biocreativity and Bio-entrepreneur 6. Biology in health sciences 7. The role of biology in the world of animal husbandry 8. The role of microbiology in the benefit of society 9. The role of biology in ecological conservation 10. The role of biology in genetic conservation 11. Exploration of plants and their use for various purposes 12. The role of Biology undergraduates in the field of health sciences 13. Application of plant engineering for industry and agriculture
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Small group presentation • Mid and Final Test Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation • Final practice exam Class score (CS): Paper project (10%), quiz (10%), presentation (10%), mid exam (35%), and final exam (35%) Practice score (PS): Report (30%), pre/post-test (15%), presentation (15%), and final practice exam (40%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).

Reading list	• Madigan et al., 2019, Brock Biology of Microorganisms 15th edition, Pearson Education. • Reece, JB, Urry, LA, Cain, ML & Wasserman, SA 2019, Campbell biology, 10th ed, Pearson, Boston. • Reece, JB, Urry, LA, Cain, ML, Wasserman, SA & Minorsky, PV 2017, Campbell biology in focus, Pearson, Boston. • Starr, C, Taggart, R, Evers, C & Lisa, S 2018, Biology: The unity and diversity of life, 15th ed, Cengage Learning, Boston.

Module Handbook
Basic Physics

<table>
<tr><td>Module Name:</td><td colspan="4">Basic Physics</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAP61190</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">1st semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Ir. Wiyono, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Drs. Wasis, M.AB
2. Muh. Gufron, S.Si., M.Si.
3. Triswantoro Putro, S.Si., M.Si</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Compulsory</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">0</td><td>-</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">-</td></tr>
<tr><td></td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

Module objective/ intended learning outcomes	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the basic concepts of Physics and their relevance to understanding Biological phenomena and following current science and technology advances.
Content	1. Basic concepts of physics 2. Unit and Quantity 3. Kinematics I 4. Kinematics II 5. Newtonian Dynamics, Rotational Dynamics 6. Impulse and Momentum 7. Effort and Energy 8. Static Fluid 9. Dynamic Fluids 10. Vibration, Swing in harmony 11. Mechanical Wave 12. Electromagnetic Waves 13. Geometric Optics 14. Shadows on optics
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment • Quiz • Mid and final exam Final score: Assignment (20%), Quiz (10%), mid exam (35%) and final exam (35%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Mansfield, M.M. and O'sullivan, C., 2020. Understanding physics. John Wiley & Sons. • Resnick, R., Halliday, D. and Walker, J., 2021. Fundamentals of physics. John Wiley & Sons.

Module Handbook
Practice in Basic Physics

<table>
<tr><td>Module Name:</td><td colspan="4">Practice in Basic Physics</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAP61191</td></tr>
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<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">1st semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. rer.nat. Abdurrouf, S.Si., M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">-</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Compulsory</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">2.8</td><td>40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>2.8</td><td>-</td><td>45.3 h</td><td>1.5</td></tr>
<tr><td>Credit point</td><td colspan="4">1 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">-</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development.</td></tr>
</table>

	Course learning outcomes (CLO) after completing this module: CLO 1. Skilled in the basic concepts of Physics and their relevance to understanding Biological phenomena and following current science and technology advances.
Content	1. Kinematics 2. Newtonian Dynamics, Rotational Dynamics 3. Impulse and Momentum 4. Effort and Energy 5. Static Fluid 6. Dynamic Fluids 7. Mechanical Wave 8. Electromagnetic Waves 9. Geometric Optics 10. Shadows on optics
Study and examination requirements and forms of examination	Form of examination in laboratory practice: • Report • Pre/post-test • Attitude • Final test Final score: Report (30%) + Pre/post-test (15%) + Attitude (10%) + final test (45%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Mansfield, M.M. and O'sullivan, C., 2020. Understanding physics. John Wiley & Sons. • Resnick, R., Halliday, D. and Walker, J., 2021. Fundamentals of physics. John Wiley & Sons.

Module Handbook
Basic Chemistry

<table>
<tr><td>Module Name:</td><td>Basic Chemistry</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAK61004</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>1st semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Drs. Sutrisno, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td>1. Suratmo, M.Sc
2. Dra. Anna Roosdiana, M.App.Sc.
3. M. Farid Rahman, S.Si., M.Si.
4. Prof. Dr. Chanif Mahdi, MS</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table><tr><td>Programme</td><td>Mode</td><td>Semester</td></tr><tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td>Odd</td></tr></table></td></tr>
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<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table><tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr><tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr></table></td></tr>
<tr><td>Credit point</td><td>2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td></td><td>Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

Module objective/ intended learning outcomes	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the basic concepts of Chemistry and their relevance to understanding Biological phenomena and following current science and technology advances.
Content	1. Introduction: Chemistry in life 2. Atoms, Molecules, Ions and Chemical Bonds 3. Chemical Reactions and Equations 4. Stoichiometry 5. Solution and Concentration 6. Acids and Bases 7. Thermodynamics 8. Chemical Kinetics 9. Organic Chemistry 10. Functional Group
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment • Quiz • Mid and final exam Final score: Assignment (20%), Quiz (10%), mid exam (35%) and final exam (35%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Brescia, F., 2012. Fundamentals of Chemistry: A Modern Introduction (1966). Elsevier. • Ebbing, D. and Gammon, S.D., 2016. General chemistry. Cengage Learning. • Oxtoby, D.W., Gillis, H.P. and Butler, L.J., 2015. Principles of modern chemistry. Cengage learning. • Petrucci, R.H., Harwood, W.S., Herring, G.E., Madura, J. 2007. General Chemistry: Principles and Modern Application. Prentice Hall.

Module Handbook
Practice in Basic Chemistry

<table>
<tr><td>Module Name:</td><td colspan="4">Practice in Basic Chemistry</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAK61005</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">1st semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Yuniar Ponco Prananto, S.Si., M.Sc., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">-</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>2.8</td><td>-</td><td>45.3 h</td><td>1.5</td></tr>
<tr><td>Credit point</td><td colspan="4">1 credit unit (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">-</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development.</td></tr>
</table>

	Course learning outcomes (CLO) after completing this module: CLO 1. Skilled in the basic concepts of Chemisty and their relevance to understanding Biological phenomena and following current science and technology advances.
Content	1. Introduction of chemical tools and materials 2. Solution preparation 3. Acid level determination 4. Separation of solids and liquids 5. Identification of simple chemical reactions 6. Buffer solution preparation 7. Distillation of binary solutions 8. Colorimetric analysis 9. Electrolyte solutions
Study and examination requirements and forms of examination	Form of examination in laboratory practice: • Report • Pre/post-test • Attitude • Final test Final score: Report (30%) + Pre/post-test (15%) + Attitude (10%) + final test (45%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Brescia, F., 2012. Fundamentals of Chemistry: A Modern Introduction (1966). Elsevier. • Ebbing, D. and Gammon, S.D., 2016. General chemistry. Cengage Learning. • Oxtoby, D.W., Gillis, H.P. and Butler, L.J., 2015. Principles of modern chemistry. Cengage learning. • Petrucci, R.H., Harwood, W.S., Herring, G.E., Madura, J. 2007. General Chemistry: Principles and Modern Application. Prentice Hall.

Module Handbook
Basic Biocomputation

Module Name:	Basic Biocomputation
Module Level:	Bachelor
Abbreviation, if applicable:	MAB61002
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	1st semester
Person responsible for the module:	Irfan Mustafa, S.Si., M.Si., Ph.D
Lecturer(s):	1. Irfan Mustafa, S.Si., M.Si., Ph.D 2. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D 3. Viky Vidayanti, S.Si., M.Si
Language:	Indonesian
Relation to curriculum	(see table below)
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc. (see table below)
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours (see table below)
Credit point	3 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	-
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:

Relation to curriculum:

Programme	Mode	Semester
Bachelor Programme in Biology	Compulsory	Odd

Type of teaching, contact hours:

Teaching method	Contact hours per week	Class size
Lectures	1.7	40
Exercise (structured assignment & independent learning/ self-study)	4.0	40
Laboratory practice	2.8	40

Workload:

Contact hours per week	Private/self-study per week	Semester workload	ECTS
4.5	4.0	136 h	4.5

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain and understand the application of computational science in the field of Biology (ILO 2) CLO 2. Able to explain and understand simple programming principles in Python (ILO 3) CLO 3. Able to explain and perform various computer applications in the field of Biology (ILO 4)
Content	1. Computer and operating system 2. Biocomputing and Big Data 3. Python and BioPython 4. Algorithm 5. Computer applications in biology 6. Biological database 7. Introduction to SPSS and RStudio 8. MS Excel application for biocomputing 9. Web-based biology application 10. Applications for presentations 11. Practice simple programming with Python
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Form of examination in laboratory practice: • Lab report • Pre/post-test • Final practice exam Class score (CS): Quiz (15%) + Assignment (15%), mid exam (35%), and final exam (35%) Practice score (PS): Report (30%) + pre/post-test (25%) + final practice exam (45%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Efendi, A., 2017. Biostatistika dengan R dan MS Excel. UB Press. Malang. • Morgan, G.A. Leech, N.L. Gloeckner, G.W. Barret, K.C. 2011. IBM SPSS for Introductory Statistics: Use and Interpretation. Routledge, NY, USA.

	• Pardalos, P.M. and Príncipe, J.C. eds., 2013. Biocomputing (Vol. 1). Springer Science & Business Media. • Zelle, J.M. 2004. Phyton Programming: An Introduction to Computer Science. Franklin, Beedle and Associate Inc. Oregon, USA.

Module Handbook Civilization

Module Name:	Civilization		
Module Level:	Bachelor		
Abbreviation, if applicable:	MPK60006		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	1st semester		
Person responsible for the module:	Triya Indra R., S.H., M.H.		
Lecturer(s):	1. Triya Indra R., S.H., M.H. 2. Prisca Kiki W., S.Pd., M.Sc. 3. Galieh Damayanti, S.H., M.H. 4. Dr. Mohamad Anas, M.Phil. 5. Emi Setyaningsih, M.Phil. 6. Destriana Saraswati, M.Phil. 7. Albar Adetary Hasibuan, M.Phil.		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40
	Exercise (structured assignment & independent learning/ self-study)	4.0	40
	Laboratory practice	0	-

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			
	Intended learning outcomes (ILO) corresponding to this module:			

Module objective/ intended learning outcomes	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.
	Course learning outcomes (CLO) after completing this module: CLO1. Able to understand the nature of civic education in developing the full capabilities of undergraduates or professionals and linking the values of Pancasila with the subject matter in the subject of Citizenship Education CLO 2. Able to interpret the concept of the Unitary State of the Republic of Indonesia and identify and recognize the uniqueness of the Indonesian legal state which is rooted in the values of Pancasila CLO 3. Able to understand the supremacy of the constitution and the peculiarities of the 1945 Constitution of the Republic of Indonesia which is based on the values of Pancasila and to sort out constitutional and unconstitutional behaviour in the life of the nation and state CLO 4. Able to understand, identify, and maintain national identity from popular culture in the current of globalization CLO 5. Able to build awareness and believe in the importance of involvement or participation in the practice of Pancasila democracy CLO 6. Able to examine Pancasila as the philosophical foundation of Human Rights in the State of Indonesia and compromise between human rights and obligations in the life of the nation and state. CLO 7. Able to understand the concept of geopolitics and geopolitics in Indonesia as well as classifying the potential diversity of natural resources and human resources in the concept of regional autonomy based on the Archipelago. CLO 8. Able to show a sense of love for the homeland, have nationalism, and a sense of responsibility answer to the state and nation.
Content	1. Introduction and Urgency of Citizenship Education 2. Indonesian State and Citizens 3. Constitution and the 1945 Constitution of the Republic of Indonesia 4. National Identity 5. Pancasila Democracy 6. Human Rights 7. Archipelago Insight 8. National Resilience
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Class participative (during discussion) • Mid and Final Test

	Final score: Quiz (10%) + Assignment (15%) + Class participative (15%) + mid exam (30%) + final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Tim Dosen Pendidikan Kewarganegaraan Universitas Brawijaya, 2019, Buku Ajar Pendidikan Kewarganegaraan • Kementerian Riset, Teknologi dan Pendidikan Tinggi, 2016, Pendidikan Kewarganegaraan untuk Perguruan Tinggi Jimly Asshiddiqie, 2010. Konstitusi dan Konstitusionalisme Indonesia. Jakarta: Sinar Grafika Jimly Asshiddiqie, 2014. Pengantar Ilmu Hukum Tata Negara. Jakarta: PT Raja Grafindo Persada • Mahfud MD, 2010, Politik di Indonesia, Jakarta: Rajawali Press • Muhamad Erwin, 2010. Pendidikan Kewarganegaraan Republik Indonesia. Bandung: • Kaelan, 2013, Negara Kebangsaan Pancasila, Yogyakarta: Paradigma • Yudi Latief, 2011, Negara Paripurna: Historisitas, Rasionalitas, dan Aktualitas Pancasila, Jakarta: Gramedia • Yudi Latief, 2014. Mata Air Keteladanan: Pancasila dalam Perbuatan, Bandung: Mizan • Suseno, Magnis, 2003, Etika Politik, Prinsip-prinsip Moral Dasar Kenegaraan Modern, Jakarta: Gramedia

Module Handbook
English Language

Module Name:	English Language
Module Level:	Bachelor
Abbreviation, if applicable:	UBU60005
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	1st semester
Person responsible for the module:	Emy Rahmawati Isfatin K, S.S., M.Hum
Lecturer(s):	1. Emy Rahmawati Isfatin K, S.S., M.Hum 2. Muh. Suluh Jati, S.S., M.A.
Language:	Indonesian and English
Relation to curriculum	<table><tr><td>Programme</td><td>Mode</td><td>Semester</td></tr><tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td>Odd</td></tr></table>
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc. <table><tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr><tr><td>Lectures</td><td>1.7</td><td>40</td></tr><tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40</td></tr><tr><td>Laboratory practice</td><td>0</td><td>-</td></tr></table>
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours <table><tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr><tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr></table>
Credit point	2 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	-
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.

	Course learning outcomes (CLO) after completing this module: CLO 1. Able to remind the basics of English grammar. CLO 2. Able to understand English reading which is related to the development of academic abilities. CLO 3. Able to write several types of paragraphs and present academic presentations.
Content	1. Introduction to the course 2. Introduction to academic English P.O.S, S-V Agreement 3. Brainstorming: Present tense 4. Identifying paragraph: Past tense 5. Introduction to academic English I: Future tense 6. Introduction to academic English I: Question and conditional 7. Descriptive writing: Sentences writing 8. Compare contrast writing: Active passive sentences 9. Academic writing: Argumentative 10. Article review: Language focus (Identifying P.O.S) 11. Article review: Language focus (Identifying present tense) 12. Article review: Language focus (Identifying past tense) 13. Article review: Language focus (Identifying future tense) 14. Article review: Language focus (Identifying active and passive)
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Exam Final score: Quiz (15%) + Assignment (20%) + Presentation (10%) + Mid exam (25%) + Final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Alexander,L.G.(2003).LongmanEnglishGrammar. • Altenberg, E. & Vago, R.M. (2010). Understanding The Basic English Grammar. • Eggenschwiller, J & Biggs, E.D. (2001). CliffsQuickReviewTM Writing: Grammar, Usage, and Style. • Lester, M. (2008). ESL Grammar: a Handbook for Intermediate and Advanced ESL Students. • Sargeant, H. (2007). Basic English Grammar for English Language Learners.

Module Handbook
Method of Bioresearch and Scientific Writing I

<table>
<tr><td>Module Name:</td><td>Method of Bioresearch and Scientific Writing I</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB61003</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>1st semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Dr. Suharjono, M.S</td></tr>
<tr><td>Lecturer(s):</td><td>1. Dr. Suharjono, M.S.
2. Nia Kurniawan, S.Si., M.P., D.Sc.
3. Tri Ardyati, M.Agr., Ph.D
4. Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D
5. Prof. Muhaimin Rifa'i, S.Si., Ph.D. Med.Sc.
6. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table><tr><td>Programme</td><td>Mode</td><td>Semester</td></tr><tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td>Odd</td></tr></table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table><tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr><tr><td>Lectures</td><td>1.7</td><td>40</td></tr><tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40</td></tr><tr><td>Laboratory practice</td><td>0</td><td>-</td></tr></table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table><tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr><tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr></table></td></tr>
<tr><td>Credit point</td><td>2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td></td><td>Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

Module objective/ intended learning outcomes	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering theoretical concepts or their applications in the scope of one field (intradisciplinary). CLO 2. Able to design and present alternatives. CLO 3. Mastering instruments related to the field of biological studies they are dealing with. CLO 4. Have responsibility in participating in lecture activities and completing assignments for one semester. CLO 5. Able to provide instructions/input in a work team.
Content	1. The nature of science, the development of science & technology and research ethics in general 2. Biology as an empirical science of scientific and non-scientific truths 3. Techniques for finding references from the internet, and making reviews, summaries (resumes) of journals and papers 4. Systematics of practicum reports; introduction (background, problem formulation, objectives), literature review (techniques for selecting, reading, and referring to library materials) and bibliography 5. Preparation of PKM MABA (new student creativity program) proposals 6. Writing method, presentation (pictures, tables, guide reader) and interpretation of practicum results and discussion, conclusions and suggestions 7. Structured assignment presentation strategies (choice of topics/journals, compiling summaries, and power points) and practice reports 8. Prepare a practice report in form of poster 9. Preparation of PKM MABA (new student creativity program) proposals
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Small Group Presentation • Mid and Final Test Final score: Quiz (10%) + Assignment (15%) + Presentation (15%) + mid exam (30%) + final exam (30%).

Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Howard, K and Sharp, J.A., J. Peters dan K. Howard. 2002. The Management of a Student Research Project. Gower Publ. Cambridge. • Kemendikbud, 2020. Buku Pedoman Program Kreativitas Mahasiswa: Pedoman Umum. Direktorat Belmawa. • Matthews, J.R. dan R.W. Matthews. 2008. Successful Scientific Writing. Cambridge Univ. Press. Cambridge; • Nazir, M. 1988. Metode Penelitian. Ghalia Indonesia, Jakarta; • Routledge, P. 2001. Science and technical writing: a manual of style. Routledge. New York; • Suriasumantri, J.S. 1981. Ilmu dalam Perspektif. Gramedia. Jakarta.

Module Handbook
Religion - Islam

Module Name:	Religion - Islam
Module Level:	Bachelor
Abbreviation, if applicable:	MAK60001
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	1st semester
Person responsible for the module:	Prof. Dr. Thohir luth, MA
Lecturer(s):	1. Prof. Dr. Thohir luth, MA 2. Dr. Nur Chanifah, S.Pd.I, M.Pd.I 3. Drs. Khusnul Fatoni, M.Ag 4. Drs. Abdul Halim, M.Ag 5. Arif Mustapa, M.Si 6. In'amul Wafi, M.Ed. 7. Mokhamad Rohma Rozikin, M.Pd 8. Khalid Rahman, M.Pd.I. 9. Siti Rohmah, SH.I, MH.I
Language:	Indonesian
Relation to curriculum	Programme: Bachelor Programme in Biology; Mode: Compulsory; Semester: Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
Credit point	2 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.

Relation to curriculum:

Programme	Mode	Semester
Bachelor Programme in Biology	Compulsory	Odd

Type of teaching, contact hours:

Teaching method	Contact hours per week	Class size
Lectures	1.7	40
Exercise (structured assignment & independent learning/ self-study)	4.0	40
Laboratory practice	0	-

Workload:

Contact hours per week	Private/self-study per week	Semester workload	ECTS
1.7	4.0	90.7 h	3

Recommended prerequisites	-
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.
	Course learning outcomes (CLO) after completing this module: CLO 1. Have faith and fear Allah SWT. CLO 2. Have good morals (honest, trustworthy, hard work, responsibility, and discipline). CLO 3. Able to develop correct and critical thinking and reasoning in understanding various actual problems from an Islamic perspective. CLO 4. Able to respect the rights of individuals and groups by providing freedom of expression with responsibility. CLO 5. Able to apply morality in everyday life, both on campus, family, and society. CLO 6. Able to build harmonious relationships and mutual respect in diversity.
Content	1. Introduction: The Urgency of Islam in Higher Education 2. Integration of Faith, Islam and Ihsan in Forming Whole Humanity 3. Implementation of Islamic Aqeedah in Realizing Happiness in the World and the Hereafter 4. Islam Rahmatan Lil 'Alamin 4. The Role of Mosques in Building Human Civilization 5. Islamic Law in Indonesian Context 6. Morals and Modern Problems 7. Islam and the Challenge of Radicalism 8. The Qur'anic Paradigm in Facing the Development of Modern Science and Technology 10. Corruption and its Prevention from an Islamic Perspective 9. Islamic Economic and Administrative System 10. Politics and Love for the Homeland in an Islamic Perspective.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Final score: Quiz (10%) + Assignment (15%) + Class participation (15%) + mid exam (30%) + final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Thohir Luth, dkk. Buku Ajar Pandidikan Agama Islam, PMPK UB, 2019 • Direktorat Belmawa Dikti, Buku Ajar MKWU Pendidikan Agama Islam, Ditjen Belmawa, 2016.

	• Thohir Luth, dkk. Buku Daras Pendidikan Agama Islam, Malang, Universitas Brawijaya, 2012.

Module Handbook
Religion - Catholicism

<table>
<tr><td>Module Name:</td><td>Religion - Catholicism</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAK60002</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>1st semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Donatus Maria Triman Adi Wibowo, Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td>Donatus Maria Triman Adi Wibowo, Ph.D</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table>
<tr><td>Programme</td><td>Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td>Odd</td></tr>
</table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table>
<tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td>0</td><td>-</td></tr>
</table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
</table></td></tr>
<tr><td>Credit point</td><td>2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand themselves in terms of their origins and goals in life as the image of God who is religious and has faith in Christ and as a Church sent to continue the work of salvation in society. CLO 2. Able to communicate well, be independent, and tolerant in developing a harmonious life between religious communities. CLO 3. Able to become Catholic students with conscience who are sensitive to their environmental situation.
Content	1. INTRODUCTION AND LEARNING CONTRACT. a. The Urgency of Catholic Religious Education. b. Explanation of Syllabus and RPS. c. Learning Contract. 2. HUMANS a. Basic Problems of Human Life. b. Noble Human Dignity. 3. RELIGION a. The Relationship between Revelation, Faith and Religion. b. The Meaning and Function of Religion. c. Religious Motivation. d. Religious plurality. e. Inter-religious harmony. 4. JESUS CHRIST. a. Sources of the Catholic Faith: Scripture and Tradition. b. The mystery of the Triune God. c. Faith in Jesus Christ. d. Mission to Proclaim Jesus Christ. 5. CHURCH a. The Nature of the Church. b. Church Functions. c. Church History. 6. LAW AND THE SACRAMENTS. a. Law and the Church. b. Ecclesiastical sacramentality. 7. MORAL. a. Human calling. b. Moral and Ethics of Christian Life. 8. COMMUNITY FAITH. a. Church Social Teaching. b. The challenges and opportunities of life of faith.. c. Capita Selecta: Environment, Gender, HIV/AIDS, Human Rights, Culture, Politics.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Class participation • Mid and Final Test

	Final score: Quiz (10%) + Assignment (15%) + Class participation (15%) + mid exam (30%) + final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• ALKITAB :Kej 2,1-7; Mat 5,1-2. • Franz Dahler, Pijar Peradaban Manusia, Yogyakarta, Kanisius. • Leahy Louis, Siapakah Manusia, Yogyakarta, Kanisius. • PausYohanes Paulus II, Fides et Ratio, Jakarta, Dokpen KWI • Paus Benediktus XVI, Hubungana ntara Ilmu Pengetahuan dan Kebenaran, PradicamusVol VIII.

Module Handbook
Religion - Protestantism

Module Name:	Religion - Protestantism		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAK60003		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	1st semester		
Person responsible for the module:	Dr. Roike Roujer Kowal. S.Th., M.Th., Ma		
Lecturer(s):	Dr. Roike Roujer Kowal. S.Th., M.Th., Ma		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40
	Exercise (structured assignment & independent learning/ self-study)	4.0	40
	Laboratory practice	0	-

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the knowledge of Christian values that come from understanding God and human nature and the sins that prevent humans from receiving God's blessings. CLO 2. Able to live according to Christian values in daily life in a critical, rational, ethical and dynamic way.
Content	1. Introduction and learning contract. 2. God: God's Existence, The nature and nature of God, and the conception of God according to the Christian faith. 3. Human: Human nature, and the concept of man according to Christianity. 4. Moral: The meaning of Christian ethics / morals for Christians 5. Science and Technology: The positive reciprocal relationship between faith and science. 6. Harmony: Pluralism in Indonesia, and the obstacles around it Pluralism. 7. Society: The role of Christians in society 8. Work culture influenced by globalization and modern era 9. Politics: Politics and in relation to Christian views, and the socio-political responsibilities of Christians. 10. Law: Definition and types of law, Christian views on law, and Christian responsibility for God's laws and commands.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Final score: Quiz (20%) + Assignment (20%) + mid exam (30%) + final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• ALKITAB :Kej 2,1-7; Mat 5,1-2. • Franz Dahler, Pijar Peradaban Manusia, Yogyakarta, Kanisius. • Leahy Louis, Siapakah Manusia, Yogyakarta, Kanisius. • PausYohanes Paulus II, Fides et Ratio, Jakarta, Dokpen KWI • Paus Benediktus XVI, Hubungana ntara Ilmu Pengetahuan dan Kebenaran, PradicamusVol VIII.

Module Handbook
Religion - Buddhism

Module Name:	Religion - Buddhism			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAK60005			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	1st semester			
Person responsible for the module:	Kadek Yudi Murdana, Ma(B.Dh)			
Lecturer(s):	Kadek Yudi Murdana, Ma(B.Dh)			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Compulsory	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40	
	Laboratory practice	0	-	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the framework and contents of the Tipitaka/Tripitaka scriptures. CLO 2. able to understand the meaning and purpose of human life that comes from the teachings of Buddha. CLO 3. Able to understand the role of Buddhist universal law in daily life. CLO 4. Able to understand the meaning of Godhead in Buddhism. CLO 5. Able to understand moral values and norms (sila) as the basis and pattern of life. CLO 6. Able to understand the harmony of science and technology and art in life. CLO 7. Able to understand the concept of Buddhist society and the construction of attitudes of inter-religious harmony. CLO 8. Able to understand the dynamics of Buddhist culture and politics in the context of Indonesian nationality. CLO 9. Able to understand about bhavana to form a clean mind of human character.
Content	1. The Tipitaka/Tripitaka scriptures 2. The meaning and purpose of human life that comes from the teachings of Buddha 3. The role of Buddhist universal laws in daily life 4. The Meaning of the Supreme Godhead in Buddhism 5. Moral values and norms (sila) as the basis and pattern of life 6. Harmony of science and technology and art in life 7. The concept of Buddhist society and the construction of an attitude of inter-religious harmony 8. The dynamics of Buddhist culture and politics in the context of Indonesian nationality 9. Bhavana to form a clean mind of human character
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Final score: Quiz (20%) + Assignment (20%) + mid exam (30%) + final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Bodhi, Bhikkhu. In the Buddha's Words.Wisdom Publication. Boston. 2005.

	• Wowor, Cornelis. 1999. Hukum Kamma Buddhis. Jakarta: Rora Karya. • Dirjen Belmawa, Pendidikan Agama Buddha untuk Perguruan Tinggi, Jakarta. 2016. • Kusaladhamma, Ashin. Kronologi Hidup Buddha. Ehipassiko Foundation. Jakarta. 2015. • Mahathera, Narada. 1996. Sang Buddha dan Ajaran-ajaranNya. Jakarta: Dhammadipa Arama

Module Handbook
Biosystematics

Module Name:	Biosystematics
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60004
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	2nd semester
Person responsible for the module:	Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D
Lecturer(s):	1. Dr. Suharjono, M.S. 2. Nia Kurniawan, S.Si., M.P., D.Sc. 3. Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D 4. Irfan Mustafa, S.Si., M.Si., Ph.D 5. Prof. Amin Setyo Leksono, M.Si., Ph.D 6. Dr. Jati Batoro, M.Si.
Language:	Indonesian
Relation to curriculum	Programme / Mode / Semester: Bachelor Programme in Biology / Compulsory / Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc. Teaching method / Contact hours per week / Class size: Lectures / 1.7 / 40 Exercise (structured assignment & independent learning/ self-study) / 4.0 / 40 Laboratory practice / 0 / -
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours Contact hours per week / Private/self-study per week / Semester workload / ECTS: 1.7 / 4.0 / 90.7 h / 3
Credit point	2 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	-
	Intended learning outcomes (ILO) corresponding to this module:

Module objective/ intended learning outcomes	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the principles and concepts of biosystematics and its important role in the field of biology. CLO 2. Explain the application of biosystematic studies in solving biological problems from a bioconservation perspective. CLO 3. Complete the task in compiling the components of biosystematics, as well as conveying their interpretation well.
Content	1. Definition of Biosystematics (difference and intersection with Taxonomy) 2. Principles of Biosystematics, its position and role in biological studies. 3. Evolution of living things, the occurrence of Variations & Species, and aspects of phylogeography. 4. Evolution of Evidence as Taxonomic markers and their reference sources (relevant literature, institutions and methods) 5. Methods of documenting relevant taxon/organism samples for biosystematics studies (e.g., herbarium, gene-bank etc.) 6. Components of Biosystematics: (Description, Classification, Identification, Nomenclature, and Phylogeny), and their application to living taxa. 7. The concept of phylogeny and its approach/study models 8. Interpretation of phylogenetic trees and recent developments 9. Construction of a phylogenetic tree (manual and electronic): dendrogram and cladogram 10. Analysis and Review.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Final score: Quiz (15%) + Assignment (15%) + mid exam (35%) + final exam (35%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Darwin, C. 1859. On the origin of species. W. Clowes and Sons. London UK

	• Futuyma, D.J. 2005. Evolution. Sinauer Associates, Inc. Publisher. Sunderland USA • Judd,W. S., C. S. Campbell, E. A. Kellog, P. F. Stevens, & M. J. Donoghue. 2008. Plant Systematics A Phylogenetic Approach Second Edition. Sinauer Associates. Sunderland. • Margulis, L. and Schwartz, K.V. 1998. Five Kingdoms, an Illustrated Guide to the Phyla of Life on Earth. 3rd edition. A.W.H. Freeman/Owl Book. New York. • Mayr, E. 2001. What Evolution Is. Orion Books Ltd. London England • Mayr, G. 2009. Paleogene Fossil Bird. Springer-Verlag Berlin Heidelberg. Heidelberg Germany • Radford, A.E. 1986. Fundamentals of Plant Systematics. Harper & Row Publisher. NY; • Simpson, M.G. 2011. Plant Systematics. Elsevier. Academic Press. NY. • Tjitrosoepomo, G. 2017. Taksonomi Tumbuhan. Gajah Mada University Press. Yogyakarta. • Vogel, E.V. 1987. Manual of Herbarium Taxonomy: Theory and Practice. Rijkherbarium. Leiden.

Module Handbook
Diversity of Flora

Module Name:	Diversity of Flora
Module Level:	Bachelor
Abbreviation, if applicable:	MAB62005
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	2nd semester
Person responsible for the module:	Rodiyati Azrianingsih, M.Sc., Ph.D
Lecturer(s):	1. Rodiyati Azrianingsih, M.Sc.,Ph.D 2. Dr. Jati Batoro, M.Si. 3. Dr. Serafinah Indriyani, M.S 4. Dr. Brian Rahardi, M.Sc
Language:	Indonesian and English
Relation to curriculum	

Programme	Mode	Semester
Bachelor Programme in Biology	Compulsory	Even

Type of teaching, contact hours:

Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.

Teaching method	Contact hours per week	Class size
Lectures	1.7	40
Exercise (structured assignment & independent learning/ self-study)	4.0	40
Laboratory practice	0	-

Workload:

(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours

Contact hours per week	Private/self-study per week	Semester workload	ECTS
1.7	4.0	90.7 h	3

Credit point	2 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on General Biology (MAB61001)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO1. Able to understand the application of plant taxonomy concepts in solving biological problems. CLO 2. Able to recognize the basic comparison of living things in the world of flora that are members of the four kingdoms (Monera, Protista, Fungi and Plantae) through available instruments/libraries. CLO 3. Able to convey ideas/opinions well orally and in writing regarding the issue of flora diversity.
Content	1. Terminology, Scope of Flora Diversity Study 2. Tropical Flora Diversity: Phytogeography, documentation, reference, and conservation. 3. Biosystematics of Kingdom Monera: Diversity of Cyanobacteria Taxa 4. Biosystematics of Kingdom Protoctista: Algae Diversity 5. Biosystematics of Kingdom Fungi (parents of Kingdom Fungi) and Evolution of Ancient Plants (parents of Kingdom Plantae) 6. Diversity of Kingdom Fungi and Lichens 7. The Diversity of the Moss Sub-kingdom 8. The Evolution of Vascular Plants: Pteridophyte Diversity 9. The Evolution of Seed Plants: The Diversity of the Gymnosperm Sub-kingdom 10. Biosystematics of the Angiosperms Sub-Kingdom: Diversity of Dicot Class 11. Biosystematics Sub Kingdom Angiosperms: Diversity of Monocot Class
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Small group discussion • Paper project • Mid and Final Test Final score: Attitude (10%), paper project (15%), presentation/ discussion (15%), mid exam (30%) and final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Backer, C. A. & R. C. Bakhuizen Van Den Brink. 1965. Flora of Java. N.V. P. Noordhoff. Groningen. Netherlands.

	• Elpel, T.J. Botany in a Day: The Pattern Methods of Plant Identification. Hops Press. • Judd,W. S., C. S. Campbell, E. A. Kellog, P. F. Stevens, & M. J. Donoghue. 2008. Plant Systematics A Phylogenetic Approach. Sinauer Associates. Sunderland. • Margulis, L. and Schwartz, K.V. 1998. Five Kingdoms, an Illustrated Guide to the Phyla of Life on Earth. 3rd edition. A.W.H. Freeman/Owl Book. New York. • Radford, A.E. 1986. Fundamentals of Plant Systematics. Harper & Row Publisher. NY; • Singh, G. 2003. Plant Systematics: An Integrated Approach. Science Publishers. London; • Stace, C.A. 1979. Plant Taxonomy and Biosystematics. Edward Arnold a Division Holder a Stoughton. London; • Sutiman, B.S., Widyarti, S., Sofy P., 2017. Biologi Sel, UB Press, Malang • Tjitrosoepomo, G. 2005. Taksonomi Tumbuhan: Spermatophyta. Gajah Mada University Press. Yogyakarta. • Tjitrosoepomo, G. 2005. Taksonomi Tumbuhan: Schizophyta, Thallophyta, Bryophyta, Pteridophyta. Gajah Mada University Press. Yogyakarta. • Tjitrosoepomo, G. 2005. Taksonomi Tumbuhan. Gajah Mada University Press. Yogyakarta. • Van Steenis. Flora Malesiana-serial. Jakarta. • Vogel, E.V. 1987. Manual of Herbarium Taxonomy: Theory and Practice. Rijkherbarium. Leiden.

Module Handbook
Practice in Diversity of Flora

<table>
<tr><td>Module Name:</td><td colspan="4">Practice in Diversity of Flora</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB62006</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">2nd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Rodiyati Azrianingsih M.Sc., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Rodiyati Azrianingsih, M.Sc., Ph.D
2. Dr. Jati Batoro, M.Si.
3. Dr. Serafinah Indriyani, M.S
4. Dr. Brian Rahardi, M.Sc</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Compulsory</td><td>Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">5.7</td><td>40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>5.7</td><td>-</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on General Biology (MAB61001)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: General Competence (Knowledge) Students have an ability: 1. to recognize local floras, both using herbaria and fresh samples, in a laboratory, in garden and in field, 2. to practice in describing taxonomically each the flora, identifying and classifying them. Specific Competence: 1. Students have ability to make botanical illustration. 2. Students have ability to use and develop identification keys. 3. Students have ability to conduct a taxonomical work for Cyanobacteria. 4. Students have ability to conduct a taxonomical work for macro-algae. 5. Students have ability to conduct a taxonomical work for fungi. 6. Students have ability to conduct a taxonomical work for Bryophytes. 7. Students have ability to conduct a taxonomical work for Pteridophytes. 8. Students have ability to conduct a taxonomical work for Spermatophytes.
Content	Botanical illustration, Identification keys, Cyanobacteria (Kingdom Monera), macro-algae (Kingdom Protista), fungi (Kingdom Fungi), Bryophytes, Pteridophytes, Spermatophytes: Gymnospermae, Magnoliopsids, Liliopsids.
Study and examination requirements and forms of examination	Form of examination in lectures: • Pre/post-test • Lab report • Small group presentation • Final lab test Final score (NA) is calculated as follow: Pre/post-test (15%), reports (20%), final exam (30%), presentation (20%) and soft skill (15%).
Media employed	LCD, laptop, google classroom, video conference (zoom/ gmeet)
Reading list	• Besse, P., 2021. Molecular Plant Taxonomy. Springer US. • Lawrence, G.H.M., 2017. Taxonomy of vascular plants. Scientific Publishers. • Simpson, M.G., 2019. Plant systematics. Academic press.

	• Backer, C. A. & R. C. Bakhuizen Van Den Brink. 1965. Flora of Java. N.V. P. Noordhoff. Groningen. Netherlands. • Elpel, T.J. Botany in a Day: The Pattern Methods of Plant Identification. Hops Press. • Judd,W. S., C. S. Campbell, E. A. Kellog, P. F. Stevens, & M. J. Donoghue. 2008. Plant Systematics A Phylogenetic Approach. Sinauer Associates. Sunderland. • Margulis, L. and Schwartz, K.V. 1998. Five Kingdoms, an Illustrated Guide to the Phyla of Life on Earth. 3rd edition. A.W.H. Freeman/Owl Book. New York. • Radford, A.E. 1986. Fundamentals of Plant Systematics. Harper & Row Publisher. NY; • Singh, G. 2003. Plant Systematics: An Integrated Approach. Science Publishers. London; • Stace, C.A. 1979. Plant Taxonomy and Biosystematics. Edward Arnold a Division Holder a Stoughton. London; • Sutiman, B/S., Widyarti, S., Sofy P., 2017. Biologi Sel, UB Press, Malang • Tjitrosoepomo, G. 2005. Taksonomi Tumbuhan: Spermatophyta. Gajah Mada University Press. Yogyakarta. • Tjitrosoepomo, G. 2005. Taksonomi Tumbuhan: Schizophyta, Thallophyta, Bryophyta, Pteridophyta. Gajah Mada University Press. Yogyakarta. • Tjitrosoepomo, G. 2005. Taksonomi Tumbuhan. Gajah Mada University Press. Yogyakarta. • Van Steenis. Flora Malesiana-serial. Jakarta. • Vogel, E.V. 1987. Manual of Herbarium Taxonomy: Theory and Practice. Rijkherbarium. Leiden.

