Faculty of Mathematics and Natural Sciences
Universitas Negeri Yogyakarta

ACADEMIC CURRICULUM TEXTBOOK
BACHELOR OF BIOLOGY STUDY PROGRAM
2025

DEAN'S REMARKS

Praise be to Allah SWT, the Almighty, for His abundant blessings, grace, mercy, and guidance, through which the curriculum for undergraduate, master's, and doctoral programs at the Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Negeri Yogyakarta (UNY), has been completed successfully. The periodic review and development of curricula is a necessity to adapt to changes in the times and advancements in science and technology (IPTEKS).

This curriculum development is based on the 2025 UNY Curriculum Guide, which aligns with various relevant regulations, especially Presidential Regulation No. 8 of 2012 on the Indonesian National Qualifications Framework (KKNI), Government Regulation No. 4 of 2022 on National Education Standards, and the Indonesian Ministry of Education, Culture, Research, and Technology Regulation No. 53 of 2023 on Higher Education Quality Assurance.

The development of this curriculum is based on the evaluation of the 2020 program curriculum, the results of the tracer study, analysis of the strategic competencies of graduates in accordance with developments in IPTEKS, competency recommendations from program study associations, and accreditation criteria, both national and international. The curriculum development is also in line with the achievement of FMIPA UNY's vision to become a faculty that is excellent, creative, and innovative in a sustainable manner in education and the sciences of mathematics, natural sciences, and technology, with global competitiveness.

We extend our gratitude to all parties who have played an important role in the development of this curriculum, especially the curriculum development team, all faculty members, the Quality Assurance Unit, students, alumni, expert resource persons, and all other stakeholders.

This curriculum has been validated by the Quality Assurance Unit of FMIPA UNY to ensure its compliance with the 2025 UNY Curriculum Guide. It will be implemented in the academic year 2025/2026 and is expected to be an essential tool for the entire educational process at FMIPA UNY to prepare graduates who are excellent, creative, and innovative.

Yogyakarta, 30 April 2025
Dean,

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PREFACE

We express our gratitude to the Almighty God, for His grace and blessings, enabling us to prepare the academic manuscript of the Biology Bachelor's Program Curriculum for FMIPA UNY 2025. This academic manuscript is a crucial foundation in the learning process, aimed at preparing students to become outstanding, creative, and innovative graduates who are ready to face challenges in the workforce.

This curriculum has been developed based on the latest advancements in biology and is aligned with the national higher education standards set out in the Ministry of Education, Culture, Research, and Technology Regulation No. 53 of 2023 on Higher Education Quality Assurance. The preparation of this manuscript is also in line with the Indonesian National Qualifications Framework (KKNI). It is hoped that this academic manuscript will enrich students' learning experiences and enhance their competitiveness in the global job market. We are committed to continuously improving and developing this curriculum to remain relevant to the needs of the times and to effectively address the existing challenges.

In conclusion, we hope that this document will serve as a valuable guide for all parties involved in the education process of the Biology Bachelor's Program. We trust that this effort will support the achievement of the institution's vision and mission and contribute positively to society.

Yogyakarta, April 2025

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STUDY PROGRAM IDENTITY

Name of Study Program	:	Bachelor of Biologi
Establishment Permit	:	240/DIKTI/Kep/1997
National Accreditation Rank	:	Excellent
Accreditation Certificate Number	:	3652/SK/BAN-PT/Akred-PMT/S/I/2022
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INTRODUCTION

A. Background

Universitas Negeri Yogyakarta (UNY), as one of the leading universities, demonstrates a strong commitment to producing high-quality graduates. This commitment is realized through the reconstruction of the curriculum that is adaptive, innovative, and collaborative, as well as the application of innovative learning and adaptive, comprehensive assessment methods. The curriculum developed is expected to be more innovative, flexible, and collaborative, in line with the human resource needs of the future. This aligns with the goal of education, which is a conscious and planned effort to create an active learning environment, enabling students to fully develop their potential, including spiritual, self-control, personality, intelligence, morality, and skills required by individuals, society, the nation, and the state, as outlined in Law No. 12 of 2012.

The challenges faced by higher education institutions in curriculum development in the Era of Industry 5.0, with its various attributes in both global and regional contexts, include producing graduates who are outstanding, competitive, and adaptive in facing future challenges, equipped with relevant knowledge and skills, as well as strong moral values. As we know, the Industrial Revolution 5.0 has started, focusing on the collaboration between humans and machines to empower humans to fully utilize their skills, making work safer, more efficient, and more meaningful. Key concepts in this include automation, robotization, big data analytics, smart systems, virtualization, AI, machine learning, and the Internet of Things. These automation systems and artificial intelligence (AI) are used not only to enhance production efficiency but also to increase human involvement in the process. The expected graduates are those who can optimally contribute to national development and work in both regional and global contexts. Universities, including UNY, need to carry out reorientation and curriculum reconstruction that can address these challenges. Skills in leadership, language, IT literacy, and writing need to be adequately incorporated.

The **UNY 2025 Curriculum Development** is carried out with attention to the context of 21st Century Education, not only prioritizing mastery of a field of knowledge or expertise but also instilling various skills outlined in the 21st Century Competencies. These competencies include life and career skills, learning and innovation skills, and information, media, and technology skills. The graduates expected are those who possess comprehensive capabilities in both hard and soft skills harmoniously.

