



FACULTY OF MATHEMATICS AND
NATURAL SCIENCES
MULAWARMAN UNIVERSITY

BACHELOR OF BIOLOGY CURRICULUM

OUTCOME BASED EDUCATION (OBE)
2023



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Samarinda, April 10, 2023
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PREFACE

Praise be to Allah SWT, whose grace, guidance, and blessings have enabled the timely completion of the curriculum for the undergraduate Biology study program, Faculty of Mathematics and Natural Sciences (FMIPA), Mulawarman University (UNMUL). This curriculum was developed within the framework of curriculum development oriented toward Independent Learning and Independent Campus (MBKM), to support students in exploring biology in depth and developing their potential and contributions to the natural sciences. The MBKM program is supported by Mulawarman University Rector's Regulation No. 17 of 2020 concerning the Implementation of Education and Teaching, Research, and Community Service. Furthermore, this curriculum implements the concept of outcome-based education, also known as Outcome-Based Education (OBE).

This curriculum is designed to provide a high-quality education in biology, strengthening not only students' conceptual and theoretical understanding but also developing the practical and analytical skills necessary for the professional world. We believe that through this study program, students will be able to become competent, creative, and responsible biologists, who are able to face challenges and contribute to the development of science and technology. This curriculum has followed government policy, namely the competency-based curriculum (KBK) which refers to the standards of the Indonesian National Qualifications Framework (KKNI) which is refined by integrating the main scientific patterns of UNMUL. Finally, we hope that the curriculum draft for the Undergraduate Biology Study Program can meet the needs of society and industry for professional personnel in the field of biology. We are committed to providing high-quality education, developing student potential, and contributing to the development of science and technology in the field of Biology, FMIPA, UNMUL.

Samarinda, April 3, 2023

Coordinator of Biology Undergraduate Study Program,



Imam Rosadi, M.Si

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THE IDENTITY OF STUDY PROGRAM

Name of University : Mulawarman University

Name of Faculty : Faculty of Mathematics and Natural Sciences

Name of Study Program : Undergraduate Biology Study Program

Establishment Decree : 2811/D/T/2001

Degree Level : Bachelor's Degree (S1)

Graduate Degree : Bachelor of Science (S.Si)

National Accreditation : Grade A

Accreditation Decree : 3417/SK/BAN-PT/Akred/S/IX/2019

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CHAPTER I INTRODUCTION

A. Background

Higher education plays a crucial role in national development, with the primary goal of educating individuals to become cultured, creative intellectuals, scientists, and professionals capable of contributing significantly to the nation's progress. Therefore, an appropriate and relevant higher education curriculum is crucial for the development of a system for higher education.

In developing the higher education curriculum, particularly in the Undergraduate Biology program at the Faculty of Mathematics and Natural Sciences (FMIPA), Mulawarman University, attention is focused on the development of science and technology. Knowledge and technology play a significant role in determining curriculum content and the learning process. In the era of the Industrial Revolution 4.0, which brings rapid social, cultural, and workplace changes, and technological advancements, transformation in learning is an urgent need.

The Undergraduate Biology Program, FMIPA, Mulawarman University, is located in East Kalimantan, a strategic location adjacent to the capital city of Indonesia. The university's location in this strategic area provides unique access and opportunities for students to engage with the developments and changes taking place in the capital city. In addition, this area is rich in biodiversity and unique ecosystems, providing opportunities for students to conduct research and exploration in the field which is rich in biological potential, especially research based on the biodiversity of humid tropical forests and their environment.

The curriculum of the Biology Undergraduate Program, Faculty of Mathematics and Natural Sciences, Mulawarman University is designed with reference to the National Standards of Higher Education which prioritize the development of intellectual intelligence, noble character, and skills. The curriculum standards developed in an educational institution are based on the fulfillment of Learning Outcome (LO) targets that can be met through the content and learning process. The Learning Outcomes (CP) planned in the scope of national education refer to the development of science, technology and global culture which are inseparable from the development of the capacity and potential of human resources. Adaptation in facing the global labor market, e.g.: while maintaining a focus on developing national identity, the Indonesian government has launched the Indonesian National Qualifications Framework (KKNI), a qualifications framework in Indonesia that can

align, equalize, and integrate the outcomes of formal, non-formal, informal education, and/or work experience to recognize work competencies in accordance with job structures in various sectors, according to the type and level of higher education. The KKNI was developed with the aim of ensuring the accountability of education providers in providing equitable qualifications/competencies for their graduates according to their level of education. Another objective is to ensure that the quality of education in Indonesia is at the same level as that of other countries.

In an effort to meet the demands of change and keep up with the latest developments, the Biology Undergraduate Study Program, Faculty of Mathematics and Natural Sciences, Mulawarman University, is reconstructing its adaptive curriculum to ensure the sustainability and relevance of higher education in this increasingly dynamic era. Through an updated and adapted curriculum framework, it is hoped that Biology undergraduate graduates will be able to face the increasingly complex challenges of the workforce with strong analytical skills, in-depth knowledge of biology, skilled laboratory skills, and the ability to adapt to ever-changing technological developments.

In implementing the curriculum, the Biology Undergraduate Study Program, Faculty of Mathematics and Natural Sciences, Mulawarman University, adheres to the policy of Minister of Education and Culture Regulation No. 3 of 2020 concerning National Higher Education Standards, which facilitates learning activities outside the study program (Merdeka Belajar Kampus Merdeka) to meet graduate learning outcomes by bridging the gap between higher education and the needs of industry, business, and the workplace (link and match). This enables students to bridge the gap between theory and practice by integrating experiences in industry, business, and the workplace.

Mulawarman University's commitment to providing quality higher education is also supported by a qualified and experienced teaching staff. Lecturers in the Biology Undergraduate Program are experts actively involved in research and scientific development. They provide guidance and instruction to students to develop their interests and potential in biology.

To optimize the learning experience, the Biology Undergraduate Program also collaborates with relevant institutions and industries, both domestically and internationally. Through these partnerships, students have the opportunity to participate in student exchange programs, internships, or joint research projects. This

provides opportunities for students to broaden their horizons, develop professional skills, and build an extensive network of contacts. To improve and adapt to current regulations, the curriculum of the Biology Undergraduate Program, Faculty of Mathematics and Natural Sciences, Mulawarman University, needs to be reconstructed.

B. Curriculum Development Objectives

The objectives of improving the curriculum for the Biology Undergraduate Study Program include:

1. Program improvements to ensure the quality of educational services and the Biology Undergraduate Program curriculum are continuously updated to reflect developments and changes.
2. Accountability to various parties (government, community, parents, education officials, and other parties who sponsor the curriculum development activities, as well as consumers of the developed curriculum).
3. Developing a curriculum based on Outcomes-Based Education (OBE) provisions, which focuses on graduate learning outcomes, refers to clear learning outcomes, encourages students to engage deeply in learning, and facilitates extensive learning opportunities to achieve good results.
4. Developing a learning management system within the study program to produce a Curriculum Draft (Document I) for the study program based on the KKNI (National Qualifications Framework) and integrating Unmul's PIP (Planning for Local Excellence) based on Outcome-Based Education (OBE). Implementation of the Independent Learning Campus (MBKM) program (Document II) for all study program courses (expertise, interest, and electives) in the form of a Learning Plan (RPS). complete one semester.

C. Basic Foundation

The development of a standard curriculum for the Biology Undergraduate Program based on the Indonesian National Qualifications Framework (KKNI). This curriculum change is based on reference to applicable laws and government regulations, namely:

1. Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System.
2. Law of the Republic of Indonesia Number 12 of 2012 concerning Higher

- Education. Government Regulation of the Republic of Indonesia Number 19 of 2005 concerning National Education Standards, as amended by Government Regulation No. 32 of 2013.
3. Presidential Regulation No. 8 of 2012 concerning the Indonesian National Qualifications Framework (KKNI).
 4. Regulation of the Minister of Education and Culture No. 73 of 2013 concerning the Implementation of the KKNI in the Field of Higher Education.
 5. Regulation of the Minister of Education and Culture No. 03 of 2020 concerning National Standards for Higher Education.
 6. Government Regulation No. 57 of 2021 concerning National Education Standards.
 7. Government Regulation No. 4 of 2022 concerning Amendments to Government Regulation No. 57 of 2021.
 8. Ministry of Education and Culture No. 03/M/2021 concerning Key Performance Indicators for State Universities and Higher Education Service Institutions under the Ministry of Education and Culture.
 9. Mulawarman University Rector's Regulation Number 6 of 2018 concerning the Implementation of Education, Research, and Community Service.
 10. Mulawarman University Rector's Regulation Number 7 of 2020 concerning the Implementation of Education and Teaching, Research, and Community Service Based on the Independent Campus and Independent Learning.
 11. Guidebook for Independent Learning, Independent Campus, Mulawarman University, 2021.
 12. Guidebook for Independent Learning, Independent Campus, Faculty of Mathematics and Natural Sciences, 2021.

The curriculum developed in the study programs also utilizes a specific curriculum development model, known as the local excellence-based curriculum development model, as used in curriculum development at Mulawarman University. As is known, the Mulawarman University curriculum, based on Mulawarman University's Core Scientific Pattern (PIP), namely "Humid Tropical Forest and Environmental Studies." This tropical forest study is a local excellence or hallmark of Mulawarman University, distinguishing it from other universities in Indonesia, the Asian region, and internationally. This PIP Unmul will become a number of compulsory university courses, as well as several compulsory courses in the Faculty

of Mathematics and Natural Sciences. Meanwhile, at the biology study program level, it will be strategically integrated into relevant courses.

Therefore, the study of humid tropical forests and their environment will be given new meaning, interpreted, transformed, described, and integrated into all activities of the Tri Dharma of Higher Education at Mulawarman University in general, and will become a distinctive feature of the Mulawarman University curriculum and all educational activities at the faculty and study program levels. Based on this, the curriculum of the Biology Undergraduate Study Program, Faculty of Mathematics and Natural Sciences will also integrate tropical forest studies into educational activities and curriculum in the study program. The integration of PIP unmul into the study program curriculum is intended to enrich and strengthen graduate competencies as well as serve as an additional characteristic of the study program. The development of the Biology Undergraduate Study Program curriculum, Faculty of Mathematics and Natural Sciences uses theoretical curriculum development steps and is followed according to the needs and conditions of the faculty and each study program. Thus, the curriculum developed in the Biology Study Program, Faculty of Mathematics and Natural Sciences can be accelerated and completed optimally within the specified time limit.

At the faculty and study program level, the developed curriculum consists of a script curriculum, which is referred to as the faculty curriculum or study program curriculum and an implementative curriculum for several compulsory faculty and/or study program courses, which consists of RPS-RPS. This Biology Study Program curriculum document will be equipped with a learning management system and descriptions of study materials for humid tropical forests and their environment selected according to the field of expertise of the Biology Study Program as a characteristic of the study program at the Faculty of Mathematics and Natural Sciences and Mulawarman University in particular, and in Indonesia in general.

D. The Result of Curriculum Evaluation and Tracer Study

Information regarding the results of past and ongoing curriculum implementation, the process underlying the curriculum redesign, including how to obtain user input regarding a curriculum that is more adaptive to the dynamics of work needs (e.g., focus group discussions, surveys, etc.), and the results of competency achievement evaluations. This section presents data from quantitative and qualitative evaluations and measurements over the past three years.

The analysis of the need for curriculum changes is based on a) stakeholder needs from the tracer study results and/or b) changes in internal and external policies. The analysis of tracer study needs (alumni, stakeholders, and the market), analysis of scientific developments and expertise within the study program, analysis of the study program's scientific vision, and analysis of national and international qualification needs. Aspects of the existing curriculum that have undergone changes in the proposed study program curriculum are described in Table 1.

Table 1. Aspects of Curriculum Change

No.	Existing Curriculum (2021)	New Curriculum (2023)
1	Refers to the Indonesian Qualifications Framework (KKNI) and National Standards for Higher Education (SN-Dikti).	Refers to KKNI and SN-Dikti with the addition of the MBKM policy.
2	The existing Programme Learning Outcomes (CPL) consist of 29 CPLs: 11 Attitude, 9 General Skills, 6 Specific Skills, and 3 Knowledge outcomes.	The CPLs were simplified into 7 CPLs: 1 Attitude, 2 General Skills, 2 Specific Skills, and 2 Knowledge outcomes.
3	Changes in Courses Animal Anatomy (2:1) Animal Histology (2:1) Cell Biology (2:1) Molecular Biology (2:1) Plant Anatomy (2:1) Plant Embryology (2:1)	Course Changes Animal Anatomy and Histology (2:2) Cell and Molecular Biology (2:1) Plant Anatomy and Embryology (2:1)
4	Removal of Old Courses Biostatistics (2:0) Protista (2:1) Plant Biotechnology (2:1)	Addition of New Courses Stem Cell Biology (2:0) Immunology (2:0) Cell Genetics (2:0) Biodiversity and Microbial Ecology (2:0) Benthic Biology (2:0)
5	Course distribution	There is a change in the distribution of courses, namely compulsory courses in Semesters 5 and 6 are condensed into the first four semesters so that students can participate in MBKM activities.
6	Course codes	There are changes in course codes.
7	All compulsory courses are taken by students.	There is recognition of MBKM learning activities taken by students.
8	The Semester Learning Plan (RPS) format in the learning experience column only consists of an online column.	The Semester Learning Plan (RPS) format in the learning experience column consists of an online column.

CHAPTER II

VISION AND MISSION OF THE INSTITUTION

A. Vision and Mission of Mulawarman University

The region's superiority and the various scientific challenges surrounding humid tropical forests and their surrounding environments prompted UNMUL to contribute as a Center of Excellence in Tropical Studies, a core scientific principle. This focus was later translated into UNMUL's vision and mission:

Vision “An internationally recognized university capable of playing a role in national development through education, research, and community service that relies on natural resources, particularly tropical rainforests and their environment.”.