Module Handbook
Diversity of Fauna

Module Name:	Diversity of Fauna			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB62007			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	2nd semester			
Person responsible for the module:	Nia Kurniawan, S.Si., M.P., D.Sc.			
Lecturer(s):	1. Nia Kurniawan, S.Si., M.P., D.Sc. 2. Dr. Bagyo Yanuwiadi 3. Prof. Amin Setyo Leksono, S.Si., M.Si., Ph.D 4. Zulfaidah Penata Gama, S.Si., M.Si., Ph.D			
Language:	Indonesian and English			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Compulsory	Even	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40	
	Laboratory practice	0	-	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on General Biology (MAB61001)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:			

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the basic science supporting animal biology which includes the concept of species, systematics and animal evolution CLO 2. Skilled in using simple methods based on observation of characteristics to determine the classification of Invertebrates and Vertebrates CLO 3. Understand the classification and characteristics of Protozoa CLO 4. Understand the classification and characteristics of Porifera and Cnidaria CLO 5. Understand the classification and characteristics of Arthropods CLO 6. Understand the classification and characteristics of worms (Platyhelminthes, Nematodes, Annelida) CLO 7. Understand the classification and characteristics of Molluscs and Echinoderms CLO 8. Understand the classification and characteristics of Pisces (Condrichtyes) CLO 9. Understand the classification and characteristics of Pieces (Osteichtyes) CLO 10. Understand the classification and characteristics of Amphibia CLO 11. Understand the classification and characteristics of Reptiles CLO 12. Understand the classification and characteristics of Aves CLO 13. Understand the classification and characteristics of Mammals CLO 14. Understanding of Fauna Diversity Conservation Applications and strategies
Content	1. Classification and characteristics of Invertebrates and Vertebrates 2. Classification and characteristics of Protozoa 3. Classification and characteristics of Porifera and Cnidaria 4. Classification and characteristics of Arthropods 5. Classification and characteristics of worms (Platyhelminthes, Nematodes, Annelida) 6. Classification and characteristics of Mollusca and Echinoderms 7. Classification and characteristics of Pisces (Chondrichthyes) 8. Classification and Characteristics of Pieces (Osteichthyes) 9. Classification and characteristics of Amphibia 10. Classification and characteristics of Aves 11. Classification and characteristics of Mammals 12. Fauna Diversity conservation applications and strategies

Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Small group presentation • Paper project • Mid and Final Test Final score: Quiz (10%) + paper project (15%), presentation (15%), mid exam (30%) and final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Barnes, R. 2001. The Invertebrates. Blackwell Science • Beutel, dkk. 2014. Insect Morphology and Phylogeny: A textbook for students of entomology. Walter de Gruyter. Berlin • Cleveland, dkk. 2002. Animal Diversity 3rd edition. McGraw-Hill. New York • Das, I. 2014. A Field Guide to the Reptiles of South East Asia. Bloomsbury Publishing Plc. London • Gilliot, C. 2005. Entomology. Springer. Berlin • Glencoe McGraw-Hill. 2004. Glencoe Science: Animal Diversity, Student Edition. McGraw- Hill. New York • Hastings, dkk. 2015. Fishes: A Guide to Their Diversity. University of California Press. California • Hickman, dkk. 2017. Integrated Principles of Zoology 17th edition. McGraw-Hill. New York. • Iskandar, D.T. 1998. The Amphibian of Java and Bali. LIPI. Bogor • Kershaw, D.R. ed., 2012. Animal diversity. Springer Science & Business Media. • MacKinnon, dkk. 1999. Seri Paduan Lapangan Burung-Burung di Sumatera, Jawa dan Bali. LIPI. Bogor • Linzey D. 2000. Biology Vertebrate. McGraw-Hill. New York • Vitt & Cadwell. 2014. Herpetology An Introductory Biology of Amphibians and Reptiles. Academic Press. London.

Module Handbook
Practice in Diversity of Fauna

Module Name:	Practice in Diversity of Fauna		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB62008		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	2nd semester		
Person responsible for the module:	Nia Kurniawan, S.Si., M.P., D.Sc.		
Lecturer(s):	1. Nia Kurniawan, S.Si., M.P., D.Sc. 2. Dr. Bagyo Yanuwiadi 3. Prof. Amin Setyo Leksono, S.Si., M.Si., Ph.D 4. Zulfaidah Penata Gama, S.Si., M.Si., Ph.D		
Language:	Indonesian and English		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	-	-
	Exercise (structured assignment & independent learning/ self-study)	-	-
	Laboratory practice	5.7	40

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	5.7	-	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on General Biology (MAB61001)			

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: General competence (knowledge). 1. Able to identify, classify, recognize the characteristics and describe Cnidaria, Mollusca, and Echinoderms 2. Able to identify, classify, recognize the characteristics and describe Worms (Platyhelminthes, Nematodes, and Annelida) 3. Able to identify, classify, recognize the characteristics and describe Arthropods 4. Able to identify, classify, recognize the characteristics and describe fish 5. Able to identify, classify, recognize the characteristics and describe Amphibia and Reptiles 6. Able to identify, classify, recognize the characteristics and describe Aves and Mammalia 7. Able to observe fauna in natural habitats 8. Able to identify fauna observed in nature 9. Able to present and discuss the results of observations in nature
Content	1. Briefing and general introduction 2. Identification of Cnidaria, Mollusca, and Echinoderms 3. Identification of Worms (Platyhelminthes, Nematodes, and Annelida) 4. Identification of Arthropods 5. Fish Identification 6. Identification of Amphibians and Reptiles 7. Identification of Aves and Mammalia 8. TNAP Fieldwork: Echinoderms to Mammals 9. Identification of TNAP Fieldwork Results 10. Fieldwork Result Presentation
Study and examination requirements and forms of examination	Form of examination in lectures: • Pre/post-test • Lab report • Small group presentation • Final lab test Final score (NA) is calculated as follow: Pre/post-test (15%) + practice report (25%) + fieldwork report (15%) + presentation of fieldwork (15%) + final exam (30%)

Media employed	LCD, laptop, google classroom, video conference (zoom/ gmeet)
Reading list	• Barnes, R. 2001. The Invertebrates. Blackwell Science • Beutel, dkk. 2014. Insect Morphology and Phylogeny: A textbook for students of entomology. Walter de Gruyter. Berlin • Cleveland, dkk. 2002. Animal Diversity 3rd edition. McGraw-Hill. New York • Das, I. 2014. A Field Guide to the Reptiles of South East Asia. Bloomsbury Publishing Plc. London • Gilliot, C. 2005. Entomology. Springer. Berlin • Glencoe McGraw-Hill. 2004. Glencoe Science: Animal Diversity, Student Edition. McGraw- Hill. New York • Hastings, dkk. 2015. Fishes: A Guide to Their Diversity. University of California Press. California • Hickman, dkk. 2017. Integrated Principles of Zoology 17th edition. McGraw-Hill. New York. • Iskandar, D.T. 1998. The Amphibian of Java and Bali. LIPI. Bogor • Kershaw, D.R. ed., 2012. Animal diversity. Springer Science & Business Media. • MacKinnon, dkk. 1999. Seri Paduan Lapangan Burung-Burung di Sumatera, Jawa dan Bali. LIPI. Bogor • Linzey D. 2000. Biology Vertebrate. McGraw-Hill. New York • Vitt & Cadwell. 2014. Herpetology An Introductory Biology of Amphibians and Reptiles. Academic Press. London.

Module Handbook
Plant Structure and Development

<table>
<tr><td>Module Name:</td><td>Plant Structure and Development</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB62009</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>2nd semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Mufidah Afiyanti, S.P., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td>1. Dr. Serafinah Indriyani, M.Si
2. Dr. Jati Batoro, M.Si.
3. Rodiyati Azrianingsih, M.Sc., PhD
4. Dr. Brian Rahardi, S.Si., M.Sc.</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table>
<tr><td>Programme</td><td>Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td>Even</td></tr>
</table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table>
<tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td>2.5</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>6.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td>-</td><td>-</td></tr>
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<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>2.5</td><td>6.0</td><td>136 h</td><td>4.5</td></tr>
</table></td></tr>
<tr><td>Credit point</td><td>3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering theoretical concepts or their applications in the scope of one field (intradisciplinary). CLO 2. Able to use biology to solve simple problems through application knowledge of biology, biological analysis methods, as well as the application of relevant technology in the scope of work. CLO 3. Have responsibility in completing taSCU as part of the organization. CLO 4. Able to provide instructions/input in a teamwork.
Content	1. The external structure of roots and stems and the branching architecture of the stem 2. External structure of leaves and metamorphosis of plant organs 3. The external structure of the flower 4. External structure of fruit, seeds, and institutions 5. Structure and development of plant cells and meristematic tissues 6. Structure and development of basic, protective, and reinforcing networks 7. Structure and development of transport and secretory tissues 8. Internal structure and development of roots, stems and leaves 9. Pollination and fertilization 10. Embryogenesis, polyembryony, and apomixis 11. Internal structure and development of fruit and seeds
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and final exam Final score: Assignment (15%) + quiz (15%) + mid exam (35%) + final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Beck, CB. 2010. An Introduction to Plant Structure and Development. Plant Anatomy for the Twenty-First Century. Second Edition. Cambridge University Press. • Crang, R., Lyons-Sobaski, S. & Wise, R. 2018. Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants. Springer. • Harris and Harris. 2001. Plant Identification Terminology: An

	Illustrated Glossary. Spring Lake Publication. • Bell, A.D. 1991. Plant Form: An Illustration Guide to Flowering Plant Morphology. Oxford University Press. New York. • Bhojwani, S.S. &S.P. Bhatnagar. 1974. The Embryology of Angiosperm. Vikas Publ. House PVT. Ltd. New Delhi. • Bowes, B.G. 1995. A Colour Atlas of Plant Structure. Manson Publishing. • Cutler, D.F., T. Botha & D.W. Stevenson. 2007. Plant Anatomy: An Applied Approach. Blackwell Publishing. • Dickison, W.C. 2000. Integrative Plant Anatomy. Harcourt Academic Press. San Diego. • Essau, K. 1987. Anatomy of Seed Plants. Second Edition. John Wiley & Sons. New York. • Evert, R.F. 2006. Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body-Their Structure, Function, and Development. Third Edition. A John Wiley & Sons, Inc. Publication. New Jersey. • Fahn, A. 1974. Plant Anatomy. Second Edition. Pergamon Press. Oxford. • Harris, J.G. & M.W. Harris. 2001. Plant IdentificationTerminology: AnIllustratedGlossary. Second Edition. Spring Lake Publishing. Spring Lake Utah. • Hidayat, E.B. 1995. Anatomi Tumbuhan Berbiji. Penerbit ITB. Bandung. • Johri, B.M. (Ed.) 1984. Embryology of Angiosperms. Springer-Verlag. Berlin-Heidelberg-New York-Tokyo. • Lawrence, G.H.M. 1964. Taxonomy of Vascular Plant. The McMillan Company. New York. • Maheshwari, P. 1950. An Introduction to The Embryology of Angiosperms. First Edition. McGraw-Hill Book Company, Inc. New York-Toronto-London.

Module Handbook
Practice in Plant Structure and Development

Module Name:	Practice in Plant Structure and Development		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB62010		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	2nd semester		
Person responsible for the module:	Mufidah Afiyanti, S.P., Ph.D		
Lecturer(s):	1. Dr. Serafinah Indriyani, M.Si 2. Dr. Jati Batoro, M.Si. 3. Rodiyati Azrianingsih, M.Sc., PhD 4. Dr. Brian Rahardi, S.Si., M.Sc.		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	-	-
	Exercise (structured assignment & independent learning/ self-study)	-	-
	Laboratory practice	5.7	40

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	5.7	-	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Skilled in analyzing the structure and development of plants. CLO 2. Able to understand the important role of analysis skills of structure and development of plants in biology. CLO 3. Able to demonstrate good attitudes and safe methodologies in working either in the laboratory or in the fields. CLO 4. Able to complete taSCU effectively and efficiently in a team harmoniously.
Content	1. The external structure of the vegetative organs of seed plants (roots, stems, and leaves 2. External structure of the reproductive organs of seed plants (flowers, fruits, seeds, and germination) 3. Organ modification (root, stem, and leaf metamorphosis) 4. Branching architecture on the stem 5. Layout of leaves on stems, preparation of leaf formulas, charts and diagrams of leaf formulas 6. Flowers, flower formulas and diagrams 7. Ergastic bodies in plant cells, dotted structures 8. Internal structure of root, stem, and leaf organs 9. Internal structure of the reproductive organs of seed plants
Study and examination requirements and forms of examination	Form of examination in lectures: • Pre/post-test • Lab report • Small group presentation • Final lab test Final score (NA) is calculated as follow: Pre/post-test (15%) + practice report (25%) + fieldwork report (15%) + presentation of fieldwork (15%) + final lab test (30%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Beck, CB. 2010. An Introduction to Plant Structure and Development. Plant Anatomy for the Twenty-First Century. Second Edition. Cambridge University Press. • Crang, R., Lyons-Sobaski, S. & Wise, R. 2018. Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants. Springer. • Harris and Harris. 2001. Plant Identification Terminology: An

	Illustrated Glossary. Spring Lake Publication. • Bell, A.D. 1991. Plant Form: An Illustration Guide to Flowering Plant Morphology. Oxford University Press. New York. • Bhojwani, S.S. &S.P. Bhatnagar. 1974. The Embryology of Angiosperm. Vikas Publ. House PVT. Ltd. New Delhi. • Bowes, B.G. 1995. A Colour Atlas of Plant Structure. Manson Publishing. • Cutler, D.F., T. Botha & D.W. Stevenson. 2007. Plant Anatomy: An Applied Approach. Blackwell Publishing. • Dickison, W.C. 2000. Integrative Plant Anatomy. Harcourt Academic Press. San Diego. • Essau, K. 1987. Anatomy of Seed Plants. Second Edition. John Wiley & Sons. New York. • Evert, R.F. 2006. Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body-Their Structure, Function, and Development. Third Edition. A John Wiley & Sons, Inc. Publication. New Jersey. • Fahn, A. 1974. Plant Anatomy. Second Edition. Pergamon Press. Oxford. • Harris, J.G. & M.W. Harris. 2001. Plant IdentificationTerminology: AnIllustratedGlossary. Second Edition. Spring Lake Publishing. Spring Lake Utah. • Hidayat, E.B. 1995. Anatomi Tumbuhan Berbiji. Penerbit ITB. Bandung. • Johri, B.M. (Ed.) 1984. Embryology of Angiosperms. Springer-Verlag. Berlin-Heidelberg-New York-Tokyo. • Lawrence, G.H.M. 1964. Taxonomy of Vascular Plant. The McMillan Company. New York. • Maheshwari, P. 1950. An Introduction to The Embryology of Angiosperms. First Edition. McGraw-Hill Book Company, Inc. New York-Toronto-London.

Module Handbook
Indonesian Language

Module Name:	Indonesian Language			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAK60007			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	2nd semester			
Person responsible for the module:	Prima Zulvarina, S.S., M.Pd			
Lecturer(s):	1. Prima Zulvarina, S.S., M.Pd. 2. Millatuz Zakiyah, S.Pd., M.A. 3. Noveria Anggraeni Fiaji, M.Pd. 4. Fitrahayunitisna, S.S., M.Pd. 5. Trisna Andarwulan, S.S., M.Pd. 6. Mokhamad Jainuri, M.Hum. 7. Muhammad Hambali. S.S., M.Pd.			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Compulsory	Even	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40	
	Laboratory practice	0	-	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			
	Intended learning outcomes (ILO) corresponding to this module:			

Module objective/ intended learning outcomes	ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.
	Course learning outcomes (CLO) after completing this module: CLO1. Able to show a positive attitude and love the Indonesian language by applying it in effective communication in the academic environment. CLO 2. Able to understand and apply various languages according to the context of use in formal/non-formal communication in the scientific field. CLO 3. Able to read critically scientific texts by linking them with previous schemata and contexts. CLO 4. Able to evaluate texts in scientific and popular writings according to proper grammar and spelling rules. CLO 5. Able to explore creative and innovative ideas in writing scientific or popular scientific works. CLO 6. Able to produce scientific or popular writings in a systematic, logical, and empirical manner that deserves to be published in journals and mass media.
Content	1. The history of the Indonesian language, the function and position of the Indonesian language 2. Variety of Indonesian 3. Ethics and Aesthetics in Scientific Forums 4. Critical Reading of Texts (scientific field) 5. Writing Quotations, Bibliography, and Plagiarism 6. Indonesian Spelling and Diction 7. Effective Sentences in Scientific Writing 8. Paragraphs in Scientific Writing 9. Popular Posts 10. Concept of Scientific Work 11. Compiling Scientific Work
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment • Presentation • Small group discussion • Mid and Final Test Final score: Assignment (10%) + Presentation (15%) + Class discussion participation (15%) + mid exam (30%) + final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet), online KBBI and PUEBI.

Reading list	• Andarwulan, Trisna. 2019. Kreatif Berbahasa Indonesia: Acuan Pembelajaran Bahasa Indonesia Ilmiah di Perguruan Tinggi. Bandung: Rosda Karya • Tim dosen Pusat MPK. 2019. Bahan Ajar Bahasa Indonesia. Malang. Pusat MPK UB 3. Suyitno, Imam.2012.Menulis Makalah dan Artikel. Bandung: Rifeka Aditama Setyowati, Eti, dkk. 2017. Bahasa Indonesia Berbasis Karakter. Malang: UB Press • Suwignyo, Heri. 2013.Bahasa Indonesia Keilmuan Perguruan Tinggi. Malang: Aditya Media Publising 6. Suyono, dkk. 2015. Cerdas Menulis Karya Ilmiah. Malang: Gunung Samudera • Sukmawan, Sony. 2008. Etika dan Estetika Berbahasa Indonesia dalam Forum Ilmiah. Makalah, disajikan dalam Seminar Nasional Menyongsong Kongres Bahasa XI di Semarang. • Suyanto, Edi. 2015. Membina, Memelihara, dan Menggunakan Bahasa Indonesia Secara Benar. Yogyakarta:Graha Ilmu • Chaer, Abdul dan Agustina, Leoni. 2010. Sosiolinguistik: Perkenalan Awal. Jakarta: Renika Cipta 4. Pedoman Umum Ejaan Bahasa Indonesia KBBI Edisi Kelima Daring Universitas Negeri Malang. 2015. Pedoman Penulisan Karya Ilmiah. Malang: UM

Module Handbook Pancasila

<table>
<tr><td>Module Name:</td><td>Pancasila</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAK60008</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>2nd semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Dr. Mohamad Anas, M.Phil.</td></tr>
<tr><td>Lecturer(s):</td><td>1. Dr. Mohamad Anas, M.Phil.
2. Emi Setyaningsih, M.Phil.
3. Galieh Damayanti, S.H., M.H.
4. Destriana Saraswati, M.Phil.
5. Albar Adetary Hasibuan, M.Phil.
6. Triya Indra R., S.H., M.H.
7. Prisca Kiki W., S.Pd., M.Sc.</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table><tr><td>Programme</td><td>Mode</td><td>Semester</td></tr><tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td>Even</td></tr></table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table><tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr><tr><td>Lectures</td><td>1.7</td><td>40</td></tr><tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40</td></tr><tr><td>Laboratory practice</td><td>0</td><td>-</td></tr></table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table><tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr><tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr></table></td></tr>
<tr><td>Credit point</td><td>2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td></td><td>Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

Module objective/ intended learning outcomes	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.
	Course learning outcomes (CLO) after completing this module: CLO1. Able to analyze, compare, and reflect on the function and important position of Pancasila in the history of the nation. CLO 2. Able to analyze the relationship between the philosophical nature of the values of the Pancasila precepts and use it as a knife to analyze the nation's problems. CLO 3. Able to understand the supremacy of the constitution and the peculiarities of the 1945 Constitution of the Republic of Indonesia which is based on the values of Pancasila and to sort out constitutional and unconstitutional behavior in the life of the nation and state. CLO 4. Able to understand, identify, and account for the analysis of laws and policies that are idealistic, practical and pragmatic based on Pancasila. CLO 5. Able to build awareness of critical and innovative thinking in the development of science and technology based on Pancasila values.
Content	1. Introduction to Pancasila Education 2. Pancasila in Historical Studies 3. Pancasila as a Philosophical System 4. Pancasila as Ideology 5. Pancasila as the State Foundation 6. Pancasila as a System of Ethics 7. Pancasila as the Value Foundation for the Development of Science
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Test Final score: Quiz (10%) + Assignment (15%) + Presentation (15%) + mid exam (30%) + final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Tim Dosen Pancasila MPK UB, 2019, Buku Ajar Pendidikan Pancasila • Buku Pendidikan Pancasila, Dikti • Kaelan, 2009, Filsafat Pancasila: Pandangan Hidup Bangsa Indonesia, Paradigma, Yogyakarta • Hariyono, 2014, Ideologi Pancasila, Roh Progresif Nasionalisme Indonesia, Malang: Intrans • Kaelan, 2013, Negara Kebangsaan Pancasila, Yogyakarta: Paradigma • Yudi Latief, 2011, Negara Paripurna: Historisitas, Rasionalitas, dan Aktualitas Pancasila, Jakarta: Gramedia

	• Yudi Latief, 2014. Mata Air Keteladanan: Pancasila dalam Perbuatan, Bandung: Mizan

Module Handbook
Animal Histology

Module Name:	Animal Histology		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB62011		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	2nd semester		
Person responsible for the module:	Drs. Aris Soewondo, M.Si.		
Lecturer(s):	1. Drs. Aris Soewondo, M.Si. 2. Dr. Agung Pramana Warih Marhendra, M.Si. 3. Sofy Permana, M.Sc., D.Sc		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	0.8	40
	Exercise (structured assignment & independent learning/ self-study)	2.0	40
	Laboratory practice	2.8	40

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	3.6	2.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on General Biology (MAB61001)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:			

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the basic science supporting Biology and success life skills CLO 2. Understand the structure, function and organization of life CLO 3. Able to demonstrate scientific attitudes (curiosity, objective, rational, critical, open mind, creative, innovative, etc.), and social attitude (polite, respecting others, being responsible, etc.) CLO 4. Skilled in using appropriate methods to solve simple problems etc CLO 5. Able to communicate in Indonesian and English in the field of biology
Content	1. Epithelial tissue 2. Binding network 3. Muscle and nerve tissue 4. Respiratory System 5. Digestive System 6. Circulation system 7. Endocrine system 8. Urinary system 9. Female genital system 10. Male genital system 11. Integumentary system 12. Nervous system 13. Sensory organs
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Form of examination in laboratory practice: • Pre/post-test • Lab report • Final lab test

	Final score (lectures-A): Quiz (15%) + Assignment (15%), mid exam (35%) and final exam (35%). Final score (lab practice-B): pre/post-test (15%) + Lab report (25%) + final test (60%) Total score: (A+B)/2
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Kierszenbaum A.L. and Tres, L.L. 2020. Histology and Cell Biology. An Introduction to Pathology. 5th ed. Elsevier. Philadelpia. • Liebich, H-G. 2019. Veterinary Histology of Domestic Mammals and Birds. 5th ed. 5M Publishing Sheffield. • Mescher, A.L. 2018. Junquiera's Basic Histology. Text and Atlas. 15th ed. Mc Graw-Hill Educatiuon. New York. • Mills, S.E. 2020. Histology for Pathologist. 5th ed. Wolters Kluwer. Philadelphia. • Ross, M.H and Pawlina W. 2016. Histology: a Text and Atlas. With Correlated Cell and Molecular Biology. 7th ed. Wolters Kluwer. Philadelphia. • Treuting, P.M.,Dintzis S.M. and Montine, K.S. 2018. Comparative Anatomy and Histology. A Mouse, Rat and Human Atlas. 2nd Ed. Elsevier. London.

Module Handbook Biostatistics

<table>
<tr><td>Module Name:</td><td colspan="12">Biostatistics</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">MAB61012</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">3rd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Achmad Efendi, Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Prof. Dr. Ir. Henny Pramoedyo, M.S
2. Achmad Efendi, Ph.D
3. Dr. Ani Budi Astuti, M.Si</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Compulsory</td><td colspan="4">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">1.7</td><td colspan="4">40</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">4.0</td><td colspan="4">40</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">2.8</td><td colspan="4">40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">4.5</td><td colspan="3">4.0</td><td colspan="3">136 h</td><td colspan="3">4.5</td></tr>
<tr><td>Credit point</td><td colspan="12">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">Passed on Basic Biocomputation (MAB60002)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="12">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
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	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand Biology and its supporting sciences and their benefits, as well as attitudes and behavior (life skills) as a biologist CLO 2. Skilled in using appropriate methods to solve simple problems in the field of biology
Content	1. Hypothesis Testing: Introduction to Hypothesis Testing; Binomial Hypothesis Testing 2. Hypothesis Testing: Normal Hypothesis Testing 3. Hypothesis Testing: Application of Hypothesis Testing 4. Experimental Design: Definition of treatment and experimental units, Analysis and Variety Test 5. Experimental Design: Completely Randomized Design (CRD), BNT Test, BNJ Test, Duncan's Test 6. Experimental Design: Randomized Block Design (RAK), BNT Test, BNJ Test, Duncan's Test 7. RBSL and its implementation 8. Factorial Experiment 9. Multiple and Orthogonal Comparison 10. Correlation and Regression 11. Non-Parametric Statistical Analysis 12. Probit Analysis 13. Data Processing
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Form of examination in laboratory practice: • Lab report • Pre/post-test • Final practice exam Class score (CS): Quiz (15%) + Assignment (15%), mid exam (35%), and final exam (35%) Practice score (PS): Report (30%) + pre/post-test (20%) + final practice exam (50%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).

Reading list	• Efendi, A., 2017. Biostatistika dengan R dan MS Excel. UB Press. Malang. • Islam, M.A. and Al-Shiha, A., 2018. Foundations of biostatistics. Singapore: Springer. • Morgan, G.A. Leech, N.L. Gloeckner, G.W. Barret, K.C. 2011. IBM SPSS for Introductory Statistics: Use and Interpretation. Routledge, NY, USA. • Rosner, B., 2015. Fundamentals of biostatistics. Cengage learning.

Module Handbook
Animal Anatomy and Physiology

<table>
<tr><td>Module Name:</td><td colspan="4">Animal Anatomy and Physiology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB61013</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">3rd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Muhaimin Rifa'i, S.Si., Ph.D.Med.Sc</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Muhaimin Rifa'i, S.Si., Ph.D.Med.Sc
2. Prof. Dr. Ir. Moch. Sasmito Djati, M.S., IPU.
3. Drs. Aris Soewondo, M.Si.
4. Dr. Agung Pramana Warih Marhendra, M.Si.
5. Dr. Sri Rahayu, M.Kes.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Compulsory</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">2.5</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">6.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">2.8</td><td>40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>5.3</td><td>6.0</td><td>181.3 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">-</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the basic science supporting Biology and success life skills CLO 2. Understand the structure, function and organization of life. CLO 3. Understand the coordination of life, regulation of growth and development and analysis. CLO 4. Understand the structure, function and organization of life. CLO 5. Understanding the reproductive system CLO 6. Understand the structure, function and organization of life. CLO 7. Understand metabolism, nutrition, energy regulation, diabetes mellitus and hypoglycemia. CLO 8. Mastering theoretical concepts, analyzing and presenting in written form CLO 9. Able to understand the circulatory system in the heart and blood pressure. CLO 10. Understand the excretory system and osmoregulation in aquatic and land animals CLO 11. Understand cellular respiration, metabolism, and bioenergetics CLO 12. Understand the skeletal and smooth muscle system CLO 13. Describe the sensory system CLO 14. Describe the central and peripheral nerves CLO 15. Mastering theoretical concepts, analyzing and presenting in written form
Content	1. Introduction of organs and their functions, chemical constituents of the body, genetic control. The chemical composition of the body, cells, signal transduction, and genetic control. 2. Tissues, organs and organ systems 3. The body's defense system. The body's defense mechanisms, B cell and T cell function, active and passive immunity, autoimmune mechanisms 4. Endocrine glands and hormones, hormone mechanism of action, pituitary gland, adrenal glands, thyroid and parathyroid glands, pancreatic glands, autocrine and paracrine regulation

	5. The role of adrenal hormone, thyroxine, and growth hormone, calcium and phosphate regulation, thermoregulation. 6. Sexual reproduction, the role of hormones in sexual reproduction, the female reproductive system, the male reproductive system, the menstrual cycle, fertilization, pregnancy, and birth. 7. Digestive system 8. Metabolism 9. Cardiovascular 10. Excretory system and osmoregulation 11. Respiratory system 12. Muscular system 13. Senses 14. Nervous system
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Form of examination in laboratory practice: • Pre/post-test • Lab report • Final lab test Final score (lectures-A): Quiz (15%) + Assignment (15%), mid exam (35%) and final exam (35%). Final score (lab practice-B): pre/post-test (15%) + Lab report (25%) + final test (60%) Total score: (3A+B)/4
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Jenkins, G. and Tortora, G.J., 2016. Anatomy and physiology. John Wiley & Sons. • Scanlon, V.C. and Sanders, T., 2018. Essentials of anatomy and physiology. FA Davis. • Rizzo, D.C., 2015. Fundamentals of anatomy and physiology. Cengage Learning. • VanPutte, C.L., Regan, J.L. and Russo, A.F., 2021. Seeley's essentials of anatomy & physiology. University of Iowa. • Tortora, G.J. and Derrickson, B., 2014. Anatomy & Physiology. Wiley India Pvt Limited. • Abbas, A.K dan A.H. Litchman. 2005. Cellular and Molecular Immunology. Elsevier Saunder. Philadelphia; • Alberts, B, Johnson, A, Lewis, J, Matin, Roberts, K, Walter, P. 2002. The Cell. Garland Science, NY; • Fox, S.I. 2004. Human Physiology. 8th Ed. McGraw Hill Company. New York; • Heiser, J.B., Janis, C., dan Pough, F.H. 1999. Vertebrate Life 5th ed. Prentice Hall International Inc. London;

	• Kardong, K.V. 2002. Vertebrates. Comparative Anatomy. Function, Evolution. McGraw Hill Company. New York; • Kent, G.C & Carr, R.K. 2001. Comparative Anatomy of the Vertebrates 9th ed. McGraw Hill Company. New York; • Schmidt-Nielsen, K. 1997. Animal Physiology. Adaptation & environment 5th. Cambridge University Press. Cambridge. New York. Post Chester. Melbourne. Sydney; • Seeley, R.R., Stephens, T.D, & Tate, P. 2003. Anatomy and Physiology 6th ed. McGraw Hill New York.

Module Handbook
Biochemistry and Instrumentation

Module Name:	Biochemistry and Instrumentation			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB61014			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	3rd semester			
Person responsible for the module:	Anna Safitri, S.Si., M.Sc., Ph.D			
Lecturer(s):	1. Anna Safitri, S.Si., M.Sc., Ph.D. 2. Dr. Sasangka Prasetyawan, M.S. 3. Prof. Dr. Ir. Chanif Mahdi, M.S. 4. Dr. Arie Srihardyastutie, M.Kes. 5. Drs. Sutrisno, M.Si. 6. Dra. Anna Roosdiana, M.App.Sc.			
Language:	Indonesian and English			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Compulsory	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40	
	Laboratory practice	2.8	40	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain correctly the terms that include the main aspects of terminology in biochemistry and the division of the organization of living things. CLO 2. Know and practice the use of spectroscopy for biological samples. CLO 3. Students describe the structure, explain the nature and function of biomolecules (carbohydrates, lipids, proteins, and enzymes). CLO 4. Able to identify, isolate, and analyze biomolecules (carbohydrates, lipids, proteins, and enzymes) qualitatively and quantitatively. CLO 5. Able to explain and calculate the kinetics of enzymatic reactions s simple. CLO 6. Know the identification, properties and kinetics of enzymes, and quantitative analysis of vitamins and calculate the activity of enzymes and their kinetic constants. CLO 7. Able to calculate changes in energy, reactions, and changes in the structure of biomolecules (carbohydrates, lipids, proteins, and enzymes) in metabolic processes and oxidative phosphorylation.
Content	Lecture content: 1. Biochemistry definition, characteristics of living matter, cell organization of prokaryotes, eukaryotes (higher plant and animal cells), biomolecules and their functions in cells and energy transformation 2. Classification, configuration and conformation, mutarotation and chemical reactions of monosaccharides. 3. Structure, nomenclature and properties of disaccharides, structure of polypeptides and their properties. 4. Amino acid structure and stereochemistry, grouping of amino acids based on side chains, acid-base properties of amino acids and chemical reactions of amino acids.

	5. Peptide formation reactions, peptide bond properties, primary, secondary, tertiary structures, quaternary protein molecules, protein properties and determination of the sequence of protein amino acid residues. 6. Enzymatic reaction kinetics, Michaelis-Menten equation, Lineweaver-Burk equation, catalytic mechanism, effect of pH, temperature, reaction time, inhibitors on the rate of enzymatic reactions. 7. Fatty acids, triacylglycerols, chemical reactions of triacylglycerols and fatty acids, phospholipids, sphingolipids, lipoproteins. 8. Structure, properties of high-energy phosphate compounds, energy cycle and ATP cycle in cells. 9. Respiratory chain, electron transport energy and mechanism of oxidative phosphorylation. 10. The process of glycogenesis, glycolysis and its control system, the conversion of pyruvate to acetyl-CoA, the TCA pathway and its control, other carbohydrate metabolism pathways, the process of gluconeogenesis, and glycogen biosynthesis. 11. β-Oxidation process, oxidation of unsaturated fatty acids, fatty acids with odd number of C atoms, control of fatty acid oxidation and fatty acid biosynthesis. 12. Transamination reactions, ammonia formation reactions, degradation of 20 kinds of amino acids, urea cycle and amino acid biosynthesis. 13. Relationship between carbohydrate, protein, and lipid metabolism metabolism. Laboratory practice content: 1. Spectronic 20 parts, dilution of biological samples, measurement of sugar content in fruit juices with spectronics 20. 2. Molisch test, Benedict test, Barfoed test, Iodine test, Saliwanoff test, Analysis of total sugar in fruit juice, Isolation of carbohydrates from fruits. 3. Amino acid solubility test, ninhydrin test, xanthoprotein reaction, amino acid titration curve, Biuret test, protein denaturation by heat and extreme pH, precipitation of protein by heavy metals, precipitation of protein by acid, determination of protein content by the Biuret method, isolation of casein from milk. 4. Determination of Michaelis constant on casein hydrolysis by trypsin, determination of lipase activity, catalase test, peroxidase test, determination of vitamin C levels.

	5. Lipid solubility test, saponification reaction, glycerol test, determination of peroxide value, determination of free fatty acids. 6. Fermentation, Schardinger test, peroxidase test, antioxidant effect of vitamin C (ascorbic acid).
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Form of examination in laboratory practice: • Pre/post-test • Lab report • Final lab test Final score (lectures-A): Quiz (20%) + Assignment (20%), mid exam (30%) and final exam (30%). Final score (lab practice-B): pre/post-test (15%) + Lab report (25%) + final test (60%) Total score: (3A+B)/4
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Garret, R. H. and Grisham, C. M., 2016, Biochemistry, 6th Ed., Brooks/Cole Cengage Learning, Belmont: USA.; • Lehninger, A. L., 2017, Principles of Biochemistry, 7th Ed., John Wiley & Sons, New York: USA.; • Berg, J.M. Stryer, L., Tymoczko, J.L., Gatto, G.J. Biochemistry, 2015, 8th Ed. Mac Millan Learning, USA; • Farrel, S. O. and Taylor, L. E., 2006, Experiments in Biochemistry: A Hands-on Approach, 2nd Ed., Thomson Brooks/Cole Laboratory, USA.; • Sheehan, D., 2009, Physical Biochemistry: Principles and Application, 2nd Ed.,Wiley-Blackwell, Chichester: UK.; • Wilson, K. and Walker, J., 2009, Principles and Techniques of Biochemistry and Molecular Biology, 7th Ed., Cambridge University Press, New York: USA.

Module Handbook
Cell Biology

Module Name:	Cell Biology		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB61015		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	3rd semester		
Person responsible for the module:	Dr. Sri Widyarti, M.Si.		
Lecturer(s):	1. Prof. Sutiman Bambang Sumitro, S.U., D.Sc. 2. Dr. Sri Widyarti, M.Si. 3. Sofy Permana, M.Sc., D.Sc. 4. Dr. Wahyu Widoretno, M.Si. 5. Mufidah Afiyanti, S.P., Ph.D.		
Language:	Indonesian and English		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40
	Exercise (structured assignment & independent learning/ self-study)	4.0	40
	Laboratory practice	2.8	40

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on General Biology (MAB61001)			

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the basic science supporting Biology and success life skills through understanding experimental models in studying cell biology, and cell physico-chemical concepts CLO 2. Skilled in using centrifugation and cell fractionation methods to solve simple problems in biology CLO 3. Skilled in using the principle of separation of proteins based on physico-chemical properties and analysis using SDS-PAGE to solve simple problems in the field of biology CLO 4. Have English skills through English presentations on the topic of microscope contrast techniques CLO 5. Understand the structure, function and organization of life through understanding the structure and function of membranes, cell organelles, cytoskeleton, transport vesicles, extracellular matrix CLO 6. Skilled in using the principle of penetration rate of solutions in lipid membranes to solve simple problems in biology CLO 7. Skilled in computer operations, especially the use of excel to calculate the standard deviation of practicum data and create graphs for analysis and synthesis in the field of biology. CLO 8. Understand the coordination of life, regulation of growth and development and its analysis through a basic understanding of cell communication systems. CLO 9. Skilled in using the DPPH method in the antioxidant activity test to solve simple problems in biology.
Content	1. Experimental models in cell biology 2. How cells are studied 3. Basic physico-chemical concepts in cell biology 4. Cell Membrane 5. Cytoskeleton 6. Extracellular Matrix 7. Cell Cycle 8. Transport of intracellular molecules 9. Cell signaling 10. Programmed Cell Death (PCD)
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment

	• Mid and Final Test Form of examination in laboratory practice: • Pre/post-test • Lab report • Final practice test Final score (lectures-A): Quiz (20%) + Assignment (20%), mid exam (30%) and final exam (30%). Final score (lab practice-B): pre/post-test (15%) + Lab report (25%) + final practice test (60%) Total score: (2A+B)/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Alberts, B., Bray, D., Hopkin, K., Johnson, A.D., Lewis, J., Raff, M., Roberts, K. and Walter, P., 2015. Essential cell biology. Garland Science. • Becker, W.M., Kleinsmith, L.J., and Hardin, J., 2000, The World of The Cell, 4th ed., Addison Wesley Longman, Inc. • Cooper, G.M. and Hausman, R.E., 2004, The Cell A Molecular Approach, 3rd ed., Sinauer Associates, Inc., Massachusetts; • Pollard, T.D., Earnshaw, W.C., Lippincott-Schwartz, J. and Johnson, G., 2016. Cell biology E-book. Elsevier Health Sciences. • Sutiman, B.S., Widyarti, S., Sofy P., 2017. Biologi Sel, UB Press, Malang.