According to **Government Regulation No. 35 of 2022**, concerning the Legal Entity State University of Universitas Negeri Yogyakarta, the vision is "To become a world-class educational university that is superior, creative, and innovative in a sustainable manner." To realize this vision, **UNY 2025 Curriculum Development** integrates superior, creative, and innovative values in each stage of the curriculum implementation. This vision is elaborated in one of the missions: to provide academic, vocational, and professional education at all levels that is superior, creative, innovative, and sustainable. In the context of becoming a world-class educational university, the **UNY 2025 Curriculum** is designed to produce graduates who are of good character, able to adapt, and succeed at the regional and international levels.

B. Foundations of Curriculum Development

1. Philosophical Foundation

a. Indonesian people, as God's creations, possess divine nature that is good; they are capable of learning and training to acquire knowledge, skills, and character, forming noble behavior, intelligence, independence, creativity, and innovation.
b. Education builds the whole Indonesian person, making them a Pancasila-oriented individual, i.e., devout to the One God, humanistic, dignified, just, democratic, and upholding social values.
c. Education equips students with progressive knowledge, skills, and attitudes to thrive and be useful in life.
d. Education takes into account the characteristics, strengths, and unique needs of students, society, the progress of IPTEKS (Science and Technology), and Indonesia's cultural heritage.
e. Educators possess professional competencies, including personality, social, pedagogical, and expertise that align with their field of study, working professionally under the principles of worship, being a role model, working together to build the spirit, and supporting others.
f. Educational institutions are independent systems with authority, dignity, and full responsibility to enlighten the life of the nation.

2. Sociological Foundation

a. **Social and Cultural Change**: Indonesian society and the world, in general, are experiencing rapid social and cultural changes, especially influenced by globalization, digitalization, and technological advancements. The curriculum must accommodate these changes and prepare students to actively participate in increasingly pluralistic and dynamic societies.
b. **Workforce Needs**: The dynamics of the labor market are also an important consideration, where graduates are expected to have competencies that meet the needs of today's industry. This includes technical skills, soft skills, and the ability to adapt to rapid changes in the workplace.
c. **Social Justice and Inclusion**: The curriculum must reflect a commitment to social justice and inclusion, ensuring that all students, regardless of their socio-economic background, culture, or gender, have equal access to quality education. This also includes efforts to address educational disparities and ensure that higher education contributes to improving the quality of life for society at large.

3. Psychological Foundation

The psychological foundation serves as the basis for curriculum development aimed at fostering students' curiosity and motivating them to continuously learn and develop themselves. This foundation allows the curriculum to help students understand their roles and functions in the surrounding environment. The curriculum is also designed to stimulate students to think critically, engage in higher-order thinking, and optimize their potential to become ideal individuals. Through this approach, students are directed to become well-rounded individuals, meaning they are free, responsible, confident, moral, capable of cooperation, tolerant, and committed to contributing to the realization of the goals outlined in the preamble of the 1945 Constitution.

4. Historical Foundation

a. Based on Existing Curriculum

Curriculum development starts from the existing curriculum, namely the 2022 Curriculum. An evaluation of the 2022 Curriculum needs to be conducted to identify its strengths and weaknesses. Strengths should be continued in the next curriculum, while weaknesses should be improved, making the 2025 curriculum better.

b. Comprehensive/All-Encompassing

Curriculum development is carried out comprehensively, covering all aspects of the curriculum, such as objectives, profiles, learning outcomes, learning materials, courses (credits, semester, and sequence), learning processes, assessment processes, internships, practical work, and achievement of objectives.

c. Continuous

Curriculum development is done continuously. The program development team conducts curriculum evaluations, and the results are used to improve the next curriculum.

d. Systematic

Curriculum development is carried out systematically, following clear stages that align with the concepts of curriculum development. These stages are explained in more detail in the curriculum development process.

e. Based on Needs

Curriculum development is based on the needs of the labor market and the development of knowledge. Therefore, surveys on labor market needs, general societal needs, and future needs are essential in curriculum development.

f. Ongoing

Every lecturer can evaluate their courses and propose improvements to the curriculum development team. Minor improvements can be made at any time. Major improvements must be done through teamwork, so curriculum development can continue on an ongoing basis.

5. Legal Foundation

a. Law No. 12 of 2012 on Higher Education.
b. Government Regulation No. 4 of 2014 on the Organization of Higher Education and the Management of Universities.
c. Government Regulation No. 13 of 2015 on the Second Amendment to Government Regulation No. 19 of 2005, Jo. No. 19 of 2005 on National Education Standards.
d. Government Regulation No. 35 of 2022 on the Legal Entity of State Universities of Universitas Negeri Yogyakarta.
e. Presidential Regulation No. 8 of 2012 on the Indonesian National Qualifications Framework.
f. Ministry of Education and Culture Regulation No. 73 of 2013 on the Implementation of the Indonesian National Qualifications Framework in Higher Education.
g. Ministry of Education, Culture, Research, and Technology Regulation No. 53 of 2023 on the Higher Education Quality Assurance System.
h. Higher Education Curriculum Development Guide to support the Freedom to Learn – Merdeka Campus towards the Golden Indonesia 2024, published by the Directorate General of Learning and Student Affairs, Ministry of Research, Technology, and Higher Education.
i. Rector's Regulation No. 08 of 2025 on the UNY Curriculum Development Guide.