Mission

1. Producing high-quality, personable, and professional human resources through the provision of international-standard higher education;
2. Producing high-quality and effective research that prioritizes the principles of environmental sustainability;
3. Organizing community service activities and producing meaningful and beneficial works in science, technology, art, and sports to achieve accountable and independent university management in accordance with national and international standards.

The vision and mission above describe the noble ideals of Mulawarman University which wants to become a world-class university and meet international standards and international standards by relying on the excellence of humid tropical forests and their environment, so that the tridharma of higher education is always based on, directed, and to realize the main scientific pattern of Mulawarman University.

B. Vision and Mission of the Faculty of Mathematics and Natural Sciences

Furthermore, the Faculty's Vision and Mission are derived from the Mission and Objectives of Mulawarman University as follows:

Vision "To become a superior higher education institution in providing education, developing science and technology, based on humid tropical forests and their environment by 2034."

- Mission**
1. To provide superior education based on tropical humid forests and their environment, thus producing high-quality and character-based graduates in the sciences and natural sciences field.
 2. To become a leading research center in the sciences and natural sciences field, contributing to the development of science and technology based on tropical humid forests and their environment.
 3. To organize and pioneer community service programs in the sciences and natural sciences field that contribute to solving real-world problems in tropical humid forests.
 4. To collaborate with national and international institutions to improve the quality of education, research, and community service in the sciences and technology fields based on tropical humid forests and their environment.

C. Vision, Mission, Goals, and Strategic Targets of the Biology Undergraduate Study Program

In order to realize the Faculty's vision and mission, the Biology undergraduate study program has formulated the following vision and mission.:

Vision To become a leading Biology study program that applies the concept of biology based on the biodiversity of humid tropical forests and their environment to support applied sciences in meeting human needs and welfare by 2034.

- Mission**
1. To produce a Biology Study Program accredited as "Unggul" (Excellent) and to produce a generation of globally competitive Biology graduates who uphold ethics and respect the right to life of all life forms, while also being able to collaborate within their environment.
 2. To conduct high-quality biology-based research that utilizes the biodiversity of humid tropical forests and their environment to generate new knowledge and support applied sciences.
 3. To carry out community service as a form of service and application of research results in humid tropical forest environments, contributing to real-world problem-solving.
 4. To establish institutional collaborations at the regional, national, and international levels to improve the quality of Tri Dharma Perguruan Tinggi.

Goals

1. Produce graduates in biology with a Bachelor of Biology (S1) qualification who are superior, professional, skilled, and sensitive to issues in humid tropical forest environments.
2. Master basic concepts and conduct research in biology, enabling them to observe and analyze resources in humid tropical forest environments.
3. Conduct community service, apply research results, and develop science and technology in biology in productive activities for the benefit of the community.
4. Collaborate with regional, national, and international institutions with a sustainable humid tropical forest environment perspective.
5. Community service in the field of Biology that has achieved international recognition or been implemented by the community involving students.
6. Increasing the percentage of undergraduate Biology courses that utilize case-based learning methods or team-based project learning.
7. Increasing the percentage of collaborations implemented with partners in the undergraduate Biology study program.
8. The undergraduate Biology study program has international accreditation or certification recognized by the government.

CHAPTER III

CONCEPT, CONTENT AND IMPLEMENTATION OF THE CURRICULUM OF THE BACHELOR OF BIOLOGY STUDY PROGRAM

A. Profile of Graduates of the Undergraduate Biology Study Program

The graduate profile is formulated based on the standards for implementing biology education at level 6 of the Indonesian National Qualifications Framework (KKNI), market demand in biology, the vision, mission, and objectives of the study program, and the results of a survey of alumni and users. Based on the survey results, currently, Biology graduates have roles including junior researchers, advanced study students, NGO (Non-Government Organization) activists working in the fields of Biodiversity and the environment, educators, employees in government institutions, biology book editors, entrepreneurs, and others. The profile of graduates of the Biology Undergraduate Study Program at UNMUL is shown in Table 3.1:

Tabel 3.1. Profile of Graduates of the Undergraduate Program in Biology

Profile	Profile Description	Code
Practitioner	Actively contributes to the development of knowledge in the field of Biology; demonstrates sensitivity in identifying various issues related to technological development and the environment; and is able to apply this knowledge creatively and innovatively in addressing problems within professional contexts, including planning, implementation, and supervision of natural resource utilization, conservation, and other related activities.	PL1
Lecturer	Able to develop themselves through further studies in the field of Biology to enhance their knowledge and academic status, as well as professional activities, so that they are able to compete in the era of Industry 4.0 and Society 5.0.	PL2
Researcher	Able to solve problems related to Biology in specific fields through procedural approaches using laboratory instruments.	PL3
Entrepreneur	Produces biology-based products through environmentally friendly procedures by utilizing natural resources from tropical rainforests and their surrounding environments.	PL4

B. Graduate Learning Outcomes (CPL/PLO)

Learning outcomes are derived from graduate profiles, referring to agreements with associations of similar study program providers and professional organizations, and meeting the KKNi (National Qualifications Framework) level. They are updated periodically every four to five years in line with developments in science and technology and user needs. The CPL comprises aspects of attitude, general skills, specific skills, and knowledge. The CPL must align with the National Education Standards (SN-Dikti) and the established KKNi level.

The qualification framework in the KKNi is structured around six parameters: science, knowledge, practical knowledge (know-how), skills, affection, and competence. These six parameters serve as the basis for formulating learning outcomes, which encompass four aspects: knowledge mastery, work ability, managerial ability, and attitude/values. The development of learning outcomes, which serve as the minimum curriculum standards for general skills and attitudes, aligns with the SN-Dikti, as stipulated in the Regulation of the Minister of Education and Culture No. 03 of 2020.

In accordance with Unmul's primary mission, namely, "To produce quality, personable, and professional human resources through the provision of international-standard higher education," and the mission of the Biology Study Program, the Biology Study Program must produce Biology undergraduate graduates who possess the knowledge, attitudes, general skills, and specific skills required in the faculty's areas of expertise and based on Unmul's PIP (National Institute of Education and Culture). The graduate qualification requirements or learning outcomes are in accordance with Presidential Decree No. 12 of 2012, Regulation of the Minister of Research, Technology, and Higher Education No. 50 of 2015, and the study of tropical rainforests and their environment as UNMUL's PIP.

Graduate learning outcomes (CPL) in the field of knowledge describe the set of knowledge required by graduates according to the areas of expertise within the faculty and/or study program at levels V, VI, VII, VIII, and IX, as stipulated in the KKNi (National Qualifications Framework) and SN Dikti. The learning outcomes of graduates in the field of attitude are a set of attitudes, behaviors, characters and personalities that must be possessed by every university graduate in Indonesia as a reflection of the character of a nation that is cultured and has a national personality.

Graduate learning outcomes in general and/or specific skills are a set of soft and hard skills required for university graduates, as they directly or indirectly assist them in carrying out their work and creative tasks within their respective fields of expertise.

Additional graduate learning outcomes must be added and possessed by Mulawarman University graduates as a characteristic or local advantage for Unmul graduates, in addition to possessing, mastering, understanding, and

possessing skills relevant to their respective fields of expertise. These additional CPLs are a set of knowledge, attitudes, and skills based on the study of tropical rainforests and their environment. These CPLs differentiate Mulawarman University graduates from those from other universities in Indonesia, Southeast Asia, and internationally.

Tabel 3.2 CPL Program Studi S1 Biologi

Aspects	Code	Description
Attitude	PLO 1	Demonstrate responsible behavior, discipline, effective communication, and the ability to work both independently and collaboratively, grounded in religion, Pancasila values, and ethics.
General Skills	PLO 2	Apply logical, critical, systematic, and innovative thinking in the development or implementation of science and technology within their area of expertise, with attention to environmental sustainability.
	PLO 3	Employ scientific methods and ethical reasoning to solve problems and make informed decisions based on data analysis within the biological sciences.
Specific Skills	PLO 4	Identify problems related to tropical rainforest biodiversity and the environment and present integrated biological solutions using relevant scientific methods and technology.
	PLO 5	Proficiently use and apply instruments relevant to biological research in a responsible, honest manner while upholding environmental conservation principles.
Knowledge	PLO 6	Master the fundamental principles of biology and core scientific disciplines comprehensively, in line with developments in modern biology.
	PLO 7	Understand theoretical concepts of biology from molecular to organismal levels, and their applications in managing and utilizing tropical rainforest biodiversity and its environment.

The CPL/PLO developed based on the KKNi aligns with the study program objectives (PEO). This alignment is shown in Table 3.3. The following matrix shows the relationship between each study program's CPL and its graduate profile formulation. The matrix of the relationship between graduate profiles and CPL is presented in Table 3.4.

Table 3.3. Relationship between CPL and PEO

	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
CPL 1	√				
CPL 2		√		√	
CPL 3			√		
CPL 4					√
CPL 5					√
CPL 6					√
CPL 7			√		

Table 3.4. Correlation between Graduate Profile (PL) and CPL/PLO Study Program

CPL Study Program		PL1	PL2	PL3	PL4
ATTITUDE (S)					
PLO 1	Contribute to community life based on religion, Pancasila, and ethics by demonstrating responsibility, discipline, and the ability to communicate and work both in groups and independently.	√	√	√	√
GENERAL SKILLS (KU)					
PLO 2	Able to apply logical, critical, systematic and innovative thinking in the context of developing or implementing science and technology in accordance with their field of expertise while taking environmental sustainability into account.	√	√	√	√
PLO 3	Able to apply scientific methods and ethics in solving problems and making appropriate decisions based on the results of data and information analysis in the field of biology expertise.	√	√	√	√
SPECIFIC SKILLS (KK)					
PLO 4	Able to identify problems related to the biodiversity of tropical rainforests and their environment and present alternative solutions through the integrated application of	√	√		√

	biological knowledge using relevant scientific methods and technology.				
PLO 5	Skilled in using and applying instruments related to the field of biological studies responsibly, honestly and with attention to the principles of environmental sustainability.	√	√	√	√
KNOWLEDGE (P)					
PLO 6	Mastering the principles of biology and the fundamentals of science comprehensively by following developments in modern biology.	√	√		√
PLO 7	Mastering theoretical concepts of biology, from molecular, cellular, and organismal, and their application in the management and utilization of tropical rainforest biodiversity and its environment.	√	√	√	√

C. Study Materials and Courses

Study materials are drawn from the scientific map (scientific clusters) that characterize the biology study program and from the scientific repertoire that the study program will build. The study materials are also supplemented with specific fields/branches of science and technology (IPTEKS) needed to anticipate future scientific developments, or are selected based on an analysis of the needs of the world of work/professions that graduates will enter. The choice of study materials in the biology study program is influenced by the program's scientific vision. The breadth, detail, and depth of the study materials are the autonomous choice of the scientific community within the biology study program.

The disciplines and expertise offered by the Biology Undergraduate Program at the Faculty of Mathematics and Natural Sciences (FMIPA) at Universitas Mulawarman include Biology, Mathematics and Natural Sciences (MIPA) encompassing Mathematics, Biology, and Chemistry, and other fields relevant to biology learning. These disciplines are related and related to similar fields of biology at the undergraduate, master's, and doctoral levels, and even correlate with biology. Therefore, the disciplines covered provide adequate preparation for continuing studies at a higher level (Master's). In a broader area, this knowledge and expertise are also related and linked to related fields (Natural Sciences: IPA) and their corresponding application fields (IPTEKS and Media). Related biological study fields are shown in Figure 3.1.

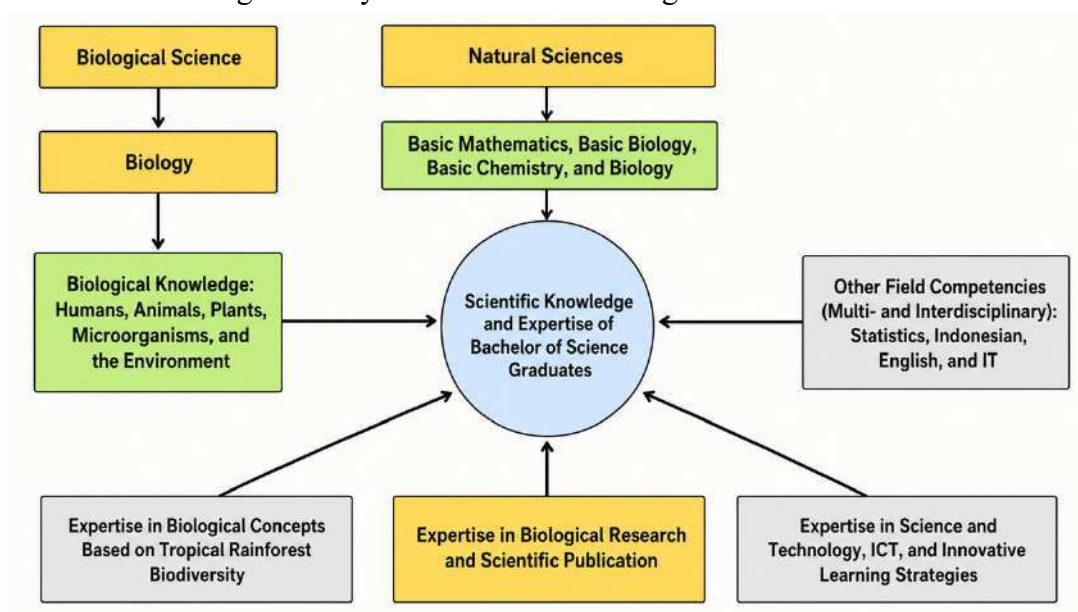


Figure 3.1. Map of the Correlation between Scientific Knowledge and Expertise of the Biology Undergraduate Program with Other Fields

Graduates of the Bachelor of Biology study program must also be able to examine the implications of the development or implementation of science and technology that pay attention to and apply humanities values according to their expertise based on scientific principles, procedures and ethics in order to produce solutions, ideas, designs or art criticism, compile scientific descriptions of the

results of their studies and publish them. For this reason, research is developed that follows the latest research trends related to tropical rainforests. These research trends are elaborated and combined with research themes from lecturers in the Mathematics and Natural Sciences Department of UNMUL that have been obtained from various research schemes. In current developments, the Body of Knowledge (study materials) of the Bachelor of Biology Study Program covers life sciences and applied biology. The Body of Knowledge of the Bachelor of Biology Study Program is derived from Learning Outcomes that include Attitudes, General Skills, Knowledge, and Special Skills. Attitude learning outcomes include study materials on personality development, which will accommodate the development of students' soft skills. Attitude learning outcomes can also be supported by forms of MBKM activities, including student exchanges, entrepreneurship, teaching campuses, scientific research, certified internships, independent studies, humanitarianism, and other MBKM activities. This MBKM activity will support the development of students' soft skills and personalities, leading them to become more independent and responsible, develop social sensitivity towards the community and the environment, and develop the ability to network with other institutions.