Module Handbook
Ecology

<table>
<tr><td>Module Name:</td><td colspan="12">Ecology</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">MAB61016</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">3rd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Dr. Catur Retnaningdyah, M.Si.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Dr. Catur Retnaningdyah, M.Si.
2. Dr. Endang Arisoesilaningsih
3. Dr. Bagyo Yanuwiadi
4. Zulfaidah Penata Gama, PhD
5. Viky Vidayanti, M.Si</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Compulsory</td><td colspan="4">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">2.5</td><td colspan="4">40</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">6.0</td><td colspan="4">40</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">2.8</td><td colspan="4">40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">5.3</td><td colspan="3">6.0</td><td colspan="3">181.3</td><td colspan="3">6</td></tr>
<tr><td>Credit point</td><td colspan="12">4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">Passed on:
1. Diversity of Flora (MAB62005)
2. Practice in Diversity of Flora (MAB62006)
3. Diversity of Fauna (MAB62007)</td></tr>
</table>

	4. Practice in Diversity of Fauna (MAB62008)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to master the concept of Ecology theoretically and its application (ILO 2) CLO 2. Conduct analysis and synthesis of boundaries, scope and concepts in Ecology (ILO 2, ILO 3, ILO 6) CLO 3. Have the skills to observe ecological phenomena using standard laboratory equipment/instruments (ILO 3, ILO 4) CLO 4. Able to complete taSCU in groups related to ecological analysis techniques to overcome environmental problems (ILO 2, ILO 3, ILO 4, ILO 6,7 ILO) CLO 5. Have the skills to search, read, create a resume, share & discuss some information related to ecology in Indonesian and English in groups (ILO 2, ILO 4, ILO 6 and ILO 7).
Content	1. Lecture contract and introduction: Scope, objectives, teaching strategy & evaluation, boundaries and division of Ecology. The concept of minimum law, limiting factors, limits of tolerance range and its changes in the era of global warming. Environmental abiotic factors: climate, edaphic, geographical, waters. Impact of human activities on environmental abiotic factors 2. Population Ecology: General character of population, growth model, population density estimation, population distribution 3. Habitat, niche and bioindicators. Intra- and inter-population interactions. Population regulation and stability 4. The concept of community: Definition of community; Community characteristics, structure and classification; Similarity-dissimilarity concept community; Continuity/discontinuity concept, Edge effect and ecotone. 5. The concept of community change: Types of change in the community. Characteristics and mechanisms of succession. Climax concept

	6. Ecosystem concept and energy flow: Ecosystem concept: boundaries and components of terrestrial and aquatic ecosystems. Transformation and energy flow: the role of the I and II laws of thermodynamics in ecosystems. Trophic levels, concepts of energy flow, energy conversion and efficiency at each trophic level. The ecological pyramid: its shape, advantages and disadvantages in describing the flow of energy. Ecological efficiency. Homeostatic mechanisms and their interactions with natural sustainability. 7. Evolutionary ecology: Evolution of the biosphere. Natural selection and adaptation. Speciation and biodiversity. Sympatric and allopatric speciation 8. Animal behavior, territoriality and home range: Behavioral responses and adaptations of organisms to the environment. Home range and territoriality. 9. Feeding behavior, food availability and biological control: Diet: Monophagy, oligophagy and polyphagy. Chain and food web. Food selection criteria: nutritional value, digestibility, size and availability of food. Predation, parasitism, parasitoidism and biological control. 10. Application of ecological concepts for ecosystem management and solving environmental problems
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Small group presentation • Mid and final test Form of examination in laboratory practice: • Lab report in form of poster • Pre/post-test • Small group presentation • Final practice exam Final score = assignment/ quiz (15%)+Student presentation (20%)+Pre/post-test (7.5)+Lab report (8.75)+Presentation of lab results (8.75)+Mid test (20%)+Final test (20%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet), GPS
Reading list	• Fath, B.D., 2018. Encyclopedia of ecology. Elsevier. • Odum, E.P. & Barrett, G.W. 2017. Fundamentals of Ecology. 5th Ed. Thomson Brooks/Cole Learning, Australia • Molles, M.C. & Sher, A.A. 2019. Ecology: Concepts and Applications, 8nd Ed. McGraw-Hill Education, Boston. • Krebs, C.J. 2008. Ecology: The Experimental Analysis of Distribution and Abundance. 6th Ed. Pearson Publsh. • Riisgard, H.U. 2017. General Ecology: Outline of contemporary ecology for university students, 1st edition, bookboon.com • Slingsby, D. and Cook, C., 2016. Practical ecology. Macmillan International Higher Education. • Wheater, C.P., Bell, J.R. and Cook, P.A., 2020. Practical field ecology: a project guide. John Wiley & Sons..

Module Handbook
Genetics

<table>
<tr><td>Module Name:</td><td>Genetics</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB61017</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>3rd semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.</td></tr>
<tr><td>Lecturer(s):</td><td>1. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.
2. Prof. Fatchiyah, M.Kes., Ph.D
3. Dr. Sri Widyarti, M.Si.
4. Mufidah Afiyanti, S.P., Ph.D.</td></tr>
<tr><td>Language:</td><td>Indonesian and English</td></tr>
<tr><td>Relation to curriculum</td><td><table><tr><td>Programme</td><td>Mode</td><td>Semester</td></tr><tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td>Odd</td></tr></table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table><tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr><tr><td>Lectures</td><td>2.5</td><td>40</td></tr><tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>6.0</td><td>40</td></tr><tr><td>Laboratory practice</td><td>2.8</td><td>40</td></tr></table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table><tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr><tr><td>5.3</td><td>6.0</td><td>181.3 h</td><td>6</td></tr></table></td></tr>
<tr><td>Credit point</td><td>4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>-</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the character of genes, the relationship between alleles, the relationship between genes, the pattern of inheritance of traits both Mendelian and molecular. CLO 2. Have the skills of chromosomal preparation, analysis of various patterns of inheritance, designing and analyzing data to solve genetic problems, as well as being responsible and actively contributing to a working group.
Content	1. Mendelism: monohybrid, dihybrid, segregation, independent assortment 2. The theory of probability and inheritance 3. Mendelian exceptions: allele interactions, gene interactions, polygenes, multiple alleles, sex determination, sex-linked 4. Sexual and asexual reproduction in relation with alternation of generations, sex linked characteristics and their transmission 5. Structure and function of chromosomes and genes (DNA) 6. Genetic code, transcription, translation and protein 7. Extrachromosomal DNA (plasmid DNA, mitochondrial DNA, chloroplast DNA) and Cytoplasmic inheritance 8. Mitosis and meiosis, the relation with cell cycle, chromosome movements and definitions of haploid and diploid 9. Chromosomes, chromosomal variations and chromosomal abnormalities 10. Structure and details of DNA duplication including details of DNA polymerase. 11. DNA mutation and repair 12. Linkage, crossing over and recombination 13. Chromosomal mapping 14. Population Genetics
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Form of examination in laboratory practice:

	• Pre/post-test • Lab report • Final practice test Final score (lectures-A): Quiz (20%) + Assignment (20%), mid exam (30%) and final exam (30%). Final score (lab practice-B): pre/post-test (15%) + Lab report (25%) + final practice test (60%) Total score: (3A+B)/4
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Clark, D.P. 2005. Molecular Biology. Understanding the genetic revolution. Elsevier Academic Press. London. • Snustad, D.P. and Simmons, M.J., 2015. Principles of genetics. John Wiley & Sons. • Surya. 1991. Genetika Manusia. Gadjah Mada University Press. Yogyakarta; • Waddington, C.H., 2016. An introduction to modern genetics. Routledge.

Module Handbook
General Microbiology

<table>
<tr><td>Module Name:</td><td colspan="4">General Microbiology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB62018</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">4th semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Irfan Mustafa, M.Si, Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Suharjono, M.Si
2. Tri Ardyati, M.Agr, Ph.D
3. Irfan Mustafa, M.Si, Ph.D
4. Yoga Dwi Jatmiko, M.App.Sc., Ph.D</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Compulsory</td><td>Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">5.7</td><td>40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>7.4</td><td>4.0</td><td>182.4 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• General Biology (MAB61001)
• Biochemistry and Instrumentation (MAB61014)</td></tr>
</table>

	• Cell Biology (MAB61015)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Can explain and understand the principle of different characteristics, and perform characterization and identification of various microorganisms (ILO 2, ILO 4, ILO 6, ILO 7) CLO 2. Can explain and understand the principles of growth, metabolism and genetics of microorganisms and their application to humans and the environment (ILO 2, ILO 3, ILO 4, ILO 6, ILO 7) CLO 3. Can explain and perform various basic techniques needed in microbiology laboratories (ILO 2, ILO 3, ILO 4, ILO 6) CLO 4. Complete assignments, discuss and present them well (ILO 6, ILO 7)
Content	1. History and scope of microbiology 2. Structure and function: prokaryotic and eukaryotic cells 3. Characteristics of bacteria, fungi, protozoa, microalgae, and viruses 4. Microbial culture and growth 5. Transport of nutrients across cell membranes 6. Metabolism in energy conservation and biosynthesis 7. Microbial genetics and genetic engineering 8. Microbial evolution and systematics 9. Application of microbes in the fields of environment, food, and medicine
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Small group presentation • Mid and Final Test Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation

	• Final practice exam Class score (CS): Paper project (10%), quiz (10%), presentation (10%), mid exam (35%), and final exam (35%) Practice score (PS): Report (30%), pre/post-test (15%), presentation (15%), and final practice exam (40%) Final score: {2 (CS) + 2 (PS)}/4
Media employed	LCD, laptop
Reading list	• Brown, A. and Smith, H., 2014. Benson's Microbiological Applications, Laboratory Manual in General Microbiology, Short Version. McGraw-Hill Education. • Madigan et al., 2019, Brock Biology of Microorganisms 15th edition, Pearson Education. • Jacquelyn G. Black and Laura J. Black, 2017, Microbiology: Principles and Explorations, 10th Edition, Wiley Publisher. • Suharjono et al., 2021, Pedoman Praktikum Mikrobiologi Umum, Jurusan Biologi – Universitas Brawijaya. • James G. Cappuccino and Natalie Sherman, 2014, A Laboratory Manual, 10th edition, Pearson Education. • Laskin, A.I., 2019. Handbook of Microbiology: Condensed Edition. CRC press. • Lud Waluyo, 2019, Mikrobiologi Umum, cetakan kelima, UMM Press.

Module Handbook
Plant Physiology

<table>
<tr><td>Module Name:</td><td colspan="4">Plant Physiology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB62019</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">4th semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Dra. Wahyu Widoretno, MSi.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Dra. Wahyu Widoretno, MSi.
2. Dra. Nunung Harijati, MS., PhD.
3. Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc.
4. Dr. Dra. Aminatun Munawarti, MSi.
5. Dian Siswanto, S.Si., M.Sc.,M.Si.,Ph.D</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td colspan="2">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>2.5</td><td colspan="2">40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>6.0</td><td colspan="2">40</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>5.3</td><td>6.0</td><td>181.3 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Biochemistry and Instrumentation (MAB61014)
• Cell Biology (MAB61015)</td></tr>
</table>

	• Plant Structure and Development (MAB62009) • Practice in Plant Structure and Development (MAB62010)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the concepts related to physiological processes that occur in plants comprehensively. CLO 2. Mastering the application of plant physiology in the scope of botany and agriculture. CLO 3. Able to perform simple analysis and synthesis of plant performance in the field based on their physiological conditions. CLO 4. Able to utilize the science of plant physiology to solve simple problems through the application of biological knowledge, biological analysis methods, and the application of relevant technology. CLO 5. Mastering instruments related to the field of plant physiology studies. CLO 6. Have responsibility in completing lectures and plant physiology practicum assignments and skilled/capable in making the right decisions based on analysis of information and practicum data as well as supporting references. CLO 7. Able to communicate and provide input in discussion group work and practicum related to understanding Plant Physiology material.
Content	1. Definition and scope of plant physiology, 2. Water and plant cells, 3. Transport of nutrients and water, 4. Transpiration, 5. Photosynthesis, 6. Translocation within the phloem, 7. Respiration, 8. Nitrogen and lipid metabolism, assimilation of mineral nutrients, 9. Secondary metabolites and plant defenses, 10. Types and roles of hormones in plant growth and development 11. Phytochromes and light control on plant development, 12. Flowering control: photoperiodism and vernalization, 13. Physiology of stress in plants
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment

	• Paper project • Presentation • Mid and Final Test Form of examination in laboratory practice: • Pre/post-test • Lab report • Presentation • Final practice test Class score (CS) : Paper project (10%), quiz (15%), presentation (15%), mid exam (30%), and final exam (30%) Practice score (PS) : Report (30%), pre/post-test (20%), presentation (20%), and final practice exam (30%) Final score : {3 (CS) + 1 (PS)}/4
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Jenks, M.A.and P.M. Hasegawa. 2005. Plant Abiotic Stress. Blackwell Publishing Ltd. • Opik, H. and S. Rolfe. 2005 The Physiology of Flowering Plants. Cambridge University Press. Cambridge, New York. • Taiz L.and E. Zeiger. 2002. Plant Physiology. Sinauer Associates, I nc. Publishers. Sunderland, Massachusetts. • Taiz L, Zeiger E, Møller IM, and Murphy A. 2015. Plant Physiology and Development, Sixth Edition. Sinauer Associates, Inc, Sunderland, Massachusetts U.S.A • Pallardy, S.G. 2008. Physiology of woody plants. Elsevier Inc, New York. • Pessarakli, M. 2001. Handbook of Plant and Crop Physiology Marcel Dekker,Inc. NewYork

Module Handbook
Biodiversity Conservation

<table>
<tr><td>Module Name:</td><td colspan="4">Biodiversity Conservation</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB62020</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">4th semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Endang Arisoesilaningsih</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Endang Arisoesilaningsih
2. Dr. Bagyo Yanuwiadi
3. Dr. Catur Retnaningdyah, M.Si.
4. Zulfaidah Penata Gama, M.Si., Ph.D
5. Viky Vidayanti, S.Si., M.Si</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td colspan="2">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40</td></tr>
<tr><td>Laboratory practice & field study</td><td>11.3</td><td colspan="2">40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, mini project etc.) and private/self-study, including examination preparation, self assessment, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>13</td><td>4.0</td><td>272 h</td><td>9</td></tr>
<tr><td>Credit point</td><td colspan="4">6 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Ecology (MAB61016)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity. ILO 8. Able to understand and has basic entrepreneurship characters relevant to biology.
	Course learning outcomes (CLO) after completing this module: Able to CLO 1. Explain and give examples of the scope, value, quality, role, mapping, threat and extinction of biodiversity in the modern biology (ILO 2). CLO 2. Explain and give examples of paradigms, status, economic values and conservation policies (ILO 2). CLO 3. Apply the concepts of ecology, population dynamics and genetics to analyze the causes and overcome the extinction of biodiversity both in situ and ex situ (ILO 2). CLO 4. Apply several diversity analysis techniques (genetic, species and ecosystem) and their mapping to support biodiversity conservation (ILO 3). CLO 5. Apply some techniques of strategic problem analysis (ILO 3). CLO 6. Analyze biodiversity in the laboratory and in the field independently according to standard methods, taking into account bioethics, as well as personal and environmental safety (ILO 4). CLO 7. Solve biodiversity conservation problems for sustainable development according to standard methods by applying ecological concepts, other relevant sciences and multimedia (ILO 5). CLO 8. Communicate well in Indonesian and English to gather information, to prepare discussion, reports, presentations in scientific forums (ILO 6).

	CLO 9. Communicate well in Indonesian and English to share science and technology to mobilize community participation in biodiversity conservation (ILO 6). CLO 10. Contribute as a multilayer leader and to build a solid team work in completing taSCU by respecting biodiversity (ILO 7). CLO 11. Understand the important role of fundraising by strengthening development of entrepreneurial characters related to biology for biodiversity conservation (ILO 8).
Content	1. Introduction 2. Scope, value, status, quality of biodiversity (genetic, species and ecosystem, α-β-γ diversity). 3. Plant & Vertebrate diversity assessment 4. Community structure, taxa richness, diversity indices, diversity quality indices 5. Invertebrate & aquatic animal diversity assessment, spatial & temporal 6. Ecosystem diversity assessment & landscape ecology. Mapping genetic, species & ecosystem diversity 7. Genetic diversity & biological globalization 8. New paradigm, status, economic value & policy in biodiversity conservation. Fundraising 9. Models for strategic conservation planning 10. Developing & proposing action plan. Reviewing, revising action plan on biodiversity conservation. 11. Implementing action plan 12. Implementing & progress report of action plan 13. Evaluating action plan 14. Academic peer review progress & final report
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment & Quiz • Action plan project • Presentation (problem-based learning progress report) • Mid and Final Test Form of examination in laboratory practice & field work: • Pre/post-test • Practical report • Presentation • Final practice test • Self-assessment test Final score: mid test (20%) + final test (20%) + lab practice (25%) + Individual assignment/quiz (10%) + Action plan (15%) + Problem based learning progress report (10%).
Media employed	LCD, laptop, Google classroom, video conference (zoom/Gmeet), Google Earth, MSOffice

Reading list	Main references: • Casetta, E., J. M. da Silva, D. Vecchi. 2019. From Assessing to Conserving Biodiversity. Conceptual and Practical Challenges. Springer Open. Cham. • Dodd, C. K. 2016. Reptile Ecology and Conservation. A Handbook of Techniques. Oxford University Press. Oxford • Foottit, R. G., P. H. Adler. 2017. Insect Biodiversity: Science and Society. Wiley-Blackwell. New Jersey. • Graney, R.L. 2020. Aquatic Mesocosm Studies in Ecological Risk Assessment. CRC Press. Boca Raton • Rojas, R. V. 2020. State of Knowledge of Soil Biodiversity. Status, challenges and potentialities. Food and Agriculture Organization of the United Nations. Roma. Additional references: • Yonghong, W. 2017. Periphyton: Functions and Application in Environmental Remediation. Elsevier. Amsterdam • Tomback, D. F. 2017. Biodiversity and Conservation in Forests. MDPI. Basel. • Rojas, R. V. 2020. State of Knowledge of Soil Biodiversity. Status, challenges and potentialities. Food and Agriculture Organization of the United Nations. Roma.

Module Handbook
Entrepreneurship

<table>
<tr><td>Module Name:</td><td colspan="12">Entrepreneurship</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">UBU60003</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">4th semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Dr. Aminatun Munawarti, M.Si.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Dr. Aminatun Munawarti, M.Si.
2. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D
3. Prof. Amin Setyo Leksono, S.Si., M.Si., Ph.D</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Compulsory</td><td colspan="4">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">0.8</td><td colspan="4">40</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">2.0</td><td colspan="4">40</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">2.8</td><td colspan="4">40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">3.6</td><td colspan="3">2.0</td><td colspan="3">90.7 h</td><td colspan="3">3</td></tr>
<tr><td>Credit point</td><td colspan="12">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">-</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="12">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity. ILO 8. Able to understand and has basic entrepreneurship characters relevant to biology.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the principles of entrepreneurship and have the mindset and basics of entrepreneurial management. CLO 2. Able to prepare business plans and carry out business simulations with a modern business management approach. CLO 3. Able to be motivated in developing an entrepreneurial spirit based on the knowledge gained. CLO 4. Able to communicate and work together in a team to analyze, compile, and present plans and business results in presentations.
Content	1. The basic concept of entrepreneurship: Creativity and Innovation 2. Explanation of the preparation of business proposals 3. Business Planning: Management strategy, marketing strategy and financial planning (BEP) 4. Biological Business Opportunities 5. Business Model Canvas: A tool for designing business models 6. Entrepreneurship Soft skills: Entrepreneurial leadership and emotional intelligence 7. Personal Branding as the Main Capital of Young Entrepreneurs in the Digital Age
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Paper project • Presentation • Mid and Final Test Form of examination in laboratory practice: • Pre/post-test • Lab report • Presentation

	• Final practice test Class score (CS) : Paper project (10%), quiz (15%), presentation (15%), mid exam (30%), and final exam (30%) Practice score (PS) : Report (30%), pre/post-test (20%), presentation (20%), and final practice exam (30%) Final score : {1 (CS) + 1 (PS)}/2
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Sinha, D., Singh, A. and Kumar, P., 2021. Introduction to Bioentrepreneurship. In Bioentrepreneurship and Transferring Technology Into Product Development (pp. 1-21). IGI Global. • Nitisastro, M. 2017. Kewirausahaan dan Manajemen Usaha Kecil. Alfabeta. • Fayolle, A., & Klandt, H. (Eds.). 2006. International entrepreneurship education: Issues and newness. Edward Elgar Publishing.Griiffin, R.W. & R.J. Ebert. 2007. Bisnis. Edisi ke-8. Alih Bahasa; Sita Wardhani. Erlangga. • Sari, A.,P., Anggraini, D.D., Sari, M.H.N., Gandasari, D., Siagian, V., Septarini, R.S., Tjiptadi, D.D., Sulaiman, O.K., Munsarif, Siregar, P.A., Nugraha, N.A., Simarmata, J. 2000. Kewirausahaan dan Bisnis Online. Kita Menulis. • Storey, D. J., & Greene, F. J. 2010. Small business and entrepreneurship. Financial Times Prentice Hall. • Meredith, G.G., Nelson R. E., Neck P.A. 1995. Kewirausahaan : Teori dan Praktik. Penerjemah Andec Asparsayogi. Lembaga PPM bekerja sama dengan PT. Pustaka Binaman Pressindo. Jakarta. • Zimmerer T.W. Scarborough N.M. 2002. Pengantar Kewirausahaan dan Manajemen Bisnis Kecil. Penerjemah Yanto Sidik Puatiknyo dan Edina Tjahyaningsih Tarmidzi. Prenhallindo. Jakarta. • Lambing P.A. & Kuehl C.R. 2003. Entrepreneurship. Third Edition. Prentice Hall. New Jersey. • Hisrisck R.D., Refers M.P. 2002. Entrepreneurship. International Edition. McGraw Hill Higher Education. Singapore.

Module Handbook
Introduction to Biotechnology

Module Name:	Introduction to Biotechnology
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60021
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	4th semester
Person responsible for the module:	Mufidah Afiyanti, S.P., Ph.D
Lecturer(s):	1. Mufidah Afiyanti, S.P., Ph.D 2. Tri Ardyati, M.Agr., Ph.D 3. Dr. Aminatun Munawarti, M.Si. 4. Dr. Sri Rahayu, M.Kes
Language:	Indonesian and English

Relation to curriculum

Programme	Mode	Semester
Bachelor Programme in Biology	Compulsory	Even

Type of teaching, contact hours:

Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.

Teaching method	Contact hours per week	Class size
Lectures	1.7	40
Exercise (structured assignment & independent learning/ self-study)	4.0	40
Laboratory practice	-	-

Workload:

(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours

Contact hours per week	Private/self-study per week	Semester workload	ECTS
1.7	4.0	90.7 h	3

Credit point	2 credit points (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	-
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain conventional and modern biotechnology including its methodology. CLO 2. Able to explain the application of biotechnology on microbes, plants and animals based on scientific papers in solving problems in human life. CLO 3. Able to explain the basics of biotechnology in general, principles and applications of biotechnology engineering in microbes, plants and animals.
Content	1. Learning contract; Basics and general application of biotechnology: Introduction 2. Basics and applications of conventional and modern biotechnology 3. The basics of cloning in microbes 4. Biotechnology applications in microbes 5. The basics of cloning in plants 6. Biotechnology applications in plants 7. Transgenic plants and tissue culture 8. The basics of cloning in animals
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Test Final score: Quiz (25%) + Presentation (35%) + mid exam (20%) + final exam (20%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Moo-Young, M., 2019. Comprehensive biotechnology. Elsevier. • Glick, B.R. and Patten, C.L., 2017. Molecular biotechnology: principles and applications of recombinant DNA (Vol. 34). John Wiley & Sons. • Gupta, V., Sengupta, M., Prakash, J. and Tripathy, B.C., 2017. Basic and applied aspects of biotechnology. Singapore: Springer Singapore. • Clark, D.P. and Pazdernik, N., 2015. Biotechnology. Newnes.

	• Abdin, M.Z., Kiran, U. and Ali, A. eds., 2017. Plant biotechnology: principles and applications. Singapore: Springer. • Renneberg, R. and Loroch, V., 2016. Biotechnology for beginners. Academic Press. • Das, S. and Dash, H.R., 2014. Microbial biotechnology-a laboratory manual for bacterial systems. Springer. • Gahlawat, S.K., Duhan, J.S., Salar, R.K., Siwach, P., Kumar, S. and Kaur, P. eds., 2018. Advances in animal biotechnology and its applications. Springer. • Renneberg, R. and Loroch, V., 2016. Biotechnology for beginners. Academic Press. • Slataer A., N.Scott, M. Fowler. 2003. Plant Biotechnology. The genetic manipulation of plants. Oxford university Press; • Srivastava, P.S., A. Narula, S. Srivastava. 2005. Plant Biotechnology and Molecular Markers. Kluwer Academic Publishers, New York. • Verma, A.S. and Singh, A. eds., 2013. Animal biotechnology: models in discovery and translation. Academic Press.

Module Handbook
Community Service

<table>
<tr><td>Module Name:</td><td colspan="4">Community Service</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">UBU60005</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Inter-semester (between 4th and 5th)</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dian Siswanto, S.Si., M.Sc., M.Si.,Ph.D (Head of Study Programme)</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dian Siswanto, S.Si., M.Sc., M.Si.,Ph.D (Head of Study Programme)
2. Supervisors of community service programme</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Compulsory</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Community service</td><td colspan="2">11.3</td><td>40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>11.3</td><td>-</td><td>181.3 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">-</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity. ILO 8. Able to understand and has basic entrepreneurship characters relevant to biology.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the scope and objectives of Community Service activities. CLO 2. Able to explain the role of humans in development and their impact on the environment and resources CLO 3. Able to explain the paradigm of community empowerment and resource conservation CLO 4. Able to organize Community Service participants CLO 5. Able to arrange Community Service activity programs CLO 6. Able to set targets for Community Service activities CLO 7. Able to establish communication with the community CLO 8. Able to explain Community Service programs to the community CLO 9. Able to run activity programs in the field CLO 10. Able to explain the work program that has been carried out, successes, problems and strategies / follow-up plans in completing the program CLO 11. Able to comprehensively elaborate data related to the program, progress, and follow-up plans CLO 12. Able to write Community Service reports well and follow applicable writing standards CLO 13. Able to comprehensively explain the achievements of Community Service activities
Content	• Introduction of Community Service Program based on Conservation • Human, natural resource development and conservation • Empowerment principles and strategies • Implement field programs • Presentation of the results that have been achieved by students • Discussion and verification of the results of student activities in the field • Discussion of the follow-up plan for program implementation
Study and examination requirements and forms of examination	Form of examination in lectures: • Report • Oral exam • Program participation Final score: report (40%) + oral exam (40%) + program participation (20%)

Media employed	LCD, laptop
Reading list	Direktorat penelitian dan pengabdian kepada masyarakat direktorat jenderal pendidikan tinggi kementerian pendidikan dan kebudayaan. 2013. Panduan Pelaksanaan Hibah Kuliah Kerja Nyata - Pembelajaran Pemberdayaan Masyarakat (KKN-PPM).

Module Handbook
Molecular Biology

<table>
<tr><td>Module Name:</td><td>Molecular Biology</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB60022</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>5th semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Prof. Dra. Fatchiyah, M.Kes.,Ph.D.</td></tr>
<tr><td>Lecturer(s):</td><td>1. Prof. Dra. Fatchiyah, M.Kes.,Ph.D.
2. Prof. Dr.Ir. Estri Laras Arumingtyas, M.Sc.St.
3. Dr. Sri Widyarti, MS.</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table>
<tr><th>Programme</th><th>Mode</th><th>Semester</th></tr>
<tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td>Odd</td></tr>
</table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table>
<tr><th>Teaching method</th><th>Contact hours per week</th><th>Class size</th></tr>
<tr><td>Lectures</td><td>1.7</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td>0</td><td>-</td></tr>
</table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table>
<tr><th>Contact hours per week</th><th>Private/self-study per week</th><th>Semester workload</th><th>ECTS</th></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
</table></td></tr>
<tr><td>Credit point</td><td>2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>Passed on:
• Cell Biology (MAB61015)
• Genetics (MAB61017)</td></tr>
<tr><td></td><td>Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

Module objective/ intended learning outcomes	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basic concepts and perspectives of molecular biology. CLO 2. Able to describe the structure of DNA, RNA-RNA, and chromosome models as well as the enzymes that play a role. CLO 3. Able to compare the process of protein synthesis or gene expression in both prokaryotes and eukaryotes, as well as explain the mechanism of DNA replication and the enzymes that play a role. CLO 4. Able to distinguish homologous recombinant, site-specific recombinant and transposition mechanisms. CLO 5. Able to explain gene regulation and gene expression regulation pathways. CLO 6. Able to determine and characterize protein structures. CLO 7. Able to explain the comparison of DNA and protein interactions or protein with protein. CLO 8. Able to explain the role of molecular biology in an applicative way in plants and bacteria as well as in the biomedical field.
Content	1. Molecular structure of genes and chromosomes 2. Gene transcription process in protein synthesis 3. Gene translation process in protein synthesis 4. DNA replication 5. Regulatory mechanisms in general at cellular & molecular level 6. Mechanism of gene regulation in prokaryotes 7. Mechanisms of gene regulation in eukaryotes 8. Basic structure of proteins: determination & classification 9. Protein modification 10. Functional Proteins 11. Interaction between DNA-Protein & Protein-Protein
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment/ paper project

	• Presentation • Class participation during discussion • Mid and Final Test Final score: Quiz (10%) + Assignment/ paper project (10%) + class participation (10%) + mid exam (40%) + final exam (20%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Allison, L.A., 2021. Fundamental molecular biology. John Wiley & Sons. • Jain, A., Jain, R. and Jain, S., 2020. Basic Techniques in Biochemistry, Microbiology and Molecular Biology (pp. 235-242). New York, NY, USA:: Springer. • Twyman, R., 2018. Advanced molecular biology: a concise reference. Garland Science. • Alberts B. Johnson A, Lewis J., Raff M., Robert K, Walter P. 2002. Molecular Biology of Cell. 4th Ed. Garland Science. www.classwire.com/garlandscience • Collins FS, ED. Green, AE. Guttmacher and MS. Guyer. 2003. A vision for the future of genomics research : A blueprint for the genomics era. Nature 422 : 1-13. • Horton HR, LA. Moran, RS. Ochs, JD. Rawn, KG. Scrimngeour. 2002. Principles of Biochemistry. 3rd Ed. Pearson Education International. (864 pages) www.prenhall.com/horton • Lodish H., Berk A., Matsudaira P., Kaiser CA., Krieger M., Scott MT. Zipursky SL., Darnell J. 2004. Molecular Cell Biology. 5th Ed. WH. Freeman. www.whfreeman.com/lodish • McKee T. & JR. McKee. 2003. Biochemistry: The molecular Basis of Life. 3rd Ed. McGraw-Hill. (771 pages) www.mhhe.com/mckee • Nelson, DL. & MM.Cox. 2005. Lehninger : Principles of Biochemistry. 4th Ed. WH. Freeman. (1400 pages) www.whfreeman.com/lehninger • Strachan T & Read Ap. 2004. Human Molecular Genetics. 3rd Ed. Garland Science. www.classwire.com/garlandscience/strachan • Weaver RF. 2003. Molecular Biology. 2nd Ed. McGraw-Hill. www.mhhe.com/weaver • Fatchiyah, Sri Widyarti, Estri Laras Arumingtyas, Sri Rahayu, 2011. Biologi Molekuler: Prinsip Dasar Analisis. Penerbit Erlangga, Jakarta. • Ausubel FM., Brent R., Kingston RE., Moore D., Seidman JG. Smith JA. Struhl K. 2002. Short Protocols in Molecular Biology. 5rd Ed. John Wiley & Sons. • GeneBank: NCBI www.ncbi.nlm.nih.gov/http://www.ddbj.nig.ac.jp/http://www.ebi.ac.uk/ • Innis MA. Gelfand DH., Sninsky JJ. 1999. PCR Application Protocol for Functional Genomics. Academics Press • Sambrook J. & Russel DW. 2001. Molecular Cloning: A laboratory manual. Cold Spring Harbor. www.cshl.org/sambrook • Bollag DM., & Edelstein SJ. 1991. Protein Methods. A John Wiley & Sons. • Robyt JF & White BJ. 1990. Biochemical Techniques: Theory & Practice. Brooks/Cole Pub. • Wilson K & Walker J. 2004. Principles & Techniques of Practical Biochemistry. 4th Ed. Cambridge University Press.

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Module Handbook
Practice in Molecular Biology

<table>
<tr><td>Module Name:</td><td colspan="4">Practice in Molecular Biology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60023</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Dra. Fatchiyah, M.Kes.,Ph.D.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Dra. Fatchiyah, M.Kes.,Ph.D.
2. Prof. Dr.Ir. Estri Laras Arumingtyas, M.Sc.St.
3. Dr. Sri Widyarti, MS.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Compulsory</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">5.7</td><td>40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>5.7</td><td>-</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (sks)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the laboratory practice to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Cell Biology (MAB61015)
• Genetics (MAB61017)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to perform the basic techniques of detection and analysis of proteins and nucleic acids in order to cover different levels of a research in molecular biology and genetics. CLO 2. Able to cognize basic concepts and terminology of the main techniques of molecular biology. CLO 3. Able to develop practical laboratory skills, generate raw experimental data, and work safely and efficiently in a molecular biology laboratory. CLO 4. Able to collect and correlate the information obtained and knowing how to present in the form of a scientific report either individually or in a teamwork.
Content	1. Briefing and placement test 2. Basic Use of Micropipettes and Sampling Techniques 3. DNA isolation 4. Quantitative and Qualitative Test of DNA 5. Protein Isolation 6. Protein Quantitative Test (Standard curve calculation)
Study and examination requirements and forms of examination	Form of examination in lab practice: • Placement-test • Lab report • Assignment • Mid and Final lab test • Attitude during lab practice Final score (NA) is calculated as follow: Placement-test (10%) + lab report (20%) + assignment (15%) + attitude (5%) + mid exam (25%) + final exam (25%)
Media employed	LCD, laptop, google classroom, video conference (zoom/ gmeet)

Reading list	• Jain, A., Jain, R. and Jain, S., 2020. Basic Techniques in Biochemistry, Microbiology and Molecular Biology (pp. 235-242). New York, NY, USA:: Springer. • Alberts B. Johnson A, Lewis J., Raff M., Robert K, Walter P. 2002. Molecular Biology of Cell. 4th Ed. Garland Science. www.classwire.com/garlandscience • Ausubel F. M., et. al. (Ed), 2002. Short protocols in molecular biology: a compendium of methods from current protocols in molecular biology, 5th Ed. (2 volumes), John Wiley & Sons, Inc., New Jersey. • Bollag DM., & Edelstein SJ. 1991. Protein Methods. A John Wiley & Sons. • Fatchiyah, Sri Widyarti, Estri Laras Arumingtyas, Sri Rahayu, 2011. Biologi Molekuler: Prinsip Dasar Analisis. Penerbit Erlangga, Jakarta. • Innis MA. Gelfand DH., Sninsky JJ. 1999. PCR Application Protocol for Functional Genomics. Academics Press. • Lodish H., Berk A., Matsudaira P., Kaiser CA., Krieger M., Scott MT. Zipursky SL., Darnell J. 2004. Molecular Cell Biology. 5th Ed. WH. Freeman. www.whfreeman.com/lodish • McKee T. & JR. McKee. 2003. Biochemistry: The molecular Basis of Life. 3rd Ed. McGraw-Hill. (771 pages) www.mhhe.com/mckee • Nelson, DL. & MM.Cox. 2005. Lehninger : Principles of Biochemistry. 4th Ed. WH. Freeman. (1400 pages) www.whfreeman.com/lehninger • Robyt JF & White BJ. 1990. Biochemical Techniques: Theory & Practice. Brooks/Cole Pub. • Sambrook J. & Russel DW. 2001. Molecular Cloning: A laboratory manual. Cold Spring Harbor. www.cshl.org/sambrook • Tagu D. & Moussard C., 2006. Techniques for molecular biology. Taylor and Francis Group, Science Publishers, New Hampshire. • Weaver RF. 2003. Molecular Biology. 2nd Ed. McGraw-Hill. www.mhhe.com/weaver • Wilson K & Walker J. 2004. Principles & Techniques of Practical Biochemistry. 4th Ed. Cambridge University Press. www.cup.cam.ac.uk/wilson

Module Handbook
Animal Embryology

Module Name:	Animal Embryology
Module Level:	Bachelor
Abbreviation, if applicable:	MAB61024
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	5th semester
Person responsible for the module:	Dr. Sri Rahayu, M.Kes.
Lecturer(s):	1. Dr. Sri Rahayu, M.Kes. 2. Prof. Dr. Ir. Moch. Sasmito Djati, M.Si., IPU. 3. Dr. Agung Pramana Warih M, M.S. 4. Drs. Aries Soewondo, M.Si.
Language:	Indonesian
Relation to curriculum	

Programme	Mode	Semester
Bachelor Programme in Biology	Compulsory	Odd

Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.

Teaching method	Contact hours per week	Class size
Lectures	1.7	40
Exercise (structured assignment & independent learning/ self-study)	4.0	40
Laboratory practice	2.8	40

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours

Contact hours per week	Private/self-study per week	Semester workload	ECTS
4.5	4.0	136 h	4.5

Credit point	3 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on Animal Anatomy and Physiology (MAB61013)

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering theoretical concepts or their application in one field (intradisciplinary) and performing simple analysis and synthesis in solving problems in the field of embryonic development. CLO 2. Able to design and present alternative solutions to problems related to embryonic development. CLO 3. Having responsibility in completing taSCU as part of the organization and able to provide input in a work team.
Content	1. Basic understanding of embryology, embryological theories 2. Gametogenesis: Spermatogenesis, Oogenesis 3. Fertilization and Cleavage 4. Asexual reproduction (Parthenogenesis/ pedogenesis) 5. Embryonic division patterns 6. Gastrulation and neurulation 7. Morphogenesis and Organogenesis 8. Hatching pattern of Oviparous /Viviparous /Ovoviviparous and parturition animals 9. Metamorphosis 10. Teratogenesis
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Form of examination in laboratory practice: • Pre/post-test • Lab report • Final practice test Final score (lectures-A): Quiz (20%) + Assignment (20%), mid exam (30%) and final exam (30%).

	Final score (lab practice-B): pre/post-test (15%) + Lab report (25%) + final practice test (60%) Total score: (2A+B)/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Gilbert, SF and Baarresi, MJM 2018, Developmental Biology. 11th Edition. Sinaur Associate Inc. Sunderland, USA • Peledri, FJ 2019, Vertebrate Embryogenesis, Second Edition. Humana Press, USA • Sadler TW 2017, Medical Embryology, 12th Edition, Lippincott Williams and Wilkins, Tokyo • Slack JMW 2012, Essential Developmental Biology, Second Edition, Blackwill Publishing. USA

Module Handbook
Microtechnique

Module Name:	Microtechnique			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB61025			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	5th semester			
Person responsible for the module:	Dra. Nunung Harijati, M.S., Ph.D			
Lecturer(s):	1. Dra. Nunung Harijati, M.S., Ph.D 2. Dr. Serafinah Indriyani, M.Si. 3. Drs. Aries Soewondo, M.Si.			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Compulsory	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	0.8	40	
	Exercise (structured assignment & independent learning/ self-study)	2.0	40	
	Laboratory practice	5.7	40	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	6.5	2.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on: • Plant Structure and Development (MAB62009) • Practice in Plant Structure and Development (MAB62010) • Animal Histology (MAB62011)			

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to operate simple and complex microscopes properly and correctly. CLO 2. Able to read material safety data sheets. CLO 3. Able to do plant tissue clearing. CLO 4. Able to make cytology preparations. CLO 5. Able to make semi-permanent plant preparations. CLO 6. Able to make permanent plant and animal preparations. CLO 7. Able to make whole mount animals. CLO 8. Able to make blood smears.
Content	1. Eye alignment with the ocular lens: adjust the left and right eyepieces to obtain a single field of view 2. Kohleran microscope so that the image can be photographed optimally 3. The use of MSDS 4. Clearing and whole mount plants 5. Making cytology preparations 6. Making permanent plant preparations 7. Making permanent animal preparations 8. Making animal whole mount 9. Making animal smear
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and Final Test Form of examination in laboratory practice: • Pre/post-test • Lab report • Final practice test Final score (lectures-A): Quiz (20%) + Assignment (20%), mid exam (30%) and final exam (30%). Final score (lab practice-B): pre/post-test (15%) + Lab report (25%) + final practice test (60%)

	Total score: (1A+2B)/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Harijati N., Samino S., Indriyani S., Soewondo A. 2017. Mikroteknik Dasar. UB Press, Malang. • Khasim SM. 2002. Botanical microtechnique: principles and practice. Capital Publ.co., New Delhi. • Marimuthu, R., 2019. Microscopy and Microtechnique. MJP Publisher. • Ruzin SE. 1999. Plant microtechnique and microscopy. Oxford University Press, New York. • Sanderson, J., 2020. Biological microtechnique. Garland Science. • Sigh RJ. 2003. Cytogenetics. CRC Press, New York. • Yeung, E.C.T., Stasolla, C., Sumner, M.J. and Huang, B.Q. eds., 2015. Plant microtechniques and protocols. Cham, Switzerland: Springer International Publishing.