C. Vision, Mission, and Goals of the University and Faculty

1. Vision, Mission, and Goals of the University

i. Vision of UNY

To become a world-class educational university that is superior, creative, and innovative in a sustainable manner.

ii. Mission of UNY

a. To provide academic, vocational, and professional education that is superior, creative, and innovative in a sustainable manner;
b. To conduct research and development in the fields of science and technology, social humanities, sports and health, and arts and culture that is superior, creative, and innovative in a sustainable manner;
c. To implement community service activities that are superior, creative, and innovative for empowering and improving the welfare of society;
d. To build and maintain sustainable networks at the national and international levels;
e. To ensure transparent and accountable institutional governance, services, and quality assurance.

iii. Goals of UNY

a. To produce graduates who are superior, creative, innovative, devout, independent, and scholarly;
b. To produce discoveries, developments, and dissemination of science, technology, arts, and/or sports that benefit individuals and society, support regional and national development, and contribute to solving global issues;
c. To conduct community service and empowerment activities that encourage the development of human, community, and environmental potential to achieve societal welfare;
d. To establish networks involving communities, academia, industry, and media at both national and international levels;
e. To ensure transparent and accountable governance in the implementation of higher education autonomy.

2. Vision, Mission, and Goals of FMIPA

i. Vision of FMIPA

To become a Faculty that is superior, creative, and innovative in a sustainable manner in education and the fields of mathematics, science, and technology with global competitiveness.

ii. Mission of FMIPA

a. To provide education in the fields of mathematics, science, and technology that is superior, creative, innovative, sustainable, and globally competitive;
b. To conduct research and development in mathematics, science, and technology that is superior, creative, innovative, and globally competitive;
c. To implement community service activities in the fields of mathematics, science, and technology that are superior, creative, and innovative for the empowerment and welfare of society;
d. To build and maintain sustainable networks in the fields of mathematics, science, and technology at both national and international levels; dan
e. To ensure transparent and accountable governance, services, and quality assurance in FMIPA UNY.

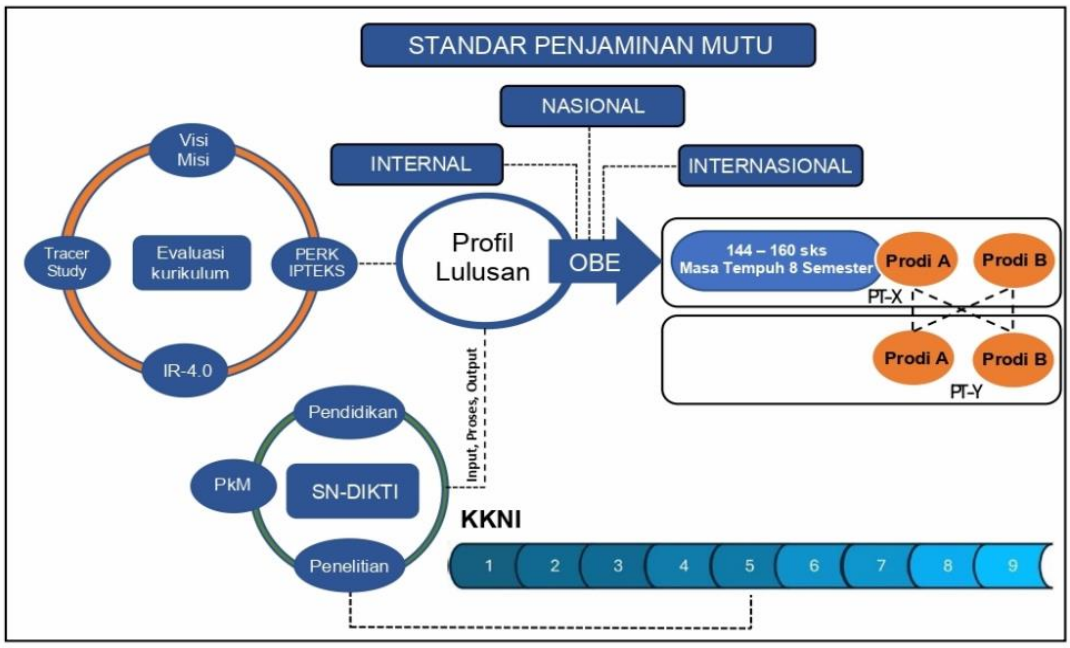
iii. Goals of FMIPA

a. To produce graduates in mathematics, science, and technology education who are superior, creative, innovative, devout, independent, scholarly, and globally competitive.

b. To produce products and innovations in mathematics, science, and technology education that benefit individuals and society, supporting regional and national development, and contributing to solving global problems.
c. To conduct community service and empowerment activities in mathematics, science, and technology that encourage the development of individual, community, and environmental potential for societal welfare;
d. To establish partnerships in the fields of mathematics, science, and technology that are sustainable at national and international levels; and
e. To ensure effective, efficient, transparent, and accountable governance in the implementation of the Tridharma (Three Pillars) of Higher Education in FMIPA UNY.

D. Curriculum Development Stages

The curriculum development procedure at UNY follows the **Higher Education Curriculum Preparation Guide** for the 4.0 Era, **Ministry of Education, Culture, Research, and Technology Regulation No. 53 of 2023** on Higher Education Quality Assurance, the **Indonesian National Qualifications Framework** (Presidential Regulation No. 8 of 2012), **Outcome-Based Education (OBE)**, and the requirements for **International Accreditation** as shown in **Figure 1**.