Learning in the areas of General Skills, Knowledge, and Special Skills is supported by scientific study materials consisting of:

1. Personality Development (A)
2. Core of National Biology (B)
3. Institutional Specific Content (C)
4. Characteristics of National Biology (D)
5. MBKM Activities (E)
6. Comprehensive Scientific Activity Content (F)

The scientific study materials provided to students during their education are intended to provide graduates with knowledge, general skills, and specific skills in accordance with the competencies in the CPL established by the Study Program (Figure 3.2). Furthermore, the Study Program is expected to be able to map courses that are in accordance with the study materials.

The scientific study materials provided to students during their education are intended to provide graduates with knowledge, general skills, and specific skills in accordance with the competencies in the CPL established by the Study Program (Figure 3.2). Furthermore, the Study Program is expected to be able to map courses that are in accordance with these study materials (Table 3.5). These study materials are described according to the correlation and matrix between the CPL and the study materials, as well as examples of courses that can be developed according to the characteristics of the institution and study program.

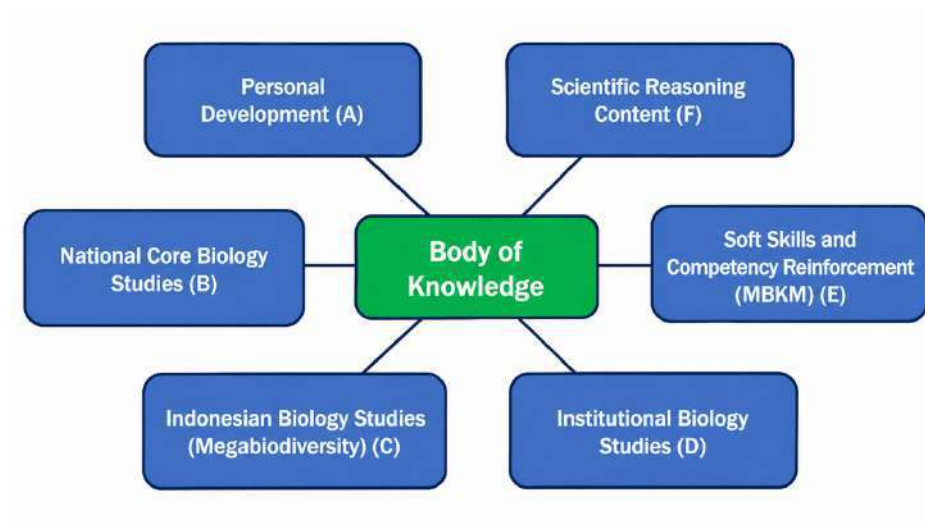


Figure 3.2 Body of knowledge of Biology

Table 3.5. Matrix of Relationships between Study Materials, Courses, and CPL/PLO

No.	Study Material	Course	PLO 1 Attitude	PLO 2 General Skills	PLO 3 General Skills	PLO 4 Specific Skills	PLO 5 Specific Skills	PLO 6 Knowledge	PLO 7 Knowledge
1	Personal Development (BK 1)	Religious Education	3	—	—	—	—	—	—
		Pancasila	3	—	—	—	—	—	—
		Civic Education	3	—	—	—	—	—	—
		Indonesian Language	3	—	—	—	—	—	—
		ISDB	3	—	—	—	—	—	—
2	National Core Biology (BK 2)	Basic Biology	1	—	1	—	1	3	—
		Introduction to Biotechnology	1	—	2	2	—	3	—
		Cell and Molecular Biology	1	—	2	2	—	3	—
		Ecology	1	—	3	3	2	2	—
		Plant Physiology	1	—	2	2	—	—	3
		Animal Physiology	1	1	—	2	—	3	—
		Genetics	1	1	—	2	—	3	—
		Microbial Physiology and Genetics	1	1	—	2	3	3	3
		Plant Morphology	1	2	—	1	—	3	—
		Plant Anatomy and Embryology	1	2	—	1	—	2	—
		Microbiology	1	2	—	—	3	2	—
		Animal Anatomy and Histology	1	—	2	—	1	—	3
		Microtechnique	1	2	2	—	3	—	—
		Animal Reproduction and Embryology	1	2	—	2	—	3	—
		Evolution	1	3	—	3	—	3	3
		Plant Systematics I	1	3	—	3	—	2	—
		Plant Systematics II	1	3	—	2	—	2	—

3	Institution-Specific Content (BK 3)	Animal Systematics I	1	3	—	3	—	2	—
		Animal Systematics II	1	3	—	3	—	2	—
		Mycology	1	3	—	2	1	1	3
		Community Service Program / KKN	1	3	—	—	—	—	—
		Entrepreneurship	2	3	—	—	—	—	—
		Elementary Calculus	1	—	3	—	1	1	—
		Basic Chemistry	1	—	3	—	2	1	—
		Basic Physics	1	—	3	—	2	1	—
		Basic Statistics	1	3	—	1	—	—	—
4	Distinctive National Biology Content / Megabiodiversity (BK 4)	Biochemistry	1	—	3	—	2	2	—
		Tropical Wet Forest Aquaculture	1	—	3	—	2	3	—
		Dipterocarp Biology	1	2	—	3	1	—	—
		Tropical Wet Forest Resource Management	1	—	3	2	—	2	—
		Tropical Wet Forest Restoration Ecology	1	—	3	2	—	2	—
		Tropical Wet Forest Biodiversity Conservation	1	3	—	3	—	2	—
5	MBKM Activities / Elective Courses (BK 5)	Biodiversity and Microbial Ecology	1	2	—	2	3	2	3
		Environmental Impact Analysis	1	—	3	—	3	2	—
		Entomology	1	3	—	2	—	2	—
		Molecular Biology Analysis Techniques	1	—	3	—	3	—	3
		Phytohormones	1	3	—	2	—	2	—
		Animal Reproductive Physiology	1	2	—	2	—	3	—
		Soil Science	1	2	—	1	—	3	—

		Histopathology	1	–	3	2	3	–	2
		Cell Genetics	1	–	2	–	3	–	3
		Ethnobiology	1	–	2	2	–	2	–
		Mammalogy	1	–	1	3	2	–	2
		Population Genetics	1	–	3	–	–	–	2
		Phytopathology	1	–	3	3	–	2	–
		Special Topics Supporting Undergraduate Thesis	1	–	3	–	2	–	2
		Bioremediation	1	–	3	2	1	–	2
		Food Microbiology	1	3	–	1	1	2	2
		Industrial Microbiology	1	3	–	1	1	2	2
		Insect Ecology	1	1	–	2	–	3	–
		Phytochemistry	–	–	2	–	3	–	2
		Seed Physiology	1	–	2	1	–	3	–
		Occupational Health and Safety	1	2	–	–	3	–	2
		Biomedical Science	1	3	–	2	–	2	–
		Aquatic Ecology	1	–	2	2	–	2	–
		Arthropods	1	–	2	2	–	2	–
		Herpetology	1	–	2	2	–	2	–
		Medicinal Plants	1	–	2	–	1	–	3
		Pest Control	1	–	3	2	–	2	–
		Ecotoxicology	1	3	–	2	–	2	–
		Palynology	1	–	2	3	–	2	–
		Biogeography	1	2	–	2	–	3	–
		Quantitative Ecology	1	–	3	–	2	–	2
		Ornithology	1	2	–	3	–	2	–
		Dendrology	1	–	3	2	–	2	–
		Environmental Microbiology	1	–	3	–	2	–	2
		Bioinformatics	1	–	2	–	3	–	2

		Molecular Genetics of Microbes	1	–	2	2	3	2	3
		Plant Tissue Culture	1	–	3	–	2	–	2
		Tropical Plants Breeding	1	2	–	2	–	3	–
		Plant Ecophysiology	1	–	2	2	–	3	–
		Endocrinology	1	2	–	–	2	–	3
		Enzyme Biotechnology	1	2	–	1	1	3	2
		Parasitology	1	2	–	3	–	2	–
		Ethology	1	2	–	2	–	3	–
		Genetic Conservation	1	2	–	3	–	–	3
		Reproductive Biology	1	3	–	2	–	2	–
		Ichthyology	1	2	–	3	–	2	–
		Morphometrics	1	2	–	3	–	2	–
		Animal Domestication	1	2	–	2	–	3	–
		Plant Ecology	1	2	–	3	–	2	–
		Limnology	1	–	2	–	1	2	–
		Plant Growth Analysis Techniques	1	–	2	2	–	3	–
		Nutrigenomics	1	–	2	–	3	–	2
		Tropical Wetland Management	1	2	–	1	–	3	–
		Water Quality Monitoring	1	2	–	1	–	3	–
		Protistology	1	2	–	1	–	3	–
		Field Work Practice	1	3	–	3	–	2	–
		Stem Cell Biology	1	–	3	2	–	–	3
		Benthic Biology	1	2	–	3	–	2	–
		Basic Immunology	1	–	3	1	–	–	1
6	Comprehensive Scientific Activities (BK 6)	English Language	1	–	1	2	–	3	–
		Research Methodology	1	–	1	3	–	2	–
		Undergraduate Thesis	1	3	–	3	–	3	3

Note: 1 = Weakly related; 2 = Related; 3 = Strongly related; – = Not directly related

D. Curriculum (Composition Structure and Distribution of Courses)

Over eight semesters, students are expected to complete a minimum of 144 credits, consisting of 100 compulsory courses and a minimum of 44 elective courses. The Biology Study Program has 102 courses, as follows:

1. Compulsory university courses (15 credits): 6 courses
2. Compulsory faculty courses (15 credits): 5 courses
3. Compulsory study program courses (70 credits): 27 courses
4. Elective courses (154 credits): 64 courses

Courses are structured based on the CPL assigned to the course and the study materials that correspond to the CPL. The distribution of courses based on the CPL and the suitability of the CPL to the study materials for each course can be seen in Figure 3.4.

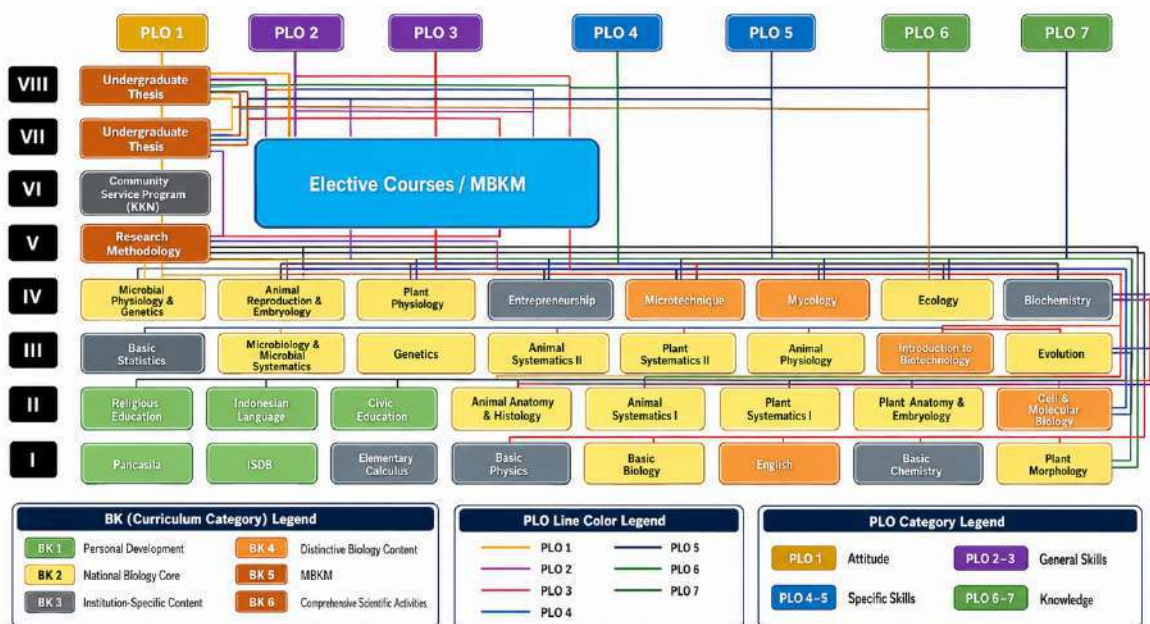


Figure 3.3 Distribution of Courses based on CPL

E. Course Content

The distribution of study program courses for each semester along with their credit weights, CPL/PLO and study materials can be seen in Table 3.6, course groupings in Table 3.7, and the course structure of the 2022 Biology Undergraduate Program curriculum in Table 3.8.