Module Handbook
Method of Bioresearch and Scientific Writing II

<table>
<tr><td>Module Name:</td><td colspan="4">Method of Bioresearch and Scientific Writing II</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB62030</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.
2. Prof. Amin Setyo Leksono, S.Si., M.Si., Ph.D
3. Zulfaidah Penata Gama, S.Si., M.Si., Ph.D
4. Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc.
5. Dr. Wahyu Widoretno, M.Si
6. Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40</td></tr>
<tr><td>Laboratory practice</td><td>0</td><td colspan="2">-</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">-</td></tr>
<tr><td></td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

Module objective/ intended learning outcomes	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to fulfill the procedures and attend lectures and complete all their duties and obligations with full responsibility. CLO 2. Able to master the nature of science, scientific truth and bioethical concepts. CLO 3. Able to compile draft journal publications and able to formulate self-profile to get grant. CLO 4. Able to develop a research framework starting from the background, problem formulation, research objectives and benefits based on the most relevant literature on the research topic. CLO 5. Able to choose and write research methods appropriately based on the activity stages and relevant to the research objectives. CLO 6. Able to present data in the right format, interpret data and discuss based on relevant literature. CLO 7. Able to draw conclusions and provide suggestions based on data as well as compiling a bibliography and attachments based on applicable regulations. CLO 8. Able to compose essays.
Content	1. Bioethics in biological research and ethics of various scientific communication techniques (oral and written) including plagiarism issues, and learning contract. 2. Introduction: relevance of research title to background, problem formulation, research objectives. 3. Search, selection and writing strategies of literature review. 4. Search strategy, selection and writing of research methods, including social survey research. 5. Management, presentation, interpretation, narration of research results data interpretation. 6. Dissemination – Journal publication: article structure – review process, CV & application letter for Competition Grant. 7. Conclusion, suggestions, bibliography and appendix.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz/post-test • Assignment I (individual review) • Assignment II (group review) • Assignment III (making essay)

	Final score: Quiz (20%) + Assignment I (25%) + Assignment II (25%) + Assignment III (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Pant, D, Ram, M, Nautiyal, OP 2020, Scientific Methods Used in Research and Writing. United States: Taylor & Francis Group. • Thomas, CG, 2021 Research Methodology and Scientific Writing. Germany: Springer International Publishing.

Module Handbook
Biological Research Design

Module Name:	Biological Research Design		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB62031		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	5th semester		
Person responsible for the module:	Dr. Endang Arisoesilaningsih, M.S.		
Lecturer(s):	1. Dr. Endang Arisoesilaningsih, M.S. 2. Dr. Serafinah Indriyani, M.Si 3. Dr. Catur Retnaningdyah, M.Si.		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40
	Exercise (structured assignment & independent learning/ self-study)	4.0	40
	Laboratory practice	2.8	40

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective.			

	ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain several research designs from a bio-conservation perspective (ILO 3). CLO 2. Able to show three main examples of biological research designs: biosocial surveys, experimental and non-experimental in solving problems in the field of biology (ILO5). CLO 3. Able to explain the application and develop three types of research designs to solve problems from a bio-conservation perspective (ILO 5). CLO 4 Able to communicate well in Indonesian and English in gathering scientific information (ILO 6). CLO 5. Skilled in working in teams using information systems to explain and improve inappropriate research designs (ILO 7).
Content	1. Non-experimental research design: survey ethnobiology 2. Experimental research design 3. Non-experimental time series research design The three topics discussed above include: a. Title, problem, and research objectives b. Data and research variables/variables c. Research design and steps d. Large/sample size e. Research instruments and data collection techniques f. The design of the data sheet table and the estimated data to be obtained g. Data validity and reliability h. Data analysis, data presentation and interpretation
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz/ Assignment • Mid and final exam Form of examination in laboratory practice: • Student presentation I, II, and III Laboratory practice score: Student presentation I (25%) + Student presentation I (25%) + Student presentation I (25%) + Class participation (25%). Final score: Lab practice (25) + Quiz/ Assignment (15%) + mid exam (40%) and final exam (20%).

Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Creswell, J.W. 2017. Research Design Qualitative, Quantitative, and Mixed Methods Approaches. SAGE Publications. Thousand Oaks. • Herzog, M.H., G. Francis, A. Clarke. 2019. Understanding Statistics and Experimental Design. How to Not Lie with Statistics. Springer International Publishing. Switzerland • Young T.J. 2016. Questionnaires and Surveys. In Zhu Hua, Ed. Research Methods in Intercultural Communication: A Practical Guide. Wiley. Oxford.

Module Handbook
Basic Technique of Cell and Tissue Culture

Module Name:	Basic Technique of Cell and Tissue Culture			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60027			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	5th semester			
Person responsible for the module:	Dr. Dra. Wahyu Widoretno, M.Si			
Lecturer(s):	1. Dr. Dra. Wahyu Widoretno, M.Si 2. Prof. Muhaimin Rifa`I, S.Si., Ph.D.Med.Sc 3. Dr. Dra. Sri Rahayu, M.Kes. 4. Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc. 5. Yoga Dwi Jatmiko, S.Si., M.App.Sc.,Ph.D			
Language:	Indonesian and English			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Compulsory	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40	
	Laboratory practice	2.8	40	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (sks)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			

<table>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:

ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective.

ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety.

ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.

ILO 7. Have a capacity for teamwork with respecting biodiversity.</td></tr>
<tr><td></td><td>Course learning outcomes (CLO) after completing this module:

CLO 1. Able to understand and explain the basic concepts and principles of cell and tissue culture techniques (ILO 3)

CLO 2. Understand and apply basic technical protocols/procedures for plant, animal, and microbial cell culture (ILO 3, ILO4).

CLO3 Able to understand and explain the role and application of plant, animal, and microbial cell culture techniques in basic research and in agricultural, medical and industrial biotechnology (ILO5).

CLO4. Have a good personality in supporting to work in a team, especially through structured assignments in lectures and lab practice (ILO7).</td></tr>
<tr><td>Content</td><td>1. Introduction: lecture contract, understanding, importance and scope of basic techniques of cell and tissue culture
2. Fundamentals of plant tissue culture, types of culture and factors that control the growth and development of plant cell and tissue cultures.
3. Principles and techniques of plant cell and tissue culture
4. The important role and application of plant cell and tissue culture in basic research (cytology, biochemistry and physiology studies)
5. Important roles and applications of plant cell and tissue culture in agricultural, medical and industrial biotechnology
6. Fundamentals of animal cell culture, types of culture and factors that control the growth and development of animal cell cultures.
7. Fundamentals of animal cell culture, types of culture and factors that control the growth and development of animal cell cultures.
8. Cell isolation technique from tissue for animal cell culture
9. Application of animal cell culture in basic research
10. Application of animal cell culture in medical biotechnology
11. Microbial culture media and techniques, measurement and kinetics of microbial growth
12. Scale-up of microbial processes, isolation of microbial products, isolation and strain development
13. Application of microbial culture technology and biosafety/bioethics issues in microbial technology</td></tr>
</table>

Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Student presentation • Mid and final exam • Attitude during lab practice Form of examination in lab practice: • Lab report • Pre/post-test • Presentation • Final practice exam Class score (CS): Quiz (10%) + Assignment (15%), mid exam (30%), and final exam (30%) + Student presentation (15%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/ gmeet)
Reading list	• Freshney, R.I., 2015. Culture of animal cells: a manual of basic technique and specialized applications. John Wiley & Sons. • Jacquelyn G. Black and Laura J. Black, 2017, Microbiology: Principles and Explorations, 10th Edition, Wiley Publisher. • James G. Cappuccino and Natalie Sherman, 2014, A Laboratory Manual, 10th edition, Pearson Education. • Neumann KH, A Kumar, J Imani. 2009. Plant Cell and Tissue Culture - A Tool in Biotechnology. Basics and Application. Springer-Verlag Berlin Heidelberg. • Madigan et al., 2019, Brock Biology of Microorganisms 15th edition, Pearson Education. • Meyer HP and DR. Schmidhalter. 2014. Industrial Scale Suspension Culture of Living Cells. Willey Blackwell Germany. • Park. 2021, Plant Tissue Culture: Techniques and Experiments. Netherlands: Elsevier Science. • Purohit SD. 2013. Introduction to Plant Cell, Tissue and Organ Culture. PHI Learning Private Limited Dehli-110092.

Module Handbook
Evolution

Module Name:	Evolution			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB62028			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	6^{th} semester			
Person responsible for the module:	Prof. Sutiman Bambang Sumitro, S.U., D.Sc.			
Lecturer(s):	1. Prof. Drs. Sutiman B. Sumitro, SU., D.Sc. 2. Prof. Amin Setyo Leksono, S.Si., M.Si., Ph.D 3. Dr. Jati Batoro, M.Si. 4. Nia Kurniawan, S.Si., M.P., D.Sc.			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Compulsory	Even	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40	
	Laboratory practice	0	-	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 78 credit units.			

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the purpose of the lecture, recognize the concept of evolution, its benefits for understanding living systems CLO 2. Understand the basic concepts of evolution: generality and life history CLO 3. Understand the basic concept of the evolution of organisms: Biodiversity CLO 4. Understand in detail the process of animal evolution through examples in certain species CLO 5. Understand in detail the process of plant evolution through examples of certain species CLO 6. Understand and summarize the basics of the theory of evolution CLO 7. Gaining experience in discussing and developing the concept of evolution
Content	1. The laws that apply in the evolution and history of life 2. Diversity of life and its relationship to evolution 3. Description and reasoning of changes in animal species through fossil evidence and animal structures that exist today 4. Description and reasoning of changes in plant species through fossil evidence and animal structures that exist today 5. Evaluate the possibility of misunderstanding and provide a learning forum together 6. Studying various works of people's minds and their evidence
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Small Group Presentation • Mid and Final Test Final score: Quiz (10%) + Assignment

	(15%) + Presentation (15%) + mid exam (30%) + final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Carmines, E.G. and Stimson, J.A., 2021. Issue evolution. Princeton University Press. • C. A. . Backer & R. C. Bakhuizen Van Den Brink. 1965. Flora of Java. N.V. P. Noordhoff. Groningen. Netherlands. • Dahler F. and Chandra J. (edisi bahasa Indonesia): Asal dan Tujuan manusia (ISBN 9794130591) • Levins, R., 2020. Evolution in changing environments. Princeton University Press. • Wikipedia: id.wikipedia.org/wiki/Asal_Usul_Spesies id.wikipedia.org/wiki/Charles_Darwin • Waluyo, L., 2010. Miskonsepsi dan Kontroversi Evolusi (ISBN: 978-979-796-115-2)

Module Handbook
Internship

Module Name:	Internship
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60034
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	7th semester
Person responsible for the module:	Viky Vidayanti, S.Si., M.Si
Lecturer(s):	1. Viky Vidayanti, S.Si., M.Si 2. Zulfaidah Penata Gama, S.Si., M.Si., Ph.D
Language:	Indonesian
Relation to curriculum	Programme: Bachelor Programme in Biology; Mode: Compulsory; Semester: Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
Credit point	3 credit units (SCU)
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	The total credit units achieved is more than 90 credit units.
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.

Relation to curriculum:

Programme	Mode	Semester
Bachelor Programme in Biology	Compulsory	Odd

Type of teaching, contact hours:

Teaching method	Contact hours per week	Class size
Lectures	-	-
Exercise (structured assignment & independent learning/ self-study)	-	-
Laboratory practice	8.5	40

Workload:

Contact hours per week	Private/self-study per week	Semester workload	ECTS
8.5	-	136 h	4.5

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the field work practices and attitudes that must be possessed as an intern. CLO 2. Able to communicate in Indonesian. CLO 3. Able to demonstrate scientific attitude and social attitude.
Content	Students do work internships at an institution for 136 hours/semester. These activities include: Briefing at the beginning of the semester, doing internships, making posters and disseminating them, and/or written reports. Monitoring and evaluation are carried out by two supervisors, an examiner and a street vendor coordinator.
Study and examination requirements and forms of examination	Form of examination in lectures: • Poster presentation (understanding level, systematics, attractiveness and clarity) Final score: understanding level (30%) + Poster systematics (10%) + Poster attractiveness (5%) + Poster clarity (10%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	Varies depend on the internship topics.

Module Handbook
Bachelor's Thesis Proposal Seminar

<table>
<tr><td>Module Name:</td><td colspan="4">Bachelor's Thesis Proposal Seminar</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60032</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dian Siswanto, S.Si., M.Sc., M.Si.,Ph.D (Head of Study Programme)</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dian Siswanto, S.Si., M.Sc., M.Si.,Ph.D (Head of Study Programme)
2. Thesis supervisors</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Compulsory</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Seminar</td><td>2.8</td><td colspan="2">Depend on the number of students who enrolled this course</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>2.8</td><td>-</td><td>45.3 h</td><td>1.5</td></tr>
<tr><td>Credit point</td><td colspan="4">1 credit unit (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">The total credit units achieved is more than 108 credit units, and has a prospective supervisor.</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to analyze and synthesize research data. CLO 2. Able to describe research results in written form. CLO 3. Able to present research results in seminar forums.
Content	1. Students analyze research results 2. Students synthesize research results 3. Students carry out resumes and report their research results to the working group; students write research reports according to the manual. 4. Students make presentation media, understand presentation techniques and present their research results openly
Study and examination requirements and forms of examination	Form of examination in lectures: • Quality of thesis proposal writing • Slide presentation • Presentation (systematics, clarity, language, attitude and timing management) • Understanding level Final score: understanding level (30%) + Quality of thesis proposal writing (30%) + Slide presentation (10%) + Presentation (systematics & clarity (10%) + Presentation (language) (10%) + Presentation (attitude and timing management) (10%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Jurusan Biologi, 2016. Pedoman Penulisan Skripsi. Jurusan Biologi, FMIPA, Universitas Brawijaya, Malang;

	• Fakultas MIPA, ---. Pedoman Penulisan Tugas Akhir. FMIPA. Universitas Brawijaya. • Varies depend on the thesis topics.

Module Handbook
Research Result Seminar

Module Name:	Research Result Seminar		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60033		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	8th semester		
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si.,Ph.D (Head of Study Programme)		
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si.,Ph.D (Head of Study Programme) 2. Thesis supervisors		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	-	-
	Exercise (structured assignment & independent learning/ self-study)	-	-
	Seminar	2.8	Depend on the number of students who enrolled this course

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	2.8	-	45.3 h	1.5
Credit point	1 credit unit (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 120 credit units			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:			

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand the order of implementation of the seminar course thesis proposal final thesis CLO 2. Understand the rules of scientific writing and implementing them correctly CLO 3. Understand the technique of preparing the final project proposal manuscript and seminar correctly CLO 4. Understand the technique of preparing the final project proposal manuscript and seminar correctly
Content	1. Contract / study rules 2. Procedures for writing and presenting the final thesis proposal 3. Thesis (final project) seminar
Study and examination requirements and forms of examination	Form of examination in lectures: • Understanding and developing ideas • Quality of thesis writing • Slide presentation • Presentation (systematics, clarity, language, attitude and timing management) • Delivering research results (presentation, interpretation, analysis) Final score: understanding and developing ideas (30%) + Quality of thesis proposal writing (10%) + Presentation (systematics & clarity (15%) + Presentation (language) (10%) + Presentation (attitude and timing management) (5%) + Delivering research results (presentation, interpretation, analysis) (20%)

Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Jurusan Biologi, 2016. Pedoman Penulisan Skripsi. Jurusan Biologi, FMIPA, Universitas Brawijaya, Malang; • Fakultas MIPA, ---. Pedoman Penulisan Tugas Akhir. FMIPA. Universitas Brawijaya. • Varies depend on the thesis topics.

Module Handbook
Bachelor's Thesis

Module Name:	Bachelor's Thesis		
Module Level:	Bachelor		
Abbreviation, if applicable:	UBU60001		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	8th semester		
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si.,Ph.D (Head of Study Programme)		
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si.,Ph.D (Head of Study Programme) 2. Thesis supervisors		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Compulsory	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	-	-
	Exercise (structured assignment & independent learning/ self-study)	-	-
	Laboratory practice / fieldwork	17	Depend on the number of students who enrolled this course

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	17	-	272 h	9
Credit point	6 credit unit (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 120 credit units			

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 6. Able to demonstrate good communication skills in delivering scientific information both in Indonesian and English. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand Biology and its supporting sciences and their benefits, as well as attitudes and behavior (life skills) as a biologist CLO 2. Understand the structure, function and organization of life. CLO 3. Understand the coordination of life, regulation of growth and development and analysis. CLO 4. Understand the concept of research and scientific writing CLO 5. Skilled in using appropriate methods to solve simple problems in the field of biology CLO 6. Able to communicate in Indonesian and English. CLO 7. Skilled in basic computer operations software applications, basic instruments, standard methods for analysis and synthesis in the field of biology. CLO 8. Able to demonstrate scientific attitudes (curiosity, objective, rational, critical, open mind, creative, innovative, etc.), and social attitude (polite, respecting others, being responsible, etc.) CLO 9. Have a Bio-entrepreneurship character (leadership, managerial, inner motivated, responsive, working in a team, etc.)
Content	1. Knowledge deepening (theoretical basis) supporting the topic

	2. Research variables and objects to be studied 3. Application of basic science in solving biological problems, especially those related to the field of research. 4. Research concepts and techniques for obtaining data related to the thesis theme taken by students. 5. Skills related to the implementation of research and its implementation to obtain data 6. Elaboration of research results in one form of scientific work in writing 7. Presentation of research results in seminar forums in accordance with standards in the Department of Biology. 8. Basic computer application programs, basic instruments, standard methods for analysis and synthesis in the field of biology, according to the topic/field of student research 9. Research methods to solve biological problems in certain areas of interest (student choice). 10. Good knowledge and attitudes/habits regarding scientific and social attitudes 11. Research group/organization cooperation methods in laboratories, Working Group or other related research groups.
Study and examination requirements and forms of examination	Form of thesis examination: • Understanding and developing ideas • Quality of thesis writing • Delivering research results (presentation, interpretation, analysis) Thesis exam score: Understanding and developing ideas (50%) + Quality of thesis writing (10%) + Delivering research results (presentation, interpretation, analysis) (20%) Final score: Thesis Proposal Seminar (10%), Research Result Seminar (20%) dan Thesis Exam (70%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Jurusan Biologi, 2016. Pedoman Penulisan Skripsi. Jurusan Biologi, FMIPA, Universitas Brawijaya, Malang; • Karjo, CH, 2020 Writing and Researching for A Thesis Proposal. (n.p.): Penerbit Universitas Katolik Indonesia Atma Jaya. • Mligo, ES, 2016 Introduction to Research Methods and Report Writing: A Practical Guide for Students and Researchers in Social Sciences and the Humanities. United Kingdom: Wipf and Stock Publishers.

ELECTIVE COURSES

FIELD OF INTEREST IN BOTANY

Module Handbook
Ethnobotany

<table>
<tr><td>Module Name:</td><td colspan="4">Ethnobotany</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60101</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Jati Batoro, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Jati Batoro, M.Si
2. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D
3. Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>0</td><td colspan="2">-</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Diversity of Flora (MAB60005)
• Practice in Diversity of Flora (MAB60006)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the principles of ethnobiological knowledge in society. CLO 2. Able to identify scientific knowledge (ethics), public knowledge (emic), community praxis about the scope of ethnobotany, ethnozoology, ethnoecology. CLO 3. Able to perform interview techniques or qualitative and quantitative approach methods. CLO 4. Able to perform data analysis, synthesizing data from the community/ethnicity and the impacts. CLO 5. Able to conduct research in the field of ethnobiology studies.
Content	1. Fundamentals of Ethnobiology 2. Anthropology of ethnic groups/community groups 3. Ethnobotany and scientific knowledge 4. Ethnozoology and scientific knowledge 5. Ethnoecology and scientific knowledge 6. Biological resources 7. Data collection techniques (interviews), ethics and emic 8. Practicum/fieldwork
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment/ paper project • Mid and Final Exam Final score: Paper project (10%), quiz (10%), assignment (10%), mid exam (35%), and final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).

Reading list	• Albuquerque, U.P., Ramos, M.A., Júnior, W.S.F. and De Medeiros, P.M., 2017. Ethnobotany for beginners. Springer International Publishing. • Balick, M.J. and Cox, P.A., 2020. Plants, people, and culture: the science of ethnobotany. Garland Science. • Backer, C.A., & R.C. Bakhuizen Van Den Brink JR. 1963. Flora of Java. Vol. I, II, III (Spermatophytes Only) N. V. P. Noordhoff. Groningen- The Netherlands. • Batoro, J. 2015. Pengelolaan lingkungan dengan pendekatan Etnobiologi-Etnobotani. UB Press. • Cotton, C.M. 1996. Ethnobotany: Principle and Applications. John Wiley & Sons. Chichester, New York, Brisbane, Toronto, and Singapore. 424 hlm. • Dharmawan, A. H. 2008. Bahan Kuliah Gerakan Sosial dan Dinamika Masyarakat Pedesaan. Mayor Sosiologi Pedesaan-Departemen Komunikasi dan Pengembangan Masyarakat. Institut Pertanian Bogor. • Johnson, T., 2019. CRC ethnobotany desk reference. CRC Press. • Martin, G.J. 1988. Ethnobotani. Sebuah Manual Pemeliharaan Manusia dan Tumbuhan. Natural History Publications, Borneo. 309 hlm. • Purwanto, Y. 2011. Valuasi Hasil Hutan Bukan Kayu (Kawasan Lindung PT Wirakarya Sakti Jambi). Jakarta LIPI Press. Hlm 121-143. • Primack, R.B, J.M. Supriatna, P. Indrawan, Kramadibrata. 1998. Biologi Konservasi.Yayasan Obor Indonesia. Jakarta. • Rugayah, E.A. Widjaya, Praptini, editor, 2004. Pedoman Pengumpulan Data Keanekaragaman Flora. Pusat Penelitian Biologi-LIPI. Bogor. • Sheil, D., R.K. Puri, I.Basuki, M. van Heiizt, M. Wan, N. Liswanti, Rukmiyati, M.A. Sardjono, L. samsoedin, K. Sudiyasa, Chrisandini, E.Permana, E. M. Angi, F. Gatzweiler, B. Johnson & Wijaya. 2004. Mengeksplorasi keanekaragaman Hayati, Lingkungan dan Pandangan Masyarakat Lokal Mengenai Lanskap Hutan. Bogor: Center for International Forestry Research (CIFOR). Indonesia. • Soemarwoto, O. 2004. Ekologi, Lingkungan Hidup dan Pembangunan. Jakarta: Djambatan.

Module Handbook
Plant Tissue Culture

<table>
<tr><td>Module Name:</td><td colspan="4">Plant Tissue Culture</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60102</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Wahyu Widoretno, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Wahyu Widoretno, M.Si
2. Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc.
3. Dr. Aminatun Munawarti, M.Si</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Plant Physiology (MAB62019)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand and be able to utilize callus culture and cell suspensions, in vitro hybridization, protoplast fusion, and meristem cell cultures in various plant biology studies (ILO 5). CLO 2. Skilled in using appropriate methods in practical activities in understanding the induction, growth and development of callus and cell suspensions, in vitro hybridization, protoplast fusion, and meristem cell cultures (ILO 3, ILO 4). CLO 3. Able to understand and explain the concepts of research and scientific articles to develop further ideas related to development of callus and cell suspensions, in vitro hybridization, protoplast fusion, and meristem cell cultures (ILO 1). CLO 4. Able to understand the importance of academic integrity especially through the discussion process and working on structured assignments in theory class (ILO 1). CLO 5. Have a good personal approach as a teamwork, especially through working on structured assignments in theory (lecture) and practice (practicum) classes (ILO 7).
Content	1. Plants as a source of various secondary metabolites 2. Process and factors affecting the induction, growth and maintenance of callus and cell suspensions 3. Utilization of callus culture and cell suspension to increase the biosynthesis of secondary products 4. Somatic vs zygotic hybridization 5. Isolation, fusion and culture of protoplasts 6. Several methods of hybrid cell selection and subsequent hybrid growth and development 7. Shoot meristem and its parts 8. Metabolism of meristem cells, meristem culture techniques and factors that influence the success of meristem culture in producing virus-free plants

Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation • Final practice exam Class score (CS): Presentation (15%) + quiz (10%) + assignment (15%), mid exam (30%) + final exam (30%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Bhojwani, S.S. dan P.K. Dantu. 2013. Plant Tissue Culture: An Introductory Text. Springer. • Gray, DJ, Trigiano, RN 2016, Plant Tissue Culture, Development, and Biotechnology, United States, CRC Press. • Iftikhar R 2018, Recent Advances in Plant in Vitro Culture. Canada: Arcler Education Incorporated. • Smith, R.H. 2012. Plant Tissue Culture: Techniques and Experiments. Acad. Press. Elsevier. London.

Module Handbook
Phytohormone

<table>
<tr><td>Module Name:</td><td colspan="4">Phytohormone</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60103</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Wahyu Widoretno, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Wahyu Widoretno, M.Si
2. Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc.
3. Nunung Harijati, M.S., Ph.D
4. Dr. Aminatun Munawarti, M.Si</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Plant Physiology (MAB62019)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Understand and be able to utilize phytohormone and its metabolism regulation in various plant biology studies (ILO 5). CLO 2. Skilled in using appropriate methods in practical activities in understanding phytohormone, and its cellular and molecular mechanisms (ILO 3, ILO 4). CLO 3. Understand and be able to explain the concepts of research and scientific articles to develop further ideas related phytohormone (ILO 1). CLO 4. Understand the importance of academic integrity especially through the discussion process and working on structured assignments in theory class (ILO 1). CLO 5. have a good personal approach as a teamwork, especially through working on structured assignments in theory (lecture) and practice (practicum) classes (ILO 7).
Content	1. Definition and types of plant hormones (auxins, gibberellins, cytokinins, ethylene, abscisic acid, salicylic acid, jasmonic acid, brasinosteroids, polyamines and cystin); 2. Structure, biosynthesis and metabolism of plant hormones; 3. Detection of the presence of endogenous hormones; transport and regulation of hormones in plants; 4. The role of hormones in plant growth and development; 5. Cellular and molecular mechanisms of hormone action in plants, 6. Hormone applications in biology and agriculture.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation

	• Final practice exam Class score (CS): Presentation (15%) + quiz (10%) + assignment (15%), mid exam (30%) + final exam (30%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Khan, NA, Iqbal N, Nazar R, 2017 Salicylic Acid: A Multifaceted Hormone. Singapore: Springer Singapore. • Mattoo, AK, 2018 The Plant Hormone Ethylene. United Kingdom: CRC Press. • Pandey, GK, 2017 Mechanism of Plant Hormone Signaling Under Stress, 2 Volume Set. Germany: Wiley. • Smith, SM, Li, J, Li, C,2017 Hormone Metabolism and Signaling in Plants. United Kingdom: Elsevier Science.

Module Handbook
Medicinal Herb

Module Name:	Medicinal Herb
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60104
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Odd semester
Person responsible for the module:	Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D
Lecturer(s):	1. Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D 2. Dr. Jati Batoro, M.Si. 3. Prof. Widodo, S.Si., M.Si., Ph.D.Med.Sc. 4. Dr. Aminatun Munawarti, M.Si. 5. Mufidah Afiyanti, S.P., Ph.D.
Language:	Indonesian and English
Relation to curriculum	Programme / Mode / Semester: Bachelor Programme in Biology / Elective / Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
Credit point	2 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on: • Diversity of Flora (MAB62005) • Plant Physiology (MAB62019)

Relation to curriculum:

Programme	Mode	Semester
Bachelor Programme in Biology	Elective	Odd

Type of teaching, contact hours:

Teaching method	Contact hours per week	Class size
Lectures	1.7	40-50
Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
Laboratory practice	0	-

Workload:

Contact hours per week	Private/self-study per week	Semester workload	ECTS
1.7	4.0	90.7 h	3

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering the principles of biology in a comprehensive manner and following the development of modern biology. CLO 2. Perform simple analysis and synthesis in solving problems in the field of biology. CLO 3. Able to utilize biological sciences to solve simple problems through the application of biological knowledge, biological analysis methods, as well as the application of relevant technology in the scope of work. CLO 4. Have responsibility in completing taSCU as part of the organization.
Content	1. Research exploration for medicinal herb 2. Chemotaxonomy and classification of medicinal herbs. 3. Diversity of Indonesia Herbs 4. Lesson from local wisdom 5. Phytochemicals as Medicines 6. Isolation and Characterization of Active Compound 7. Pharmacokinetic and Pharmacodynamic 8. Mechanism of Drug Activity 9. The Synergy Principle at Work with Plants and Pathogens 10. Bioassay 11. From Traditional to Industrial standard
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Small group presentation • Paper project • Mid and Final Test Final score: Attitude (10%), paper project (15%), presentation (15%), mid exam (30%) and final exam (30%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Blumenthal, M. 1998. Therapeutic Guide to Herbal Medicines, American Botanical Council, Integrative Medicine Communications, Boston, Massachusetts.

	• Chevallier, A., 2016. Encyclopedia of Herbal Medicine: 550 Herbs and Remedies for Common Ailments. Penguin. • Schulz, V. Haensel, R. Tyler, V.E. Rational Phytotherapy, A Physicians Guide to Herbal Medicine, Springer Publishers, Berlin, ISBN: 3-540-67096-3 • Kapoor, L.D., 2018. CRC handbook of Ayurvedic medicinal plants. CRC press. • McKenna, D.J. Jones, K. Hughes K, 2004. Botanical Medicines, The Desk Reference for Major Herbal Supplements, The Haworth Herbal Press, New York, ISBN: 0-7890-1265-0 • Natural Medicines Comprehensive Database (www.naturaldatabase.com). • Pengelly, A., 2021. The constituents of medicinal plants. Cabi. • Van Wyk, B.E. and Wink, M., 2018. Medicinal plants of the world. CABI.

Module Handbook
Plant Identification Technique

<table>
<tr><td>Module Name:</td><td colspan="4">Plant Identification Technique</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60105</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D
2. Dr. Jati Batoro, M.Si.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>5.7</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>7.4</td><td>4.0</td><td>181.3 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Diversity of Flora (MAB62005)
• Practice in Diversity of Flora (MAB62006)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the systematic principles of plants (identification, classification, nomenclature and kinship), theoretical concepts, applications and the development of the systematic world. CLO 2. Able to do simple analysis, synthesis of taxa positions, characterization of plants CLO 3. Able to make collections, herbariums, descriptions, draw plants, make determination keys and use kinship programs. CLO 4. Able to conduct research on plant systematics, national, international presentations and presentations in journals.
Content	1. Lecture strategy and systematic botany 2. Systematic Botany and Biodiversity 3. Botanical nomenclature 4. Collection, herbarium and specimen drawing 5. Description of flower plants 6. Terminology of organs (characterization) Identification key analysis kunci 7. Classification theory 8. Phenetic and phylogenetic classification and use of manuals and programs 9. Administration of herbarium 10. Preparation of research in the field of taxonomy, revision, census. Monograph
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation

	• Final practice exam Class score (CS): Presentation (15%) + quiz (10%) + assignment (15%), mid exam (30%) + final exam (30%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 2(PS)}/4
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Besse, P., 2021. Molecular Plant Taxonomy. Springer US. • Lawrence, G.H.M., 2017. Taxonomy of vascular plants. Scientific Publishers. • Simpson, M.G., 2019. Plant systematics. Academic press. • Backer, C. A. and R. C. Bakhuizen Van Den Brink 1963. Flora of Java. Vol. I, II, III (Spermatophytes Only) N. V. P. Noordhoff. Groningen-The Netherlands. • Batoro, J. 2001. The Kalimantan Genus Licuala (Arecaceae). Post Graduate Program Bogor Institute of Agriculture. P. 1-77. • Batoro, J. & Rahardi B. 2016. Dasar-dasar Sistematika Tumbuhan. Laboratorium Taksonomi dan Perkembangan Tumbuhan Universitas Brawijaya Malang. • Batoro, et al,. 2006. Panduan Laboratorium dan Lapang. Pengenalan Taksa: Bacteria, Protista dan Funggi. Laboratorium Taksonomi Tumbuhan. Jurusan Biologi Fakultas MIPA Universitas Brawijaya. • Bell, A.D. 1991. Plant Form. An illustrated Guide to Flowering Plant Morphology.Oxford University Press. • Claridge, M.F., H.A. Dawah and M.R. Wilson 1997. Species the units of Biodiversity. The Systematics Association Special Volume Series 54. London UK. • Davis, P.H. and V.H. Heywood. 1963. Principles of Angiosperm Taxonomy. Oliver & Boyd Edinburg and London. • Dunn, G. And B. S. Everitt 1982. An Introduction to mathematical Taxonomy. Cambridge University Press. • De Vogel, E.F. 1987. Manual of Herbarium Taxonomy (Theory and Practice). UNESCO. Jakarta. • Gesink, R.; Leeuwenberg, A.J.M.; Ridsdale, C.E.; Veldkamp, J.F. 1981. Thorner" analytical key to the families of flowering plants. Leiden University Press. • Girmansyah, D.; Y. Santika; Suratman (penyunting) 2006. Index Herbariorum Indonesianum. Puslit Biologi LIPI Bogor. • Greuter, W. 1994. International Code of Botanical Nomenclature (Tokyo Code). • Kitching, I.J., P.L. Forey, C.J. Humphries, D. M. Williams 1998. Cladistics. Second Edition.The Theory and Practise of Parsimony Analysis. Oxford University Press. • Radford, A.E 1986. Fundamentals of Plant Systematics. Harper & Row Publisher Inc. New York. • Jeffrey, C. and V.H. Heywood. 1977. Biological Nomenclature. Edward Arnold. London. • Keng, K. 1989. Malayan Seed Plants. Singapore University Press. Singapore. • Stearn, W. 1983. Botanical Latin. History, Grammar, Syntax, Terminology and Vocabulary.North Pomfret Vermont.

	- Swofford, D.L. 1993. PAUP. Phylogenetic Analysis Using Parsimony Version 3.1. Laboratorium Moleculer Sistematics Smithsonian Institution. Center for Biodiversity Illionis Natural History Survey. - Stace, C.A. 1989. Plant Taxonomy and Biosystematics. Edward Arnold. London. - Verheij, E. W. M. and R. E. Coronel. 1992. Prosea Plant Resources of South-East Asia 2 Edible Fruits and Nuts. Indonesia and Backhuys Publishers. Bogor. - Wesphal, E and P.C.M. Jansen (Editors) 1989. Plant Resources of south-East Asia A Selection. PudocWageningen.

Module Handbook
Radiation Biology

<table>
<tr><td>Module Name:</td><td colspan="4">Radiation Biology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60106</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr.Sri Widyarti, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Sri Widyarti, M.Si
2. Chomsin Sulistya, PhD</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>0</td><td colspan="2">-</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• General Biology (MAB61001)
• Basic Physics (MAP61190)
• Genetics (MAB61017)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering the principles of biological response to the effects of radiation, as well as analyzing the effects of radiation in biophysics, biochemistry, molecular, cellular and organismal processes on mutagenesis. CLO 2. Able to compile and present articles in accordance with the problem.
Content	1. Irradiation of cells: direct action in cell damage by radiation, indirect action of cell damage by radiation, fate of irradiated cells 2. Type of radiation damage: Time scale, Classification of radiation damage, Somatic and genetic effects, Stochastic and deterministic (non-stochastic) effects, Acute vs. chronic effects, Total body radiation response, Fetal irradiation 3. Cell survival and dose-response curves 4. Analysis of radiation damage in tissue 5. Cell susceptibility and resistance during cell cycle and cell death 6. Classification of radiation in radiobiology 7. The effect of oxygen on the influence of radiation 8. Radioprotectors and radiosensitizers 9. Dose rate and fractionation 10. Relative biological effectiveness
Study and examination requirements and forms of examination	Form of examination in lectures: • Group Assignment • Individual Assignment • Comprehension • Class participation Final score: Group Assignment (25%) + Individual Assignment (40%), Comprehension (20%) + Class participation (15%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Carroll, Q.B., 2018. Radiography in the Digital Age: Physics-exposure-radiation biology. Charles C Thomas Publisher. • Gunderson, L.L. and Tepper, J.E., 2015. Clinical radiation oncology. Elsevier Health Sciences.

	• Joiner, M.C. and van der Kogel, A.J. eds., 2018. Basic clinical radiobiology. CRC press. • Nias, A.H.W. 1998. An Introduction to Radiobiology. John Wiley & Sons, Inc., New York.

Module Handbook
Biodiversity Survey and Data Management

<table>
<tr><td>Module Name:</td><td colspan="4">Biodiversity Survey and Data Management</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60107</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Endang Arisoesilaningsih, M.S.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Endang Arisoesilaningsih, M.S.
2. Dr. Bagyo Yanuwiadi
3. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D
4. Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">0.8</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">2.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">8.5</td><td>40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>9.3</td><td>2.0</td><td>181.3 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Biodiversity Conservation (MAB62020)</td></tr>
</table>

<table>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.

ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective.

ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety.

ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.

ILO 7. Have a capacity for teamwork with respecting biodiversity.</td></tr>
<tr><td></td><td>Course learning outcomes (CLO) after completing this module:

CLO 1. Improve physical preparation and experience in applying the concepts of population, community, ecosystem, and biodiversity conservation in tropical field studies. Furthermore, students are able

CLO 2. Designing activities, using instruments and methods of ecological analysis and handling specimens in field surveys according to topics, digitizing and cataloging data, image processing

CLO 3. increase responsibility and teamwork skills for all activities starting from fundraising, preliminary studies, field surveys, specimen handling and transportation and data analysis to biological resource data management using information systems

CLO 4. Able to make decisions based on the data and information obtained

CLO 5. Able to formulate oral reports, acting as academic peer review in disseminating survey results in the form of posters and scientific articles.</td></tr>
<tr><td>Content</td><td>1. Research design: Preliminary study, gathering information, research topic & problem formulation. Developing research design on tropical ecosystem studies (biodiversity & culture)
2. Communication of resource persons, recording techniques, preparation of questionnaires, deepening and verification of information from resource persons for the use of LH biodiversity
3. Descriptive observation, morphometrics, field identification for specimens and management of plant/animal specimens, digitizing & cataloging data, photography, image processing RA
4. Coordinate recording, sample distribution, data management and input, analysis of vegetation, invertebrates and vertebrates.
5. Presenting & reviewing proposals of tropical ecosystem studies
6. Fieldwork to implement proposals of tropical ecosystem studies
7. Reporting research for seminar papers or journals</td></tr>
</table>

Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation • Final practice exam Class score (CS): Presentation (15%) + quiz (10%) + assignment (15%), mid exam (30%) + final exam (30%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 2(PS)}/4
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Yonghong, W. 2017. Periphyton : Functions and Application in Environmental Remediation. Elsevier. Amsterdam • Tomback, D. F. 2017. Biodiversity and Conservation in Forests. MDPI. Basel. • Rojas, R. V. 2020. State of Knowledge of Soil Biodiversity. Status, challenges and potentialities. Food and Agriculture Organization of the United Nations. Roma.