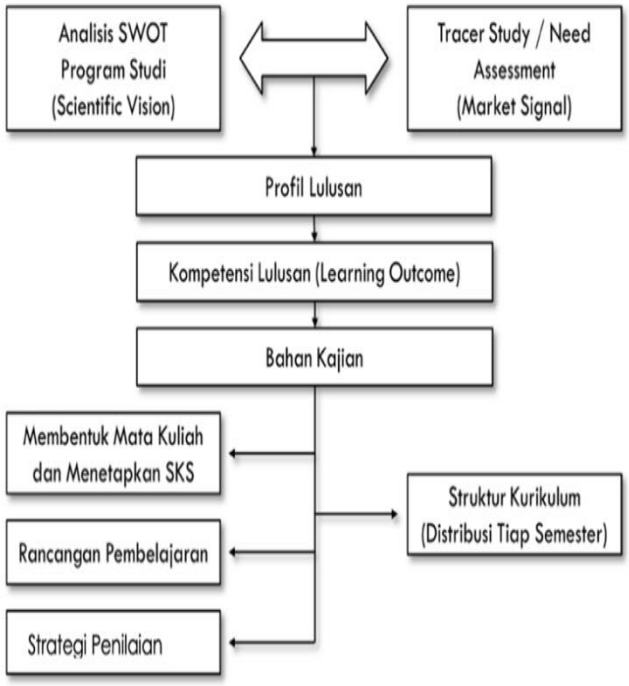


Gambar 1. General curriculum development flow for all levels of study programs at UNY.

Curriculum development is carried out through stages of needs analysis (market signals) that result in graduate profiles, and studies conducted by the study programs according to the biological discipline (scientific vision), which generate study materials. Subsequently, from these two results, Learning Outcomes (LO), courses, and their respective credit weights are formulated.

The curriculum development process begins with a needs analysis (market signals) through curriculum evaluation, which includes measuring the achievement of LO in the current curriculum, tracer studies, input from employers, alumni, and field experts. Curriculum evaluation is also conducted by reviewing the developments in science and technology in relevant fields, the labor market needs, as well as the vision and values developed by the institution (scientific vision).

The needs analysis stage (market signals) and studies conducted by the study programs according to their scientific discipline (scientific vision) result in the graduate profile. Based on this graduate profile, the Learning Outcomes (CPL), study materials, courses, credit weights, and curriculum structure are formulated. The next stage is the formulation of teaching and assessment strategies. These stages are schematically presented in **Figure 2**.



Gambar 2. Stages of Curriculum Development

Stages of curriculum development as illustrated in **Figure 1**, the stages of curriculum development can be described in detail as follows:

1. Establishing Graduate Profiles

   The graduate profile refers to the roles that graduates can perform in specific fields of expertise or work after completing their studies. The profile is determined based on studies of the labor market needs required by the government, businesses, and industries, as well as the needs for developing science and technology. The graduate profile of a study program is formulated by a group of similar study programs, so that an agreement can be reached and accepted as a national reference. To perform the roles stated in the profile, graduates must have the competencies outlined in the formulation of Learning Outcomes (LO).

2. Formulating Graduate Learning Outcomes (LO)
   The determination of LO is formulated by integrating the values of attitude, knowledge, and skills that reflect students' achievements at the end of their higher education program. The formulation of learning outcomes integrates values of attitude, knowledge, and skills (as per the Ministry of Education, Culture, Research, and Technology Regulation No. 53 of 2023).
3. Determining Study Materials
   Each item in the study program's LO contains study materials that will be used to form courses. These study materials may include one or more branches of knowledge and its sub-branches, or a group of knowledge that has been integrated into a new body of knowledge agreed upon by similar study program forums as the characteristic of the study program's field of knowledge. These study materials are then elaborated into more detailed learning materials. The breadth and depth of the learning materials refer to the LO.
4. Course Formation and Determining Credit Weights
   The formation of courses for the current curriculum is carried out by evaluating each course in relation to the LO that has been previously determined. Evaluation is conducted by examining how well each course (learning materials, assignments, exams, and assessments) is connected to the formulated LO. New courses are created based on several LO elements assigned to them. The credit weight of a course is interpreted as the amount of time students need to acquire the competencies formulated in that course. Determining the estimated credit weight includes factors such as: the level of competency to be achieved; the depth and breadth of the learning materials to be mastered; and the teaching/learning methods chosen to achieve these competencies.
5. Curriculum Structure Formulation
   The organization of courses in the curriculum structure must be done carefully and systematically to ensure that the learning stages for students are appropriate, ensuring that learning is conducted efficiently and effectively to achieve the program's LO. The organization of courses in the curriculum structure includes both horizontal and vertical organization. The horizontal organization within a semester aims to broaden the scope and skills of students in a wider context. Meanwhile, the vertical organization across semesters aims to deepen students' mastery of competencies according to the difficulty level of learning, to achieve the LO of the program.
6. Planning the Learning Process
   Planning the learning process involves formulating: (a) learning outcomes that become learning objectives; (b) strategies and teaching methods to achieve the learning objectives; and (c) methods of assessing the achievement of learning outcomes. The implementation of the learning process is carried out in a structured manner according to the instructions of the lecturer(s) with specific teaching methods and strategies. Learning is a process of interaction between students and lecturers and learning resources in a learning environment. The implementation of the learning process is organized with: (a) creating an enjoyable, inclusive, collaborative, creative, and effective learning atmosphere; (b) providing equal learning opportunities regardless of students' educational, social, economic, cultural, language backgrounds, admission pathways, or special needs; (c) ensuring the safety, comfort, and well-being of the academic community; and (d) providing flexibility in the educational process to facilitate lifelong learning.