Table 3.6. Distribution of Courses per Semester, CPL and Study Materials**SEMESTER I**

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	MU0000602W002	Pancasila	2	C	3.2	1
2.	MU0000602W006	Basic Cultural and Social Sciences	2	C	3.2	1
3.	PA0700603W001	Elementary Calculus	3	C	4.8	1
4.	PA0700603W002	Basic of Biology	3	C	4.8	1, 3, 5, 7
5.	PA0700603W004	Basic of Physics	3	C	4.8	1, 2, 4, 6
6.	230702603W001	English	3	C	4.8	1, 2, 4, 6
7.	PA0700603W003	Basic of Chemistry	3	C	4.8	1, 2, 4, 6
8.	230702603W002	Plant Morphology	3	C	4.8	1, 3, 4, 5, 6

SEMESTER II

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	MU0000603W00	Religion	3	C	4.8	1
2.	MU0000602W004	Indonesian Language	2	C	3.2	1
3.	MU0000602W003	Civic Education	2	C	3.2	1

4.	230702604W003	Animal Anatomy and Histology	4	C	6.4	1, 3, 5, 7
5.	230702603W004	Animal Systematics I	3	C	4.8	1, 2, 4, 6
6.	230702603W005	Plant Systematics I	3	C	4.8	1, 2, 4, 6
7.	230702603W006	Plant Anatomy and Embryology	3	C	4.8	1, 2, 4, 6
8.	230702602W007	Cell and Molecular Biology	2	C	3.2	1, 3, 4, 5, 6

SEMESTER III

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	PA0700603W005	Basic of Statistic	3	C	4.8	1, 2, 4, 6
2.	230702603W008	Microbiology	3	C	4.8	1, 2, 5, 6
3.	230702603W009	Genetics	3	C	4.8	1, 2, 4, 6
4.	230702603W010	Animal Systematics II	3	C	4.8	1, 2, 4, 6
5.	230702603W011	Plant Systematics II	3	C	4.8	1, 2, 4, 6
6.	230702603W014	Animal Physiology	3	C	4.8	1, 2, 4, 6
7.	230702602W013	Introduction of Biotechnology	2	C	3.2	1, 3, 4, 6
8.	230702602W023	Evolution	2	C	3.2	1, 2, 4, 6, 7

SEMESTER IV

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	230702603W022	Microbial Physiology and Genetics	3	C	4.8	1, 2, 4, 5, 6,7
2.	230702603W020	Animal Embryology and Reproduction	3	C	4.8	1, 2, 4, 6
3.	230702603W015	Plant Physiology	3	C	4.8	1, 3, 4, 7
4.	230702602W012	Entrepreneurship	2	C	3.2	1, 2
5.	230702602W016	Microtechniques	2	C	3.2	1, 2, 3, 5, 7
6.	230702603W017	Mycology	3	C	4.8	1, 2, 4, 5, 6, 7
7.	230702603W018	Ecology	2	C	3.2	1, 3, 4, 7
8.	230702603W019	Biochemistry	3	C	4.8	1, 3, 5, 6

SEMESTER V

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	230702602W021	Research Methodolody	2	C	3.2	1, 3, 5, 6
2.		Elective Course	3	E		

SEMESTER VI

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	MU0000603W007	Community Services	4	C	6.4	1, 2
2.		Elective Course	3	E		

SEMESTER VII

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	230702606W024	Undergraduate Thesis	6	C	9.6	1, 2, 4, 6, 7

ELECTIVE COURSES OF FIRST SEMESTER

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	230702602P025	Environmental Impact Assessment	2	E	3.2	1, 3, 5, 6
2.	230702602P026	Entomolgy	2	E	3.2	1, 2, 4, 6
3.	230702603P027	Technique of Molecular Biology Analysis	3	E	4.8	1, 3, 5, 7
4.	230702603P028	Phytohormon	3	E	4.8	1, 3, 4, 6
5.	230702602P029	Internship	2	E	3.2	1, 2, 4, 6
6.	230702602P030	Physiological of Animal Reproduction	2	E	3.2	1, 2, 4, 6
7.	230702603P031	Tropical Rainforest Aquaculture	3	E	4.8	1, 3, 5, 6
8.	230702602P032	Histopathology	2	E	3.2	1, 3, 4, 5, 7
9.	230702603P033	Biology of Dipterocarpaceae	3	E	4.8	1, 2, 4, 5, 7
10.	230702602P034	Ethnobiology	2	E	3.2	1, 3, 4, 6
11.	230702603P035	Mammalogy	3	E	4.8	1, 3, 4, 5, 7
12.	230702603P036	Population Genetics	3	E	4.8	1, 3, 5, 7
13.	230702603P037	Phytophatology	3	E	4.8	1, 3, 4, 6
14.	230702602P038	Special Topics Supporting Thesis	2	E	3.2	1, 3, 5, 7

15.	230702602P039	Water Resources Tropical Management	2	E	3.2	1, 3, 4, 6
16.	230702602P040	Bioremediation	2	E	3.2	1, 3, 4, 7
17.	230702603P041	Food Microbiology	3	E	4.8	1, 2, 4, 5, 6, 7
18.	230702603P042	Industrial Microbiology	3	E	4.8	1, 2, 4, 5, 6, 7
19.	230702603P043	Ecology of Wet Tropical Forest Restoration	2	E	3.2	1, 3, 4, 6
20.	230702603P044	Tropical Rainforest Biodiversity Conversation	2	E	3.2	1, 2, 4, 6
21.	230702603P045	Insect Ecology	2	E	3.2	1, 2, 4, 6
22.	230702603P046	Phytochemistry	2	E	3.2	1, 3, 5, 7
23.	230702603P047	Seeds Physiology	2	E	3.2	1, 3, 4, 6
24.	230702603P048	Occupational Health and Safety	2	E	3.2	1, 3, 5, 7
25.	230702603P049	Biomedical Sciences	2	E	3.2	1, 2, 4, 6
26.	230702603P050	Aquatic Ecology	2	E	3.2	1, 3, 4, 6
27.	230702603P051	Arthropods	3	E	4.8	1, 3, 4, 6
28.	230702603P052	Herpetology	2	E	3.2	1, 3, 4, 6
29.	230702603P053	Medicinal Plant	2	E	3.2	1, 3, 5, 7

30.	230702603P085	Stem Cell Biology	2	E	3.2	1, 3, 4, 7
31.	230702603P086	Microbial Biodiversity and Ecology	2	E	3.2	1, 2, 4, 5, 6, 7
32.	230702603P088	Soil Sciences	2	E	3.2	1, 2, 4, 6
33.	230702603P087	Benthic Biology	2	E	3.2	1, 2, 4, 6

ELECTIVE COURSES OF SECOND SEMESTER

No.	Courses Code	Courses	Credits	Type	ECTS	PLO
1.	230702602P054	Biological Pest Control	2	E	3.2	1, 3, 4, 6
2.	230702602P055	Ecotoxicology	2	E	3.2	1, 2, 4, 6
3.	230702602P056	Palynology	3	E	4.8	1, 3, 4, 6
4.	230702602P057	Biogeography	2	E	3.2	1, 2, 4, 6
5.	230702602P058	Quantitative Ecology	3	E	4.8	1, 3, 5, 7
6.	230702602P059	Ornithology	3	E	4.8	1, 2, 4, 6
7.	230702602P060	Dendrology	3	E	4.8	1, 3, 4, 6
8.	230702602P061	Environmental Microbiology	3	E	4.8	1, 3, 5, 7
9.	230702602P062	Bioinformatics	2	E	3.2	1, 3, 5, 7

10.	230702602P063	Microbial Molecular Genetics	3	E	4.8	1, 3, 4, 5, 6, 7
11.	230702602P064	Plant Tissue Culture	3	E	4.8	1, 3, 5, 7
12.	230702602P065	Tropical Plant Breeding	3	E	4.8	1, 2, 4, 6
13.	230702602P066	Plant Ecophysiology	2	E	3.2	1, 3, 4, 6
14.	230702602P067	Endocrinology	2	E	3.2	1,2,5,7
15.	230702603P068	Enzymes Biotechnology	3	E	4.8	1, 2, 4, 5, 6, 7
16.	230702602P069	Parasitology	2	E	3.2	1, 2, 4, 6
17.	230702603P070	Ethology	3	E	4.8	1, 2, 4, 7
18.	230702603P071	Conservation Genetics	3	E	4.8	1, 2, 4, 6
19.	230702603P072	Fish Reproductive Biology	3	E	4.8	1, 2, 4, 6
20.	230702603P073	Ichtiology	3	E	4.8	1, 2, 4, 6
21.	230702603P074	Morphometrics	3	E	4.8	1, 2, 4, 6
22.	230702602P038	Special Topics Supporting Thesis	2	E	3.2	1, 3, 5, 7
23.	230702603P075	Animal Domestication	3	E	4.8	1, 2, 4, 6
24.	230702602P076	Plant Ecology	2	E	3.2	1, 2, 4, 7

25.	230702602P077	Plant Nutrition	2	E	3.2	1, 3, 5, 7
26.	230702602P078	Plant Growth Analysis	2	E	3.2	1, 3, 4, 6
27.	230702602P079	Nutrigenomics	2	E	3.2	1, 3, 5, 7
28.	230702602P080	Aquatic Animal Physiology	2	E	3.2	1, 2, 4, 6
29.	230702602P081	Water Quality Monitoring	2	E	3.2	1, 2, 4, 6
30.	230702602P082	Management of Wet Tropical Soils	2	E	3.2	1, 2, 4, 6
31.	230702602P029	Internship	2	E	3.2	1, 2, 4, 6
32.	230702602P083	Cytogenetics	2	E	3.2	1, 3, 5, 7
33.	230702602P084	Immunology	2	E	3.2	1, 3, 4, 7

Table 3.7. Course Grouping**Compulsory University Courses**

No	Code	Courses	Credits
1	MU0000603W001	Religion	3
2	MU0000602W002	Pancasila	2
3	MU0000602W006	Basic Social and Cultural Sciences	2
4	MU0000602W003	Civic Education	2
5	MU0000602W004	Indonesian Language	2
6	MU0000603W007	Community Services	4
Total of Credits			15

Faculty Compulsory Courses

No	Code	Courses	Credits
1	PA0700603W001	Elementary Calculus	3
2	PA0700603W002	Basic of Biology	3
3	PA0700603W003	Basic of Chemistry	3
4	PA0700603W004	Basic of Physics	3
5	PA0700603W005	Basic of Statistic	3
Total of Credits			15

Compulsory Courses of Study Program

No	Code	Courses	Credits
1	230702603W001	English	3
2	230702603W002	Plant Morphology	3
3	230702604W003	Animal Anatomy and Histology	4
4	230702603W004	Animal Systematics I	3
5	230702603W005	Plant Systematics I	3
6	230702603W006	Plant Anatomy and Embryology	3
7	230702602W007	Cell and Molecular Biology	2
8	230702603W008	Microbiology	3
9	230702602W016	Microtechniques	2
10	230702603W017	Mycology	3
11	230702603W018	Ecology	3
12	230702603W019	Biochemistry	3
13	230702603W020	Animal Embriology and Reproduction	3
14	230702602W021	Research Methodology	2
15	230702603W022	Microbial Physiology and Genetics	3
16	230702602W023	Evolution	2
17	230702606W024	Undergraduate Thesis	6
18	230702603W010	Animal Systematics II	3
19	230702603W011	Plant Systematics II	3
20	230702602W012	Entrepreneurship	2
21	230702602W013	Introduction of Biotechnology	2
22	230702603W014	Animal Physiology	3
23	230702603W015	Plant Physiology	3

24	230702602W016	Microtechniques	2
25	230702603W017	Mycology	3
26	230702603W018	Ecology	3
27	230702603W019	Biochemistry	3
28	230702603W020	Animal Embriology and Reproduction	3
29	230702602W021	Research Methodology	2
30	230702603W022	Microbial Physiology and Genetics	3
31	230702602W023	Evolution	2
32	230702606W024	Undergraduate Thesis	6
Total of Credits			70

Elective Courses of Study Program

No	Code	Courses	Credits
1	230702602P025	Environmental Impact Assessment	2
2	230702602P026	Entomology	2
3	230702603P027	Technique of Molecular Biology Analysis	3
4	230702603P028	Phytohormon	3
5	230702602P029	Internship	2
6	230702602P030	Physiology of Animal Reproduction	2
7	230702603P031	Tropical Rain Forest Aquaculture	3
8	230702602P032	Histopathology	2
9	230702603P033	Biology of Dipterocarpaceae	3
10	230702602P034	Ethnobiology	2
11	230702603P035	Mammalogy	3
12	230702603P036	Population Genetics	3
13	230702603P037	Phytopathology	3
14	230702602P038	Special Topics Supporting Thesis	2
15	230702602P039	Water Resources Tropical Management	2
16	230702602P040	Bioremediation	2
17	230702603P041	Food Microbiology	3
18	230702603P042	Industrial Microbiology	3
19	230702602P043	Ecology of Wet Tropical Forest Restoration	2
20	230702602P044	Tropical Rain Forest Biodiversity Conservation	2
21	230702602P045	Insect Ecology	2
22	230702602P046	Phytochemistry	2
23	230702602P047	Seeds Physiology	2
24	230702602P048	Occupational Health and Safety	2
25	230702602P049	Biomedical Sciences	2
26	230702602P050	Aquatic Ecology	2
27	230702602P051	Arthropods	2
28	230702602P052	Herpetology	3