Module Handbook
Plant Biotechnology

<table>
<tr><td>Module Name:</td><td colspan="12">Plant Biotechnology</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">MAB60120</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Dr. Dra. Wahyu Widoretno, MSi.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Dr. Wahyu Widoretno, MSi.
2. Prof. Dr. Ir. Estri Laras Arumingtyas, MSc.St.
3. Dr. Aminatun Munawarti, MSi.
4. Dra. Nunung Harijati, MS., PhD.</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Elective</td><td colspan="4">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">1.7</td><td colspan="4">40-50</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">4.0</td><td colspan="4">40-50</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">2.8</td><td colspan="4">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">4.5</td><td colspan="3">4.0</td><td colspan="3">136 h</td><td colspan="3">4.5</td></tr>
<tr><td>Credit point</td><td colspan="12">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">Passed on Genetics (MAB61017)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="12">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
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	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering the principles, techniques and applications of biotechnology in agriculture/plant development/biopharma CLO 2. Able to perform simple analysis and synthesis in biotechnology field problems CLO 3. Able to utilize plant biotechnology to produce useful products to improve people's welfare CLO 3. Mastering instruments related to the field of plant biotechnology studies CLO 4. Have responsibility in completing lectures and plant biotechnology practicums and skilled/capable in making the right decisions based on analysis of information and practicum data as well as supporting references (journals and so on) CLO 5. Able to communicate and provide input in discussion group work and practicum related to understanding plant biotechnology material
Content	1. Definition, scope and objectives of Plant Biotechnology 2. Development of Plant Biotechnology 3. Modern Biotechnology Techniques: Plant Tissue Culture 4. Modern Biotechnology Techniques: Recombinant DNA 5. Transformation technology: direct gene transfer 6. Transformation technology: indirect gene transfer 7. Molecular farming and industrial products 8. Application of biotechnology to increase crop productivity and performance 9. Analysis of transgenic plants 10. Prospects, regulation and biosafety of transgenic crops
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test

	Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): paper project (10%), presentation (15%), quiz (15%), mid test (30%), and final test (30%) Practice score (PS): quiz (20%), report (30%), presentation (20%), and final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Abdin, M.Z., Kiran, U. and Ali, A. eds., 2017. Plant biotechnology: principles and applications. Singapore: Springer. • Slataer A., N.Scott, M. Fowler. 2003. Plant Biotechnology. The genetic manipulation of plants. Oxford university Press; • Chawla H.S. 2003. Plant Biotechnology. A Practical Approach.Science Publishers, Inc. USA; • Chawla H.S. 2002. Introduction to Plant Biotechnology. Science publisher, Inc. USA; • Ricroch, A., Chopra, S. and Kuntz, M. eds., 2021. Plant biotechnology: experience and future prospects. Springer Nature. • Stewart Jr, C.N. ed., 2016. Plant biotechnology and genetics: principles, techniques, and applications. John Wiley & Sons. • Srivastava, P.S., A. Narula, S. Srivastava. 2005. Plant Biotechnology and Molecular Markers. Kluwer Academic Publishers, New York.

Module Handbook
Plant Reproductive Biology

Module Name:	Plant Reproductive Biology		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60121		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Even semester		
Person responsible for the module:	Dr. Serafinah Indriyani, M.Si.		
Lecturer(s):	1. Dr. Serafinah Indriyani, M.Si. 2. Dr. Wahyu Widoretno, MSi.		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	2.8	40-50

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on: • Plant Structure and Development (MAB62009) • Practice in Plant Structure and Development (MAB62010)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering theoretical concepts or their application in the scope of one field (intradisciplinary). CLO 2. Able to utilize biological sciences to solve simple problems through the application of biological knowledge, biological analysis methods, as well as the application of relevant technology in the scope of work. CLO 3. Have responsibility in completing taSCU as part of the organization. CLO 4. Able to provide instructions/input in a work team.
Content	1. Sexual and asexual reproduction in plants 2. Reproduction in Thallophyta, Bryophyta, and Pteridophyta 3. Reproduction in Gymnosperms 4. Reproduction in Angiosperms: The process of developing reproductive organs 5. Pollination and fertilization 6. Embryo development 7. Development of fruit and seeds 8. Ripening and dispersal of seeds/fruits 9. Genetic variation in plant reproductive biology 10. Natural vegetative reproduction in plants 11. Artificial vegetative reproduction in plants 12. Plant reproductive biology research applications
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test

	Class score (CS): paper project (10%), presentation (15%), quiz (15%), mid test (30%), and final test (30%) Practice score (PS): quiz (20%), report (30%), presentation (20%), and final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• de Craene, LPR. 2010. Floral Diagrams: An Aid to Understanding Flower Morphology and Evolution. Cambridge University Press. • Batygina, TB. (Ed.). 2009. Embryology of Flowering Plants: Terminology and Concepts. Vol. 3: Reproductive Systems. Science Publishers. Enfield New Hampshire. • Ramawat, KG, Merillon, JM & Shivanna, KR (Eds.). 2014. Reproductive Biology of Plants. CRC Press Taylor & Francis Group.

Module Handbook Ecotourism

Module Name:	Ecotourism		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60122		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Even semester		
Person responsible for the module:	Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D		
Lecturer(s):	1. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D 2. Dr. Bagyo Yanuwiadi		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	2.8	40-50

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on Biodiversity Conservation (MAB62020)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering theoretical concepts or their application in one field (intradisciplinary) and performing simple analysis and synthesis in solving biological resource management problems in ecotourism development. CLO 2. Able to design and present alternative solutions to problems related to ecotourism development. CLO 3. Have responsibility in completing taSCU as part of the organization and able to provide input in a work team that works in ecotourism development.
Content	1. Basic understanding and principles of ecotourism 2. The basic principles of tourist destinations and the role of biological principles in the management of tourist destinations 3. Basic principles of corridor ecology 4. Basic principles of community ecology 5. The basic principles of biology and ecology of biodiversity as a tourist attraction 6. The basic principles of community empowerment 7. Ecotourism destination planning 8. Case studies of ecotourism activities 9. Evaluation of ecotourism field learning activities
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Assignment/ Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%)+ presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3

Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Baud-Bovi, M and Lawson, F (2002) Tourism and Recreation: Handbook of Planning and Design. Architectural Press, Oxford. • Fennell, D.A., 2020. Ecotourism. Routledge. • Fyall, A, Garrod B and Leask A (2005) Managing Visitor Attraction. Elsevier, Oxford. • Gunn, C A and Var, T (2002) Tourism Planning: Basic, Concepts and Cases. Roudledge, New York. • Hakim, L. 2004. Dasar-dasar Ekowisata (General Ecotourism). Bayu Media Press. • Hakim, L.S.K. Hong, J.E. Kim and N. Nakagoshi. 2007. Nature-based Tourism in Small

Module Handbook
Horticulture Biology

<table>
<tr><td>Module Name:</td><td colspan="4">Horticulture Biology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60123</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Dr. Ir. Estri Laras Arumingtyas, MSc.St.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Dr. Ir. Estri Laras Arumingtyas, MSc.St.
2. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D
3. Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Plant Structure and Development (MAB62009)
Practice in Plant Structure and Development (MAB62010)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
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	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the characteristics, propagation and cultivation techniques, and horticultural plant management. CLO 2. Have the skills to grow and reproduce horticultural plants in a limited environment. CLO 3. Able to design and perform data analysis to solve horticultural crop problems. CLO 4. Able to take responsibility and actively contribute to a work team.
Content	1. Characteristics of horticultural crops: Classification 2. Horticultural crop characteristics: plant structure 3. Growth manipulation using plant growth hormones 4. Manipulation of plant growth using chemicals (mutagens) 5. Physical/mechanical manipulation of plant growth: pruning 6. Propagation of horticultural crops 7. Environmental influence on plant growth 8. Plant growth in a greenhouse 9. Hydroponics 10. Verticulture 11. Pests and diseases that commonly attack horticultural crops
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%)

	Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Orton, TJ, 2019 Horticultural Plant Breeding. United Kingdom: Elsevier Science. • Geilfus, C, 2019 Controlled Environment Horticulture: Improving Quality of Vegetables and Medicinal Plants. Germany: Springer International Publishing. • Halstead, A 2018 Pests and Diseases. United States: DK/Penguin Randon House. • Shukla, AC, Mandal, D, Siddiqui, MW, 2018 Sustainable Horticulture, Volume 1: Diversity, Production, and Crop Improvement. United States: Apple Academic Press.

Module Handbook
Biomolecular Analysis Technique

<table>
<tr><td>Module Name:</td><td colspan="4">Biomolecular Analysis Technique</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60124</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Fatchiyah, M.Kes., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Fatchiyah, M.Kes., Ph.D
2. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.
3. Dr. Sri Widyarti, M.Si.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40</td></tr>
<tr><td>Laboratory practice</td><td>5.7</td><td colspan="2">40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>7.4</td><td>4.0</td><td>182.4 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit points (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Biochemistry and Instrumentation (MAB61014)
• Genetics (MAB61017)
• Molecular Biology (MAB60022)
• Practice in Molecular Biology (MAB60023)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basic concepts of molecular analysis techniques CLO 2. Able to isolate DNA and RNA from various plant, animal, bacterial tissues, and measuring the levels of biomolecules qualitatively and quantitatively CLO 3. Able to perform and analyze DNA and RNA amplification and their applications CLO 4. Able to explain the manufacture of cDNA or RNA probes CLO 5. Able to analyze polyformisms of various organisms based on genome data CLO 6. Able to explain the concepts of genetic manipulation and the basic techniques of molecular cloning. CLO 7. Able to understand hybridization techniques with gene expression identification systems: Shoutern and Northern blot. CLO 8. Able to explain the basics of DNA sequencing CLO 9. Able to perform protein isolation and precipitation CLO 9. Able to create standard curves and measure protein content. CLO 10. Able to perform SDS PAGE electrophoresis and analyze the results. CLO 11. Able to perform immunoblotting analysis. CLO 12. Able to explain the basic techniques of immunohistochemistry
Content	1. Basic techniques of genetic material analysis and qualitative & quantitative measurement of biomolecules 2. Basic DNA RNA amplification techniques and their applications 3. Probe Manufacturing 4. Polymorphism analysis 5. Genetic manipulation 6. Basic Molecular cloning techniques 7. Hybridization: Gene detection system & mRNA level 8. DNA sequencing 9. Basic techniques of protein isolation and precipitation 10. Making standard protein curve and measuring Protein content kadar 11. Protein electrophoresis 12. Protein Analysis 13. Immunohistochemistry

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>Form of examination in lectures:
Quiz
Paper project
Enthusiasm
Mid and Final Test
Form of examination in laboratory practice:
Lab report
Placement test
Final practice exam
Class score (CS): paper project (10%), enthusiasm (10%), quiz (10%), mid test (35%), and final test (35%)
Practice score (PS): Placement test (20%), report (40%), and final practice exam (40%)
Final score: {(CS) + (PS)}/2</td></tr>
<tr><td>Media employed</td><td>LCD, laptop, google classroom, video conference (zoom/gmeet).</td></tr>
<tr><td>Reading list</td><td>Fatchiyah, Widyarti, S. Arumingtyas, E.L. Rahayu, S. 2008, Teknik Dasar Analisis Biologi Molekuler, Universitas Brawijaya, Malang.
Fatchiyah, Widyarti, S. Arumingtyas, E.L. Rahayu, S. 2011. Biologi Molekuler: Prinsip Dasar Analisis. Penerbit Erlangga, Jakarta.
Jain, A., Jain, R. and Jain, S., 2020. Basic Techniques in Biochemistry, Microbiology and Molecular Biology (pp. 235-242). New York, NY, USA:: Springer.
Katoch, R. 2011. Analytical Techniques in Biochemistry and Molecular Biology. Springer-Verlag New York
Ochs, M.F. 2014. Methods in Molecular Biology. 2nd Edition. Humana Press. Springer. UK.
Rapley, R. and Whitehouse, D. eds., 2015. Molecular biology and biotechnology. Royal Society of Chemistry.
Wild, D. 2013. The Immunoassay Handbook: Theory and Applications of Ligand Binding, ELISA and Related Techniques, 4 edition.Elsevier Science.
Andrews AT. 1986. Electrophoresis: Theory, Techniques & Biochemical and Clinical Apllication. 2nd Ed. Clarendon Press, Oxford.
Ausubel FM., Brent R., Kingston RE., Moore D., Seidman JG. Smith JA. Struhl K. 2002. Short Protocols in Molecular Biology. 5rd Ed. John Wiley & Sons.
GeneBank: NCBI GeneBank: www.ncbi.nlm.nih.gov/,5
DDBJ: http://www.ddbj.nig.ac.jp/
Embl: http://www.ebi.ac.uk/
Innis MA. Gelfand DH., Sninsky JJ. 1999. PCR Application Protocol for Functional Genomics. Academics Press
Sambrook J. &Russel DW. 2001. Molecular Cloning: A laboratory manual. Cold Spring Harbor. www.cshl.org/sambrook
Bollag DM., & Edelstein SJ. 1991. Protein Methods. A John Wiley & Sons.
Harlow E. & Lane D. 1988. Antibodies: A laboratory manual. Cold Spring</td></tr>
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	• Harbor Konfermann R. &Dubel S. 2001. Antibody Engeneering. Springer Lab. Manual. www.duebel.uni-hd.de • Robyt JF & White BJ. 1990. Biochemical Techniques: Theory & Practice. Brooks/Cole Pub. • Wilson K & Walker J. 2004. Principles & Techniques of Practical Biochemistry. 4th Ed. Cambridge University Press. www.cup.cam.ac.uk/wilson • www.cup.org/wilson.

Module Handbook
Molecular Fingerprint

<table>
<tr><td>Module Name:</td><td colspan="4">Molecular Fingerprint</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60125</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Fatchiyah, M.Kes., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Fatchiyah, M.Kes., Ph.D
2. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.
3. Dr. Suharjono, M.Si
4. Nia Kurniawan, S.Si., M.P., D.Sc.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">2.8</td><td>40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Molecular Biology (MAB60022)
• Practice in Molecular Biology (MAB60023)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basics of DNA fingerprinting and DNA typing in forensics CLO 2. Able to perform sampling, purification, storage CLO 3. Able to perform methods of isolation and analysis of molecular samples and sequencing CLO 4. Able to understand the difference between genome and mitochondrial typing CLO 5. Able to distinguish DNA Fingerprinting & Forensic DNA system CLO 6. Able to analyze molecular data in silico CLO 7. Able to explain the basic theory of DNA Barcoding CLO 8. Able to compare DNA Barcoding analysis on biodiversity and relationship of animals, plants and microbes. CLO 9 Able to determine biomarkers for fingerprint analysis in plants
Content	1. Fundamentals of DNA fingerprinting and DNA typing in forensics 2. Sampling, purification, storage 3. Molecular sample preparation 4. Genetic basis of DNA typing 5. Comparation of Fingerprinting DNA & Forensic DNA system 6. Molecular data analysis in silico 7. Basic theory of DNA Barcoding 8. Analysis of DNA Barcoding on biodiversity and animal kinship 9. Basics of species kinship analysis 10. Analysis of DNA Barcoding on biodiversity and kinship in microbes 11. Basic DNA Barcoding analysis for species kinship 12. Type of biomarker for fingerprint analysis in plants 13. Analysis of DNA Barcoding on biodiversity and kinship in plants
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation)

	• Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Butler, J.M., 2014. Advanced topics in forensic DNA typing: interpretation. Academic Press. • Dolf, G., 2013. DNA fingerprinting: approaches and applications (Vol. 58). Birkhäuser. • Goodwin, W. ed., 2016. Forensic DNA typing protocols. Humana Press. • Gunn, A., 2019. Essential forensic biology. John Wiley & Sons. • Ida Lopez and David L. Erickson. 2012. DNA Barcodes: Methods and Protocols (Methods in Molecular Biology). Human Press. ISBN-13: 978-1617795909. ISBN-10: 1617795909 • John M Butler. 2009. Fundamentals of Forensic DNA Typing 1st Edition. Academic Press. ISBN-13: 978-0123749994. ISBN-10: 0123749999 • Richads Li. 2015. Forensic Biology. 2nd Edition. CRS. • ISBN-10: 1439889708 • ISBN-13: 978-1439889701 • Jörg Epplen and Thomas Lubjuhnn. 1999. DNA Profiling and DNA Fingerprinting. Birkhäuser. ISBN-10: 3764360186. ISBN-13: 978-3764360184 • Nikolaus J. Sucher and James R. Hennell. 2012. Plant DNA Fingerprinting and Barcoding: Methods and Protocols (Methods in Molecular Biology). Human Press. ISBN-13: 978-1617796081. ISBN-10: 1617796085 • Gene Helfman and Bruce B. Collette. 2009. The Diversity of Fishes: Biology, Evolution, and Ecology. Wiley-Blackwell; 2 edition. ISBN-10: 1405124946. ISBN-13: 978-1405124942 • Jacques Izard and Maria Rivera. 2014. Metagenomics for Microbiology. !rst Ed. Academic Press. ISBN-13: 978-0124104723. ISBN-10: 012410472X • Sandra Tscherwizek. 2008. 16S Ribosomal RNA Gene Sequencing: Establishment of a Method for the Identification of Microorganisms in Biopharmaceutical Production Areas. VDM Verlag Dr Muller. ISBN-13: 978-3639109030. ISBN-10: 3639109031.

FIELD OF INTEREST IN ZOOLOGY

Module Handbook
Animal Cell and Tissue Culture

<table>
<tr><td>Module Name:</td><td colspan="4">Animal Cell and Tissue Culture</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60108</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Muhaimin Rifa’i, S.Si., Ph.D.Med.Sc.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Muhaimin Rifa’i, S.Si., Ph.D.Med.Sc.
2. Prof. Dr. Ir. Moch. Sasmito Djati, M.Si., IPU.
3. Dr. Sri Rahayu, M.Kes</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Animal Anatomy and Physiology (MAB61013)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain and analyze cell growth in vitro, and utilize it in various animal biology studies (ILO 5). CLO 2. Skilled in using appropriate methods in practical activities in understanding the growth of animal cell and tissue culture and its maintenance (ILO 3, ILO 4). CLO 3. Understand and be able to explain the concepts of research and scientific articles to develop further ideas related to development of animal cell and tissue culture (ILO 1). CLO 4. Understand the importance of academic integrity especially through the discussion process and working on structured assignments in theory class (ILO 1). CLO 5. have a good personal approach as a teamwork, especially through working on structured assignments in theory (lecture) and practice (practicum) classes (ILO 7).
Content	1. History and development of animal cell tissue culture. 2. Cell culture biology. 3. laboratory equipment preparation and sterilization. 4. Primary culture. 5. Cell line culture treatment. 6. Cell separation methods.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation • Final practice exam

	Class score (CS): Presentation (15%) + quiz (10%) + assignment (15%), mid exam (30%) + final exam (30%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Al_Rubeai M. 2015. Animal Cell Culture. 9th ed. Springer International Publishing. Switzerland • Freshney, I. 2015. Culture of Animal Cells (7th ed.). Wiley. Retrieved from https://www.perlego.com/book/992388/culture-of-animal-cells-pdf (Original work published 2015) • Healy L and Ruban L. 2015. Atlas of Human Pluripotent Stem Cells in Culture. Springer Science. New York

Module Handbook Ornithology

Module Name:	Ornithology		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60109		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Odd semester		
Person responsible for the module:	Drs. Aris Suwondo, M.Si.		
Lecturer(s):	1. Drs. Aris Suwondo, M.Si. 2. Prof. Dr. Ir. Moch. Sasmito Djati, M.Si., IPU. 3. Dr. Agung Pramana Warih M, M.Si.		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	2.8	40-50

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on Diversity of Fauna (MAB62007)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:			

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand and be able to explain the structure and function, reproduction, behavior and conservation of birds, and utilize it in further bird studies (ILO 5). CLO 2. Skilled in using appropriate methods in practical activities in understanding the growth of birds and its cultivation (ILO 3, ILO 4). CLO 3. Able to understand and be able to explain the concepts of research and scientific articles to develop further ideas related to development of birds (ILO 1). CLO 4. Able to understand the importance of academic integrity especially through the discussion process and working on structured assignments in theory class (ILO 1). CLO 5. Have a good personal approach as a teamwork, especially through working on structured assignments in theory (lecture) and practice (practicum) classes (ILO 7).
Content	1. Morphology and Field Identification 2. Anatomical structure of birds 3. Gametogenesis, ovulation and fertilization in birds 4. Breeding system 5. Endocrine glands associated with the reproductive system of birds 6. Nest structure and egg incubation 7. Nestling development 8. Respiratory system 9. Metabolism and thermoregulation 10. Vocalization and communication 11. Feeding and foraging/hunting behavior, social behavior of birds 12. Migration and Navigation 13. Conservation
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation

	• Mid and Final Exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation • Final practice exam Class score (CS): Presentation (15%) + quiz (10%) + assignment (15%), mid exam (30%) + final exam (30%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Gill, F.B. and Prum, R.O. 2019. Ornithology. 4th ed.. W.H Freeman. Newyork. • Lovevette, I.J. and Fizpatrick, J.W. 2016. Cornell Laboratory of Ornithology. Handbook of Bird Biology. 3th ed. John Wiley & Sons, Ltd.West Sussex. • Murgui, E. And Hedblom, M. 2017. Ecology and Conservationof Birds in Urban Environment. Springer International Publishing. • Scanes, C.G. 2015. Sturkie's Avian Physiology. 6th ed. Elsivier. London. • Scout, G. 2020. Essential Ornithology. 2nd ed. Oxford University Press. Oxford. • Tong, W. 2020. Understanding Bird Behavior. An Illustrated Guide What Birds Do and Why. Princeton University Press. Princeton and Oxford.

Module Handbook
Ichtiology

Module Name:	Ichtiology			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60126			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Even semester			
Person responsible for the module:	Dr. Agung Pramana Warih M, M.Si.			
Lecturer(s):	1. Dr. Agung Pramana Warih M, M.Si. 2. Nia Kurniawan, S.Si., M.P., D.Sc. 3. Drs. Aris Soewondo, M.Si.			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Even	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40-50	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50	
	Laboratory practice	0	-	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on: • Diversity of Fauna (MAB62007) • Animal Anatomy and Physiology (MAB61013)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:			

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the basic science supporting Biology and success life skills CLO 2. Able to understand the structure, function and organization of life. CLO 3. Able to demonstrate scientific attitudes (curiosity, objective, rational, critical, open mind, creative, innovative, etc.), and social attitude (polite, respecting others, being responsible, etc.) CLO 4. Skilled in using appropriate methods to solve simple problems CLO 5. Able to communicate in Indonesian and English in the field of biology
Content	1. External anatomical structure 2. Internal anatomical structure 3. Locomotion and Feeding 4. Homeostasis 5. Metabolism and energetic 6. Sensory System 7. Fish Reproduction 8. Fish as Predators 9. Fish as Prey 10. Social Activities 11. Cyclic Activity 12. Fish Geography 13. Fish Conservation
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment • Quiz • Mid and final exam Final score: Assignment (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Baldisserotto B., Urbinati, E.C., Cyrino J.E.P.2020. Biology and Physiology of Freshwater Neotropical Fish. Elsevier. London.

	• Burton, D and Burton, M. 2018. Essential Fish Biology Diversity, Structure and Function. 1st ed. Oxford University Press. Oxford. • Evans, D.H., Caliborne, J.B.and Currie, S.2014. The Physiology of Fishes. 4^{th} ed. CRC Press. Taylor & Francis Group,Boca Raton. • Hastings, P.A, Walker, H.J. and Galland, G.A. 2014. Fishes; Guide to Diversity. University of California Press • Wooton, R.J and Smith, C. 2015. Reproductive Biology of Teleost Fishes. John Wiley & Sons, Ltd., Chichester

Module Handbook
Herpetology

Module Name:	Herpetology
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60127
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Even semester
Person responsible for the module:	Nia Kurniawan, S.Si., M.P., D.Sc.
Lecturer(s):	1. Nia Kurniawan, S.Si., M.P., D.Sc. 2. Drs. Aris Soewondo, M.Si
Language:	Indonesian

Relation to curriculum

Programme	Mode	Semester
Bachelor Programme in Biology	Elective	Even

Type of teaching, contact hours:

Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.

Teaching method	Contact hours per week	Class size
Lectures	0.8	40-50
Exercise (structured assignment & independent learning/ self-study)	2.0	40-50
Laboratory practice	5.7	40-50

Workload:

(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours

Contact hours per week	Private/self-study per week	Semester workload	ECTS
6.5	2.0	136 h	4.5

Credit point	3 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on Diverity of Fauna (MAB62007)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand and explain structure, function, toxicology, behavior, ecology, systematics, and economic benefits of amphibian and reptiles. CLO 2. Able to design and perform data analysis to solve herpetology conservation problems. CLO 3. Able to take responsibility and actively contribute to a work team.
Content	1. Definition of herpetology 2. Structure and function of the body of amphibians and reptiles 3. Anatomy, physiology of respiration, metabolism and energetics, osmoregulation, thermoregulation. 4. Modes of reproduction, 5. Toxicology, 6. Social behavior, 7. Body defense and communication, 8. Ecology: biogeography, conservation, diversity and systematics, and 9. The economic role of amphibians and reptiles.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {1 (CS) + 2 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).

Reading list	• Aldridge, R.D. and Sever, D.M. eds., 2016. Reproductive biology and phylogeny of snakes. CRC Press. • Gale Group; Zug, G.R., Vitt, L.J., and Caldwell, J.P. 2001. Herpetology: An Introductory Biology of Amphibians and Reptiles.2nd edition. Academic Press. San Diego; • Hutchins, M. Murphy, J.B. and Schlager, N. 2003. Grzimek's Animal Life Encyclopedia: Reptiles. 2nd edition. Volume 7 Farmington Hills, MI: • Harding, J.H. and Mifsud, D.A., 2017. Amphibians and reptiles of the Great Lakes region. University of Michigan Press. • Vitt, L.J. and Caldwell, J.P., 2013. Herpetology: an introductory biology of amphibians and reptiles. Academic press.

Module Handbook
Animal Reproductive Biology

Module Name:	Animal Reproductive Biology
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60128
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Even semester
Person responsible for the module:	Dr. Sri Rahayu, M.Kes.
Lecturer(s):	1. Dr. Sri Rahayu, M.Kes. 2. Prof. Dr. Ir. Moch. Sasmito Djati, M.Si., IPU. 3. Dr. Agung Pramana Warih M, M.S. 4. Drs. Aries Soewondo, M.Si.
Language:	Indonesian
Relation to curriculum	<table><tr><td>Programme</td><td>Mode</td><td>Semester</td></tr><tr><td>Bachelor Programme in Biology</td><td>Elective</td><td>Even</td></tr></table>
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc. <table><tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr><tr><td>Lectures</td><td>1.7</td><td>40-50</td></tr><tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40-50</td></tr><tr><td>Laboratory practice</td><td>2.8</td><td>40-50</td></tr></table>
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours <table><tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr><tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr></table>
Credit point	3 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on Animal Embryology (MAB61024)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the basic science supporting Biology and success life skills CLO 2. Able to understand the structure, function and organization of life related to animal reproduction. CLO 3. Able to communicate in Indonesian and English CLO 4. Able to demonstrate scientific attitudes (curiosity, objective, rational, critical, open mind, creative, innovative, etc.), and social attitude (polite, respecting others, being responsible, etc.) CLO 5. Skilled in using appropriate methods related to animal reproduction to solve simple problems in the field of biology
Content	1. Basic understanding of reproductive biology 2. Female and Male Reproductive Physiology 3. Intersexuality and transsexuality 4. Hormonal regulation, ovulation, puberty 5. Estrus, puberty 6. Pregnancy, placentation, parturition 7. Male and female infertility 8. Reproductive Technology and its benefits to overcome reproductive disorders 9. Reproduction of fish 10. Conservation reproduction technology 11. Reproductive technology and therapeutic cloning 12. Parthenogenesis technology
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation)

	• Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Hopper MR. 2015. Bovine Reproduction. John Wiley and Sons, Inc. USA • Jones RE and Lopez KH. 2014. Human Reproductive Biology. 4th ed. Academic Press. Elsevier Inc. USA • Nieman H and Wrenzycki C. 2018. Animal Biotechnology : Reproductive Biotechnologies. Springer International Publishing. Switzerland • Sharma M and Kumar A. 2017. Basic of Human Andrology. Springer NAture. Singapore • Singh SK. 2016. Mammalian Endocrinology and Male Reproductive Biology. CRC Press. Taylor and Francis Group, New York • Wooton RJ and Smith C. 2015. Reproductive Biology of Teleost Fishes. John Wiley and Sons Ltd. Oxford.

Module Handbook
Ecotoxicology

<table>
<tr><td>Module Name:</td><td colspan="4">Ecotoxicology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60129</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Catur Retnaningdyah, M.Si.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Catur Retnaningdyah, M.Si.
2. Dr. Sri Rahayu, M.Kes.
3. Dr. Suharjono, M.Si.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Ecology (MAB61016)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the theoretical concepts about aspects of environmental toxicology and the effect of pollutants on individual organisms, populations, communities and ecosystems. CLO 2. Able and skilled in analyzing and synthesizing as well as capable of making the right decisions to design and present alternative solutions related to management of the problem of pollutants exposed in the ecosystem and have the skills to conduct bioassay experiments in the laboratory CLO 3. Able to conduct observations on ecotoxicological-related phenomena occurring in the ecosystem using standard laboratory equipment/instruments.
Content	1. Scope, goals, strategies & evaluation of teaching. 2. Introduction: History and understanding of ecotoxicology; classical toxicology and ecotoxicological aspects 3. Source, type and level of pollutant toxicity in the ecosystem 4. The fate and transport (behaviour) of pollutants (organic, heavy metals and radioactive isotopes) in organisms and ecosystems 5. Effect of pollutants on organisms (acute, short-term and long-term toxicity tests) 6. Toxic effects of pollutants on the microorganism community 7. Toxic effects of pollutants on plant communities 8. Toxic effects of pollutants on plant and animal communities in the waters 9. Toxic effects of pollutants on terrestrial ecosystems 10. Toxic effects of pollutants on aquatic ecosystems 11. Toxic effects of pollutants on land animal communities 12. Bioconcentration, bioaccumulation and biomagnification 13. Biomarkers, bioindicators, and biomonitoring of pollutants in ecosystems 14. Mechanisms of stress and toxic effects of pollutants on organisms at the molecular level
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project

	• Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Erik Jorgensen. Ecotoxicology. 2010. Academic Press. • Hybska, H. & D Samesova, 2015. Ecotoxicology. Published by Technical University in Zvolen • James M. Lynch, Alan Wiseman and Robert May. 2011. Environmental Biomonitoring: The Biotechnology Ecotoxicology Interface (Biotechnology Research), Cambridge University Press. • Newman, M.C. 2020. Fundamentals of Ecotoxicology, fifth Edition, CRC Press.

Module Handbook
Histopathology

<table>
<tr><td>Module Name:</td><td colspan="4">Histopathology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60130</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Drs. Aris Soewondo, M.Si.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Drs. Aris Soewondo, M.Si.
2. Sofy Permana, M.Sc., D.Sc.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Even</td></tr>
<tr><td rowspan="6">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">5.7</td><td>40</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>7.4</td><td>4.0</td><td>182.4 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit points (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Animal Histology (MAB62011)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the theoretical concepts about the histopathology condition of various organs and tissues. CLO 2. Able and skilled in analyzing and synthesizing as well as capable of making the right decisions to design and present alternative solutions related to histopathology. CLO 3. Able to make a histology preparate using standard laboratory equipment/instruments in a teamwork.
Content	1. Adaptation, Cell Injury and Cell Death 2. Inflammation 3. Neoplasia 4. Gastrointestinal Histopathology 5. Histopathology of the Respiratory Tract and Lungs 6. Histopathology of the Endocrine System 7. Histopathology of the Circulatory System 8. Histopathology of the liver 9. Histopathology of the Urinary System 10. Histopathology of the Genital System 11. Histopathology of the mammary glands 12. Skin 13. Histopathology of the Nervous System 14. Histopathology of sensory organs
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment/ Paper project • Mid and Final Test Form of examination in laboratory practice: • Lab report • Pre/post-test • Final practice exam Class score (CS): Assignment/paper project (20%), quiz (10%), mid test (35%), and final test (35%) Practice score (PS): Pre/post-test (20%), report (40%), and final practice exam (40%)

	Final score: {(CS) + (PS)}/2
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Kumar,V., Abbas, A.K. and Aster, J.C. 2018 .Robbins Basic Pathology, 10th ed.. Elsevier Inc. Philadelphia • Kumar,V., Abbas, A.K., Fausto, N. and Aster, J.C. 2019 .Robbins and Cotran Pathologic Basis of Disease, 18th ed.. Saunders Elsevier Inc. Philadelphia • Mohan, H. 2015, Textbook of Pathology. 7th ed. Jaypee Brothers Medical Publishers (P) Ltd. Daryaganj • O'Dowd, G., Bell, S., and Wright, S. 2020. Weather's Pathology. A Text, Atlas and Review of Histopathology. 6th ed. Elsevier. London. • Rubin, E. and Reisner, H.M. 2014. Essentials of Rubin's pathology . 6th ed. Lippincott Williams & Wilkins, Philadelphia • Zachary, J.F. 2017. Pathologic Basis of Veterinary Diseases. 6thed. Elsevier Inc. Missouri.

Module Handbook
Ecotourism

<table>
<tr><td>Module Name:</td><td colspan="12">Ecotourism</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">MAB60122</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D
2. Dr. Bagyo Yanuwiadi</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Elective</td><td colspan="4">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">1.7</td><td colspan="4">40-50</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">4.0</td><td colspan="4">40-50</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">2.8</td><td colspan="4">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">4.5</td><td colspan="3">4.0</td><td colspan="3">136 h</td><td colspan="3">4.5</td></tr>
<tr><td>Credit point</td><td colspan="12">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">Passed on Biodiversity Conservation (MAB62020)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="12">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
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	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering theoretical concepts or their application in one field (intradisciplinary) and performing simple analysis and synthesis in solving biological resource management problems in ecotourism development. CLO 2. Able to design and present alternative solutions to problems related to ecotourism development. CLO 3. Have responsibility in completing taSCU as part of the organization and able to provide input in a work team that works in ecotourism development.
Content	1. Basic understanding and principles of ecotourism 2. The basic principles of tourist destinations and the role of biological principles in the management of tourist destinations 3. Basic principles of corridor ecology 4. Basic principles of community ecology 5. The basic principles of biology and ecology of biodiversity as a tourist attraction 6. The basic principles of community empowerment 7. Ecotourism destination planning 8. Case studies of ecotourism activities 9. Evaluation of ecotourism field learning activities
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%)+ presentation (20%) + final test (30%)

	Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Baud-Bovi, M and Lawson, F (2002) Tourism and Recreation: Handbook of Planning and Design. Architectural Press, Oxford. • Fennell, D.A., 2020. Ecotourism. Routledge. • Fyall, A, Garrod B and Leask A (2005) Managing Visitor Attraction. Elsevier, Oxford. • Gunn, C A and Var, T (2002) Tourism Planning: Basic, Concepts and Cases. Roudledge, New York. • Hakim, L. 2004. Dasar-dasar Ekowisata (General Ecotourism). Bayu Media Press. • Hakim, L.S.K. Hong, J.E. Kim and N. Nakagoshi. 2007. Nature-based Tourism in Small.

Module Handbook
Biomolecular Analysis Technique

Module Name:	Biomolecular Analysis Technique
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60124
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Even semester
Person responsible for the module:	Prof. Fatchiyah, M.Kes., Ph.D
Lecturer(s):	1. Prof. Fatchiyah, M.Kes., Ph.D 2. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St. 3. Dr. Sri Widyarti, M.Si.
Language:	Indonesian and English
Relation to curriculum	Programme: Bachelor Programme in Biology; Mode: Elective; Semester: Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
Credit point	4 credit points (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on: • Biochemistry and Instrumentation (MAB61014) • Genetics (MAB61017) • Molecular Biology (MAB60022) • Practice in Molecular Biology (MAB60023)

Relation to curriculum:

Programme	Mode	Semester
Bachelor Programme in Biology	Elective	Even

Type of teaching, contact hours:

Teaching method	Contact hours per week	Class size
Lectures	1.7	40
Exercise (structured assignment & independent learning/ self-study)	4.0	40
Laboratory practice	5.7	40

Workload:

Contact hours per week	Private/self-study per week	Semester workload	ECTS
7.4	4.0	182.4 h	6

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basic concepts of molecular analysis techniques CLO 2. Able to isolate DNA and RNA from various plant, animal, bacterial tissues, and measuring the levels of biomolecules qualitatively and quantitatively CLO 3. Able to perform and analyze DNA and RNA amplification and their applications CLO 4. Able to explain the manufacture of cDNA or RNA probes CLO 5. Able to analyze polyformisms of various organisms based on genome data CLO 6. Able to explain the concepts of genetic manipulation and the basic techniques of molecular cloning. CLO 7. Able to understand hybridization techniques with gene expression identification systems: Shoutern and Northern blot. CLO 8. Able to explain the basics of DNA sequencing CLO 9. Able to perform protein isolation and precipitation CLO 9. Able to create standard curves and measure protein content. CLO 10. Able to perform SDS PAGE electrophoresis and analyze the results. CLO 11. Able to perform immunoblotting analysis. CLO 12. Able to explain the basic techniques of immunohistochemistry
Content	1. Basic techniques of genetic material analysis and qualitative & quantitative measurement of biomolecules 2. Basic DNA RNA amplification techniques and their applications 3. Probe Manufacturing 4. Polymorphism analysis 5. Genetic manipulation 6. Basic Molecular cloning techniques 7. Hybridization: Gene detection system & mRNA level 8. DNA sequencing 9. Basic techniques of protein isolation and precipitation 10. Making standard protein curve and measuring Protein content kadar 11. Protein electrophoresis 12. Protein Analysis 13. Immunohistochemistry

Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Paper project • Enthusiasm • Mid and Final Test Form of examination in laboratory practice: • Lab report • Placement test • Final practice exam Class score (CS): paper project (10%), enthusiasm (10%), quiz (10%), mid test (35%), and final test (35%) Practice score (PS): Placement test (20%), report (40%), and final practice exam (40%) Final score: {(CS) + (PS)}/2
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Fatchiyah, Widyarti, S. Arumingtyas, E.L. Rahayu, S. 2008, Teknik Dasar Analisis Biologi Molekuler, Universitas Brawijaya, Malang. • Fatchiyah, Widyarti, S. Arumingtyas, E.L. Rahayu, S. 2011. Biologi Molekuler: Prinsip Dasar Analisis. Penerbit Erlangga, Jakarta. • Jain, A., Jain, R. and Jain, S., 2020. Basic Techniques in Biochemistry, Microbiology and Molecular Biology (pp. 235-242). New York, NY, USA:: Springer. • Katoch, R. 2011. Analytical Techniques in Biochemistry and Molecular Biology. Springer-Verlag New York • Ochs, M.F. 2014. Methods in Molecular Biology. 2nd Edition. Humana Press. Springer. UK. • Rapley, R. and Whitehouse, D. eds., 2015. Molecular biology and biotechnology. Royal Society of Chemistry. • Wild, D. 2013. The Immunoassay Handbook: Theory and Applications of Ligand Binding, ELISA and Related Techniques, 4 edition.Elsevier Science. • Andrews AT. 1986. Electrophoresis: Theory, Techniques & Biochemical and Clinical Apllication. 2nd Ed. Clarendon Press, Oxford. • Ausubel FM., Brent R., Kingston RE., Moore D., Seidman JG. Smith JA. Struhl K. 2002. Short Protocols in Molecular Biology. 5rd Ed. John Wiley & Sons. • GeneBank: NCBI GeneBank: www.ncbi.nlm.nih.gov/,5 ▪ DDBJ: http://www.ddbj.nig.ac.jp/ ▪ Embl: http://www.ebi.ac.uk/ • Innis MA. Gelfand DH., Sninsky JJ. 1999. PCR Application Protocol for Functional Genomics. Academics Press • Sambrook J. &Russel DW. 2001. Molecular Cloning: A laboratory manual. Cold Spring Harbor. www.cshl.org/sambrook • Bollag DM., & Edelstein SJ. 1991. Protein Methods. A John Wiley & Sons. • Harlow E. & Lane D. 1988. Antibodies: A laboratory manual. Cold Spring

	• Harbor Konfermann R. &Dubel S. 2001. Antibody Engeneering. Springer Lab. Manual. www.duebel.uni-hd.de • Robyt JF & White BJ. 1990. Biochemical Techniques: Theory & Practice. Brooks/Cole Pub. • Wilson K & Walker J. 2004. Principles & Techniques of Practical Biochemistry. 4th Ed. Cambridge University Press. www.cup.cam.ac.uk/wilson • www.cup.org/wilson.