7. Planning Learning Assessment

   The assessment of the learning process is an activity that evaluates the planning and implementation of the learning process to improve the learning process. The assessment of the learning process is carried out by lecturers and/or the teaching team in coordination with the program management unit. The assessment of students' learning outcomes is carried out in a valid, reliable, transparent, accountable, fair, objective, and educational manner. Student learning outcomes are assessed through formative and summative assessments. Formative assessments aim to: (a) monitor students' learning progress; (b) provide feedback to help students meet their learning outcomes; and (c) improve the learning process. Meanwhile, summative assessments aim to evaluate students' achievement of learning outcomes as a basis for determining course and program completion, based on meeting the graduate learning outcomes. Summative assessments are conducted through written exams, oral exams, project assessments, task assessments, competency tests, and/or other similar assessment forms.

BACHELORE OF BIOLOGY CURRICULUM

A. Rationale

In 2025, Universitas Negeri Yogyakarta (UNY) published the latest **Curriculum Development Guide**. This publication is outlined in **Rector's Regulation No. 08 of 2025** concerning the UNY Curriculum Development Guide. This is a follow-up to **Ministerial Regulation No. 53 of 2023** on quality assurance in higher education, which also regulates the curriculum for undergraduate, master's, and doctoral programs. There are several key policy points related to the undergraduate curriculum, including course types, final project formats, and study load. As a result, a review and revision of the **Biology Bachelor's Program Curriculum** at UNY is necessary to align with these policies.

The **Era of the Fourth Industrial Revolution (Industry 4.0)** and the **Revolution of Society 5.0** have had a profound impact on various aspects of life, including academic life in higher education for the biology undergraduate program. In facing the challenges of **Industry 4.0** and **Society 5.0**, biology graduates must be capable of critical and systemic thinking, effective communication, collaboration, entrepreneurship, mastering new literacy (technology literacy, data literacy, and humanities literacy), and lifelong learning. Consequently, the Biology Bachelor's Program requires a well-designed curriculum alongside highly qualified lecturers capable of producing graduates who can meet these challenges. The 21st century is an era of disruption. This era is marked by rapid and unpredictable changes. Innovations emerge rapidly and unexpectedly, altering or even destroying the dominance of previous systems. These innovations are accompanied by fast accelerations. The era of disruption demands that biology graduates and lecturers master digital technologies, be adaptive, possess innovation skills, be anticipatory, and have a futuristic mindset.

One principle in curriculum development is that "curriculum development is more effective if it is a comprehensive process." Curriculum development must be comprehensive, covering all aspects such as objectives, content, processes, and evaluation. The curriculum development process is based on the **Indonesian National Qualifications Framework (KKNI)**, **Outcome-Based Education (OBE)**, the progression of time, and new government policies. A review of the **2022 Curriculum**, involving alumni, employers, lecturers, and students, has produced several curriculum evaluation points that need to be considered in the curriculum revision. Some of these points include: 1) the study program's vision should align with the new university vision; 2) several courses need to be reviewed to make them more relevant to developments in IPTEKS (Science and Technology); 3) adding courses that can provide specific experiences for students and strengthen their character to face the job market; 4) incorporating concepts and ideas such as developing an entrepreneurial spirit, AI-based learning, and ensuring the distribution of courses aligns with program objectives.

The **2025 Biology Bachelor's Program Curriculum** revision is carried out comprehensively and systematically. This is done to accommodate as many inputs, suggestions, issues, and considerations as possible, including the characteristics of the study program and how the curriculum is accepted by other institutions, both domestically and internationally. The revision of the **2025 Biology Bachelor's Program Curriculum** includes adjustments to the study program's vision and mission, changes in the graduate profile, mechanisms for forming courses, semester-based curriculum structure, learning outcomes, course descriptions, and the preparation of the **Semester Learning Plan**.

B. Evaluation dan Tracer Study

1. Results of the Curriculum Evaluation and Tracer Study

Table 1 is a summary of the curriculum evaluation results of the study program that can be adjusted according to the needs of the program

Table 1. Summary of Curriculum Evaluation and Tracer Study Results

Input Content	Importance Level (v)					Accepted (v)	
	5	4	3	2	1	Yes	No
A. Input and Needs from Alumni							
1. Courses need to be added based on updates or through alumni questionnaires regarding courses needed in the workforce.		v				v	
2. There should be a course discussing the use of AI in education		v				v	
3. The curriculum still needs to be updated to match the demands of the workforce and current digital advancements.		v				v	
4. It would be better to include adolescent psychology to help become outstanding and respectful individuals, especially in the workplace.		v					v
B. Input and Needs from Employers							
1. The old curriculum was good, but more courses should be added, such as mycology and toxicology			v			v	
2. The assessment description is still relevant, but there should be more case studies and discussions to support learning.		v				v	
3. The value scope can be more varied by adding case studies and practical aspects.		v				v	
4. The elective courses are already quite varied, but it is recommended that they be more interactive and discussion-based.		v				v	
C. Input and Needs from Students							
1. Most student respondents stated that the vision and mission are still relevant, but some pointed out the need to include sustainability aspects.		v				v	
2. It is necessary to add sustainability aspects, IT skills, and English proficiency.		v				v	
3. The graduate profile is still relevant to the development of IPTEKS and the labor market, but it should be expanded to include professions such as laboratory technicians, environmental consultants, and quality control.		v					v
4. It should follow developments in IPTEKS, especially in laboratory skills and biological techniques.	v					v	