29	230702603P053	Medicinal Plant	2
30	230702602P054	Biological Pest Control	2
31	230702602P055	Ecotoxicology	2
32	230702603P056	Palynology	3
33	230702602P057	Biogeography	2
34	230702603P058	Quantitative Ecology	3
35	230702603P059	Ornithology	3
36	230702603P060	Dendrology	3
37	230702603P061	Environmental Microbiology	3
38	230702602P062	Bioinformatics	2
39	230702603P063	Microbial Molecular Genetics	3
40	230702603P064	Plant Tissue Culture	3
41	230702603P065	Tropical Plant Breeding	3
42	230702602P066	Plant Ecophysiology	2
43	230702602P067	Endocrinology	2
44	230702603P068	Enzyme Biotechnology	3
45	230702602P069	Parasitology	2
46	230702603P070	Ethology	3
47	230702603P071	Conservation Genetics	3
48	230702603P072	Fish Reproductive Biology	3
49	230702603P073	Ichthyology	3
50	230702603P074	Morphometrics	3
51	230702603P075	Animal Domestication	3
52	230702602P076	Plant Ecology	2
53	230702602P077	Plant Nutrition	2
54	230702602P078	Plant Growth Analysis	2
55	230702602P079	Nutrigenomics	2
56	230702602P080	Aquatic Animal Physiology	2
57	230702602P081	Water Quality Monitoring	2
58	230702602P082	Management of Wet Tropical Soils	2
59	230702602P083	Cytogenetics	2
60	230702602P084	Immunology	2
61	230702602P085	Stem Cells Biology	2
62	230702602P086	Microbial Biodiversity and Ecology	2
63	230702602P087	Benthos Biology	2
64	230702603P088	Soil Science	3
Total of Credits			154

Tabel 3.8. Susunan Mata Kuliah Kurikulum PS S1 Biologi 2023**SEMESTER I**

No	Code	Courses	Theory	Practical	Σ Credits	Type	Type of Course	Prerequisiute
1	MU0000602W002	Pancasila	2	0	2	C	MPK	None
2	MU0000602W006	Basic Social and Cultural Sciences	2	0	2	C	MPB	None
3	PA0700603W001	Elementary Calculus	2	1	3	C	MKK	None
4	PA0700603W002	Basic of Biology	2	1	3	C	MKK	None
5	PA0700603W004	Basic of Physics	2	1	3	C	MKK	None
6	230702603W001	English	3	0	3	C	MKK	None
7	PA0700603W003	Basic of Chemistry	2	1	3	C	MPB	None
8	230702603W002	Plant Morphology	2	1	3	C	MKK	None
Total of Semester I			17	5	22			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

SEMESTER II

No	Code	Courses	Theory	Practical	Σ Credits	Type	Type of Course	Prerequisiute
1	MU0000603W001	Religion	2	1	3	C	MPK	None
2	MU0000602W004	Indonesian Language	2	0	2	C	MPK	None
3	MU0000602W003	Civic Education	2	0	2	C	MPK	None
4	230702604W003	Animal Anatomy and Histology	2	2	4	C	MKK	None
5	230702603W004	Animal Systematics I	2	1	3	C	MKK	None
6	230702603W005	Plant Systematics I	2	1	3	C	MKK	
7	230702603W006	Plant Anatomy and	2	1	3	C	MKK	None

		Embryology						
8	230702602W007	Cell and Molecular Biology	2	0	2	C	MKK	None
Total of Semester II			16	6	22			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

SEMESTER III

No	Code	Courses	Theory	Practical	Σ Credits	Type	Type of Course	Prerequisite
1	PA0700603W005	Basic of Statistic	2	1	3	C	MKK	None
2	230702603W008	Microbiology	2	1	3	C	MKK	None
3	230702603W009	Genetics	2	1	3	C	MKK	Basic Biology
4	230702603W010	Animal Systematics II	2	1	3	C	MKK	Animal Systematics I
5	230702603W011	Plant Systematics II	2	1	3	C	MKK	Plant Systematics I
6	230702603W014	Animal Physiology	2	1	3	C	MKK	Animal Anatomy and Histology
7	230702602W013	Introduction of Biotechnology	2	0	2	C	MKK	None
8	230702602W023	Evolution	2	0	2	C	MKK	Basic Biology
Total of Semester III			16	6	22			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

SEMESTER IV

No	Code	Courses	Theory	Practical	ΣCredits	Type	Type of Course	Prerequisiute
1	230702603W022	Microbial Physiology and Genetics	2	1	3	W	MKK	Microbiology and Microbial Systematics
2	230702603W020	Animal Embriology and Reproduction	2	1	3	W	MKK	Animal Physiology
3	230702603W015	Plant Physiology	2	1	3	W	MKK	Plant Anatomy and Embryology
4	230702602W012	Entrepreneurship	1	1	2	W	MKB	None
5	230702602W016	Microtechniques	1	1	2	W	MKK	Animal Anatomy and Histology; Plant Anatomy and Embryology
7	230702603W018	Ecology	2	1	3	W	MKK	None
8	230702603W019	Biochemistry	2	1	3	W	MKK	Basic Biology; Basic Chemistry
Total of Semester IV			14	8	22			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

SEMESTER V

No	Code	Courses	Theory	Practical	ΣCredits	Type	Type of Course	Prerequisiute
1	230702602W021	Research Methodology	2	0	2	C	MPB	None
2		Elective Courses/MBKM				E		
Total of Semester V			2	0	2 (C)			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

SEMESTER VI

No	Code	Courses	Theory	Practical	ΣCredits	Type	Type of Course	Prerequisite
1	MU0000603W007	<i>Community Services</i>	0	4	4	C	MBB	None
2		Elective Courses/MBKM				E	MKK	None
Total of Semester VI			0	4	4 (C)			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

SEMESTER VII

No	Code	Courses	Theory	Practical	ΣCredits	Type	Type of Course	Prerequisite
1	230702606W024	<i>Undergraduate Thesis</i>	0	6	6	C	MBB	None
2		Elective Courses/MBKM				E	MKK	None
Total of Semester VII			0	6	6 (C)			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

SEMESTER VIII

No	Code	Courses	Theory	Practical	ΣCredits	Type	Type of Course	Prerequisite
1	230702606W024	<i>Undergraduate Thesis</i>	0	6	6	C	MBB	None
Total of Semester VII			0	6	6 (C)			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

ELECTIVE COURSES OF THE FIRST SEMESTER

No	Code	Courses	Theory	Practical	ΣCredits	Type	Type of Course	Prerequisite
1	230702602P025	Environmental Impact Assessment	2	0	2	E	MKK	Ecology; Plant Systematics; Animal Systematics
2	230702602P026	Entomology	2	0	2	E	MKK	Animal Systematics I
3	230702603P027	Technique of Molecular Biology Analysis	2	1	3	E	MKK	Cell and Molecular Biology
4	230702603P028	Phytohormon	2	1	3	E	MKK	Plant Physiology
5	230702602P029	Internship	0	2	2	E	MKK	None
6	230702602P030	Physiology of Animal Reproduction	2	0	2	E	MKK	Animal Physiology; Animal Reproduction and Embryology
7	230702603P031	Tropical Rain Forest Aquaculture	2	1	3	E	MKK	None
8	230702602P032	Histopathology	2	0	2	E	MKK	Animal Anatomy and Histology
9	230702603P033	Biology of Dipterocarpaceae	2	1	3	E	MKK	Plant Systematics II
10	230702602P034	Ethnobiology	2	0	2	E	MKK	Animal Systematics II; Plant Systematics II
11	230702603P035	Mammalogy	2	1	3	E	MKK	Animal Systematics II
12	230702603P036	Population Genetics	2	1	3	E	MKK	Genetics
13	230702603P037	Phytopathology	2	1	3	E	MKK	Plant Morphology; Plant Anatomy and Embryology
14	230702602P038	Special Topics Supporting Thesis	0	2	2	E	MKK	None
15	230702602P039	Water Resources Tropical Management	2	0	2	E	MKK	None
16	230702602P040	Bioremediation	2	0	2	E	MKK	Introduction to Biotechnology

17	230702603P041	Food Microbiology	2	1	3	E	MKK	Microbiology; Mycology; Microbial Physiology and Genetics
19	230702603P042	Industrial Microbiology	2	1	3	E	MKK	Microbiology; Mycology; Microbial Physiology and Genetics
20	230702602P043	Ecology of Wet Tropical Forest Restoration	2	0	2	E	MKK	Ecology
21	230702602P044	Tropical Rain Forest Biodiversity Conservation	2	0	2	E	MKK	Ecology; Plant Systematics; Animal Systematics
22	230702602P045	Insect Ecology	2	0	2	E	MKK	Animal Systematics I
23	230702602P046	Phytochemistry	2	0	2	E	MKK	Basic Chemistry; Biochemistry
24	230702602P047	Seeds Physiology	2	0	2	E	MKK	Plant Physiology
25	230702602P048	Occupational Health and Safety	2	0	2	E	MKK	None
26	230702602P049	Biomedical Sciences	2	0	2	E	MKK	None
27	230702602P050	Aquatic Ecology	2	0	2	E	MKK	Ecology
28	230702602P051	Arthropods	2	0	2	E	MKK	Animal Systematics I
29	230702602P052	Herpetology	2	1	3	E	MKK	Animal Systematics II
30	230702603P053	Medicinal Plant	2	0	2	E	MKK	Plant Physiology
31	230702602P086	Microbial Biodiversity and Ecology	2	0	2	E	MKK	Microbiology; Mycology; Microbial Physiology and Genetics
32	230702602P085	Stem Cells Biology	2	0	2	E	MKK	Cell and Molecular Biology

33	230702603P088	Soil Science	2	1	3	E	MKK	Basic Chemistry; Basic Biology
34	230702602P087	Benthos Biology	2	0	2	E	MKK	Animal Systematics II
	230702602P082	Management of Wet Tropical Soils	2	0	1	E	MKK	Ecology; Microbiology
Total			62	15	77			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

ELECTIVE COURSES OF THE SECOND SEMESTER

No	Code	Courses	Theory	Practical	ΣCredits	Type	Type of Course	Prerequisite
1	230702602P054	Biological Pest Control	2	0	2	E	MKK	Animal Systematics I
2	230702602P055	Ecotoxicology	2	0	2	E	MKK	None
3	230702603P056	Palynology	2	1	3	E	MKK	Plant Systematics I and II
4	230702602P057	Biogeography	2	0	2	E	MKK	Plant Systematics; Ecology; Animal Systematics I and II
5	230702603P058	Quantitative Ecology	2	1	3	E	MKK	None
6	230702603P059	Ornithology	2	1	3	E	MKK	Sistematika Hewan II; Ekologi
7	230702603P060	Dendrology	2	1	3	E	MKK	Plant Systematics II
8	230702603P061	Environmental Microbiology	2	1	3	E	MKK	Microbiology; Mycology; Microbial Physiology and Genetics
9	230702602P062	Bioinformatics	2	0	2	E	MKK	None
10	230702603P063	Microbial Molecular Genetics	2	1	3	E	MKK	Microbiology; Introduction to Biotechnology; Cell and Molecular Biology; Microbial

								Physiology and Genetics
11	230702603P064	Plant Tissue Culture	2	1	3	E	MKK	Plant Physiology
12	230702603P065	Tropical Plant Breeding	2	1	3	E	MKK	Plant Physiology
13	230702602P066	Plant Ecophysiology	2	0	2	E	MKK	Plant Physiology
14	230702602P067	Endocrinology	2	0	2	E	MKK	Animal Physiology
15	230702603P068	Enzyme Biotechnology	2	1	3	E	MKK	Biochemistry; Introduction to Biotechnology; Cell and Molecular Biology
16	230702602P069	Parasitology	2	0	2	E	MKK	Animal Systematics I
17	230702603P070	Ethology	2	1	3	E	MKK	Animal Systematics I and II
18	230702603P071	Conservation Genetics	2	1	3	E	MKK	Molecular Biology Analysis Techniques
19	230702603P072	Fish Reproductive Biology	2	1	3	E	MKK	None
20	230702603P073	Ichtiology	2	1	3	E	MKK	Animal Systematics II
21	230702603P074	Morphometrics	2	1	3	E	MKK	Basic Statistics
22	230702602P038	Special Topics Supporting Thesis	0	2	2	E	MKK	None
23	230702603P075	Animal	2	1	3	E	MKK	Animal Systematics II

		Domestication						
24	230702602P076	Plant Ecology	2	0	2	E	MKK	Ecology; Plant Physiology
25	230702602P077	Plant Nutrition	2	0	2	E	MKK	Plant Physiology
26	230702602P078	Plant Growth Analysis	2	0	2	E	MKK	None
27	230702602P079	Nutrigenomics	2	0	2	E	MKK	None
28	230702602P080	Aquatic Animal Physiology	2	0	2	E	MKK	Animal Physiology
29	230702602P081	Water Quality Monitoring	2	0	2	E	MKK	Ecology; Animal Systematics I
30	230702602P082	Management of Wet Tropical Soils	2	0	2	E	MKK	None
31	230702602P029	Internship	0	2	2	E	MBB	None
32	230702602P083	Cytogenetics	2	0	2	E	MKK	None
33	230702602P084	Immunology	2	0	2	E	MKK	None
Total			62	19	81			

Note: MKK = Scientific Knowledge and Skills Courses; MPB = Professional Conduct and Practice Courses; MBB = Community and Civic Life Courses

CHAPTER V SEMESTER LEARNING PLAN (RPS) AND LEARNING IMPLEMENTATION PLAN (RPP)

A. SEMESTER LEARNING PLAN (RPS)

Each course requires a semester learning plan (RPS). The RPS is the learning program for a course that will be implemented over a semester, either through face-to-face lectures or practical classes. The RPS has the following components.:

1. Course Identity
2. Course Description
3. Course Learning Outcomes (CPMK)
4. Special Competencies (KK)
5. Indicators
6. Study Materials (Main Subject)
7. Learning Strategies and Methods
8. Student Learning Experiences
9. Assessment
10. Reading/Reference Materials

At Mulawarman University, the RPS is created following the RPS format developed by the Mulawarman University Pekerti/AA Team. The steps for developing an RPS are as follows:

1. Analyze the CPMK, KK, and indicators.
2. Create a CPMK analysis chart or CPMK mapping.
3. Create a RPS using the specified format.