Module Handbook
Molecular Fingerprint

Module Name:	Molecular Fingerprint
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60125
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Even semester
Person responsible for the module:	Prof. Fatchiyah, M.Kes., Ph.D
Lecturer(s):	1. Prof. Fatchiyah, M.Kes., Ph.D 2. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St. 3. Dr. Suharjono, M.Si 4. Nia Kurniawan, S.Si., M.P., D.Sc.
Language:	Indonesian
Relation to curriculum	

Programme	Mode	Semester
Bachelor Programme in Biology	Elective	Even

Type of teaching, contact hours:

Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.

Teaching method	Contact hours per week	Class size
Lectures	1.7	40-50
Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
Laboratory practice	2.8	40-50

Workload:

(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours

Contact hours per week	Private/self-study per week	Semester workload	ECTS
4.5	4.0	136 h	4.5

Credit point	3 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on: • Molecular Biology (MAB60022) • Practice in Molecular Biology (MAB60023)

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basics of DNA fingerprinting and DNA typing in forensics CLO 2. Able to perform sampling, purification, storage CLO 3. Able to perform methods of isolation and analysis of molecular samples and sequencing CLO 4. Able to understand the difference between genome and mitochondrial typing CLO 5. Able to distinguish DNA Fingerprinting & Forensic DNA system CLO 6. Able to analyze molecular data in silico CLO 7. Able to explain the basic theory of DNA Barcoding CLO 8. Able to compare DNA Barcoding analysis on biodiversity and relationship of animals, plants and microbes. CLO 9 Able to determine biomarkers for fingerprint analysis in plants
Content	1. Fundamentals of DNA fingerprinting and DNA typing in forensics 2. Sampling, purification, storage 3. Molecular sample preparation 4. Genetic basis of DNA typing 5. Comparation of Fingerprinting DNA & Forensic DNA system 6. Molecular data analysis in silico 7. Basic theory of DNA Barcoding 8. Analysis of DNA Barcoding on biodiversity and animal kinship 9. Basics of species kinship analysis 10. Analysis of DNA Barcoding on biodiversity and kinship in microbes 11. Basic DNA Barcoding analysis for species kinship 12. Type of biomarker for fingerprint analysis in plants 13. Analysis of DNA Barcoding on biodiversity and kinship in plants
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report

	• Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Butler, J.M., 2014. Advanced topics in forensic DNA typing: interpretation. Academic Press. • Dolf, G., 2013. DNA fingerprinting: approaches and applications (Vol. 58). Birkhäuser. • Goodwin, W. ed., 2016. Forensic DNA typing protocols. Humana Press. • Gunn, A., 2019. Essential forensic biology. John Wiley & Sons. • Ida Lopez and David L. Erickson. 2012. DNA Barcodes: Methods and Protocols (Methods in Molecular Biology). Human Press. ISBN-13: 978-1617795909. ISBN-10: 1617795909 • John M Butler. 2009. Fundamentals of Forensic DNA Typing 1st Edition. Academic Press. ISBN-13: 978-0123749994. ISBN-10: 0123749999 • Richads Li. 2015. Forensic Biology. 2nd Edition. CRS. • ISBN-10: 1439889708 • ISBN-13: 978-1439889701 • Jörg Epplen and Thomas Lubjuhnn. 1999. DNA Profiling and DNA Fingerprinting. Birkhäuser. ISBN-10: 3764360186. ISBN-13: 978-3764360184 • Nikolaus J. Sucher and James R. Hennell. 2012. Plant DNA Fingerprinting and Barcoding: Methods and Protocols (Methods in Molecular Biology). Human Press. ISBN-13: 978-1617796081. ISBN-10: 1617796085 • Gene Helfman and Bruce B. Collette. 2009. The Diversity of Fishes: Biology, Evolution, and Ecology. Wiley-Blackwell; 2 edition. ISBN-10: 1405124946. ISBN-13: 978-1405124942 • Jacques Izard and Maria Rivera. 2014. Metagenomics for Microbiology. 1st Ed. Academic Press. ISBN-13: 978-0124104723. ISBN-10: 012410472X • Sandra Tscherwizek. 2008. 16S Ribosomal RNA Gene Sequencing: Establishment of a Method for the Identification of Microorganisms in Biopharmaceutical Production Areas. VDM Verlag Dr Muller. ISBN-13: 978-3639109030. ISBN-10: 3639109031.

FIELD OF INTEREST IN ECOLOGY

Module Handbook
Biological Control

Module Name:	Biological Control		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60110		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Odd semester		
Person responsible for the module:	Zulfaidah Penata Gama, S.SI., M.Si., Ph.D.		
Lecturer(s):	1. Zulfaidah Penata Gama, S.Si., M.Si., Ph.D. 2. Dr. Bagyo Yanuwiadi 3. Dr. Suharjono, M.Si		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	5.7	40-50

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	7.4	4.0	182.4 h	6
Credit point	4 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on Ecology (MAB61016)			
Module objective/ intended learning outcomes	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes after completing this module: CLO 1. Able to analyze problems of pests, diseases, natural enemies and their ecosystems. CLO 2. Able to design alternative solutions and implementations on a lab and semi-field scale. CLO 3. Able to present them responsibly according to theory and data.
Content	1. What is the Biological control? 2. Ecology as the basis for biological control 3. Conditions for Biological Control Measures 4. Introduction, 5. Augmentation 6. Conservation 7. Integrated Biological Control (IPM) 8. Research directions for Biological Control with various biological agents (predators, pathogens, parasites, parasitoids) 9. Development of Biological Control research as a solution problems in the field
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Small group presentation • Progress report Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation • Final practice exam Class score (CS): Quiz (20%), slide & discussion (30%), assignments (30%), and progress report (20%) Practice score (PS): Report (30%), test (15%), presentation (15%), and final practice exam (40%) Final score: {2 (CS) + 2 (PS)}/4
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)

Reading list	• Askary, T.H. and Martinelli, P.R.P. eds., 2015. Biocontrol agents of phytonematodes. CABI. • Barbosa, P.A. ed., 1998. Conservation biological control. Elsevier. • Flint, M.L. and Dreistadt, S.H., 1998. Natural enemies handbook: the illustrated guide to biological pest control (Vol. 3386). Univ of California Press. • Hajek, A.E. and Eilenberg, J., 2018. Natural enemies: an introduction to biological control. Cambridge University Press. • Heimpel, G.E. and Mills, N.J., 2017. Biological control. Cambridge University Press. • Stirling, G.R., 2018. Biological control of plant-parasitic nematodes (pp. 103-150). CRC Press. • Shantharam, S., J.F. Montgomery. 1999. Biotechnology, Biosafety and Biodiversity. Science Publ. USA. • Poinar, G.O., 2018. Nematodes for biological control of insects. CRC press. • Waage, J., 2012. Biological control: measures of success. Springer Science & Business Media.

Module Handbook
Aquatic Ecosystem Management

<table>
<tr><td>Module Name:</td><td>Aquatic Ecosystem Management</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB60111</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Dr. Catur Retnaningdyah, M.Si.</td></tr>
<tr><td>Lecturer(s):</td><td>1. Dr. Catur Retnaningdyah, M.Si.
2. Nia Kurniawan, S.Si., M.P., D.Sc.
3. Viky Vidayanti, S.Si., M.Si.</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>
<table>
<tr><th>Programme</th><th>Mode</th><th>Semester</th></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td>Odd</td></tr>
</table>
</td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Teaching method</th><th>Contact hours per week</th><th>Class size</th></tr>
<tr><td>Lectures</td><td>1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td>40-50</td></tr>
</table>
</td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
<table>
<tr><th>Contact hours per week</th><th>Private/self-study per week</th><th>Semester workload</th><th>ECTS</th></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
</table>
</td></tr>
<tr><td>Credit point</td><td>3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>Passed on Ecology (MAB61016)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering theoretical concepts related to aquatic ecology and their applications. CLO 2. Able and skilled in analyzing and synthesizing as well as capable of making the right decisions to design and present alternative solutions related to management of problems that exist in aquatic ecosystems. CLO 3. Have the skills to observe phenomena that occur in aquatic ecosystems using standard laboratory equipment/instruments.
Content	1. Scope, goals, strategies & evaluation of teaching. 2. Introduction: Boundaries, scope of aquatic ecosystem management, global water problems (e.g. water scarcity, pollution, the effects of climate change on water resources) 3. Physical and chemical properties of freshwater and marine ecosystems 4. Biological components in freshwater and marine ecosystems 5. Assessment and monitoring of water quality using biological indicators 6. Water quality monitoring application using bioindicators in both fresh and marine waters 7. Impacts of land use and human activities on aquatic ecosystems and how they are managed 8. Mangrove ecosystem and its management 9. Wetland ecosystems: the problems of physical chemical and community structure of wetland organisms 10. Agricultural water regulations & best management for agricultural effluents treatment (Special focus: Nitrogen, Phosphorus and pesticide removal)
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Test Form of examination in laboratory practice: • Lab report • Pre/post-test

	• Small group presentation • Final practice exam Laboratory practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: Mid test (20%) + final test (20%) + laboratory practice (25%), presentation (20%) + discussion (15%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Castro, P., M.E. Huber. 2003. Marine Biology Laboratory and Field Exercises. Oxford Univ. Press, New York. • Closs, G., B. Downes & A. Boulton. 2004. Freshwater Ecology A Scientific Introduction. Blackwell Publishing. MA, USA. • Duxburi, D., A.C. Duxburi, K.A. Sverdrup. 2002. Fundamentals of Oceanography. 4th Ed. McGraw-Hill, Boston. • Haefner, P.A. 2001. Exploring Marine Biology Laboratory and Field Exercises. Oxford Univ. Press, New York. • Likens, G.E. 2010. River Ecosystem Ecology. 1st edition. Academic Press • Retnaningdyah, C. 2019. Cyanobacterial Harmful Algal Blooms (CyanoHABs): Blooming Microcystis di Ekosistem Perairan Tawar dan Cara Pengendaliannya, UB Press • Reynolds, C.S. 2006 The Ecology of Phytoplankton, Cambridge University Press Cambridge • Wetzel, R.G. 2001. Limnology: Lake and River Ecosystem, 3rd Edition, Academic Press

Module Handbook
Biodiversity Survey and Data Management

<table>
<tr><td>Module Name:</td><td colspan="4">Biodiversity Survey and Data Management</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60107</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Endang Arisoesilaningsih, M.S.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Endang Arisoesilaningsih, M.S.
2. Dr. Bagyo Yanuwiadi
3. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D
4. Rodiyati Azrianingsih, S.Si., M.Sc., Ph.D</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>0.8</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>2.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>8.5</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>9.3</td><td>2.0</td><td>181.3 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Biodiversity Conservation (MAB62020)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Improve physical preparation and experience in applying the concepts of population, community, ecosystem, and biodiversity conservation in tropical field studies. Furthermore, students are able CLO 2. Designing activities, using instruments and methods of ecological analysis and handling specimens in field surveys according to topics, digitizing and cataloguing data, image processing CLO 3. increase responsibility and teamwork skills for all activities starting from fundraising, preliminary studies, field surveys, specimen handling and transportation and data analysis to biological resource data management using information systems CLO 4. Able to make decisions based on the data and information obtained CLO 5. Able to formulate oral reports, acting as academic peer review in disseminating survey results in the form of posters and scientific articles.
Content	1. Research design: Preliminary study, gathering information, research topic & problem formulation. Developing research design on tropical ecosystem studies (biodiversity & culture) 2. Communication of resource persons, recording techniques, preparation of questionnaires, deepening and verification of information from resource persons for the use of LH biodiversity 3. Descriptive observation, morphometrics, field identification for specimens and management of plant/animal specimens, digitizing & cataloging data, photography, image processing RA 4. Coordinate recording, sample distribution, data management and input, analysis of vegetation, invertebrates and vertebrates. 5. Presenting & reviewing proposals of tropical ecosystem studies 6. Fieldwork to implement proposals of tropical ecosystem studies 7. Reporting research for seminar papers or journals
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation

	• Mid and Final Exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation • Final practice exam Class score (CS): Presentation (15%) + quiz (10%) + assignment (15%), mid exam (30%) + final exam (30%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 2(PS)}/4
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet)
Reading list	• Borcard, D., Gillet, F. and Legendre, P., 2011. Numerical ecology with R (Vol. 2, p. 688). New York: springer. • Gaston, K.J. 2000. Global patterns in biodiversity. Nature 405: 220-227. • Kumar, H.D. 1999. Biodiversity and Sustainable Conservation. Science Publ. Inc., New Hampshire; • Krebs, C. 1989. Ecological Method. Harper and Prw Publ. New York; • Purvis, A. & A. Hector. 2000. Getting the measure of biodiversity. Nature 405: 212-219; • Wildi, O., 2017. Data analysis in vegetation ecology. CABI. • Whitmore, N. ed., 2015. A rapid biodiversity survey of Papua New Guinea's Manus and Mussau Islands. Wildlife Conservation Society, Papua New Guinea Program.

Module Handbook
Computational Ecology

<table>
<tr><td>Module Name:</td><td colspan="4">Computational Ecology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60131</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Catur Retnaningdyah, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Catur Retnaningdyah, M.Si
2. Dr. Endang Arisoesilaningsih, M.S
3. Dr. Brian Rahardi, M.Sc.
4. Viky Vidayanti, S.Si., M.Si</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>0.8</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>2.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>5.7</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>6.5</td><td>2.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">-</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to apply the principles of information technology-based ecological data processing. CLO 2. Able to understand several tools that are often used in ecological computing either independently or in a collaboration. CLO 3. Able to design tools according to their analysis needs to give the alternative solutions of ecological issues.
Content	1. Ecological data management. 2. Ecological data structures and systems, 3. Ecological data analysis, 4. Ecological modeling and simulation. 5. Practice in discriminant analysis, cluster, PCA, factor analysis, growth curve time series analysis, path analysis, and PLS. 6. Interpretation of computational data analysis results.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Assignment/ Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Pre/post-test • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): pre/post-test (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {1 (CS) + 2 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).

Reading list	• Jørgensen, S.E., Halling-Sørensen, B. and Nielsen, S.N., 2017. Handbook of environmental and ecological modeling. CRC Press. • McGarigal, K., Cushman, S.A. and Stafford, S., 2013. Multivariate statistics for wildlife and ecology research. Springer Science & Business Media. • Michener, W.K. and Brunt, J.W. eds., 2009. Ecological data: Design, management and processing. John Wiley & Sons. • Plant, R.E., 2018. Spatial data analysis in ecology and agriculture using R. CRC Press. • Wheater, C.P., Bell, J.R. and Cook, P.A., 2020. Practical field ecology: a project guide. John Wiley & Sons. • Zhang, W., 2010. Computational ecology: artificial neural networks and their applications. World Scientific.

Module Handbook
Social Ecology

Module Name:	Social Ecology			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60132			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Even semester			
Person responsible for the module:	Dr. Bagyo Yanuwiadi			
Lecturer(s):	1. Dr. Bagyo Yanuwiadi 2. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Even	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40-50	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50	
	Laboratory practice	0	-	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on Ecology (MAB61016)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to develop the implementation of biological innovations to be introduced to the community effectively through various strategic approaches to the community capable of presenting them responsibly according to theory and data. CLO 2. Able to demonstrate scientific attitudes (curiosity, objective, rational, critical, open mind, creative, innovative, etc.), and social attitude (polite, respecting others, being responsible, etc.) CLO 3. Skilled in using appropriate methods in social ecology approaches to solve simple problems.
Content	1. Ecology and biology in general as social ecology 2. Various biological innovations and their applications 3. Research results of lecturers and other researchers 4. Various biological findings from journals 5. Various strategies for approaching the community and scientific reasons for the pluses and minuses of the action and the appropriate selection strategy for a particular community 6. Development of biological control research as a solution to problems in the field
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment • Quiz • Mid and final exam Final score: Assignment (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Haberl, H., Fischer-Kowalski, M., Krausmann, F. and Winiwarter, V., 2016. Social Ecology. Springer International Publishing. • Grichting, A. and Zebich-Knos, M. eds., 2017. The social ecology of border landscapes. Anthem Press. • Kramm, J., Pichler, M., Schaffartzik, A. and Zimmermann, M. eds., 2018. Social Ecology State of the Art and Future Prospects. MDPI.

Module Handbook
Ecotourism

Module Name:	Ecotourism
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60122
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Even semester
Person responsible for the module:	Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D
Lecturer(s):	1. Prof. Luchman Hakim, S.Si., M.Agr.Sc., Ph.D 2. Dr. Bagyo Yanuwiadi
Language:	Indonesian
Relation to curriculum	see table below
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
Credit point	3 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on Biodiversity Conservation (MAB62020)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.

Relation to curriculum:

Programme	Mode	Semester
Bachelor Programme in Biology	Elective	Even

Type of teaching, contact hours:

Teaching method	Contact hours per week	Class size
Lectures	1.7	40-50
Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
Laboratory practice	2.8	40-50

Workload:

Contact hours per week	Private/self-study per week	Semester workload	ECTS
4.5	4.0	136 h	4.5

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering theoretical concepts or their application in one field (intradisciplinary) and performing simple analysis and synthesis in solving biological resource management problems in ecotourism development. CLO 2. Able to design and present alternative solutions to problems related to ecotourism development. CLO 3. Have responsibility in completing taSCU as part of the organization and able to provide input in a work team that works in ecotourism development.
Content	1. Basic understanding and principles of ecotourism 2. The basic principles of tourist destinations and the role of biological principles in the management of tourist destinations 3. Basic principles of corridor ecology 4. Basic principles of community ecology 5. The basic principles of biology and ecology of biodiversity as a tourist attraction 6. The basic principles of community empowerment 7. Ecotourism destination planning 8. Case studies of ecotourism activities 9. Evaluation of ecotourism field learning activities
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%)+ presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3

Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Baud-Bovi, M and Lawson, F (2002) Tourism and Recreation: Handbook of Planning and Design. Architectural Press, Oxford. • Fennell, D.A., 2020. Ecotourism. Routledge. • Fyall, A, Garrod B and Leask A (2005) Managing Visitor Attraction. Elsevier, Oxford. • Gunn, C A and Var, T (2002) Tourism Planning: Basic, Concepts and Cases. Roudledge, New York. • Hakim, L. 2004. Dasar-dasar Ekowisata (General Ecotourism). Bayu Media Press. • Hakim, L.S.K. Hong, J.E. Kim and N. Nakagoshi. 2007. Nature-based Tourism in Small.

Module Handbook
Ecotoxicology

<table>
<tr><td>Module Name:</td><td>Ecotoxicology</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB60129</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Dr. Catur Retnaningdyah, M.Si.</td></tr>
<tr><td>Lecturer(s):</td><td>1. Dr. Catur Retnaningdyah, M.Si.
2. Dr. Sri Rahayu, M.Kes.
3. Dr. Suharjono, M.Si.</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table>
<tr><td>Programme</td><td>Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td>Even</td></tr>
</table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table>
<tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td>40-50</td></tr>
</table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
</table></td></tr>
<tr><td>Credit point</td><td>3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>Passed on Ecology (MAB61016)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the theoretical concepts about aspects of environmental toxicology and the effect of pollutants on individual organisms, populations, communities and ecosystems. CLO 2. Able and skilled in analyzing and synthesizing as well as capable of making the right decisions to design and present alternative solutions related to management of the problem of pollutants exposed in the ecosystem and have the skills to conduct bioassay experiments in the laboratory CLO 3. Able to conduct observations on ecotoxicological-related phenomena occurring in the ecosystem using standard laboratory equipment/instruments.
Content	1. Scope, goals, strategies & evaluation of teaching. 2. Introduction: History and understanding of ecotoxicology; classical toxicology and ecotoxicological aspects 3. Source, type and level of pollutant toxicity in the ecosystem 4. The fate and transport (behaviour) of pollutants (organic, heavy metals and radioactive isotopes) in organisms and ecosystems 5. Effect of pollutants on organisms (acute, short-term and long-term toxicity tests) 6. Toxic effects of pollutants on the microorganism community 7. Toxic effects of pollutants on plant communities 8. Toxic effects of pollutants on plant and animal communities in the waters 9. Toxic effects of pollutants on terrestrial ecosystems 10. Toxic effects of pollutants on aquatic ecosystems 11. Toxic effects of pollutants on land animal communities 12. Bioconcentration, bioaccumulation and biomagnification 13. Biomarkers, bioindicators, and biomonitoring of pollutants in ecosystems 14. Mechanisms of stress and toxic effects of pollutants on organisms at the molecular level
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test

	Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Erik Jorgensen. Ecotoxicology. 2010. Academic Press. • Hybska, H. & D Samesova, 2015. Ecotoxicology. Published by Technical University in Zvolen • James M. Lynch, Alan Wiseman and Robert May. 2011. Environmental Biomonitoring: The Biotechnology Ecotoxicology Interface (Biotechnology Research), Cambridge University Press. • Newman, M.C. 2020. Fundamentals of Ecotoxicology, fifth Edition, CRC Press.

FIELD OF INTEREST IN MICROBIOLOGY

Module Handbook
Food Microbiology

<table>
<tr><td>Module Name:</td><td>Food Microbiology</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB60112</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Tri Ardyati, M.Agr., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td>1. Tri Ardyati, M.Agr., Ph.D
2. Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D.</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td>
<table>
<tr><th>Programme</th><th>Mode</th><th>Semester</th></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td>Odd</td></tr>
</table>
</td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><th>Teaching method</th><th>Contact hours per week</th><th>Class size</th></tr>
<tr><td>Lectures</td><td>1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td>40-50</td></tr>
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<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
<table>
<tr><th>Contact hours per week</th><th>Private/self-study per week</th><th>Semester workload</th><th>ECTS</th></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
</table>
</td></tr>
<tr><td>Credit point</td><td>3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>Passed on General Microbiology (MAB62018)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain, characterize, and identify the types of microorganisms that cause food spoilage, food-borne diseases and important microorganisms that contribute to the food production process (fermented food). CLO 2. Able to explain the methods used for food preservation through controlling intrinsic and extrinsic factors. CLO 3. Able to explain and test the microbiological quality of several types of food ingredients. CLO 4. Able to solve the problems related to food production by applying standard microbiological methods. CLO 5. Able to work together to create, present, discuss, and maintain structured assignments, make good and correct posters and slide presentation.
Content	1. Introduction: Scope of Food Microbiology; Factors affected food spoilage (intrinsic & extrinsic factors) 2. Food Spoilage 3. Food Preservation and Technologies 4. Fermented and Microbial Foods 5. Agents of Food Borne Diseases 6. Detection of Food Borne Diseases 7. Methods for microbiological examination of foods and Microbial food indicator 8. Examination of Microbial Food Indicator/ quality control 9. Probiotics 10. HACCP/ Quality control 11. Journal reading and presentation
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Test Form of examination in laboratory practice: • Lab report

	• Pre/post-test • Small group presentation • Final practice exam Laboratory practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Class score (CS): Mid test (30%) + final test (30%) + presentation (20%) + Quiz (10%) + Assignment (10%) Final score: (2CS+PS)/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Doyle, M.P., Diez-Gonzalez, F. and Hill, C. eds., 2020. Food microbiology: fundamentals and frontiers. John Wiley & Sons. • Matthews, K.R., Kniel, K.E. and Montville, T.J., 2017. Food microbiology: an introduction. John Wiley & Sons. • Roberts, D. and Greenwood, M., 2008. Practical food microbiology. John Wiley & Sons. • Erkmen, O. and Bozoglu, T.F., 2016. Food Microbiology, 2 Volume Set: principles into practice. John Wiley & Sons. • Yousef, A.E. and Carlstrom, C., 2003. Food microbiology: a laboratory manual. John Wiley & Sons. • Marth, E.H. and Steele, J. eds., 2001. Applied dairy microbiology. CRC Press. • Spencer, J.F. and de Spencer, A.L.R. eds., 2001. Food microbiology protocols (Vol. 14). Springer Science & Business Media.

Module Handbook
Virology

<table>
<tr><td>Module Name:</td><td colspan="12">Virology</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">MAB60113</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Dr.Sri Widyarti, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Dr. Sri Widyarti, M.Si
2. Prof. Widodo, S.Si., M.Si., Ph.D.Med.Sc.
3. Irfan Mustafa, S.Si., M.Si., Ph.D</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Elective</td><td colspan="4">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">1.7</td><td colspan="4">40-50</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">4.0</td><td colspan="4">40-50</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">0</td><td colspan="4">-</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">1.7</td><td colspan="3">4.0</td><td colspan="3">90.7 h</td><td colspan="3">3</td></tr>
<tr><td>Credit point</td><td colspan="12">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">Passed on General Microbiology (MAB62018)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="12">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the scope of virus particle limitations as a non-living system with a living system CLO 2. Able to explain the development of virus discovery and the underlying analysis technology CLO 3. Able to explain the role of modern analytical technology in studying and detecting viruses CLO 4. Able to explain the structure of virus particles CLO 5. Able to explain the basic classification of viruses CLO 6. Able to explain how the virus transmits / spreads the virus CLO 7. Able to explain the origin and evolution of viruses CLO 8. Able to explain the mechanism of the entry of viruses into cells CLO 9. Able to explain the mechanism of transcription, translation & transport by viruses CLO 10. Be able to explain the mechanism of viral genome replication CLO 11. Able to explain the assembly mechanism of virus particle components and the release of virus from the host CLO 12. Able to explain the relationship between viruses and the mechanism of carcinogenicity CLO 13. Able to explain current cases (case studies on Covid-19: replication, pathogenesis, and strategies therapy) CLO 14. Able to explain recent cases (case studies on Covid-19: ADE antibody-dependent enhancement)
Content	1. Overview of lecture materials 2. Discovery of viruses 3. The Method of Studying Viruses and Virus Detection 4. Virus Particle Structure 5. Virus Classification 5. Transmission Virus 6. Origin & Evolution of Virus 7. Attachment & entry virus into cell 8. Transcription, translation & transport 9. Virus Genome Replication 10. Assembly & exit of virion from cells 11. Virus & Cancer 12. COVID-19: Coronavirus replication, pathogenesis, and therapeutic strategies 13. COVID-19: ADE (Antibody dependent Enhancement)
Study and examination requirements and forms of examination	Form of examination in lectures: • Group Assignment • Individual Assignment

	• Comprehension • Class participation Final score: Group Assignment (25%) + Individual Assignment (40%), Comprehension (20%) + Class participation (15%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Fenner, F.J., Bachmann, P.A. and Gibbs, E.P.J., 2014. Veterinary virology. Academic Press. • Flint, S.J., Racaniello, V.R., Rall, G.F., Hatziioannou, T. and Skalka, A.M., 2020. Principles of virology, Volume 2: pathogenesis and control. John Wiley & Sons. • Richman, D.D., Whitley, R.J. and Hayden, F.G. eds., 2020. Clinical virology. John Wiley & Sons. • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3427559/ https://www.sciencedirect.com/science/article/pii/S1201971212001191 • https://agrilife.org/vetmed/files/2012/10/LS_5_4_sample_lesson.pdf • https://juniperpublishers.com/artoaj/pdf/ARTOAJ.MS.ID.556181.pdf https://core.ac.uk/download/pdf/288872.pdf https://link.springer.com/chapter/10.1007/978-1-4020-8761-5_7 • https://www.ccjm.org/content/ccjom/early/2020/05/12/ccjm.87a.20047.full.pdf • https://www.nature.com/articles/s41586-020-2538-8 https://www.nature.com/articles/s41587-020-0577-1 https://jvi.asm.org/content/94/5/e02015-19.

Module Handbook
Medical Microbiology

Module Name:	Medical Microbiology		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60114		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Odd semester		
Person responsible for the module:	Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D.		
Lecturer(s):	1. Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D. 2. Prof. Muhaimin Rifa'i, S.Si., Ph.D.Med.Sc 3. Irfan Mustafa, S.Si., M.Si., Ph.D		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	2.8	40-50

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on General Microbiology (MAB62018)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to analyze the role and interaction of normal flora (disease-causing microbes) with the body's immune system in causing disease in humans (ILO 3) CLO 2. Able to explain the factors involved in the pathology of infectious diseases and their treatment (ILO 3) CLO 3. Able to analyze the positive role of microbes to improve human health (ILO 3) CLO 4. Able to run and design simple experiments related to medical microbiology (ILO 1, ILO 4, ILO 7) CLO 5. Able to communicate in English and work together in analyzing, compiling, and presenting results in presentations (ILO 5)
Content	1. Microbial flora in humans: commensals, pathogens and pathogenicity mechanisms 2. Pathogenesis of disease by microorganisms 3. Immune response to infectious agents 4. Epidemiology of infectious diseases and control of disease outbreaks: One Health Concept 5. Microbial diagnostics: immunodiagnostic and molecular diagnostic approaches 6. Antibiotic resistant microorganisms: mechanisms, types of microbes and solutions 7. Infectious diseases in the tropics: types, distribution and control 8. Important infectious diseases caused by microorganisms: description, pathogenesis, diagnostic procedures in the laboratory and their treatment/therapy 9. Therapeutic microbiology: the role of microorganisms (probiotics) as agents of disease therapy in humans 10. Recent Developments in Medical Microbiology: Human Microbiome Project
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Final assignment Form of examination in laboratory practice:

	• Lab report • Small group presentation (Comprehension, Slide presentation) • Lab performance/ attitudes Laboratory practice score (PS): Report (30%) + presentation (50%) + lab performance/ attitude (20%) Class score (CS): presentation (40%) + Quiz (20%) + Final assignment (40%) Final score: (2CS+PS)/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Berkowitz, F.E., & Jerris, R.C., 2016. Practical Medical Microbiology for Clinicians. Willey Blackwell. New Jersey. • Murray, P.R., Rosenthal, K.S. & Pfaller, M.A. 2020. Medical Microbiology. 9th Edition. Elsivier • Riedel, S., Morse, S.A., Mietzner, T. & Miller, S. 2019. Medical Microbiology. 28th Edition. McGraw Hill. New York.

Module Handbook
Environmental Microbiology

<table>
<tr><td>Module Name:</td><td colspan="4">Environmental Microbiology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60115</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Irfan Mustafa, S.Si., M.Si., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Irfan Mustafa, S.Si., M.Si., Ph.D
2. Dr. Suharjono, M.Si.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">2.8</td><td>40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on General Microbiology (MAB62018)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the role of microorganisms as the main catalyst in driving the flow of material on the earth globally which is a basic knowledge in the use of microorganism activities as biological agents to solve environmental problems. CLO 2. Able to describe the various applications of microorganisms in producing energy as an alternative to fossil fuels, recycling wastewater, bioremediation, improving soil structure, and as an indicator of environmental quality. CLO 3. Able to explain the principle of the mechanism of interaction between microorganisms and the association of microorganisms with other living things such as humans, animals, and plants. CLO 4. Able to critically evaluate scientific data articles and research journals from the internet in the field of environmental microbiology comprehensively to improve understanding of the role of microorganisms in the environment. CLO 5. Able to demonstrate a range of skills in the laboratory in the use of microorganisms to solve problems in the environment. CLO 6. Able to work and learn effectively independently and work together in task groups, practicums, and small research projects as a form of caring, needing each other, and being responsible to others. CLO 7. Able to demonstrates basic skills in formulating scientific methods in the form of research project proposals, demonstrate laboratory and field research skills to test and investigate hypotheses including how to collect, organize, analyze, evaluate, and interpret experimental data relevant especially to the field of environmental microbiology using critical thinking skills, quantitative approach and appropriate technology. CLO 8. Able to demonstrates writing, oral and visual presentation skills to effectively communicate microbiological scientific principles and information using various learning media including scientific papers, and oral presentations in English.

	CLO 9. Develop microbiology disciplines to improve critical thinking skills, communicate effectively, ethically, socially, and understand in an international environment.
Content	1. The role of microbes in the carbon, nitrogen, sulphur, and iron cycles. 2. Energy production in the form of methane gas, microbial fuel cell, bioethanol. 3. The role of microbes in recycled water treatment, bioremediation, biomediated geomechanical processes, and environmental quality indicators. 4. Associations between microbes and microbes with plants and animals. 5. The problem of microbes on the environment in the modern era. 6. International Journal of Microbiology articles with material that is in accordance with the topic of the lecture. 7. Production of methane gas, manufacture of MFC, biodegradation of crude oil, and nitrification with biofilm reactors.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Class presentation (Comprehension, Slide presentation) • Journal presentation Form of examination in laboratory practice: • Small group presentation (Comprehension, Slide presentation) • Lab performance/ attitudes Class score (CS) : (quiz + class presentation + journal presentation) / 3 Practice score (PS) : (1 quiz + 2 presentation) / 3 Final score : {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Bertrand, J.C., Caumette, P., Lebaron, P., Matheron, R., Normand, P. and Ngando, T.S. eds., 2015. Environmental microbiology: fundamentals and applications (pp. 3-7). Dordrecht: Springer. • Grant, W.D. and Long, P.E., 2013. Environmental microbiology. Springer Science & Business Media. • Haug, R.T., 2019. Lessons in environmental microbiology. CRC Press. • Madsen, E.L., 2015. Environmental microbiology: from genomes to biogeochemistry. John Wiley & Sons.

Module Handbook
Microbial Diversity

<table>
<tr><td>Module Name:</td><td colspan="4">Microbial Diversity</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60116</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dr. Suharjono, M.Si.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dr. Suharjono, M.Si.
2. Irfan Mustafa, S.Si., M.Si., Ph.D
3. Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• General Microbiology (MAB62018)
• Biosystematics (MAB60004)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to analyze the characteristics of phenotypic and phylogenetic as well as analyze and identify the diversity, systematic and evolution of microbes. CLO 2. Able to plan and apply methods to study the distribution, diversity and potential of microbes in the environment. CLO 3. Able to communicate in English and work together in analyzing, compiling, and presenting results in seminars. CLO 4. Able to analyze the diversity and potential of microbes as well as make plans and implementation methods of their use based on the results of the analysis, and able to present them in English presentations.
Content	1. The concept of microbial diversity and evolution, methods of detection of distribution and diversity and identification of microbes 2. Diversity of microbial symbionts of plants and animals as well as in extreme environments 3. Biofilm-forming microbial diversity, metagenomics and microbial diversity prospecting 4. International Journal Presentation
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Class presentation (Comprehension, Slide presentation) • Journal presentation Form of examination in laboratory practice: • Small group presentation (Comprehension, Slide presentation) • Post-test Class score (CS): [(Quiz x1)+(Presentation x 2)+(Journal Presentation x 2)] / 5 Practice score (PS): [(Post Test 1)+ (Presentation x1)] / 2 Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).

Reading list	• Bull, A. 2003. Microbial Diversity and Bioprospect. ASM Press, Washington, DC. • Dash, H.R., & Das, S. 2018. Microbial Diversity in the Genomic Era. Elsevier Science. UK. • Gunjal, A. & Shinde, S. 2021. Microbial Diversity and Ecology in Hotspots. Elsevier Science. UK.

Module Handbook
Industrial Microbiology

<table>
<tr><td>Module Name:</td><td colspan="4">Industrial Microbiology</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60136</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Tri Ardyati, M.Agr., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Tri Ardyati, M.Agr., Ph.D
2. Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td colspan="2">40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td colspan="2">40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td colspan="2">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on General Microbiology (MAB62018)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand and explain the important aspects of microbes related to industry and the principle of isolation and its strain improvement for industrial application. CLO 2. Able to explain the principle of fermentation and downstream as well as upstream processing CLO 3. Able to understand the production of important industrial metabolites (primary and secondary metabolites) CLO 4. Able to understand the quality control and safety carried out by certain industries which are the objectives of field study activities. CLO 5. Able to solve the problems related to important industrial metabolites production by applying standard microbiological methods. CLO 6. Able to work together to create, present, discuss, and maintain structured assignments, make good and slide presentation.
Content	1. Introduction: Important Microbes in Industrial Microbiology (Characteristics important microbes used in industry) 2. Metabolic pathway for the Biosynthesis of Industrial Microbiology Products 3. Overproduction of metabolites of Industrial Microorganisms 4. Selection and improvement of micro-organisms of industrial interest 5. Bioprocessing: Fermentation Technology (basic techniques in fermentation) upstream and downstream processing 6. Industrial Process and Products: primary metabolites products (enzymes) 7. Industrial Process and Products: secondary metabolites products (antibiotics) 8. Case study 1: From Biomass to Biofuel (ethanol) 9. Case study 2: Biotransformation and Fermentation in pharmaceutical industry 10. Case study 3: Production of amino acids by fermentation 11. Case study 4: Production of organic acids by fermentation 12. Case study 5: Mushroom production 13. Case study 6: Treatment of wastes in industry

Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Presentation • Mid and Final Test Form of examination in laboratory practice: • Lab report • Small group presentation (comprehension, slide presentation) Laboratory practice score (PS): Report (40%) + presentation (60%) Class score (CS): Mid test (30%) + final test (30%) + presentation (20%) + Quiz (10%) + Assignment (10%) Final score: (2CS+PS)/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• El-Mansi, E.M.T., Nielsen, J., Mousdale, D. and Carlson, R.P. eds., 2018. Fermentation microbiology and biotechnology. CRC press. • Okafor, N. and Okeke, B.C., 2017. Modern industrial microbiology and biotechnology. CRC Press. • Stanbury, P.F., A. Whitaker & S.J. Hall. 2003. Principles of Fermentation Technology, Second Edition, Butter Worth Heinemann • Waites, M.J., N.L. Morgan, J.S. Rockey & G. Higton. 2001. Industrial Microbiology: an introduction. Blackwell Science.

Module Handbook
Agricultural Microbiology

Module Name:	Agricultural Microbiology		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60137		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Even semester		
Person responsible for the module:	Dr. Suharjono, M.Si.		
Lecturer(s):	1. Irfan Mustafa, S.Si., M.Si., Ph.D 2. Dr. Suharjono, M.Si. 3. Tri Ardyati, M.Agr., Ph.D 4. Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	2.8	40-50

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on General Microbiology (MAB62018)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basic concepts of soil, plant, and microbial interactions; sustainable farming systems, and identify the factors that influence them. CLO 2. Able to explain and identify the types and roles of microbes in the elemental cycle in soil as well as PGPR and endophytes. CLO 3. Able to explain and analyze the principles of composting, pest control, and bioindicators of agricultural ecosystem quality CLO 4. Able to explain methods of mass development, formulation, and quality testing of effective microbial products for agriculture. CLO 5. Able to demonstrates writing, oral and visual presentation skills to effectively communicate microbiological scientific principles and information using various learning media including scientific papers, and oral presentations in English.
Content	1. Basic concepts of soil, plant and microbial interactions 2. Sustainable farming system. 3. The role of microbes as plant pathogens. 4. The role of microbes in the cycle of chemical elements in nature. 5. PGPR, endophytes, and mycorrhizae 6. Agricultural solid waste composting process 7. Pest control with microbes 8. Microbes as an indicator of the quality of agricultural ecosystems 9. Mass production, formulation, and quality standards of Effective Microorganisms (EM) products. 10. Review and presentation of scientific papers related to agricultural microbiology.
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Class presentation (Comprehension, Slide presentation) • Journal presentation Form of examination in laboratory practice: • Small group presentation (Comprehension, Slide presentation) • Lab performance/ attitudes

	Class score (CS) : (quiz + class presentation + journal presentation) / 3 Practice score (PS) : (1 quiz + 2 presentation) / 3 Final score : {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Burlage R.S., Atlas R., Stahl D., Geesey G. & Sayler G. 1998. Techniques in Microbial Ecology. Oxford University press, Inc. • Christon J.Hurst, Ronald L. Crawford, Jay L. Garland, David A. Lipson, Aaron L. Mills. 2007. Manual of Environmental Microbiology. ASM Press • Pareek, R.P. and Pareek, N., 2019. Agricultural microbiology. Scientific Publishers. • Paul E. A. 2007. Soil Microbiology, Ecology and Biochemistry. 3rdEd. Academic Press. • Rao, N.S. ed., 2016. Advances in agricultural microbiology. Elsevier. • Singh, D.P., Singh, H.B. and Prabha, R. eds., 2016. Microbial inoculants in sustainable agricultural productivity (pp. 342-342). New Delhi: Springer. • Tate III, R.L., 2020. Soil microbiology. John Wiley & Sons. • Van Elsas, J.D., Trevors, J.T., Rosado, A.S. and Nannipieri, P. eds., 2019. Modern soil microbiology. CRC press. • Varnam A.H. & Evans M.G. 2000. Environmental Microbiology. Manson Publishing Ltd.