5. In the attitude domain, particularly LO 3, the aspect of "law-abiding" could be emphasized, such as promoting an anti-corruption culture.			v				v
6. Courses such as logic and critical thinking, communication, IT, medical microbiology, and digitization of biological objects need to be added.		v					v
7. Suggestion for flexibility in course selection across semesters		v					v
8. Suggestion to add courses related to medical microbiology, molecular analysis methods, metabolomics, and digitization of biological objects		v				v	
D. Input and Needs from Educational Staff							
1. The use of modern technology, biology-based entrepreneurship, and international collaboration should be incorporated.	v					v	
2. It is recommended that the vision and mission emphasize bioinformatics, biotechnology, conservation, sustainability, and collaboration with various parties, including industry and academia.	v					v	
3. The graduate profile is still relevant to the labor market and IPTEKS developments but should be strengthened with competencies in bioinformatics, digital biotechnology, and biological policy.	v					v	
4. Most CPLs are still relevant, but they need to be updated to align with trends in bioinformatics, AI, industrial biotechnology, and sustainability.	v					v	
5. It is necessary to introduce technology- and research-based courses earlier in the curriculum.		v				v	
6. It is suggested that the composition of courses be more flexible with more choices based on specialization and industry trends.		v				v	
7. Some elective courses are proposed to become mandatory, such as environmental management and bioindustry, as well as adding options related to modern biotechnology.		v				v	
8. The assessment methods are still relevant, but more project-based evaluations, industry skills assessments, and bioinformatics research simulations are needed.		v				v	
E. Input and Needs from Lecturers							
1. The vision and mission of the study program need to be updated to better align	v						

with the faculty and university vision, as well as developments in IPTEKS, especially in biotechnology and sustainability.							
2. Suggested changes in the wording of the vision and mission by adding aspects of technobiology, biological science, and its applications for human survival and biodiversity preservation.		v				v	
3. The graduate profile is still relevant, but needs to be adjusted to the MIPA 2023-2026 strategic plan and the latest recommendations from KOBI.	v					v	
4. The graduate profile should include competencies as academics, research assistants, and entrepreneurs in biology and biological technology.	v					v	
5. Most CPLs are still relevant but need updating by adding proficiency in information technology and the latest biological techniques.		v				v	
6. Some courses need to be reviewed to align better with IPTEKS developments and add the latest materials like multiomics, biotechnology, and biodiversity conservation.		v				v	
7. Suggestions to add courses such as Mammalogy, Biospeleology, and Animal Ecology, while reducing redundancy in courses with similar competencies.		v				v	
8. The composition of mandatory and elective courses should be re-evaluated to be more flexible and align with IPTEKS developments and university policies.		v				v	
9. Elective courses should be reviewed, adding more specific areas such as biological science curators and applied ecology.		v					v
10. Revisions are needed in course descriptions to prevent overlap and emphasize case studies and project-based learning.	v					v	

Notes: 5 = Very Important, 4 = Important, 3 = Quite Important, 2 = Not Important, 1 = Very Not Important

2. Formulation of Curriculum Changes for the Study Program

The description of curriculum changes can be summarized according to the components of the curriculum as follows.

Table 2. Dimensions of Changes Based on Curriculum Evaluation and Tracer Study Results

Change Component	Curriculum 2022	Curriculum 2025
1. Graduate Profile	1. Biologist 2. Assistant Biology Researcher 3. Entrepreneur in Biology.	1. Biology Academic 2. Biology Researcher 3. Biology Practitioner 4. Entrepreneur in Biology
2. Vision and Mission of the Program	**Vision** By 2025, the Biology Study Program of FMIPA UNY aims to become an internationally recognized institution for producing Biology Graduates who are devout, independent, scholarly, creative, innovative, and globally-minded. **Mission** 1) To provide undergraduate education in Biology based on piety, independence, intellect, and global awareness. 2) To conduct research and development in Biology and its applications. 3) To provide community service in the field of Biology. 4) To develop entrepreneurship in the field of Biology.	**Vision** To develop the science of Biology and applied Biology by harnessing local potential with a focus on sustainable development to support outstanding, creative, innovative, and globally-minded graduates.. **Mission** 1) To provide education in the field of Biology and applied Biology that is superior, creative, and innovative. 2) To conduct research and development in Biology and applied Biology based on local potential. 3) To conduct community service in the field of Biology and applied Biology that is superior, creative, and innovative for the empowerment and well-being of society in support of sustainable development. 4) To ensure governance, quality assurance, and networks in Biology and applied Biology in a local, national, and global context. 5) To offer superior, creative, and innovative entrepreneurship education based on Biology and applied Biology.
3. Graduate Learning Outcomes (LO)	Attitudes LO 1: Possess religious values, humanitarian values, and environmental awareness. LO 2: Demonstrate nationalism and responsibility to the state by contributing to improving the quality of life in society based on Pancasila.	LO 1: Demonstrate religious, humanitarian, nationalism values, and environmental awareness. LO 2: Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying Biology.