B. LEARNING IMPLEMENTATION PLAN (RPP)

A lesson plan (RPP) is a learning program designed for each specific skill (KK) and will be presented in one, two, or more face-to-face meetings and/or practicums. The number of RPPs required to be created by the lecturer in charge of a course is equal to the number of KKs in the previously created RPS for one semester. The RPP has the following components:

1. Course Identity
2. Course Description
3. CPMK
4. KK
5. Indicators
6. Learning Objectives
7. Study Material/Main Subject
8. Meeting Stages (beginning, main, and end)
9. Learning Activities
10. Methods
11. Time Allocation
12. Assessment

The steps for preparing the RPP are as follows:

1. Use the lesson plan format developed by the UNMUL Pekerti/AA team (format

attached)

2. Part of the lesson plan content is taken or transferred from the lesson plan created in the next stage
3. Complete any missing lesson plan components

F. Learning

1. Lecture Schedule and Lecture Room

The lecture schedule for the Biology Study Program is prepared and determined based on the Mulawarman University Academic Calendar, which is established each academic year. The Faculty compiles this lecture schedule, involving all Study Programs in a meeting held at least one month before the start of the odd semester of the current academic year. The next step is to develop the lecture schedule for each Study Program, involving all lecturers teaching the respective courses.

The lecture schedule for compulsory university courses (MKWU) and compulsory faculty courses (MKWF) for each Study Program is reported to the Faculty. This schedule is then synchronized and coordinated with the MKWF and MKWU Management to obtain the names of the lecturers teaching the courses and the exact lecture times. The lecture duration for one credit unit (SKS) is 50 minutes for face-to-face lectures, 60 minutes for independent assignments, and 170 minutes for practical activities.

The lecture schedule is arranged in such a way that there is sufficient time for students to move to other lecture rooms, sufficient break time for worship and/or lunch, so that the lecture atmosphere becomes more conducive..

The lecture schedule is structured to allow sufficient time for students to move between lecture rooms, breaks for prayer, and/or lunch, to ensure a more conducive learning environment.

The Biology study program utilizes lecture rooms owned by the Biology study program and a shared lecture room owned by the Faculty of Mathematics and Natural Sciences. For general lectures, the Biology study program borrows meeting rooms/halls owned by the faculty or Mulawarman University.

2. Face-to-Face Lecture Activities

Face-to-face lectures are conducted according to the lecture schedule prepared and determined by the Study Program and acknowledged/approved by the Faculty. Face-to-face lectures are held for 16 weeks, including Mid-Semester and Final Exams (UTS and UAS). Students and lecturers are required to sign the attendance list, and lecturers must complete the lecturer teaching monitoring form for each face-to-face lecture held weekly, using <https://elearning.unmul.ac.id/> (Figure 3.4).



Figure 3.4. E-learning display

Lecturers are not permitted to move the definitive lecture schedule of a course they teach to another time, to another room or lecture location, without the knowledge or permission of the Study Program. The transfer of the face-to-face lecture schedule must also be agreed to by all students, so that no student is disadvantaged or unable to attend the lecture due to the change in the lecture schedule. The length of face-to-face lectures conducted by lecturers is in accordance with the provisions set by the Faculty based on the number of credits per course, namely 1 credit = 50 minutes.

3. Integrated Learning with PIP UNMUL

To implement the transformation and integration of Unmul's PIP into learning, the strategic models used are the Separated Model, the Segmented Model, and the Strategic Integration Model.

The Pancasila and Citizenship, Indonesian Language, and Religious Education courses in the Biology study program will be taught with enriched material aligned with the Biology study program's expertise, or at least within the Faculty of Mathematics and Natural Sciences. Facts, examples, problems, or cases, as well as activities and assignments given to Biology students, must be relevant or related to the study program's area of expertise, ensuring meaningful and contextual learning. The facts, examples, problems, cases, and assignments provided must also be related to Unmul's PIP, fostering critical and collective awareness of the aspects of Unmul's PIP and its descriptions. This will positively impact students' understanding, thinking skills, and long-term actionability. Meanwhile, the integration of Unmul's PIP into the MKWF course group and Study Program courses is carried out strategically and carefully, only for courses that have CPMK, Special Abilities, and relevant indicators, integrated naturally, not forced or simply as a tack or formality. The Faculty of Mathematics and Natural Sciences and study programs will pay attention to this in the RPS prepared by the Lecturer Teaching the course. This is in accordance with the concept of critical pedagogy and critical thinking model learning.

4. Student-Centered Learning

In accordance with the Process Standards in the National Standards of

Higher Education (SN DIKTI), learning in higher education must activate and involve students in various well-planned learning activities, thus providing meaningful learning experiences. The learning approach used in this case is Student-Centered Learning (SCL), as opposed to Lecturer-Centered Learning. In SCL, conventional learning methods such as lectures, Q&A sessions, assignments, exercises, or regular discussions can still be used. However, lecturers are expected to use learning models that are constructive, cooperative, collaborative, contextual, or based on ICT and multimedia. The goal is to make learning more enjoyable, challenging, relevant, and meaningful, and to develop students' character and attitudes as required by the KKNi (National Qualifications for Indonesia National Qualifications) or SN DIKTI.

SCL learning integrates various learning activities that can develop students' soft skills from the beginning and continuously. All lecturers in the Biology study program are encouraged to maximize the use of SCL learning, which can develop soft skills in accordance with the courses they teach. The Biology study program will closely monitor the implementation of SCL in the Lesson Plan (RPS) and in the lecture process conducted by lecturers. The Biology study program will periodically improve the competence of lecturers regarding learning with SCL and soft skills.

5. ICT and Multimedia Based Learning

In line with advances in technology and communications (ICT), the learning process needs to utilize ICT to increase learning effectiveness and create a conducive and enjoyable learning environment. Many learning models utilize ICT, including online learning, combining modules and learning materials (printed or non-printed), and offline learning supported by non-printed learning materials. The combination of ICT-based learning with face-to-face learning is known as the blended learning model. This method is also known as the hybrid method. This learning is supported by facilities using the Zoom platform (online lectures) combined with face-to-face lectures (offline lectures), with webcams provided in each classroom. This method has been implemented during the relaxation period following the transition to fully online learning due to the COVID-19 pandemic. Furthermore, comprehensive improvements to the information system have streamlined the teaching and learning process and academic activities (such as lectures and research for theses), increased access to the latest information (internet access and textbook procurement), and created a more comfortable and conducive learning process. UNMUL has also developed e-learning facilities through the Mulawarman e-learning application, which facilitates teaching and learning activities with digital classes, accessible anywhere and anytime via <https://elearning.unmul.ac.id/>. This application has been used by lecturers and students during lectures.

6. Practical Activities

Practical activities are part of a specific course. Some courses are

structured as (2-1) or (1-1), meaning 2 credits of face-to-face lectures + 1 credit of practicum, or 1 credit of face-to-face lectures + 1 credit of practicum. The number of credits for practicum is determined in the course structure of the Undergraduate Biology Study Program. The duration of practicum is 1 credit = 170 minutes per week.

The schedule for practicum activities is prepared separately from the face-to-face lecture schedule for ease of implementation. The lecture and practicum model can be: (a) face-to-face lectures are completed first, followed by practicum, or (b) face-to-face lectures are alternated with practicum each week. This practicum model will influence the preparation of both the face-to-face lecture and practicum schedules. To facilitate practicum implementation, lecturers in charge of practicum courses are required to develop practicum guidelines and prepare practicum activities for students, as these will be related to the procurement of necessary materials and equipment. Practical work can be carried out in laboratories or other places prepared for practical work, either within the faculty, at the university, or outside the campus (Figure 3.5).



Figure 3.5 Practical activities in the laboratory of the Biology Department, FMIPA, UNMUL

The Biology Study Program has a Basic Biology Laboratory, a Systematics and Plant Anatomy Laboratory, an Animal Anatomy and Microtechnics Laboratory, a Physiology and Plant Development Laboratory, an Animal Ecology and Systematics Laboratory, a Microbiology and Molecular Genetics Laboratory, an Animal Physiology, Development and Molecular Laboratory, and a Plant Tissue Culture Laboratory that can be used for practicums. In addition, it also utilizes practicum facilities from other study programs within the Faculty of Mathematics and Natural Sciences.

7. Field Work Practice (PKL) Activities

Internships (PKL) are offered as an elective course within the study program and are taken by students as a form of work experience in an agency or industry. The selection of the agency or industry is based on the interest in the curriculum (KBK).

Field Work Internships (PKL) for Biology students are worth 2 credits. The locations of the student PKL are companies, hospitals, and other institutions that partner with the Faculty for PKL activities. Students are assigned to PKL locations individually or in groups. Students can submit or find their own PKL locations through the Study Program. The Study Program will review the student's proposal and, if deemed appropriate, will follow up with correspondence and communication with potential PKL partners.

Before students depart, the Faculty and the Study Program will provide briefings and guidelines that students must adhere to during the PKL. The PKL supervisor for each student group will be determined by the Faculty and the Study Program. PKL supervisors from partner institutions are fully appointed by the partner. At the end of the internship, students submit individual and group reports. Assessment is based on the assessments of the Supervisor, Supervisors at partner institutions, and the internship report. The Biology Undergraduate Program is equipped with facilities and infrastructure to support the teaching and learning process (<https://Biologi.fmipa.unmul.ac.id/layanannya/>) (Figure 3.6).



Figure 3.6. Supporting facilities for the learning process, faculty library (left) and classroom (right)

a. Basic Laboratory

The Basic Laboratories within the Faculty of Mathematics and Natural Sciences include the Basic Biology Laboratory, Basic Chemistry Laboratory, Basic Physics Laboratory, and Computational Mathematics Laboratory. These Basic Laboratories are located in the Science Learning Center (SLC) building.

The Basic Biology Laboratory is one of the laboratories used to support practical activities, with facilities tailored to scientific needs, including space, equipment, and competent human resources (laboratory technicians and assistants). Activities in the Basic Biology Laboratory include practical activities for first-year students from various study programs within the Faculty of Mathematics and Natural Sciences (https://biologi.fmipa.unmul.ac.id/lab_biodas/).

The Faculty of Mathematics and Natural Sciences (FMIPA) Laboratory Building, with its "Basic Science" concept, serves as a foundation for supporting the development of science and technology. The first floor functions as a library, academic service center, and a lecture theater designed similar to Studio 21. The

building is also equipped with Wi-Fi and a sound system to support online lectures with a capacity of 300 people. The third floor houses laboratories for Physics and Mathematics, and the fourth floor houses Chemistry and Biology. The building also features small rooms for students to practice seminars.

b. Plant Systematics and Anatomy Laboratory

The Plant Systematics and Anatomy Laboratory is located on the 4th floor of Building G, Faculty of Mathematics and Natural Sciences. This laboratory supports practical activities for courses based on Plant Systematics. It also serves as a research laboratory for lecturers and students interested in the Plant Systematics and Anatomy Expertise Group (KBK) (https://biologi.fmipa.unmul.ac.id/lab_sistum/).

c. Animal Anatomy and Microtechnics Laboratory

The Animal Anatomy and Microtechnics Laboratory is located on the third floor of Building G, Faculty of Mathematics and Natural Sciences. This laboratory is a facility to support lectures based on Animal Anatomy dan Mikroteknik. Beberapa KBK yang dapat memanfaatkan laboratorium ini untuk keperluan penelitian dari KBK Anatomi Hewan and Microtechnics. (https://biologi.fmipa.unmul.ac.id/lab_anhis/).

d. Plant Physiology and Development Laboratory

The Plant Physiology and Development Laboratory is located on the first floor of Building C, Faculty of Mathematics and Natural Sciences. This laboratory provides support for students and lecturers in the Plant Physiology and Development KBK specialization. (https://biologi.fmipa.unmul.ac.id/lab_fistum/).

e. Animal Ecology and Systematics Laboratory

The Animal Ecology and Systematics Laboratory is located on the first floor of Building C, Faculty of Mathematics and Natural Sciences. This laboratory supports practical activities for courses based on Animal Ecology and Systematics. It also serves as a research laboratory for lecturers and students interested in the Animal Ecology and Systematics Expertise Group (KBK). (https://biologi.fmipa.unmul.ac.id/lab_eksistwan/).

f. Microbiology and Molecular Genetics Laboratory

The Microbiology and Molecular Genetics Laboratory is located on the second floor of Building C, Faculty of Mathematics and Natural Sciences. The purpose of this laboratory is to support lectures based on Microbiology and Molecular Genetics and to serve as a research center for lecturers and students interested in the Microbiology and Molecular Genetics KBK (https://biologi.fmipa.unmul.ac.id/lab_mikro/).

g. Animal Physiology, Development and Molecular Laboratory

The Animal Physiology, Development, and Molecular Biology Laboratory is located on the second floor of Building C, Faculty of Mathematics and Natural Sciences. The purpose of this laboratory is to support lectures based on Animal

Physiology, Development, and Molecular Biology and to serve as a research center for lecturers and students interested in the Animal Physiology, Development, and Molecular Biology (KBK) (https://biologi.fmipa.unmul.ac.id/lab_fishew/).

h. Plant Tissue Culture Laboratory

The Plant Tissue Culture Laboratory is located on the first floor of Building E (Green House) of the Faculty of Mathematics and Natural Sciences. The purpose of this laboratory is to support lectures based on Plant Tissue Culture and to serve as a research center for lecturers and students interested in Plant Tissue Culture (PTC) (https://biologi.fmipa.unmul.ac.id/lab_kuljar/).