Module Handbook
Bioremediation

Module Name:	Bioremediation		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60138		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Even semester		
Person responsible for the module:	Dr. Suharjono, M.Si.		
Lecturer(s):	1. Dr. Suharjono, M.Si. 2. Irfan Mustafa, S.Si., M.Si., Ph.D 3. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Even
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	2.8	40-50

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on General Microbiology (MAB62018)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to analyze theoretical concepts on waste problems and their biological treatment in the environment based on mono, inter and multidisciplinary approaches CLO 2. Able to make an experimental application plan for the use of organisms to degrade waste and remediate waste polluted ecosystems and present it in scientific forums based on valid data.
Content	1. Introduction and historical perspective on the development of the concept of biodegradation and bioremediation. 2. Existence and ecological impact of toxic organic chemical waste. 3. The principle of metabolism for the biodegradation of organic chemical compounds. 4. Factors affecting the biodegradation of pollutant compounds by microorganisms. 5. Mechanism of metabolism and resistance in the process of biosorption and bioaccumulation of pollutants by microorganisms. 6. Mechanism of biodegradation of pesticides, hydrocarbons, and detergents by biofilm microorganisms. 7. Utilization of bioremediation methods to improve the quality of the ecosystem of water, soil, and air polluted by waste. 8. Phytoremediation to improve ecosystem quality. 9. Application of the latest technology and genetically engineered organisms for bioremediation of ecosystems. 10. Review and presentation of bioremediation journal articles
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Class presentation (Comprehension, Slide presentation) • Journal presentation Form of examination in laboratory practice: • Small group presentation (Comprehension, Slide presentation) • Quiz/ pre/post-test Class score (CS) : (quiz + class presentation + journal presentation) / 3 Practice score (PS) : (1 quiz/ pre/post-test + 2 presentation) / 3

	Final score : {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Bharagava, R.N. ed., 2017. Environmental pollutants and their bioremediation approaches. CRC Press. • Catherine N. and Mulligan. 2002. Environmental Biotreatment: Technologies for Air, Water, Soil and Wastes. Government Institutes Publ. • Chandra, R. ed., 2015. Advances in biodegradation and bioremediation of industrial waste. • Clark D. P. & Pazdernik N. J. (2012) Environmental Biotechnology in Biotechnology, Academic Cell, Elsevier Inc. • Evans G. M. & Furlong J. C. (2003) Environmental biotechnology: theory and application, John Wiley & Sons, Chichester • Gill, S.S., Gill, R., Lanza, G. and Newman, L. eds., 2016. Phytoremediation. Springer International Publishing. • Mackova M., Dowling D., Macek T. eds (2006) Phytoremediation and rhizoremediation, Springer-Verlag, Dordrecht • Prasad, R. and Aranda, E., 2018. Approaches in bioremediation. Springer International Publishing https://www. springer. com/de/book/9783030023683. • Saxena, G., Kishor, R. and Bharagava, R.N., 2020. Bioremediation of industrial waste for environmental safety. Springer Singapore. • Singh A., Kuhad R. C., Ward O. P. eds. (2009) Advances in applied bioremediation, Springer Verlag, Berlin Heidelberg • Singh A. & Ward O. P. eds. (2004) Applied Bioremediation and Phytoremediation, Springer • Terry, N. and Banuelos, G.S. eds., 2020. Phytoremediation of contaminated soil and water. CRC Press.

Module Handbook
Molecular Fingerprint

<table>
<tr><td>Module Name:</td><td colspan="4">Molecular Fingerprint</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60125</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Fatchiyah, M.Kes., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Fatchiyah, M.Kes., Ph.D
2. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.
3. Dr. Suharjono, M.Si
4. Nia Kurniawan, S.Si., M.P., D.Sc.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">2.8</td><td>40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Molecular Biology (MAB60022)
• Practice in Molecular Biology (MAB60023)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basics of DNA fingerprinting and DNA typing in forensics CLO 2. Able to perform sampling, purification, storage CLO 3. Able to perform methods of isolation and analysis of molecular samples and sequencing CLO 4. Able to understand the difference between genome and mitochondrial typing CLO 5. Able to distinguish DNA Fingerprinting & Forensic DNA system CLO 6. Able to analyze molecular data in silico CLO 7. Able to explain the basic theory of DNA Barcoding CLO 8. Able to compare DNA Barcoding analysis on biodiversity and relationship of animals, plants and microbes. CLO 9 Able to determine biomarkers for fingerprint analysis in plants
Content	1. Fundamentals of DNA fingerprinting and DNA typing in forensics 2. Sampling, purification, storage 3. Molecular sample preparation 4. Genetic basis of DNA typing 5. Comparation of Fingerprinting DNA & Forensic DNA system 6. Molecular data analysis in silico 7. Basic theory of DNA Barcoding 8. Analysis of DNA Barcoding on biodiversity and animal kinship 9. Basics of species kinship analysis 10. Analysis of DNA Barcoding on biodiversity and kinship in microbes 11. Basic DNA Barcoding analysis for species kinship 12. Type of biomarker for fingerprint analysis in plants 13. Analysis of DNA Barcoding on biodiversity and kinship in plants
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice:

	• Lab report • Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Butler, J.M., 2014. Advanced topics in forensic DNA typing: interpretation. Academic Press. • Dolf, G., 2013. DNA fingerprinting: approaches and applications (Vol. 58). Birkhäuser. • Goodwin, W. ed., 2016. Forensic DNA typing protocols. Humana Press. • Gunn, A., 2019. Essential forensic biology. John Wiley & Sons. • Ida Lopez and David L. Erickson. 2012. DNA Barcodes: Methods and Protocols (Methods in Molecular Biology). Human Press. ISBN-13: 978-1617795909. ISBN-10: 1617795909 • John M Butler. 2009. Fundamentals of Forensic DNA Typing 1st Edition. Academic Press. ISBN-13: 978-0123749994. ISBN-10: 0123749999 • Richads Li. 2015. Forensic Biology. 2nd Edition. CRS. • ISBN-10: 1439889708 • ISBN-13: 978-1439889701 • Jörg Epplen and Thomas Lubjuhnn. 1999. DNA Profiling and DNA Fingerprinting. Birkhäuser. ISBN-10: 3764360186. ISBN-13: 978-3764360184 • Nikolaus J. Sucher and James R. Hennell. 2012. Plant DNA Fingerprinting and Barcoding: Methods and Protocols (Methods in Molecular Biology). Human Press. ISBN-13: 978-1617796081. ISBN-10: 1617796085 • Gene Helfman and Bruce B. Collette. 2009. The Diversity of Fishes: Biology, Evolution, and Ecology. Wiley-Blackwell; 2 edition. ISBN-10: 1405124946. ISBN-13: 978-1405124942 • Jacques Izard and Maria Rivera. 2014. Metagenomics for Microbiology. !rst Ed. Academic Press. ISBN-13: 978-0124104723. ISBN-10: 012410472X • Sandra Tscherwizek. 2008. 16S Ribosomal RNA Gene Sequencing: Establishment of a Method for the Identification of Microorganisms in Biopharmaceutical Production Areas. VDM Verlag Dr Muller. ISBN-13: 978-3639109030. ISBN-10: 3639109031.

FIELD OF INTEREST IN BIOMEDIC

Module Handbook
Immunology

Module Name:	Immunology			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60117			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Odd semester			
Person responsible for the module:	Prof. Muhaimin Rifa'i, PhD.Med.Sc			
Lecturer(s):	1. Prof. Muhaimin Rifa'i, PhD.Med.Sc 2. Prof. Dra. Fatchiah, M.Kes, PhD 3. Dr. Sri Widyarti, M.Si			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40-50	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50	
	Laboratory practice	2.8	40-50	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on Animal Anatomy and Physiology (MAB61013)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the mechanism of the occurrence of the immune system and the factors that influence it. CLO 2. Able to explain the history of immunology, the importance and integration of immunology with other disciplines. CLO 3. Able to explain the factors involved in the body's defense system CLO 4. Able to explain the factors of abnormalities in the body's defense system CLO 5. Able to explain the occurrence of infectious diseases, and autoimmune diseases CLO 6. Able to describe manipulation and therapy using regulatory cells CLO 7. Able to design research related to immunology
Content	1. Integration of immunology with other sciences and the history of the development of immunology, adaptive and cellular immunity. 2. B and T lymphocytes, the function of the thymus in the development of regulatory cells, and the mechanism for the formation of regulatory T cells 3. Regulatory T cells, Allergy and Hypersensitivity 4. Autoimmune disease 5. Antibodies and antigens 6. B, T, NK, and MHC cell receptors 7. Manipulation of the immune system 8. Immunity to tumors: general characteristics, tumor antigens, immune response, immunotherapy 9. Serology and tropical diseases 10. Effector mechanisms of immune response: cytokines, activation 11. Innate and adaptive immunity 12. Mucosal Immunity 13. Immunotherapy
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment

	• Presentation • Mid and Final Exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Small group presentation • Final practice exam Class score (CS): Presentation (15%) + quiz (10%) + assignment (15%), mid exam (30%) + final exam (30%) Practice score (PS): Report (30%) + pre/post-test (15%) + presentation (15%) + final practice exam (40%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Abbas, A.K., Lichtman, A. and Pillai, S., 2019. Basic Immunology: Functions and Disorders of the Immune System, 6e: Sae-E-Book. Elsevier India. • Abbas, A.K., Lichtman, A.H. and Pober, J.S., 2000, Cellular and Molecular Immunology, W.B. Saunders Co., Toronto; • Actor, J.K., 2019. Introductory Immunology, 2nd: Basic Concepts for Interdisciplinary Applications. Academic Press. • Bona, C.A. and Bonilla, F.A., 2019. Textbook of immunology. CRC press. • Coico, R., 2021. Immunology: a short course. John Wiley & Sons. • Delves, P.J., Martin, S.J., Burton, D.R. and Roitt, I.M., 2017. Roitt's essential immunology. John Wiley & Sons. • Harlow, E. and Lane, D., 1988, Antibodies A Laboratory Manual, Cold Spring Harbor Laboratory, USA; • Roitt, I.M. and Delves, P.J., 2001, Essential Immunology, Blackwell Science; • Roit, I., Brostoff, J., and Male., D., 2001, Immunology, 7th ed., Mosby Publ.

Module Handbook
Human Genetics

Module Name:	Human Genetics
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60118
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Odd semester
Person responsible for the module:	Prof. Dra. Fatchiah, M.Kes, PhD
Lecturer(s):	1. Prof. Dra. Fatchiah, M.Kes, PhD 2. Prof. Widodo, S.Si., M.Si., Ph.D.Med.Sc.
Language:	Indonesian
Relation to curriculum	Programme: Bachelor Programme in Biology; Mode: Elective; Semester: Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
Credit point	2 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on Genetics (MAB61017)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.

Relation to curriculum:

Programme	Mode	Semester
Bachelor Programme in Biology	Elective	Odd

Type of teaching, contact hours:

Teaching method	Contact hours per week	Class size
Lectures	1.7	40-50
Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
Laboratory practice	0	-

Workload:

Contact hours per week	Private/self-study per week	Semester workload	ECTS
1.7	4.0	90.7 h	3

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain differences in the pattern of inheritance of diseases in humans. CLO 2. Able to identify gene-environment interaction in behavior related Genomics to the study of complex diseases, epigenetic and transgenerational inheritance, and chromosomal and genomic disorders. CLO 3. Able to explain the potential benefits and riSCU/challenges of genomic medicine, and the ethical challenges raised by the prevalence of genomic data. CLO 4. Able to perform data analysis of genomic data to solve the problems related to inheritance diseases in humans.
Content	1. Basic concepts of human genetics 2. Identify and Compare a Mendelian inheritance pattern of different types of inheritance patterns of human disease 3. Identify a multigenic inheritance pattern. 4. Identify Gene-environment interaction in behavior related Genomics to the study of complex diseases 5. Explain the basics of epigenetic and transgenerational inheritance. 6. Identify Chromosomal and genomic disorders 7. Explain the potential benefits and riSCU/challenges of genomic medicine. 8. Explain some of the ethical challenges raised by the prevalence of genomic data 9. Analyze data from genome-wide association studies.
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment • Quiz • Mid and final exam Final score: Assignment (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Lewis, R., 2016. Human Genetics: The Basics. Garland Science. • Read, A.P., 2018. Human molecular genetics. Garland Science. • Rick Lewis. 2011. Basic Human Genetics. Routledge Taylor & Francis group, NY. ISBN-10: 0415579864 . ISBN-13: 978-0415579865,

	• Ricki Lewis. 2011. Human Genetics concepts and application. McGraw-Hill Education; 10 edition ISBN-13: 978-0073525303, ISBN-10: 0073525308 or ISBN: 007246268x • Robert Nussbaum, Roderick R. McInnes, and Huntington F Willard. 2007. Genetics in Medicine, 7th Edition. Sounders. ISBN: 9781416030805. • Tom Strachan & Andrew Read.2003. Human Molecular genetics. Garland Science; 3 edition. ISBN-10: 0815341822 . ISBN-13: 978-0815341826.

Module Handbook
Virology

Module Name:	Virology
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60113
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Odd semester
Person responsible for the module:	Dr.Sri Widyarti, M.Si
Lecturer(s):	1. Dr. Sri Widyarti, M.Si 2. Prof. Widodo, S.Si., M.Si., Ph.D.Med.Sc. 3. Irfan Mustafa, S.Si., M.Si., Ph.D
Language:	Indonesian
Relation to curriculum	

Programme	Mode	Semester
Bachelor Programme in Biology	Elective	Odd

Type of teaching, contact hours:

Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.

Teaching method	Contact hours per week	Class size
Lectures	1.7	40-50
Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
Laboratory practice	0	-

Workload:

(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours

Contact hours per week	Private/self-study per week	Semester workload	ECTS
1.7	4.0	90.7 h	3

Credit point	2 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on General Microbiology (MAB62018)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the scope of virus particle limitations as a non-living system with a living system CLO 2. Able to explain the development of virus discovery and the underlying analysis technology CLO 3. Able to explain the role of modern analytical technology in studying and detecting viruses CLO 4. Able to explain the structure of virus particles CLO 5. Able to explain the basic classification of viruses CLO 6. Able to explain how the virus transmits / spreads the virus CLO 7. Able to explain the origin and evolution of viruses CLO 8. Able to explain the mechanism of the entry of viruses into cells CLO 9. Able to explain the mechanism of transcription, translation & transport by viruses CLO 10. Able to explain the mechanism of viral genome replication CLO 11. Able to explain the assembly mechanism of virus particle components and the release of virus from the host CLO 12. Able to explain the relationship between viruses and the mechanism of carcinogenicity CLO 13. Able to explain current cases (case studies on Covid-19: replication, pathogenesis, and strategies therapy) CLO 14. Able to explain recent cases (case studies on Covid-19: ADE antibody-dependent enhancement)
Content	1. Overview of lecture materials 2. Discovery of viruses 3. The Method of Studying Viruses and Virus Detection 4. Virus Particle Structure 5. Virus Classification 5. Transmission Virus 6. Origin & Evolution of Virus 7. Attachment & entry virus into cell 8. Transcription, translation & transport 9. Virus Genome Replication 10. Assembly & exit of virion from cells 11. Virus & Cancer 12. COVID-19: Coronavirus replication, pathogenesis, and therapeutic strategies 13. COVID-19: ADE (Antibody dependent Enhancement)

Study and examination requirements and forms of examination	Form of examination in lectures: • Group Assignment • Individual Assignment • Understanding level • Class participation Final score: Group Assignment (25%) + Individual Assignment (40%), Understanding level (20%) + Class participation (15%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Fenner, F.J., Bachmann, P.A. and Gibbs, E.P.J., 2014. Veterinary virology. Academic Press. • Flint, S.J., Racaniello, V.R., Rall, G.F., Hatziioannou, T. and Skalka, A.M., 2020. Principles of virology, Volume 2: pathogenesis and control. John Wiley & Sons. • Richman, D.D., Whitley, R.J. and Hayden, F.G. eds., 2020. Clinical virology. John Wiley & Sons. • https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3427559/ https://www.sciencedirect.com/science/article/pii/S1201971212001191 • https://agrilife.org/vetmed/files/2012/10/LS_5_4_sample_lesson.pdf • https://juniperpublishers.com/artoaj/pdf/ARTOAJ.MS.ID.556181.pdf https://core.ac.uk/download/pdf/288872.pdf https://link.springer.com/chapter/10.1007/978-1-4020-8761-5_7 • https://www.ccjm.org/content/ccjom/early/2020/05/12/ccjm.87a.20047.full.pdf • https://www.nature.com/articles/s41586-020-2538-8 https://www.nature.com/articles/s41587-020-0577-1 https://jvi.asm.org/content/94/5/e02015-19

Module Handbook Radiation Biology

Module Name:	Radiation Biology		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60106		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Odd semester		
Person responsible for the module:	Dr.Sri Widyarti, M.Si		
Lecturer(s):	1. Dr. Sri Widyarti, M.Si 2. Chomsin Sulistya, PhD		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	0	-

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on: • General Biology (MAB61001) • Basic Physics (MAP61190) • Genetics (MAB61017)			

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Mastering the principles of biological response to the effects of radiation, as well as analyzing the effects of radiation in biophysics, biochemistry, molecular, cellular and organismal processes on mutagenesis. CLO 2. Able to compile and present articles in accordance with the problem.
Content	1. Irradiation of cells: direct action in cell damage by radiation, indirect action of cell damage by radiation, fate of irradiated cells 2. Type of radiation damage: Time scale, Classification of radiation damage, Somatic and genetic effects, Stochastic and deterministic (non-stochastic) effects, Acute vs. chronic effects, Total body radiation response, Fetal irradiation 3. Cell survival and dose-response curves 4. Analysis of radiation damage in tissue 5. Cell susceptibility and resistance during cell cycle and cell death 6. Classification of radiation in radiobiology 7. The effect of oxygen on the influence of radiation 8. Radioprotectors and radiosensitizers 9. Dose rate and fractionation 10. Relative biological effectiveness
Study and examination requirements and forms of examination	Form of examination in lectures: • Group Assignment • Individual Assignment • Comprehension • Class participation Final score: Group Assignment (25%) + Individual Assignment (40%), Comprehension (20%) + Class participation (15%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Carroll, Q.B., 2018. Radiography in the Digital Age: Physics-exposure-radiation biology. Charles C Thomas Publisher.

	• Gunderson, L.L. and Tepper, J.E., 2015. Clinical radiation oncology. Elsevier Health Sciences. • Joiner, M.C. and van der Kogel, A.J. eds., 2018. Basic clinical radiobiology. CRC press. • Nias, A.H.W. 1998. An Introduction to Radiobiology. John Wiley & Sons, Inc., New York.

Module Handbook
Medical Microbiology

Module Name:	Medical Microbiology		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60114		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Odd semester		
Person responsible for the module:	Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D.		
Lecturer(s):	1. Yoga Dwi Jatmiko, S.Si., M.App.Sc., Ph.D. 2. Prof. Muhaimin Rifa'i, S.Si., Ph.D.Med.Sc 3. Irfan Mustafa, S.Si., M.Si., Ph.D		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	1.7	40-50
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
	Laboratory practice	2.8	40-50

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	4.5	4.0	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on General Microbiology (MAB62018)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module:			

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to analyze the role and interaction of normal flora (disease-causing microbes) with the body's immune system in causing disease in humans (ILO 3) CLO 2. Able to explain the factors involved in the pathology of infectious diseases and their treatment (ILO 3) CLO 3. Able to analyze the positive role of microbes to improve human health (ILO 3) CLO 4. Able to run and design simple experiments related to medical microbiology (ILO 1, ILO 4, ILO 7) CLO 5. Able to communicate in English and work together in analyzing, compiling, and presenting results in presentations (ILO 5)
Content	1. Microbial flora in humans: commensals, pathogens and pathogenicity mechanisms 2. Pathogenesis of disease by microorganisms 3. Immune response to infectious agents 4. Epidemiology of infectious diseases and control of disease outbreaks: One Health Concept 5. Microbial diagnostics: immunodiagnostic and molecular diagnostic approaches 6. Antibiotic resistant microorganisms: mechanisms, types of microbes and solutions 7. Infectious diseases in the tropics: types, distribution and control 8. Important infectious diseases caused by microorganisms: description, pathogenesis, diagnostic procedures in the laboratory and their treatment/therapy 9. Therapeutic microbiology: the role of microorganisms (probiotics) as agents of disease therapy in humans 10. Recent Developments in Medical Microbiology: Human Microbiome Project

Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Final assignment Form of examination in laboratory practice: • Lab report • Small group presentation (Comprehension, Slide presentation) • Lab performance/ attitudes Laboratory practice score (PS): Report (30%) + presentation (50%) + lab performance/ attitude (20%) Class score (CS): presentation (40%) + Quiz (20%) + Final assignment (40%) Final score: (2CS+PS)/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Berkowitz, F.E., & Jerris, R.C., 2016. Practical Medical Microbiology for Clinicians. Willey Blackwell. New Jersey. • Murray, P.R., Rosenthal, K.S. & Pfaller, M.A. 2020. Medical Microbiology. 9th Edition. Elsivier • Riedel, S., Morse, S.A., Mietzner, T. & Miller, S. 2019. Medical Microbiology. 28th Edition. McGraw Hill. New York.

Module Handbook Vaccine Engineering

<table>
<tr><td>Module Name:</td><td colspan="4">Vaccine Engineering</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60140</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Muhaimin Rifai, S.Si., Ph.D.Med.Sc.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Widodo, S.Si., M.Si., Ph.D.Med.Sc
2. Prof. Muhaimin Rifai, S.Si., Ph.D.Med.Sc.
3. Dr. Sri Widyarti, M.Si</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">0</td><td>-</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Animal Anatomy and Physiology (MAB61013)
• Cell Biology (MAB61015)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to able to understand and explain the basic principles of vaccine manufacture. CLO 2. Able to understand the vaccine technology development in order to solve problems in the field of biology CLO 3. Able to demonstrate scientific attitudes (curiosity, objective, rational, critical, open mind, creative, innovative, etc.), and social attitude (polite, respecting others, being responsible, etc.)
Content	1. History of vaccine technology development. 2. The use of hybridoma. 3. B cell recognition and antibody production 4. Antibody binding. 5. Antigen Presenting cell and antigen presentation. 6. From genome to vaccine. 7. Genetic diversity, and mechanism of pathogen escape from immunocompetent cells. 8. Map of epitopes based on base sequence and three-dimensional structure. 9. Peptide formation design for immunization. 10. DNA vaccine design, and DNA vaccine adjuvant. 11. Manufacture of immunostimulators (natural and artificial immunostimulators). 12. Antigen delivery strategies in immunization. 13. Mucosal adjuvants (Adjuvants in vaccines for non-infectious diseases).
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment • Quiz • Mid and final exam Final score: Assignment (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Bloom, B.R. & Lambert, P.H. 2016. The vaccine book. Elsevier Science. UK

	• Virgil E J.C. Schijns and Derek T. O'hagan, 2006, immunopotentiators in modern vaccine, Elsevier, USA. • Mark Saltzman, Hong shen and Janet L. Brandsma, DNA Vaccine: methods and protocols, 2006, Human press, USA. • Flower Darren R. Bioinformatics for Vaccinology Publisher: UK, John Wiley & Sons Inc. 2008. ISBN: 9780470027110. • Flower Darren R. Immunoinformatics: Predicting Immunogenicity In Silico Publisher: New Jersey, Humana Press. 2007. ISBN: 9781603271189. • Kindt, Thomas J., Osborne Barbara A. Goldsby Richard A. Kuby Immunology 6th Edition. Publisher: New York, W. H. Freeman. 2007. ISBN: 9780716785903. • Lund Ole, Nielsen Morten, Lundegaard Claus, Kesmir Can, Brunak SA¸ren. Immunological Bioinformatics. Publishesr: London, MIT PRess 2005 ISBN: 0262122804. • Foundation Novartis.Immunoinformatics: Bioinformatic Strategies for Better Understanding of Immune Function. Publisher: Chichester, John Wiley & Sons Inc. 2003. ISBN: 0470853565. • Roitt Ivan Delves Peter. Roitt's Essential Immunology 10th Edition.Publisher: Canada, Blackwell. 2001, ISBN: 0632059028. • Ellis Ronald W. Vaccines: New Approaches to Immunological Problems. Publisher.

Module Handbook
Bioinformatics

<table>
<tr><td>Module Name:</td><td colspan="12">Bioinformatics</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">MAB60141</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Prof. Fatchiyah, M.Kes., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Prof. Fatchiyah, M.Kes., Ph.D
2. Prof. Widodo, S.Si., M.Si., Ph.D.Med.Sc.
3. Nia Kurniawan, S.Si., M.P., D.Sc.</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Elective</td><td colspan="4">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">0.8</td><td colspan="4">40-50</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">2.0</td><td colspan="4">40-50</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">5.7</td><td colspan="4">40-50</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">6.5</td><td colspan="3">2.0</td><td colspan="3">136 h</td><td colspan="3">4.5</td></tr>
<tr><td>Credit point</td><td colspan="12">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">Passed on:
- Basic Biocomputation (MAB60002)
- Genetics (MAB61017)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the basics of computational biology and bioinformatics, including browsing and searching raw data on GeneBank: Nucleotide Database. CLO 2. Able to analyze basic nucleotide sequence using BLAST, primary design & Identification restriction mapping. CLO 3. Able to analyze SNP mapping & genome diversity and identify polymorphism and genome variation. CLO 4. Able to create a phylogenetic tree and identify taxon organisms in the molecular hierarchy. CLO 5. Able to analyze protein sequence and design 3D protein modeling. CLO 6. Able to analyze protein folding: homology modeling, threading, ab initio methods, and make protein network pathway. CLO 7. Able to present their abilities with the chosen topics as a teamwork.
Content	1. Raw data 2. Blast analysis, Primary design 3. dbSNP Sequence Variation, Physical mapping 4. Polymorphism Identification, Submission Sequence 5. Phylogenetic analysis 6. Taxonomy database. Hierarchical mapping 7. Protein sequence analysis 8. 3D protein analysis 9. Protein folding 10. Protein network pathway 11. Nucleotide database to genome mapping and analysis Genome mapping and analysis 12. Polymorphism to taxonomy mapping Taxonomy analysis 13. 3D protein to protein folding & network pathway Proteomic analysis
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Assignment/ Paper project • Mid and final test Form of examination in laboratory practice:

	• Lab report • Small group presentation (Comprehension, Slide presentation) • Pre/post-test • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): pre/post-test (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {1 (CS) + 2 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Baxevanis, A.D., Bader, G.D. and Wishart, D.S. eds., 2020. Bioinformatics. John Wiley & Sons. • Cynthia Gibas and Per Jambeck, 2001, Developing Bioinformatics Computer Skills, O'Reilly Media publisher. • Jean-Michel Claverie, Ph. D., Cedric Notredame, Ph.D. 2006, Bioinformatics For Dummies, 2nd Edition, For Dummies Publisher • Lesk, A., 2019. Introduction to bioinformatics. Oxford university press. • Marketa Zvelebil and Jeremy O. Baum, 2008, Understanding bioinformatic, Garland Science, Taylor and Francis group publisher. • Huaiyu Mi and Paul Thomas Methods in Molecular Biology, 2009, Volume 563, Part 2, 123-140 • GeneBank: NCBI GeneBank: www.ncbi.nlm.nih.gov/, • DDBJ: http://www.ddbj.nig.ac.jp/ • Embl: http://www.ebi.ac.uk/ • Protein analysis: http://www.expasy.ch/sprot/sprot-top.html • protein characterization http://www.mips.biochem.mpg.de dan http://www.protomap.cs.huji.ac.il • Database alligment sequence: Hovergen http://pbil.univ-lyon1.fr/databases/hovergen.html (vertebrate alignments) • Pfam http://www.sanger.ac.uk/Software/Pfam/ (protein domain alignments and profile HMMs) • BLOCKS http://blocks.fhcrc.org/ • Ribosomal Database Project http://rdp.cme.msu.edu/html/ alignments and trees derived from rRNA sequences2.

Module Handbook
Cancer Biology

<table>
<tr><td>Module Name:</td><td>Cancer Biology</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB60142</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Prof. Widodo, S.Si., M.Si., Ph.D.Med.Sc</td></tr>
<tr><td>Lecturer(s):</td><td>1. Prof. Widodo, S.Si., M.Si., Ph.D.Med.Sc
2. Prof. Muhaimin Rifai, S.Si., Ph.D.Med.Sc.</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table><tr><td>Programme</td><td>Mode</td><td>Semester</td></tr><tr><td>Bachelor Programme in Biology</td><td>Elective</td><td>Even</td></tr></table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table><tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr><tr><td>Lectures</td><td>1.7</td><td>40-50</td></tr><tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40-50</td></tr><tr><td>Laboratory practice</td><td>0</td><td>-</td></tr></table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table><tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr><tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr></table></td></tr>
<tr><td>Credit point</td><td>2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>Passed on:
• Animal Anatomy and Physiology (MAB61013)
• Cell Biology (MAB61015)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:</td></tr>
</table>

	ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the cell cancer phenomena and its preventive strategies and developing its therapy. CLO 2. Able to demonstrate scientific attitudes (curiosity, objective, rational, critical, open mind, creative, innovative, etc.), and social attitude (polite, respecting others, being responsible, etc.)
Content	1. Introduction (basic principles and conceptual framework of cancer). 2. Diet, environmental factors, and cancer. 3. Tumor viruses, growth factors and oncogenes, and signal transduction. 4. Tumor suppressor genes, cell cycle, p53, apoptosis. 5. Cell immortalization and tumorigenesis. 6. Angiogenesis, invasion, and metastasis. 7. Tumor immunity, immunosurveillance, and immunotherapy.
Study and examination requirements and forms of examination	Form of examination in lectures: • Assignment • Quiz • Mid and final exam Final score: Assignment (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Adami, H.O. Hunter, D. & Trichopoulos, D. 2008. Textbook of Cancer Epidemiology. Oxford University Press, USA • Greenstein, J.P., 2016. Biochemistry of cancer. Elsevier. • Tannock, I.F., P Hill, R., Bristow, R.G. and Harrington, L., 2013. The basic science of oncology. McGraw-hill. • Pecorino, L. 2005. Molecular Biology of Cancer. Oxford University Press, USA • Weinberg, R.A., 2013. The biology of cancer. Garland science. • Watson, M. 2006. Oncology. Oxford University Press, USA.

Module Handbook
Science Perspective of Traditional Medicine

<table>
<tr><td>Module Name:</td><td colspan="4">Science Perspective of Traditional Medicine</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60143</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Sutiman Bambang Sumitro, S.U., D.Sc.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Sutiman Bambang Sumitro, S.U., D.Sc.
2. Dr. Sri Widyarti, M.Si</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">0</td><td>-</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on Biochemistry and Instrumentation (MAB61014)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the theory or concept of good clinical trial guidelines for herbal products and be able to get an overview of clinical trials conducted from scientific articles. CLO 2. Have the opportunity to further develop their abilities, think critically, and dare to express opinions, so as to increase their self-confidence, also train students' skills in using information technology (internet) to access information through scientific journals both nationally and internationally, and train teamwork and skills in making presentations.
Content	1. Introduction (philosophy, culture and local wisdom, legal basis, scope of discussion, terminology) 2. Research on herbal medicine based on community service 3. Herbal medicine scientific methodology. 4. Guidelines for traditional medicine clinical trials 5. Guidelines for good clinical trials in Indonesia
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz/Assignment • Presentation • Mid and final exam Final score: Presentation (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Direktorat Pengawasan Obat Tradisional, 2000, Pedoman Pelaksanaan Uji Klinik Obat Tradisional, Direktrorat Jenderal Pengawasan Obat dan Makanan, Departemen Kesehatan RI, Jakarta • Badan POMRI, 2001, Pedoman Cara Uji Klinik yang Baik di Indonesia, Jakarta • Badan POM, 2005, Peraturan perundang-undangan di bidang obat tradisional, obat herbal terstandar, dan fitofarmaka, Badan Pengawas Obat & Makanan, Jakarta. • Peletier, M.A., Van Santen, R.A. and Steur, E. eds., 2019. Complexity science: an introduction. World Scientific.

Module Handbook Histopathology

<table>
<tr><td>Module Name:</td><td>Histopathology</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB60130</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Drs. Aris Soewondo, M.Si.</td></tr>
<tr><td>Lecturer(s):</td><td>1. Drs. Aris Soewondo, M.Si.
2. Sofy Permana, M.Sc., D.Sc.</td></tr>
<tr><td>Language:</td><td>Indonesian and English</td></tr>
<tr><td>Relation to curriculum</td><td>
<table>
<tr><td>Programme</td><td>Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td>Even</td></tr>
</table>
</td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.
<table>
<tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td>5.7</td><td>40</td></tr>
</table>
</td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours
<table>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>7.4</td><td>4.0</td><td>182.4 h</td><td>6</td></tr>
</table>
</td></tr>
<tr><td>Credit point</td><td>4 credit points (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>Passed on Animal Histology (MAB62011)</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the theoretical concepts about the histopathology condition of various organs and tissues. CLO 2. Able and skilled in analyzing and synthesizing as well as capable of making the right decisions to design and present alternative solutions related to histopathology. CLO 3. Able to make a histology preparate using standard laboratory equipment/instruments in a teamwork.
Content	1. Adaptation, Cell Injury and Cell Death 2. Inflammation 3. Neoplasia 4. Gastrointestinal Histopathology 5. Histopathology of the Respiratory Tract and Lungs 6. Histopathology of the Endocrine System 7. Histopathology of the Circulatory System 8. Histopathology of the liver 9. Histopathology of the Urinary System 10. Histopathology of the Genital System 11. Histopathology of the mammary glands 12. Skin 13. Histopathology of the Nervous System 14. Histopathology of sensory organs
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment/ Paper project • Mid and Final Test Form of examination in laboratory practice: • Lab report • Pre/post-test • Final practice exam Class score (CS): Assignment/paper project (20%), quiz (10%), mid test (35%), and final test (35%) Practice score (PS): Pre/post-test (20%), report (40%), and final practice exam (40%)

	Final score: {(CS) + (PS)}/2
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Kumar,V., Abbas, A.K. and Aster, J.C. 2018 .Robbins Basic Pathology, 10^{th} ed.. Elsevier Inc. Philadelphia • Kumar,V., Abbas, A.K., Fausto, N. and Aster, J.C. 2019 .Robbins and Cotran Pathologic Basis of Disease, 18^{th} ed.. Saunders Elsevier Inc. Philadelphia • Mohan, H. 2015, Textbook of Pathology. 7^{th} ed. Jaypee Brothers Medical Publishers (P) Ltd. Daryaganj • O'Dowd, G., Bell, S., and Wright, S. 2020. Weather's Pathology. A Text, Atlas and Review of Histopathology. 6th ed. Elsevier. London. • Rubin, E. and Reisner, H.M. 2014. Essentials of Rubin's pathology . 6^{th} ed. Lippincott Williams & Wilkins, Philadelphia • Zachary, J.F. 2017. Pathologic Basis of Veterinary Diseases. 6^{th}ed. Elsevier Inc. Missouri.

Module Handbook
Molecular Fingerprint

<table>
<tr><td>Module Name:</td><td>Molecular Fingerprint</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB60125</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Prof. Fatchiyah, M.Kes., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td>1. Prof. Fatchiyah, M.Kes., Ph.D
2. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.
3. Dr. Suharjono, M.Si
4. Nia Kurniawan, S.Si., M.P., D.Sc.</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table>
<tr><td>Programme</td><td>Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td>Even</td></tr>
</table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table>
<tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td>1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td>2.8</td><td>40-50</td></tr>
</table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>4.5</td><td>4.0</td><td>136 h</td><td>4.5</td></tr>
</table></td></tr>
<tr><td>Credit point</td><td>3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>Passed on:
• Molecular Biology (MAB60022)
• Practice in Molecular Biology (MAB60023)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basics of DNA fingerprinting and DNA typing in forensics CLO 2. Able to perform sampling, purification, storage CLO 3. Able to perform methods of isolation and analysis of molecular samples and sequencing CLO 4. Able to understand the difference between genome and mitochondrial typing CLO 5. Able to distinguish DNA Fingerprinting & Forensic DNA system CLO 6. Able to analyze molecular data in silico CLO 7. Able to explain the basic theory of DNA Barcoding CLO 8. Able to compare DNA Barcoding analysis on biodiversity and relationship of animals, plants and microbes. CLO 9 Able to determine biomarkers for fingerprint analysis in plants
Content	1. Fundamentals of DNA fingerprinting and DNA typing in forensics 2. Sampling, purification, storage 3. Molecular sample preparation 4. Genetic basis of DNA typing 5. Comparation of Fingerprinting DNA & Forensic DNA system 6. Molecular data analysis in silico 7. Basic theory of DNA Barcoding 8. Analysis of DNA Barcoding on biodiversity and animal kinship 9. Basics of species kinship analysis 10. Analysis of DNA Barcoding on biodiversity and kinship in microbes 11. Basic DNA Barcoding analysis for species kinship 12. Type of biomarker for fingerprint analysis in plants 13. Analysis of DNA Barcoding on biodiversity and kinship in plants
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Presentation (Comprehension, Slide presentation) • Paper project • Mid and final test Form of examination in laboratory practice: • Lab report

	• Small group presentation (Comprehension, Slide presentation) • Quiz (pre/post-test) • Final test Class score (CS): Assignment/ paper project (10%) + presentation (15%) + quiz (15%) + mid test (30%) + final test (30%) Practice score (PS): quiz (20%) + report (30%) + presentation (20%) + final test (30%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Butler, J.M., 2014. Advanced topics in forensic DNA typing: interpretation. Academic Press. • Dolf, G., 2013. DNA fingerprinting: approaches and applications (Vol. 58). Birkhäuser. • Goodwin, W. ed., 2016. Forensic DNA typing protocols. Humana Press. • Gunn, A., 2019. Essential forensic biology. John Wiley & Sons. • Ida Lopez and David L. Erickson. 2012. DNA Barcodes: Methods and Protocols (Methods in Molecular Biology). Human Press. ISBN-13: 978-1617795909. ISBN-10: 1617795909 • John M Butler. 2009. Fundamentals of Forensic DNA Typing 1st Edition. Academic Press. ISBN-13: 978-0123749994. ISBN-10: 0123749999 • Richads Li. 2015. Forensic Biology. 2nd Edition. CRS. • ISBN-10: 1439889708 • ISBN-13: 978-1439889701 • Jörg Epplen and Thomas Lubjuhnn. 1999. DNA Profiling and DNA Fingerprinting. Birkhäuser. ISBN-10: 3764360186. ISBN-13: 978-3764360184 • Nikolaus J. Sucher and James R. Hennell. 2012. Plant DNA Fingerprinting and Barcoding: Methods and Protocols (Methods in Molecular Biology). Human Press. ISBN-13: 978-1617796081. ISBN-10: 1617796085 • Gene Helfman and Bruce B. Collette. 2009. The Diversity of Fishes: Biology, Evolution, and Ecology. Wiley-Blackwell; 2 edition. ISBN-10: 1405124946. ISBN-13: 978-1405124942 • Jacques Izard and Maria Rivera. 2014. Metagenomics for Microbiology. !rst Ed. Academic Press. ISBN-13: 978-0124104723. ISBN-10: 012410472X • Sandra Tscherwizek. 2008. 16S Ribosomal RNA Gene Sequencing: Establishment of a Method for the Identification of Microorganisms in Biopharmaceutical Production Areas. VDM Verlag Dr Muller. ISBN-13: 978-3639109030. ISBN-10: 3639109031.