		LO 3	Be law-abiding and disciplined in societal and national life, internalizing academic values, norms, and ethics.	LO 3	Master the principles and applications of Biology, biological resources, and the environment.
		LO 4	Be adaptive, creative, and innovative in applying Biology and related sciences.	LO 4	Master the principles and applications of software, basic instruments, methods for analysis and synthesis in general and specific areas of Biology.
	Knowledge	LO 5	Master the core structure of Biology to solve problems in the field of Biology (problem-solving) and as a foundation for mastering related sciences.	LO 5	Apply logical, critical, systematic, and innovative thinking in the context of developing or implementing science and/or technology while utilizing local potential in the relevant expertise.
		LO 6	Master biological laboratory techniques and equipment, and the methodology used to acquire biological knowledge.	LO 6	Apply scientific skills to solve problems in Biology by utilizing local potential based on analysis of information and data.
	General Skills	LO 7	Possess managerial skills to supervise and evaluate subordinates, and optimize networks for professional development.	LO 7	Formulate solutions to Biology-related problems using relevant biological knowledge, methods, and technology in a monodisciplinary manner.
		LO 8	Possess scientific communication skills for public speaking at local, national, and international forums.	LO 8	Create creative ideas in managing biological resources and the environment in a specific scope.
	Specialized Skills	LO 9	Be skilled in applying biological techniques in the laboratory and daily life.	LO 9	Create job opportunities based on biological science.
		LO 10	Be skilled in utilizing local potential in line with interests in the field of Biology.		
		LO 11	Able to build a career or create job opportunities/entrepreneurship in Biology.		
4. Study Materials	Not explicitly stated			There are 6 Study Materials	

C. Vision, Mission, and Goals of the Study Program

1. Academic Vision of the Study Program

To develop the science of Biology and applied Biology by leveraging local potential with a focus on sustainable development to support graduates who are outstanding, creative, innovative, and globally-minded.

2. Mission of the Study Program

The Biology Study Program at FMIPA UNY has the following missions:

a. To provide education in the fields of Biology and applied Biology that is superior, creative, and innovative.

b. To conduct research and development in Biology and applied Biology that is superior, creative, and innovative, based on local potential.
c. To conduct community service activities in the fields of Biology and applied Biology that are superior, creative, and innovative for the empowerment and well-being of society in support of sustainable development.
d. To ensure governance, quality assurance, and networks in the fields of Biology and applied Biology that are superior, creative, and innovative in a local, national, and global context.
e. To offer entrepreneurship education that is superior, creative, and innovative, based on the sciences of Biology and applied Biology.

3. Goals of the Study Program

a. Goals of the Study Program (TP)

TP1 : To produce graduates who have competencies as academics in Biology and its applications that are superior, creative, innovative, and globally competitive.

TP2 : To produce graduates who have competencies as researchers in Biology and its applications that are superior, creative, innovative, and globally competitive.

TP3: To produce graduates who have competencies as Biology practitioners that are superior, creative, innovative, and globally competitive.

TP4: To produce graduates who are capable of pursuing careers and/or creating job opportunities in Biology that can provide accountable and credible contributions to society.

b. Alignment of the Study Program Goals with the Vision of the Program, Faculty, and University

The alignment between the goals of the study program and the vision of the program, faculty, and university is as follows.

Table 3. Matrix of Alignment Between Study Program Goals (TP) and the Vision of the Higher Education Institution, Faculty, and Program

TP	UNY Vision			FMIPA Faculty Vision			Program's Academic Vision		
	Excellent	Creative	Innovative & Sustainable	Excellent	Creative	Innovative & Sustainable	Excellent	Creative	Innovative & Sustainable
TP 1	v			v			v		
TP 2	v			v			v		
TP 3		v	v		v	v		v	v
TP 4		v	v		v	v		v	v

c. Alignment of the Study Program Goals with KKNI

The competency level in the Indonesian National Qualifications Framework (KKNI) for undergraduates is Level 6. Below is the alignment of the study program's goals (TP) with the KKNI Level 6 descriptor for undergraduates.

Table 4. Alignment of the Biology Study Program Goals with KKNI Level 6

KKNI Level 6 Descriptors	Study Program Goals			
	TP1	TP2	TP3	TP4
Able to apply their expertise and use science and technology (IPTEKS) to solve problems and adapt to the situations they face.	T	T	T	S
Master theoretical concepts in a particular field of knowledge generally and more deeply in its specialized parts, and able to formulate solutions for procedural problems.	T	T	S	S

Able to make decisions based on the analysis of information and data, and able to provide guidance in selecting various alternative solutions, independently or in groups.	S	S	S	T
Responsible for their own work and can be entrusted with responsibility for the achievement of organizational results.	T	T	T	T

T = High S = Medium R = Low

D. Graduate Profile

1. Graduate Profile and Profile Description

Table 5. Graduate Profile Description

Graduate Profile	Profile Description
Biology Academic	Has outstanding, creative, and innovative qualifications and competencies, sustained up to the highest level as a biology academic.
Biology Researcher	Able to conduct research that contributes to solving biological problems in various institutions or agencies related to the field of Biology.
Biology Practitioner	Has qualifications to work in government or private institutions or agencies related to the field of Biology.
Entrepreneur in Biology	Has knowledge and competencies in entrepreneurship in the field of Biology, able to make accountable and credible contributions to society.

2. Alignment of Graduate Profiles with the Goals of the Study Program

Table 6. Alignment of Graduate Profiles with the Goals of the Biology Bachelor's Program at FMIPA UNY

Graduate Profile	TP 1	TP 2	TP 3	TP 4
Biology Academic	V			
Biology Researcher		V		
Biology Practitioner			V	
Entrepreneur in Biology				V

E. Graduate Learning Outcomes

1. Formulation of Graduate Learning Outcomes

Table 7. Graduate Learning Outcomes (LO) of the Biology Bachelor's Program

No	Graduate Learning Outcomes (LO)
LO-1	Demonstrates religious, humanitarian, nationalism attitudes, and environmental awareness.
LO-2	Demonstrates adaptive, critical, creative, collaborative, and innovative attitudes in applying Biology.
LO-3	Master the principles and applications of Biology, biological resources, and the environment.
LO-4	Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in general and specific areas of Biology.
LO-5	Apply logical, critical, systematic, and innovative thinking in the development or implementation of science and/or technology by leveraging local potential in the relevant field of expertise.