8. Community Service Program (KKN)

The Community Service Program (KKN) at Mulawarman University is managed and organized by the LPPM (Research Institute for Community Service). Several KKN models are available at Unmul, as described below.

- a. Random Independent Regular Model. Prospective KKN participants register their names with the LPPM (Institute for Community Service) and determine which of the three cities they will participate in: Samarinda, Balikpapan, or Bontang. LPPM will randomly organize student groups, with each group consisting of 5–10 students from at least three different faculties. The village or sub-district where the KKN will be conducted will be randomly determined by LPPM.
- b. Non-random Independent Model. Prospective KKN participants are asked to find 5-10 colleagues from at least three different faculties and must state the name of their village/sub-district. The sub-district and regency where the KKN program is being conducted, along with a letter stating the village/sub-district's readiness to accept KKN students. LPPM will approve proposals from groups that meet the requirements.
- c. Competency Model. Students from one faculty in the same or different study programs, or from several faculties, search for their own agencies/agencies/organizations or KKN destinations, whether in Samarinda or outside Samarinda. The agencies/agencies/companies or KKN locations must be in accordance with the competencies to be developed from each student, with a total of between 5 – 10 people. The proposal of prospective KKN participants to LPPM is accompanied by the willingness of the agencies/agencies/companies to accept a certain number of KKN students.

The faculty can guide and coordinate prospective students participating in the competency-based Community Service Program (KKN) in finding institutions/agencies/companies relevant to the faculty's area of expertise, so that students can optimally develop their competencies in the KKN location. This is intended to prevent "misplaced" KKN, which could result in students not being able

to develop their competencies properly, or instead completing assignments or engaging in activities irrelevant to their study program.

The faculty can provide soft skills and entrepreneurship training for sixth-semester students who will be participating in KKN the following semester. The training will be held 3-4 months before the KKN implementation (July). The purpose of the training is to ensure that students participating in KKN have a positive attitude, maturity, responsibility, and good character, possess insight and understanding of entrepreneurship so they can assist communities in developing their businesses, and collaborate with various parties. Participants in this training will receive a soft skills and entrepreneurship certificate from the faculty. The Biology study program will coordinate the formation of non-random KKN student groups to ensure they are allocated a linear KKN location, or at least one that aligns with their study program's expertise, allowing students to optimally develop their general and specific skills. The study program will then register the KKN student groups with the Institute for Community Service (LPPM).

The KKN will be implemented over 60 working days, between July and September of the current academic year. The KKN supervisor will be appointed by the LPPM. The KKN guidelines will also be established by the LPPM. The Biology Study Program recommends that the KKN supervisors, for the non-random model, be lecturers from the same study program, to ensure better guidance.

9. Final Project (Thesis)

A thesis is a final assignment for undergraduate students, the result of their research on a problem or topic within their study program, under the guidance of two supervisors and subject to an open examination within the study program. Writing a thesis serves as a vehicle for students to cultivate and develop a culture of scientific thinking and action, as well as high moral integrity.

In preparing a thesis, the study program and supervisors are expected to guide the research to incorporate local settings as described by the Unmul PIP (Planning for the Implementation of the University of Mulawarman), thereby enhancing the color and nuance of Unmul's local excellence in the student's thesis. Discussion of student research findings should not only address the analysis and findings, but also address the potential implementation of these findings within the context of East Kalimantan or the district/city, particularly in terms of physical, social, cultural, and economic environments. The faculty and study program will develop Thesis Guidelines and a Thesis Consultation Book to ensure students can complete their thesis within the correct timeframe and process.

10. Cross-Study Program or Cross-Faculty Lectures

To optimize educational services, particularly for students with above-average abilities and high GPAs, or those requiring special treatment or retaking incomplete courses from compulsory university or faculty courses, the Biology

study program provides these students with the opportunity to take courses in the MKWU (Cross-Programmed Learning) and/or MKWF (Cross-Programmed Learning) groups across study programs and even across faculties within Unmul.

Cross-program MKWU or MKWF courses are offered to students in one study program who will be taking a specific course offered by another study program because it is not offered in their own program that semester. If the student in question plans to take the course in the following semester in their own program, it may not be possible for several reasons, such as time constraints, limited remaining study period, etc. The consequence of cross-programme courses within this faculty is the need to develop sound regulations and administrative procedures within the SIA application at Unmul. This allows students to take the WKWU or MKWF course groups more freely and maintain proper administration. This program also implements one of the Merdeka Belajar (Independent Campus) program schemes.

Cross-faculty lectures at Unmul (Mulawarman University) are conducted for MKWU courses that will be taken by certain students from other faculties that happen to offer the MKWU this semester, and the schedule does not conflict with the student's study program schedule. Consequently, Unmul has established regulations, mechanisms, and procedures for cross-faculty and/or cross-study program lectures within faculties to ensure certainty, supported by the SIA application at Unmul.

In the near future, Unmul will equip lecturers in compiling and developing printed and non-printed learning materials, as well as interactive learning media, utilizing available applications. Printed and non-printed learning materials, learning media, and a collection of supporting materials for Unmul's PIP (Planning for Integrated Learning) will be gathered from various sources, along with electronic library services such as i-kaltim or i-perpusnas (National Library) will support content in blended/hybrid learning.

11. Monitoring and Evaluation of Lectures

Lecture activities, including face-to-face lectures, practicums, and internships, need to be monitored regularly and in a systematic manner every semester and annually. The goal is to ensure that educational services within the Faculty or Study Program meet established standards, are of high quality, and provide satisfaction to students and graduates. This monitoring and evaluation also aims to ensure that achieved quality standards are maintained, improved, or maximized, thereby achieving qualifications above national or even international standards.

This monitoring and evaluation is conducted by the Faculty, involving the GJMF (Guidelines for the Study Program), the study program quality assurance unit, administrative staff, and students. The Faculty and study program compile and prepare a Lecture Monitoring and Evaluation Guide, monitoring instruments, and an application for processing and analyzing monitoring results. The results of this monitoring will be used as material for the Faculty's lecture

evaluation, and will be followed up based on the evaluation findings.

12. Implementation of the Independent Learning Independent Campus Program

To prepare students for rapid social, cultural, and technological changes, the world of work and technological advancements, student competencies must be developed to better reflect the needs of the times. This linkage is not only with the industrial and professional worlds but also with a rapidly changing future. Higher education institutions, particularly study programs, are required to design and implement innovative learning processes so that students can achieve learning outcomes encompassing attitudes, knowledge, and skills optimally and consistently. The Independent Learning and Independent Campus policy is expected to address these demands.

Independent Campus is a form of autonomous and flexible learning in higher education, creating a learning culture that is innovative, non-restrictive, and tailored to student needs. One of the MBKM programs is the right to study outside of their study program for three semesters. Students are given the freedom to take credits outside of their study program. The three semesters consist of one semester (equivalent to 20 credits) of courses outside of their study program and two semesters (equivalent to 40 credits) of learning activities outside of the university. This aligns with Minister of Education and Culture Regulation Number 3 of 2020 concerning National Higher Education Standards.

Biology students can engage in various forms of MBKM activities, specifically learning outside of university, including internships/work experience in industry or other workplaces, community service projects in villages, teaching in educational institutions, participating in student exchanges, conducting research, engaging in entrepreneurial activities, conducting independent studies/projects, and participating in humanitarian programs (Figure 3.7). All of these activities must be carried out under the guidance of a lecturer. The MBKM scheme includes:

- a. Taking courses outside the study program within the same university
- b. Internship/Industrial Internship
- c. Village Development Project
- d. Student Exchange
- e. Research
- f. Entrepreneurial Activities
- g. Independent Study/Projects
- h. Humanitarian Projects
- i. Teaching at Schools/Educational Units
- j. National Defense



Figure 3.7. PMM MBKM activities implemented at Al-Azhar University Indonesia

In addition, the Biology Study Program is participating in the proposed implementation of the MBKM (Teaching Practitioner) program. This way, students not only gain knowledge from the study program's permanent lecturers but also directly from practitioners. All learning programs at the Independent Campus are expected to provide contextual field experiences that will enhance students' overall competency, prepare them for work, or create new jobs (Figure 3.8).

The learning process at the Independent Campus is one manifestation of the essential student-centered learning approach. Learning at the Independent Campus provides challenges and opportunities for developing innovation, creativity, capacity, personality, and student needs, as well as fostering independence in seeking and discovering knowledge through real-world situations and dynamics, such as skill requirements, real-world problems, social interactions, collaboration, self-management, performance demands, targets, and achievements. Through a well-designed and implemented independent learning program, students' hard and soft skills will be solidified. The Independent Learning - Independent Campus program is expected to address the challenges of higher education institutions to produce graduates who are in tune with current developments, advances in science and technology, the demands of the business and industrial worlds, and the dynamics of society.



Figure 3.8. MBKM Certified Internship Program

G. Assesment

Assessment of learning in the Biology study program is essentially based on the Assessment Guidelines from Mulawarman University. Assessment procedures and mechanisms are implemented in accordance with established regulations. The Biology study program, together with the faculty, develops a schedule for midterm and final exams to be administered during the current semester.

The type and variety of assessments used by lecturers are entirely up to the instructors teaching each course. The Biology study program encourages lecturers to create questions with varying levels of difficulty, not just low-order thinking skills (LOTS) questions but also high-order thinking skills (HOTS). Assignments given to students are expected to develop critical thinking skills, enabling them to analyze problems from multiple perspectives, boldly propose alternative solutions, and be creative and innovative, as defined by critical pedagogy.

The assessment mechanism implemented in the Biology Undergraduate Study Program begins with the development, delivery, and agreement between lecturers and students on the stages, techniques, instruments, criteria, indicators, and assessment weighting, in accordance with the Learning Plan. Implement the assessment process in accordance with the stages, techniques, instruments, criteria, indicators, and assessment weights that contain assessment principles; provide feedback and opportunities for students to question assessment results; and document the assessment process and student learning outcomes in an accountable and transparent manner.

The assessment and evaluation system is implemented from the course level, which ensures achievement of the PLO, to the level of overall program completion through an average GPA and evaluation of alumni success after graduation. Assessment at the course level involves providing assessments designed specifically to align with the Learning Outcomes students need to achieve in the course. These assessments aim to determine whether the learning process has successfully facilitated students' achievement of learning objectives and what improvements need to be made to achieve unmet objectives. Course grading can refer to one of the schemes presented in Table 3.9 and the assessment guidelines presented in Table 3.10.

Table 3.9. Quality Grade Percentage Reference

Scheme	Cognitive		Psychomotoric		Affective	Total
	Quiz/ MidTest	Final Test/ Final Project	Practical	Task		
I	20	40	20	10	10	100
II	30	40	20		10	100
III	45	45			10	100
IV	40	50			10	100
V	30	40		20	10	100
VI		40	50		10	100
VII		50	10	30	10	100
VIII		60		30	10	100

Table 3.10 Assessment Guidelines

Quality Score (AM)	Weight Value (NB)	Relative Value
$80 \leq AM \leq 100$	4,0	A
$75 \leq AM < 80$	3,5	B
$70 \leq AM < 75$	3,0	
$65 \leq AM < 70$	2,5	C
$60 \leq AM < 65$	2,0	
$50 \leq AM < 60$	1,5	D
$40 \leq AM < 50$	1,0	
$0 \leq AM < 40$	0,0	E

Lecture activities, including face-to-face lectures, practicums, and internships, require regular and programmed monitoring every semester and annually. The goal is to ensure that educational services within the Faculty or Study Program meet established standards, maintain high quality, and satisfy students and graduates. This monitoring and evaluation also aims to maintain, improve, or maximize achieved quality standards, thereby achieving qualifications above national or even international

standards.

This monitoring and evaluation is conducted by the Faculty, involving the GJMF (Guidelines for the Study of the Faculty), administrative staff, and students. The Faculty and study program develop and prepare a Lecture Monitoring and Evaluation Guide, monitoring instruments, and applications for processing and analyzing monitoring results. The results of this monitoring will be used by the Faculty for course evaluation and will be followed up based on the evaluation findings. The GJMF uses the PPEPP cycle as its internal quality assurance system (SPMI).

H. Curriculum Evaluation System

The curriculum is based on Presidential Regulation No. 8 of 2012 concerning the Indonesian National Qualifications Framework (KKNI) and Law No. 12 of 2012 concerning Higher Education. To implement curriculum quality assurance, the Biology Undergraduate Program at Universitas Mulawarman refers to the Minister of Education and Culture Regulation No. 3 of 2020 concerning National Standards for Higher Education. The national standards that form the basis for curriculum development at the Faculty of Mathematics and Natural Sciences (FMIPA) at Universitas Mulawarman include graduate competency standards, learning content standards, learning process standards, and educational assessment standards.

The implementation of curriculum quality assurance in the Biology Undergraduate Program is based on the Faculty's quality document. This document comprises a quality policy, a quality manual and quality standards, standard operating procedures, and work instructions. The quality manual explicitly states that the Faculty implements quality assurance using the PPEPP (Determination, Implementation, Evaluation, Control, and Improvement) model, as illustrated in Figure 3.9.