Module Handbook
Parasitology

Module Name:	Parasitology			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60145			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Even semester			
Person responsible for the module:	Dr. Bagyo Yanuwiadi			
Lecturer(s):	1. Dr. Bagyo Yanuwiadi 2. Zulfaidah Penata Gama, S.Si., M.Si., Ph.D			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Even	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	1.7	40-50	
	Exercise (structured assignment & independent learning/ self-study)	4.0	40-50	
	Laboratory practice	0	-	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	1.7	4.0	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	Passed on Diversity of Fauna (MAB62007)			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

<table>
<tr><td></td><td>ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development.

ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective.

ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.</td></tr>
<tr><td></td><td>Course learning outcomes (CLO) after completing this module:

CLO 1. Able to develop implementation of various sampling methods for Parasitology research so that it can be used to conduct research

CLO 2. Able to develop solutions to overcome the problems related to parasite and present it with full responsibility according to theory and data.</td></tr>
<tr><td>Content</td><td>1. Introduction: What is the Parasitology?
2. Systematics and biology in general
3. Various biological innovations and their application to Parasitology
4. Research results from lecturers and other researchers
5. Various biological findings from journals
6. Various sampling methods and scientific reasons of the action and the selection strategy for Parasitology research
7. Development of Parasitology research as a solution to problems in the field</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>Form of examination in lectures:
• Quiz/Assignment
• Presentation
• Mid and final exam
Final score: Presentation (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%)</td></tr>
<tr><td>Media employed</td><td>LCD, laptop, google classroom, video conference (zoom/gmeet).</td></tr>
<tr><td>Reading list</td><td>• Bogitsh, B.J., Carter, C.E. and Oeltmann, T.N., 2018. Human parasitology. Academic Press.
• Garcia, L.S. ed., 2021. Practical guide to diagnostic parasitology. John Wiley & Sons.
• Janovy, J & Larry, R. 2007. Foundations of Parasitology. McGrawHill-Higher Education, Boston.
• Loker, E. and Hofkin, B., 2015. Parasitology: a conceptual approach. Garland Science.
• Prianto, J. Tjahaya, PU. & Darwanto, 2002. Atlas Parasitologi Kedokteran. PT Gramedia Utama, Jakarta.
• Taylor, M.A., Coop, R.L. and Wall, R.L., 2015. Veterinary parasitology. John Wiley & Sons.</td></tr>
</table>

Module Handbook
Microscopic Technique

Module Name:	Microscopic Technique
Module Level:	Bachelor
Abbreviation, if applicable:	MAB60146
Sub-heading, if applicable:	-
Courses included in the module, if applicable:	-
Semester/term:	Even semester
Person responsible for the module:	Dr. Sri Widyarti, M.Si
Lecturer(s):	1. Dr. Sri Widyarti, M.Si 2. Prof. Sutiman Bambang Sumitro, S.U., D.Sc 3. Sofy Permana, M.Sc., D.Sc.
Language:	Indonesian
Relation to curriculum	see table below

Programme	Mode	Semester
Bachelor Programme in Biology	Elective	Even

Type of teaching, contact hours:

Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.

Teaching method	Contact hours per week	Class size
Lectures	1.7	40-50
Exercise (structured assignment & independent learning/ self-study)	4.0	40-50
Laboratory practice	2.8	40-50

Workload:

(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours

Contact hours per week	Private/self-study per week	Semester workload	ECTS
4.5	4.0	136 h	4.5

Credit point	3 credit units (SCU)
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.
Recommended prerequisites	Passed on: • General Biology (MAB60001) • Basic Physics (MAP61190)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to understand the basic science supporting Biology and success life skills through understanding the basics of light microscopy and various contrast systems in microscopes. CLO 2. Able to understand the coordination of life, regulation of growth and development of living things and their analysis through knowledge of microphotography techniques CLO 3. Able to understand the concept of research and scientific writing through the preparation and presentation of reports in groups
Content	1. Basics of light microscopy 2. Contrast system in light microscope 3. Microphotography and videomicrograph - recording techniques 4. Electron Microscopy 5. Micrography
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Assignment • Mid and final exam Form of examination in laboratory practice: • Lab report • Pre/post-test • Final practice exam Class score (CS): Assignment (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%) Practice score (PS): Pe/post-test (20%), report (40%), and final practice exam (40%) Final score: {2 (CS) + 1 (PS)}/3
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Goldstein, J.I., Newbury, D.E., Michael, J.R., Ritchie, N.W., Scott, J.H.J. and Joy, D.C., 2017. Scanning electron microscopy and X-ray microanalysis. Springer. • Herman, B., 2020. Fluorescence microscopy. Garland Science.

	• Jerome, W.G. and Price, R.L., 2018. Basic confocal microscopy. Berlin: Springer. • Mertz, J., 2019. Introduction to optical microscopy. Cambridge University Press. • Ratcliff, M.J., 2016. The quest for the invisible: microscopy in the Enlightenment. Routledge. • Ul-Hamid, A., 2018. A beginners' guide to scanning electron microscopy (Vol. 1, p. 402). Cham: Springer International Publishing.

Module Handbook
Biomolecular Analysis Technique

<table>
<tr><td>Module Name:</td><td colspan="4">Biomolecular Analysis Technique</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60124</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Fatchiyah, M.Kes., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Fatchiyah, M.Kes., Ph.D
2. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.
3. Dr. Sri Widyarti, M.Si.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian and English</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">5.7</td><td>40</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>7.4</td><td>4.0</td><td>182.4 h</td><td>6</td></tr>
<tr><td>Credit point</td><td colspan="4">4 credit points (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Biochemistry and Instrumentation (MAB61014)</td></tr>
</table>

	• Genetics (MAB61017) • Molecular Biology (MAB60022) • Practice in Molecular Biology (MAB60023)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basic concepts of molecular analysis techniques CLO 2. Able to isolate DNA and RNA from various plant, animal, bacterial tissues, and measuring the levels of biomolecules qualitatively and quantitatively CLO 3. Able to perform and analyze DNA and RNA amplification and their applications CLO 4. Able to explain the manufacture of cDNA or RNA probes CLO 5. Able to analyze polyformisms of various organisms based on genome data CLO 6. Able to explain the concepts of genetic manipulation and the basic techniques of molecular cloning. CLO 7. Able to understand hybridization techniques with gene expression identification systems: Shoutern and Northern blot. CLO 8. Able to explain the basics of DNA sequencing CLO 9. Able to perform protein isolation and precipitation CLO 9. Able to create standard curves and measure protein content. CLO 10. Able to perform SDS PAGE electrophoresis and analyze the results. CLO 11. Able to perform immunoblotting analysis. CLO 12. Able to explain the basic techniques of immunohistochemistry
Content	1. Basic techniques of genetic material analysis and qualitative & quantitative measurement of biomolecules 2. Basic DNA RNA amplification techniques and their applications 3. Probe Manufacturing 4. Polymorphism analysis 5. Genetic manipulation 6. Basic Molecular cloning techniques 7. Hybridization: Gene detection system & mRNA level 8. DNA sequencing 9. Basic techniques of protein isolation and precipitation 10. Making standard protein curve and measuring Protein content kadar

	11. Protein electrophoresis 12. Protein Analysis 13. Immunohistochemistry
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz • Paper project • Enthusiasm • Mid and Final Test Form of examination in laboratory practice: • Lab report • Placement test • Final practice exam Class score (CS): paper project (10%), enthusiasm (10%), quiz (10%), mid test (35%), and final test (35%) Practice score (PS): Placement test (20%), report (40%), and final practice exam (40%) Final score: {(CS) + (PS)}/2
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Fatchiyah, Widyarti, S. Arumingtyas, E.L. Rahayu, S. 2008, Teknik Dasar Analisis Biologi Molekuler, Universitas Brawijaya, Malang. • Fatchiyah, Widyarti, S. Arumingtyas, E.L. Rahayu, S. 2011. Biologi Molekuler: Prinsip Dasar Analisis. Penerbit Erlangga, Jakarta. • Jain, A., Jain, R. and Jain, S., 2020. Basic Techniques in Biochemistry, Microbiology and Molecular Biology (pp. 235-242). New York, NY, USA:: Springer. • Katoch, R. 2011. Analytical Techniques in Biochemistry and Molecular Biology. Springer-Verlag New York • Ochs, M.F. 2014. Methods in Molecular Biology. 2nd Edition. Humana Press. Springer. UK. • Rapley, R. and Whitehouse, D. eds., 2015. Molecular biology and biotechnology. Royal Society of Chemistry. • Wild, D. 2013. The Immunoassay Handbook: Theory and Applications of Ligand Binding, ELISA and Related Techniques, 4 edition.Elsevier Science. • Andrews AT. 1986. Electrophoresis: Theory, Techniques & Biochemical and Clinical Apllication. 2nd Ed. Clarendon Press, Oxford. • Ausubel FM., Brent R., Kingston RE., Moore D., Seidman JG. Smith JA. Struhl K. 2002. Short Protocols in Molecular Biology. 5rd Ed. John Wiley & Sons. • GeneBank: NCBI GeneBank: www.ncbi.nlm.nih.gov/,5 ▪ DDBJ: http://www.ddbj.nig.ac.jp/ ▪ Embl: http://www.ebi.ac.uk/ • Innis MA. Gelfand DH., Sninsky JJ. 1999. PCR Application Protocol for Functional Genomics. Academics Press • Sambrook J. &Russel DW. 2001. Molecular Cloning: A laboratory manual. Cold Spring Harbor. www.cshl.org/sambrook

	• Bollag DM., & Edelstein SJ. 1991. Protein Methods. A John Wiley & Sons. • Harlow E. & Lane D. 1988. Antibodies: A laboratory manual. Cold Spring • Harbor Konfermann R. &Dubel S. 2001. Antibody Engeneering. Springer Lab. Manual. www.duebel.uni-hd.de • Robyt JF & White BJ. 1990. Biochemical Techniques: Theory & Practice. Brooks/Cole Pub. • Wilson K & Walker J. 2004. Principles & Techniques of Practical Biochemistry. 4th Ed. Cambridge University Press. www.cup.cam.ac.uk/wilson • www.cup.org/wilson.

NON-FIELD OF INTEREST

Module Handbook
Bioentrepreneur

Module Name:	Bioentrepreneur			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60150			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Odd semester			
Person responsible for the module:	Prof. Luchman Hakim, M.Agr.Sc.,Ph.D.			
Lecturer(s):	Prof. Luchman Hakim, M.Agr.Sc.,Ph.D.			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	-	-	
	Exercise (structured assignment & independent learning/ self-study)	-	-	
	Laboratory practice	8.5	Depend on the student number who enrolled this course	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	8.5	-	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	-			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its			

	application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity. ILO 8. Able to understand and has basic entrepreneurship characters relevant to biology.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to explain the basic principles of bio-entrepreneurship which is the integration of conservation biology and entrepreneurship. CLO 3. Able to demonstrate a practical implementation of scientific foundations and biological thinking as a basis for entrepreneurship development. CLO 2. Able to prepare activity proposals and run the bio-entrepreneurship pilot projects in a teamwork.
Content	1. Introduction to bio-entrepreneurship: conservation-entrepreneurship integration 2. Case studies and best practical bio-entrepreneurship 3. Preparation of bio-entrepreneurship proposals 4. Bio-entrepreneurship feasibility study 5. Implementation of the bio-entrepreneurship project
Study and examination requirements and forms of examination	Form of examination in laboratory practice: • Pilot project report • Pre/post-test • Small group presentation • Final practice exam Practice score: Pilot project report (30%) + pre/post-test (20%) + class participation/ discussion (20%) + final practice exam (30%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Agarwal, S., Kumari, S. and Khan, S., 2021. Bioentrepreneurship and Transferring Technology Into Product Development. IGI Global. • Cromie, S., McGowan, P., & Hill, J. 1995. Marketing and entrepreneurship in SMEs: An innovative approach (Vol. 1). London: Prentice Hall. • Steyaert, C., & Hjorth, D. (Eds.). 2008. Entrepreneurship as social change: A third new movements in entrepreneurship book. Edward Elgar Publishing.

	• Langer, R., 2018. Mastering Bioentrepreneurship. Innovative Research in Life Sciences: Pathways to Scientific Impact, Public Health Improvement, and Economic Progress, p.291. • Drucker, P. 2014. Innovation and entrepreneurship. Routledge. • Schaper, M. (Ed.). 2012. Making ecopreneurs: developing sustainable entrepreneurship. Gower Publishing, Ltd.

Module Handbook Population Genetics

<table>
<tr><td>Module Name:</td><td colspan="4">Population Genetics</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60151</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Prof. Dr. Ir. Estri Laras Arumingtyas, M.Sc.St.
2. Mufidah Afiyanti, S.P., Ph.D
3. Nia Kurniawan, S.Si., M.P., D.Sc.</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">1.7</td><td>40-50</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">4.0</td><td>40-50</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">0</td><td>-</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>1.7</td><td>4.0</td><td>90.7 h</td><td>3</td></tr>
<tr><td>Credit point</td><td colspan="4">2 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Passed on:
• Genetics (MAB61017)
• Molecular Biology (MAB61022)
• Practice in Molecular Biology (MAB61023)</td></tr>
</table>

Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 2. Able to understand the biological science principles comprehensively and its supporting basic sciences, as well as keep updating the modern biology development. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to analyze population structure based on allele frequencies, genes, and genotypes. CLO 2. Able to apply the application of Hardy Weinberg's law to populations in nature and can explain the factors that influence it. CLO 3. Have population structure analysis skills, perform secondary data analysis to understand changes in population structure CLO 4. Able to take responsibility and actively contribute to a teamwork.
Content	1. Definition of population, gene pool, allele frequency and genotype Calculation of allele frequency, genotype frequency. 2. Hardy Weinberg Law and its Requirements 3. The relationship between allele frequency, genotype frequency, gamete formation and the formation of new individuals (offspring) 4. Homozygosity and heterozygosity analysis 5. Selection, mutation, migration and their effect on allele and genotype frequencies 6. Marriage types: random and non-random 7. Changes in allele frequency due to directed mating 8. Effect of genetic drift on population structure 9. Multi-locus evolution and heterogeneity in fitness (Adaptive landscape, Spatial variation, and Temporal variation) 10. Quantitative genetics: Measuring natural selection, G-Matrix, and QTL simplified 11. Inbreeding depression and mating systems (Evolution of selfing rate, Modifier models, and Breeding system evolution) 12. Population substructure (F statistics. Migration, Hierarchical F, derived from coalescent theory, and Likelihood, Bayesian statistics) 13. Evolution of recombination
Study and examination requirements and forms of examination	Form of examination in lectures: • Quiz/Assignment • Presentation • Mid and final exam

	Final score: Presentation (15%) + Quiz (15%), Mid exam (35%) + Final exam (35%)
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Crow, J.F., 2017. An introduction to population genetics theory. Scientific Publishers. • Hamilton, M.B., 2021. Population genetics. John Wiley & Sons. • Hartl DL & Clark AG 2007 Principles of Population Genetics, 4th Edition. Sinauer Associates: Sunderland, Massachusetts; • Perry GH, Dominy NJ, Claw KG, et al. 2007. Diet and the evolution of human amylase gene copy number variation. Nature Genetics 39, 1256-1260 • Novembre J, Pritchard JK, Coop G. 2007. Adaptive drool in the gene pool. Nature Genetics 39, 1188-1190.

Module Handbook
Special Topics Supporting Thesis

<table>
<tr><td>Module Name:</td><td colspan="4">Special Topics Supporting Thesis</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60152</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Even semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc.</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Ir. Retno Mastuti, M.Agr.Sc., D.Agr.Sc.
2. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D
3. Undergraduate thesis supervisor candidates</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Even</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Laboratory practice</td><td>8.5</td><td colspan="2">Depend on the student number who enrolled this course</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>8.5</td><td>-</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">A student must have attended at least 80% of the lectures to sit in the exams. In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">• The total credit units achieved is more than 120 credit units
• The GPA ≥ 2,0
• It is not programmed in the same semester as Thesis Proposal</td></tr>
</table>

	Seminar (MAB60032)
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning. ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to implement and understand the research techniques related to thesis CLO 2. Able to compile a thesis research proposal draft CLO 3. Able to present the preliminary research report and thesis research proposal draft to get some inputs.
Content	1. Reviewing articles/journals/textbooks to compile a synthesis to improve the theoretical basis of the proposal draft. 2. Reviewing articles/journals/textbooks to develop research methods to improve proposal drafts. 3. Reviewing articles/journals/textbooks to make data analysis/interpretation to improve the proposal draft. 4. Presentation of the undergraduate thesis proposal draft 5. Deepening of laboratory/field work techniques.
Study and examination requirements and forms of examination	Final score : discipline and independence (20%), quality of work (25%), academic integrity (15%), thesis proposal draft (20%), creativity and idea development (20%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	• Varies depend on the thesis topics • Fakultas Matematika dan Ilmu Pengetahuan Alam, 2020 PEDOMAN PENDIDIKAN PROGRAM SARJANA TAHUN AKADEMIK 2020/2021. Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Brawijaya. viewed 27 October 2021. https://mipa.ub.ac.id/wp-content/uploads/2020/08/pedoman-pendidikan-S1-BIO-2020-2021-24.08.2020-1.pdf.

ENRICHMENT PROGRAM

Enrichment Program Information

The Merdeka-Belajar-Kampus Merdeka (MBKM) program launched by the government in 2020 with aim to develop conditions and provide opportunities for students to learn and self-actualize so that they can be absorbed into the world of work. One of the strategies for achieving MBKM is the formulation of a student apprentice system at prospective institutions as their target workplace after graduation. Students are encouraged to carry out activities both lectures and/or practical internships for 1-3 semesters which are equivalent to 20 credit units/semester.

The flexibility demanded by the MBKM program requires adjustments to the 2019 Bachelor Programme in Biology (BPB) curriculum so that the integration of Enrichment Program (EP) in the MBKM program is needed, especially regarding the plan to implement learning rights for a maximum of three semesters outside the study programme as well as the management and mechanism for implementing the curriculum. The EP, which is planned to be implemented for the next two years (when the 2019 batch of students are in semester 7), must be accelerated and implemented this year. The initial step to integrate EP into MBKM is carried out by creating a linkage matrix (Table 1).

Table 1. The relationship between five learning schemes outside the BPB Enrichment Program (EP) with eight learning activities launched by the Ministry of Education and Culture

EP Schema/ MBKM Activities	Research	Entrepreneurship	Community Development	Industrial Internship	Overseas Internship/ Credit Transfer
Student exchange					✓
Internship				✓	
Research	✓				✓
Independent study/ project	✓	✓	✓		
Projects in the village			✓		
Humanity project			✓		
Teaching in schools			✓		
Entrepreneurial activities		✓			

The EP design is an activity with a total load of 17 credits as shown in Table 2.

Table 2. Enrichment Program design in BPB curriculum

	Research	Entrepreneurship	Community Development	Industrial Internship	Credit Transfer
Internship	Internship (3 SCU)	Internship (3 SCU)	Internship (3 SCU)	Internship (3 SCU)	Credit transfer in Indonesian and overseas university.
Main Project	Research Internship (5 SCU)	Business Initiation (5 SCU)	Community Development (5 SCU)	Industrial Internship (5 SCU)	
EP Supporting Course 1	Research Management (3 SCU)	Business Management (3 SCU)	Community Development Appraisal (3 SCU)	Research and Development (3 SCU)	
EP Supporting Course 2	Scientific Communication (3 SCU)	Business Communication (3 SCU)	Community Communication (3 SCU)	Business Communication (3 SCU)	
EP Supporting Course 3	Attitude, Ethics, and Leadership (2 SCU)	Attitude, Ethics, and Leadership (2 SCU)	Attitude, Ethics, and Leadership (2 SCU)	Attitude, Ethics, and Leadership (2 SCU)	
Seminar	Proposal Seminar (1 SCU)	Proposal Seminar (1 SCU)	Proposal Seminar (1 SCU)	Proposal Seminar (1 SCU)	

Module Handbook
Attitude, Ethics, and Leadership

Module Name:	Attitude, Ethics, and Leadership			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60201			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Odd semester			
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D			
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D 2. Internship supervisors			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	-	-	
	Exercise (structured assignment & independent learning/ self-study)	-	-	
	Laboratory practice	5.67	Depend on the student number who enrolled this course	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	5.67	-	90.7 h	3
Credit point	2 credit units (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 90 credit units.			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to recognize the importance of ethical issues in research/society/business/entrepreneurial/cross-cultural and leadership in research/social/business/entrepreneurial/education activities abroad. CLO 2. Able to demonstrate the importance of ethics in social, economic, and cultural environments. CLO 3. Able to demonstrate critical thinking skills in managing research/society/business/entrepreneurship/education abroad according to the culture of the local community. CLO 4. Able to demonstrate confidence in research/society/initiating business/industrial business//education abroad, disseminating research results/action research/promoting business products/services/portfolios, making decisions and the importance of the activities to other parties. CLO 5. Able to be responsible for the choice of doing research / community / business / entrepreneurship / cross-cultural, risk and success obtained.
Content	1. Application of ethical principles. 2. Corporate social responsibility. 3. Global ethics, rights, and obligations of interested parties. 4. Consumer rights and halal, safe and healthy products. 5. Ethics in publication/dissemination/marketing, report generation. investment management and the environment.
Study and examination requirements and forms of examination	Form of examination: • Interaction process with the supervisors and others • Interview / oral test Final score : interaction process (40%) + interview/ oral test (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Research Internship

<table>
<tr><td>Module Name:</td><td colspan="4">Research Internship</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60202</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D
2. Internship supervisors</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Laboratory practice</td><td>14.17</td><td colspan="2">Depend on the student number who enrolled this course</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>14.17</td><td>-</td><td>226.7 h</td><td>7.5</td></tr>
<tr><td>Credit point</td><td colspan="4">5 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">The total credit units achieved is more than 90 credit units.</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to recognize the importance of ethical issues in research/society/business/entrepreneurial/cross-cultural and leadership in research/social/business/entrepreneurial/education activities abroad. CLO 2. Able to demonstrate the importance of ethics in social, economic, and cultural environments. CLO 3. Able to demonstrate critical thinking skills in managing research/society/business/entrepreneurship/education abroad according to the culture of the local community. CLO 4. Able to demonstrate confidence in research/society/initiating business/industrial business//education abroad, disseminating research results/action research/promoting business products/services/portfolios, making decisions and the importance of the activities to other parties. CLO 5. Able to be responsible for the choice of doing research / community / business / entrepreneurship / cross-cultural, risk and success obtained.
Content	1. Determination of research topics in accordance with research activities at the targeted institution. 2. Making research plans according to topics. 3. Research preparation. 4. Research implementation. 5. Compiling and analyzing research data. 6. Presentation of research results. 7. Making research reports. 8. Evaluating research internship results.
Study and examination requirements and forms of examination	Form of examination: • Assignment • Draft of research proposal Final score : Assignment (40%) + draft of research proposal (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Business Initiation

<table>
<tr><td>Module Name:</td><td colspan="4">Business Initiation</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60203</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D
2. Internship supervisors</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td colspan="2">Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td colspan="2">Elective</td><td>Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td colspan="2">Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td colspan="2">-</td><td>-</td></tr>
<tr><td>Laboratory practice</td><td colspan="2">14.17</td><td>Depend on the student number who enrolled this course</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>14.17</td><td>-</td><td>226.7 h</td><td>7.5</td></tr>
<tr><td>Credit point</td><td colspan="4">5 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">The total credit units achieved is more than 90 credit units.</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to gain work experience in a unit either at home country or overseas in the context of business initiation related to biological sciences.
Content	The form of business initiation is an internship by carrying out activities in accordance with the job description given by the supervisor where the student is doing the internship. After starting with observation activities through Internship, the students are given a problem (mini project) related to business initiation to find a solution with a scientific approach related to biological sciences (problem-based learning). The output of this mini project is that one of them can be used as a preliminary study for the final project (thesis) which in the end can be used to prepare a thesis proposal. After completing this research internship, students prepare a written internship report and can proceed to become a thesis proposal.
Study and examination requirements and forms of examination	Form of examination: • Assignment • Draft of research proposal Final score : Assignment (40%) + draft of research proposal (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Community Development

Module Name:	Community Development			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60204			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Odd semester			
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D			
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D 2. Internship supervisors			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	-	-	
	Exercise (structured assignment & independent learning/ self-study)	-	-	
	Laboratory practice	14.17	Depend on the student number who enrolled this course	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	14.17	-	226.7 h	7.5
Credit point	5 credit units (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 90 credit units.			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to gain work experience in a unit either at home country or overseas in the context of business initiation related to biological sciences.
Content	The form of community development is an internship by carrying out activities in accordance with the job description given by the supervisor where the student is doing the internship. After starting with observation activities through Internship, the students are given a problem (mini project) related to community empowerment to find a solution with a scientific approach related to biological sciences (problem-based learning). The output of this mini project is that one of them can be used as a preliminary study for the final project (thesis) which in the end can be used to prepare a thesis proposal. After completing this research internship, students prepare a written internship report and can proceed to become a thesis proposal.
Study and examination requirements and forms of examination	Form of examination: • Assignment • Draft of research proposal Final score : Assignment (40%) + draft of research proposal (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Industrial Internship

<table>
<tr><td>Module Name:</td><td>Industrial Internship</td></tr>
<tr><td>Module Level:</td><td>Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td>MAB60205</td></tr>
<tr><td>Sub-heading, if applicable:</td><td>-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td>-</td></tr>
<tr><td>Semester/term:</td><td>Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td>Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td>1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D
2. Internship supervisors</td></tr>
<tr><td>Language:</td><td>Indonesian</td></tr>
<tr><td>Relation to curriculum</td><td><table>
<tr><td>Programme</td><td>Mode</td><td>Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td>Odd</td></tr>
</table></td></tr>
<tr><td>Type of teaching, contact hours:</td><td>Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.<table>
<tr><td>Teaching method</td><td>Contact hours per week</td><td>Class size</td></tr>
<tr><td>Lectures</td><td>-</td><td>-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>-</td><td>-</td></tr>
<tr><td>Laboratory practice</td><td>14.17</td><td>Depend on the student number who enrolled this course</td></tr>
</table></td></tr>
<tr><td>Workload:</td><td>(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours<table>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>14.17</td><td>-</td><td>226.7 h</td><td>7.5</td></tr>
</table></td></tr>
<tr><td>Credit point</td><td>5 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td>In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td>The total credit units achieved is more than 90 credit units.</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td>Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to gain professional work experiences in a business unit/industry either at home country or overseas related to biological sciences.
Content	The form of industrial internship is an internship by carrying out activities in accordance with the job description given by the supervisor where the student is doing the internship. After starting with observation activities through Internship, the students are given a problem (mini project) related to community empowerment to find a solution with a scientific approach related to biological sciences (problem-based learning). The output of this mini project is that one of them can be used as a preliminary study for the final project (thesis) which in the end can be used to prepare a thesis proposal. After completing this research internship, students prepare a written internship report and can proceed to become a thesis proposal.
Study and examination requirements and forms of examination	Form of examination: • Assignment • Draft of research proposal Final score : Assignment (40%) + draft of research proposal (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Research Internship Abroad

Module Name:	Research Internship Abroad		
Module Level:	Bachelor		
Abbreviation, if applicable:	MAB60206		
Sub-heading, if applicable:	-		
Courses included in the module, if applicable:	-		
Semester/term:	Odd semester		
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D		
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D 2. Internship supervisors		
Language:	Indonesian		
Relation to curriculum	Programme	Mode	Semester
	Bachelor Programme in Biology	Elective	Odd
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.		
	Teaching method	Contact hours per week	Class size
	Lectures	-	-
	Exercise (structured assignment & independent learning/ self-study)	-	-
	Laboratory practice	14.17	Depend on the student number who enrolled this course

Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	14.17	-	226.7 h	7.5
Credit point	5 credit units (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 90 credit units.			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to gain experience in college, doing research or community service related to biological sciences in overseas research institutions.
Content	1. Determining the topic of lectures/research/community service in accordance with research activities at the targeted institution. 2. Making plans for lectures/research/community service according to the topic. 3. Preparation of lectures/research/community service. 4. Conducting lectures/research/community service. 5. Report/ Presentation of lectures/research/community service results. 6. Evaluation of research internship results.
Study and examination requirements and forms of examination	Form of examination: • Assignment • Draft of research proposal Final score : Assignment (40%) + draft of research proposal (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Research Management

<table>
<tr><td>Module Name:</td><td colspan="12">Research Management</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">MAB60207</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D
2. Internship supervisors</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Elective</td><td colspan="4">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">-</td><td colspan="4">-</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">-</td><td colspan="4">-</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">8.5</td><td colspan="4">Depend on the student number who enrolled this course</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">8.5</td><td colspan="3">-</td><td colspan="3">136 h</td><td colspan="3">4.5</td></tr>
<tr><td>Credit point</td><td colspan="12">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">The total credit units achieved is more than 90 credit units.</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="12">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
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	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to gain experience in managing a research activity with a specific topic related to the biological sciences.
Content	1. Making a schedule of research activities. 2. Recording research activities in a logbook. 3. Managing research implementation time according to schedule. 4. Carrying out research according to plan. 5. Evaluating research results and outputs according to targets.
Study and examination requirements and forms of examination	Form of examination: • Interaction process with the supervisors and others • Interview / oral test Final score : interaction process (40%) + interview/ oral test (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Business Management

Module Name:	Business Management			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60208			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Odd semester			
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D			
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D 2. Internship supervisors			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	-	-	
	Exercise (structured assignment & independent learning/ self-study)	-	-	
	Laboratory practice	8.5	Depend on the student number who enrolled this course	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	8.5	-	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 90 credit units.			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to gain experience in managing an entrepreneurial activity with a specific topic related to the biological sciences.
Content	1. Making a schedule for entrepreneurial activities. 2. Recording activities in a logbook. 3. Managing implementation time according to schedule. 4. Implementing entrepreneurial activities according to plan. 5. Evaluating entrepreneurial results and outputs according to targets
Study and examination requirements and forms of examination	Form of examination: • Interaction process with the supervisors and others • Interview / oral test Final score : interaction process (40%) + interview/ oral test (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Community Development Appraisal

<table>
<tr><td>Module Name:</td><td colspan="4">Community Development Appraisal</td></tr>
<tr><td>Module Level:</td><td colspan="4">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="4">MAB60209</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="4">-</td></tr>
<tr><td>Semester/term:</td><td colspan="4">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="4">Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="4">1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D
2. Internship supervisors</td></tr>
<tr><td>Language:</td><td colspan="4">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td>Programme</td><td>Mode</td><td colspan="2">Semester</td></tr>
<tr><td>Bachelor Programme in Biology</td><td>Elective</td><td colspan="2">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="4">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td>Teaching method</td><td>Contact hours per week</td><td colspan="2">Class size</td></tr>
<tr><td>Lectures</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Exercise (structured assignment & independent learning/ self-study)</td><td>-</td><td colspan="2">-</td></tr>
<tr><td>Laboratory practice</td><td>8.5</td><td colspan="2">Depend on the student number who enrolled this course</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="4">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td>Contact hours per week</td><td>Private/self-study per week</td><td>Semester workload</td><td>ECTS</td></tr>
<tr><td>8.5</td><td>-</td><td>136 h</td><td>4.5</td></tr>
<tr><td>Credit point</td><td colspan="4">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="4">In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">The total credit units achieved is more than 90 credit units.</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="4">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to gain experience in analyzing and solving problems in the context of community empowerment with certain topics related to the biological sciences.
Content	1. Making a schedule for community development activities. 2. Recording activities in a logbook. 3. Managing implementation time according to schedule. 4. Implementing community development activities according to plan. 5. Evaluating entrepreneurial results and outputs according to targets.
Study and examination requirements and forms of examination	Form of examination: • Interaction process with the supervisors and others • Interview / oral test Final score : interaction process (40%) + interview/ oral test (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Research and Development

Module Name:	Research and Development			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60210			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Odd semester			
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D			
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D 2. Internship supervisors			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	-	-	
	Exercise (structured assignment & independent learning/ self-study)	-	-	
	Laboratory practice	8.5	Depend on the student number who enrolled this course	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	8.5	-	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 90 credit units.			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to gain experience in conducting research and development in the context of industrial work internships with certain topics related to biological sciences.
Content	1. Making a schedule for research and development activities. 2. Recording activities in a logbook. 3. Managing implementation time according to schedule. 4. Implementing research and development activities according to plan. 5. Evaluating results and outputs according to targets.
Study and examination requirements and forms of examination	Form of examination: • Interaction process with the supervisors and others • Interview / oral test Final score : interaction process (40%) + interview/ oral test (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Scientific Communication

<table>
<tr><td>Module Name:</td><td colspan="12">Scientific Communication</td></tr>
<tr><td>Module Level:</td><td colspan="12">Bachelor</td></tr>
<tr><td>Abbreviation, if applicable:</td><td colspan="12">MAB60211</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Courses included in the module, if applicable:</td><td colspan="12">-</td></tr>
<tr><td>Semester/term:</td><td colspan="12">Odd semester</td></tr>
<tr><td>Person responsible for the module:</td><td colspan="12">Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D</td></tr>
<tr><td>Lecturer(s):</td><td colspan="12">1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D
2. Internship supervisors</td></tr>
<tr><td>Language:</td><td colspan="12">Indonesian</td></tr>
<tr><td rowspan="2">Relation to curriculum</td><td colspan="4">Programme</td><td colspan="4">Mode</td><td colspan="4">Semester</td></tr>
<tr><td colspan="4">Bachelor Programme in Biology</td><td colspan="4">Elective</td><td colspan="4">Odd</td></tr>
<tr><td rowspan="5">Type of teaching, contact hours:</td><td colspan="12">Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.</td></tr>
<tr><td colspan="4">Teaching method</td><td colspan="4">Contact hours per week</td><td colspan="4">Class size</td></tr>
<tr><td colspan="4">Lectures</td><td colspan="4">-</td><td colspan="4">-</td></tr>
<tr><td colspan="4">Exercise (structured assignment & independent learning/ self-study)</td><td colspan="4">-</td><td colspan="4">-</td></tr>
<tr><td colspan="4">Laboratory practice</td><td colspan="4">8.5</td><td colspan="4">Depend on the student number who enrolled this course</td></tr>
<tr><td rowspan="3">Workload:</td><td colspan="12">(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours</td></tr>
<tr><td colspan="3">Contact hours per week</td><td colspan="3">Private/self-study per week</td><td colspan="3">Semester workload</td><td colspan="3">ECTS</td></tr>
<tr><td colspan="3">8.5</td><td colspan="3">-</td><td colspan="3">136 h</td><td colspan="3">4.5</td></tr>
<tr><td>Credit point</td><td colspan="12">3 credit units (SCU)</td></tr>
<tr><td>Requirement according to the examination regulations</td><td colspan="12">In order to pass the course, student must obtain a minimal score of 55%.</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="12">The total credit units achieved is more than 90 credit units.</td></tr>
<tr><td>Module objective/ intended learning outcomes</td><td colspan="12">Intended learning outcomes (ILO) corresponding to this module:

ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.</td></tr>
</table>

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to communicate effectively in all scientific activities carried out during the internship not only with the staffs of the research institution but also with both supervisors.
Content	1. Consultation and discussion of research activity schedule. 2. Presentation of research internship plan proposal. 3. Presentation of research progress report I. 4. Presentation of research progress report II. 5. Presentation of research results. 6. Consultation and discussion of research report.
Study and examination requirements and forms of examination	Form of examination: • Interaction process with the supervisors and others • Interview / oral test Final score : interaction process (40%) + interview/ oral test (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Business Communication

Module Name:	Business Communication			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60212			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Odd semester			
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D			
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D 2. Internship supervisors			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	-	-	
	Exercise (structured assignment & independent learning/ self-study)	-	-	
	Laboratory practice	8.5	Depend on the student number who enrolled this course	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	8.5	-	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 90 credit units.			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to communicate effectively in all business activities carried out during the internship not only with the staffs of the institution but also with both supervisors.
Content	1. Consultation and discussion of business activity schedule. 2. Presentation of business plan. 3. Presentation of business progress report I. 4. Presentation of business progress report II. 5. Presentation of business results. 6. Consultation and discussion of business report.
Study and examination requirements and forms of examination	Form of examination: • Interaction process with the supervisors and others • Interview / oral test Final score : interaction process (40%) + interview/ oral test (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics

Module Handbook
Community Communication

Module Name:	Community Communication			
Module Level:	Bachelor			
Abbreviation, if applicable:	MAB60213			
Sub-heading, if applicable:	-			
Courses included in the module, if applicable:	-			
Semester/term:	Odd semester			
Person responsible for the module:	Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D			
Lecturer(s):	1. Dian Siswanto, S.Si., M.Sc., M.Si., Ph.D 2. Internship supervisors			
Language:	Indonesian			
Relation to curriculum	Programme	Mode	Semester	
	Bachelor Programme in Biology	Elective	Odd	
Type of teaching, contact hours:	Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar, etc.			
	Teaching method	Contact hours per week	Class size	
	Lectures	-	-	
	Exercise (structured assignment & independent learning/ self-study)	-	-	
	Laboratory practice	8.5	Depend on the student number who enrolled this course	
Workload:	(Estimated) workload, divided into contact hours (lecture, exercise, laboratory session, etc.) and private/self-study, including examination preparation, specified in hours			
	Contact hours per week	Private/self-study per week	Semester workload	ECTS
	8.5	-	136 h	4.5
Credit point	3 credit units (SCU)			
Requirement according to the examination regulations	In order to pass the course, student must obtain a minimal score of 55%.			
Recommended prerequisites	The total credit units achieved is more than 90 credit units.			
Module objective/ intended learning outcomes	Intended learning outcomes (ILO) corresponding to this module: ILO 1. Able to demonstrate academic integrity and the ability to develop themselves through lifelong learning.			

	ILO 3. Able to understand the methodology of biological science and its application in a bio-conservation perspective. ILO 4. Able to work independently in the laboratory and the field in compliance with the standard methodology of biology concerning bioethics and safety. ILO 5. Able to solve problems based on scientific methods by applying biological sciences, biological analysis methods and technological applications. ILO 7. Have a capacity for teamwork with respecting biodiversity.
	Course learning outcomes (CLO) after completing this module: CLO 1. Able to communicate effectively in all community development activities carried out during the internship not only with the community but also with both supervisors.
Content	1. Consultation and discussion of community development activity schedule. 2. Presentation of community development plan. 3. Presentation of community development progress report I. 4. Presentation of community development progress report II. 5. Presentation of community development results. 6. Consultation and discussion of community development report.
Study and examination requirements and forms of examination	Form of examination: • Interaction process with the supervisors and others • Interview / oral test Final score : interaction process (40%) + interview/ oral test (60%).
Media employed	LCD, laptop, google classroom, video conference (zoom/gmeet).
Reading list	Varies depend on the internship topics