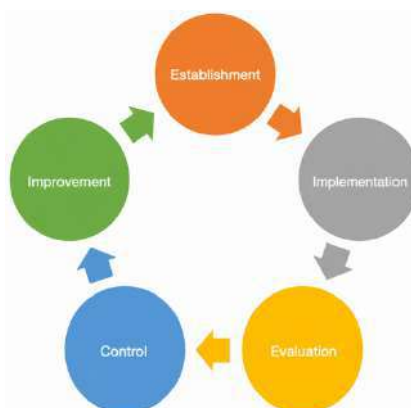


Figure 3.9. Curriculum Evaluation Pattern

The Biology Undergraduate Study Program has compiled documents to ensure the quality of curriculum implementation, including:

1. General learning implementation guidelines
2. Learning guidelines related to research and community service
3. Semester learning plan (RPS) documents for all courses

4. Lecture teaching materials
5. Practical guides
6. Learning assessment documents

To guarantee the quality of the curriculum in the Biology Undergraduate Study Program, the Quality Assurance Unit (UJM) of the study program carries out monitoring and evaluation of:

1. Alignment of learning material content to the learning plan
2. Alignment of the learning implementation process to the learning plan
3. Alignment of the learning process related to research and community service
4. Alignment of methods to learning outcomes
5. Alignment of theoretical and practical learning hours in accordance with learning process standards

The quality control stage involves interpreting and concluding the fulfillment of all curriculum-related standards. This stage defines four assessment categories: exceeding standards, meeting standards, not meeting standards, and deviating from standards. The assessment results from this stage serve as the basis for implementing the next stage, namely standard improvement.

The standard improvement stage is carried out during the Management Review Meeting (RTM) held at the end of each semester. This meeting is attended by a team of lecturers from study programs, departments and faculties, and the faculty quality assurance task force. The results of the previous stage are presented. Participants then engage in discussions regarding the determination of fixed and improved standards.

CHAPTER IV

CONCLUSION

A curriculum is a structured set of courses used as a reference for teaching materials at an educational institution and serves as a guide for the knowledge and skills expected to be acquired by students studying for a specific period. The curriculum is dynamic and adapts to changing times, as human knowledge increases and skills become increasingly needed in a particular field of study or profession. The curriculum is also unique, with each institution possessing its own unique characteristics. Therefore, reviewing practicums conducted at the study program level is mandatory.

The Biology Undergraduate Program, Faculty of Mathematics and Natural Sciences, Mulawarman University, was established in 2001, allowing for curriculum changes to reflect the dynamics of education at the time. The 2023 Curriculum emphasizes the study program's support for MBKM activities as part of government policy, taking into account various factors such as developments in science and technology and the latest issues in biology at the regional, national, and international levels. Therefore, the Biology Undergraduate Program curriculum is expected to continue to evolve with the changing times. This curriculum also aligns with the latest government policies regarding the National Standards for Higher Education (SN Dikti) and the Indonesian National Qualifications Framework (KKNI). In this new curriculum, the course selection process is more clearly based on the formulation of graduate profiles, learning outcomes, and research materials. The character of superior graduates can be developed through a series of courses that can be monitored and evaluated measurably, enabling students to develop their knowledge of biology wherever they apply their knowledge.

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12. Panduan Merdeka Belajar Kampus Merdeka Fakultas Matematika dan Ilmu Pengetahuan Alam Tahun 2021

Appendix 1. The Example of Course Module Description



Module Handbook Department of Physics Mulawarman University

Module Description

Title	Biology
Code, if applicable	210700602W002
Semester(s) in which the module is taught	1 st semester
Person responsible for the module	Dr. agr. Budiman, M.Si. Febry Rahmadhani H, M.Si.
Language	Indonesian
Relation to curriculum	This course is compulsory and is offered in the 1 st semester.
Teaching methods	Lecture, lesson
Workload	For this course, students are required to meet a minimum of 136 hours in one semester, which consists of: - 150 minutes for lectures, - 180 minutes for structural activities, - 180 minutes for individual study
Credit points	3 credit points (equivalent to 4,8 ECTS) Details: 1 Credits = 170mins/week/semester 1 Credits = 170 mins x 14 week = 2,380 mins = 39.7hours/semester



Module Handbook

Department of Physics

Mulawarman University

	1 ECTS = 39.7h/29h = 1.6 Explanation: 1 semester = 16 weeks including the two weeks for mid-semester test in between and final examination at the end of semester. 1 semester consists of 2 quartiles, 1 quartile equals to 12.5 – 15 ECTS, therefore 1 ECTS = 25 – 30 hours. The 29 hours is set as a standard for 1 ECTS.
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	Programme Learning Outcomes (PLO) : Exhibiting awareness and responsible behavior in relation to the conservation of tropical rainforests and their ecosystems (PLO 3) Course Learning Outcomes (CLO) : 1. Students are able to master the basic concepts of biology. 2. Students are able to apply scientific process skills in solving problems in their surrounding environment. 3. Students are able to make appropriate decisions based on the analysis of information and data, and are capable of providing guidance in selecting various alternative solutions, both independently and in groups, in the field of biology.



Module Handbook Department of Physics Mulawarman University

Module Description

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Code, if applicable	210700602W002
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Person responsible for the module	Dr. agr. Budiman, M.Si. Febry Rahmadhani H, M.Si.
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Credit points	3 credit points (equivalent to 4,8 ECTS) Details: 1 Credits = 170mins/week/semester 1 Credits = 170 mins x 14 week = 2,380 mins = 39.7hours/semester

Appendix 2. The Example of Course Assessment and Evaluation Plan (RAE)

Course Learning Outcome (CLO): After completing this course, students are expected to be able to comprehensively analyze and solve problems based on biotechnology knowledge.

Week	Sub-CLO	Indicator	C2	C3	C4	P3	A2	A3	Test Type	Weight
1–3	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain the definition of biotechnology.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain the scope and coverage of biotechnology.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain the learning objectives of biotechnology.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain cell structure.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain the basic concept of molecules of life.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain chromosome structure, DNA replication, and genome.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain the basic concept of RNA and protein synthesis.	√						Essay	20%

	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain the basic concept of mutation, including causes and consequences.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain recombinant DNA technology and DNA cloning.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain suitable types of vectors for cloning.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain how to identify and amplify the desired gene.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain laboratory techniques and applications of recombinant DNA technology.	√						Essay	20%
	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivatives, namely protein as a product.	Explain genomics and bioinformatics.	√						Essay	20%
4–5	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Describe protein as a biotechnology product.	√						Essay	30%
	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Explain protein structure.	√						Essay	30%
	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Explain types of protein production in biotechnology.	√						Essay	30%

	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Explain proteomics.	√						Essay	30%
	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Explain microbial structure.	√						Essay	30%
	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Explain microbes as tools.	√						Essay	30%
	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Explain microbial applications in biotechnology.	√						Essay	30%
	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Explain vaccines, biofuels, and diagnostics.	√						Essay	30%
	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	Explain bioterrorism.	√						Essay	30%
6–7	Able to explain the application of biotechnology in animals and human health.	Describe research in the field of animal biotechnology.	√						Essay	30%
	Able to explain the application of biotechnology in animals and human health.	Explain the history of animal cloning.	√						Essay	30%
	Able to explain the application of biotechnology in animals and human health.	Explain transgenic animals.	√						Essay	30%
	Able to explain the application of biotechnology in animals and human health.	Explain the concept of antibody production in humans using animals.	√						Essay	30%
	Able to explain the application of biotechnology in animals and human health.	Explain the scope of health biotechnology, including disease diagnostics in humans.		√					Essay	30%

	Able to explain the application of biotechnology in animals and human health.	Explain the scope of medical products and biotechnology applications.		√					Essay	30%
	Able to explain the application of biotechnology in animals and human health.	Explain gene therapy.		√					Essay	30%
	Able to explain the application of biotechnology in animals and human health.	Explain the potential of regenerative medicine.		√					Essay	30%
8	Mid-Semester Examination	Mid-Semester Examination							Examination	
16	Final-Semester Examination	Explain examples of ethical applications such as Genetically Modified Organisms (GMO) and Synthetic Biology.	√	√	√	√		√	Final Examination	
	Final-Semester Examination	Final-Semester Examination							Examination	

Appendix 3. The Example of Course Contract

COURSE CONTRACT

1. Course Identity

Component	Description
Study Program	Biology
Course	Introduction to Biotechnology
Course Code	210702602
Semester/Credits	3/2 (2:0)
Prerequisite Course	–
Lecturers	Imam Rosadi, M.Si; Muhammad Fauzi Arif, M.Sc

2. Course Benefits

After completing this course, students are expected to be able to explain the concepts of biotechnology, including genes, genomes, proteins, recombinant DNA technology, and their applications related to tropical rainforests and the environment.

3. Course Description

Introduction to Biotechnology is an elective course that discusses biotechnology concepts, including genes, genomes, proteins, recombinant DNA technology, and their applications in microbial, animal, health, plant, forensic, aquatic, and bioremediation biotechnology. This course also introduces biotechnology regulations and ethics, particularly in Indonesia.

4. Course Learning Outcomes, Sub-CLOs, and Study Materials

Course Learning Outcome (CLO): Students are able to comprehensively analyze problems in the field of biology based on biotechnology knowledge.

Week	Sub-CLO	Study Materials
1–3	Able to explain the concept of biotechnology, including genetic material, recombinant DNA technology, and its derivative, namely protein as a product.	a. Definition of biotechnology b. Scope and coverage of biotechnology c. Learning objectives of biotechnology d. Cell structure e. Basic concepts of molecules of life f. Chromosome structure, DNA replication, and genome g. Basic concepts of RNA and protein synthesis h. Basic concepts of mutation, including causes and consequences i. Recombinant DNA technology and DNA cloning j. Suitable cloning vectors k. Identification and cloning of the desired gene l. Laboratory techniques and

		applications of recombinant DNA technology m. Genomics and bioinformatics
4–5	Able to explain the principle of protein as a biotechnology product and the basic concepts of microbial biotechnology.	a. Protein as a biotechnology product b. Protein structure c. Types of protein production d. Microbial structure in proteomics e. Applications of microbes in biotechnology, including vaccines, biofuels, and cosmetics f. Bioterrorism
6–7	Able to explain the application of biotechnology in animals and human health.	a. Research in animal biotechnology b. History of animal cloning c. Transgenic animals d. Concept of antibody production in humans using animals e. Scope of health biotechnology, including disease diagnostics in humans f. Scope of medical products and biotechnology applications g. Gene therapy h. Potential of regenerative medicine
8	Mid-Semester Examination	Mid-Semester Examination
9	Able to explain the basic principles of DNA fingerprinting analysis in various organisms and its application in forensic analysis.	a. Principles of DNA fingerprinting b. Use of DNA fingerprinting in various organisms
10	Able to explain bioremediation, pollutants that contaminate the environment, and the use of bioremediation to overcome environmental pollution.	a. Definition of bioremediation b. Types of pollutants c. Aerobic and anaerobic biodegradation d. Applications of bioremediation and its implementation
11	Able to explain aquatic biotechnology and its applications.	Principles and issues related to aquatic biotechnology, applications, and prospects.
12	Able to analyze the basic principles of plant biotechnology, including mechanisms, applications, examples of applications, and products.	a. Basic principles of plant biotechnology b. Mechanisms of plant biotechnology applications c. Examples of applications and plant biotechnology products
13–15	Able to explain issues related to biotechnology ethics and its interactions with other fields.	a. Biotechnology ethics b. b. Examples of ethical applications, such as Genetically Modified Organisms (GMO) and Synthetic Biology
16	Final-Semester Examination	Final-Semester Examination

5. Reading Materials / References

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6. Teaching Strategies

In several meetings, the lecturer delivers lectures on the course materials. Students are assigned exercises and are encouraged to discuss or review the materials. Some meetings apply a case-study learning method. The lecturer acts as a facilitator who guides, directs, and provides feedback.

7. Assignments

No.	Assignment Description
1	In each class meeting, students must study the required readings or lecture materials that can be accessed through UNMUL e-learning.
2	In each class meeting, students must read book references available through UNMUL e-learning.
3	In each class meeting, students must actively complete and discuss assigned tasks related to each topic.
4	The mid-semester examination is conducted in Week 8, and the final-semester examination schedule is determined by the faculty.
5	Evaluation is conducted using essay-type questions.

8. Assesment and Grading Criteria

8.1 Grade Conversion

Grade	Weight	Quality Score Range
A	4.0	$80 \leq AM \leq 100$
B	3.5	$75 \leq AM < 80$
B	3.0	$70 \leq AM < 75$
C	2.5	$65 \leq AM < 70$
C	2.0	$60 \leq AM < 65$
D	1.5	$50 \leq AM < 60$
D	1.0	$40 \leq AM < 50$
E	0.0	$0 \leq AM \leq 40$

Note: The final grade is determined using the assessment weighting scheme based on the Rector Regulation Number 17 of 2020.

8.2 Assesment Components

No.	Assessment Component	Weight
1	Quiz / Mid-Semester Examination (UTS)	30%
2	Final Project / Final-Semester Examination (UAS)	40%

3	Affective assessment, including attendance, completeness of assignments, and class participation	10%
4	Assignment: Journal Review	20%
	Total	100%

9. Course Schedule

Week	Day / Date	Topic
1		Basic concepts of bioinformatics
2		Introduction to and use of bioinformatics software
3		Introduction to similarity analysis of nucleotide sequences
4		DNA primer design and protein analysis (1)
5		DNA primer design and protein analysis (2)
6		Alignment and phylogenetic analysis (1)
7		Alignment and phylogenetic analysis (2)
8		Mid-Semester Examination (UTS)
9		Protein databank and protein structure prediction (1)
10		Protein databank and protein structure prediction (2)
11		Protein structure visualization
12		Identification of protein targets and protein interaction pathway analysis (1)
13		Identification of protein targets and protein interaction pathway analysis (2)
14		Molecular docking: roles, prospects, and limitations in health biology (1)
15		Molecular docking: roles, prospects, and limitations in health biology (2)
16	Faculty Schedule	Final-Semester Examination (UAS)

Student Representative

Samarinda,
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