No	Graduate Learning Outcomes (LO)
LO-6	Apply scientific skills in solving problems in the field of Biology by utilizing local potential based on the analysis of information and data.
LO-7	Formulate solutions to Biology-related problems by applying relevant biological knowledge, methods, and technology in a monodisciplinary manner.
LO-8	Develop creative ideas in managing biological resources and the environment within a specific scope.
LO-9	Create job opportunities based on biological science.

2. Alignment of Graduate Learning Outcomes with the Study Program

The alignment of Graduate Learning Outcomes (LO) with the Study Program Goals can be presented in **Table 8**..

Table 8. Alignment Between LO and the Goals of the Biology Bachelor's Program

Graduate Learning Outcomes (LO)	TP 1	TP 2	TP 3	TP 4
LO1: Demonstrates religious, humanitarian, nationalism attitudes, and environmental awareness.	T	T	T	T
LO2: Demonstrates adaptive, critical, creative, collaborative, and innovative attitudes in applying Biology.	T	T	T	T
LO3: Master the principles and applications of Biology, biological resources, and the environment.	S	T	T	S
LO4: Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in general and specific areas of Biology.	T	T	S	R
LO5: Apply logical, critical, systematic, and innovative thinking in the development or implementation of science and/or technology by leveraging local potential in the relevant field of expertise.	T	T	S	S
LO6: Apply scientific skills in solving problems in the field of Biology by utilizing local potential based on the analysis of information and data.	T	T	S	S
LO7: Formulate solutions to Biology-related problems by applying relevant biological knowledge, methods, and technology in a monodisciplinary manner.	T	T	T	R
LO8: Develop creative ideas in managing biological resources and the environment within a specific scope.	S	S	T	T
LO9: Create job opportunities based on biological science.	R	R	R	T

T = High S = Medium R = Low

3. Alignment of Graduate Learning Outcomes with the Graduate Profile

The alignment of Graduate Learning Outcomes (LO) with the Graduate Profile can be presented in **Table 9**.

Table 9. Table of Alignment between Graduate Learning Outcomes and Graduate Profile

Graduate Profile	CPL								
	1	2	3	4	5	6	7	8	9
Biology Academic	T	T	S	T	T	T	T	S	R
Biology Researcher	T	T	T	T	T	T	T	S	R
Biology Practitioner	T	T	T	S	S	S	T	T	R
Entrepreneur in Biology	T	T	S	R	S	S	R	T	T

T = high S = medium R = low

F. Study Materials and Courses

Each item of the Program Learning Outcomes (PLO) contains areas of study that serve as the foundation for developing courses. These areas of study may consist of one or more branches and sub-branches of science, or a group of knowledge fields that have been integrated into a new, recognized body of knowledge—agreed upon by the forum of similar study programs—as a defining characteristic of the program's discipline.

From these areas of study, more detailed learning materials are then derived. Both the areas of study and the learning materials may be updated or further developed in accordance with advancements in science, technology, and the direction of the program's academic development.

The process of determining the areas of study should involve the academic divisions or laboratories within the study program. The formation of a course based on the selected areas of study may begin by creating a matrix that links the PLOs with the areas of study to ensure their alignment (see Table 10 and Table 11).

Table 10. Groups of Study Areas and Courses

Study Areas	Courses	Credit Hours
A. Personality Development	Religious Education	2
	Citizenship Education	2
	Pancasila	2
	Indonesian Language	2
	English for Specific Purposes	2
	Physical Education and Fitness	2
	Education and Sustainable Development	2
	Perspectives and Studies in Mathematics and Natural Sciences (MIPA)	2
B. Core Studies of National Biology		
B.1. Basic Biology	Basic Biology	3
B.2. Introduction to Biotechnology	Biotechnology	2
	Biotechnology Laboratory	1
B.3. Branches/Subfields of Biology		
B.3.1. Cell and Molecular Biology	Biochemistry	2
	Biochemistry Laboratory	1
	Cell and Molecular Biology	2
	Cell and Molecular Biology Laboratory	1
B.3.2. Physiology	Plant Physiology	2
	Plant Physiology Laboratory	2
	Animal Physiology	2
	Animal Physiology Laboratory	2
	Plant Ecophysiology	*2*
	Plant Ecophysiology Laboratory	*1*
B.3.3. Genetics	Genetics	2
	Genetics Laboratory	1
	Molecular Genetics	*2*
B.3.4. Structure and Development	Plant Morphology	2
	Plant Morphology Laboratory	1
	Plant Anatomy	2
	Plant Anatomy Laboratory	1
	Animal Anatomy and Histology	2
	Animal Anatomy and Histology Laboratory	2
	Plant Developmental Biology	2
	Plant Developmental Biology Laboratory	1
	Animal Developmental Biology	2
	Animal Developmental Biology Laboratory	1
B.3.5. Evolution	Evolution	2
	Evolution Laboratory	1
B.3.6. Biosystematics and Taxonomy	Invertebrate Biology	2
	Invertebrate Biology Laboratory	2
	Vertebrate Biology	2
	Vertebrate Biology Laboratory	2
	Plant Systematics	2
	Plant Systematics Laboratory	1
	Entomology	*2*
	Entomology Laboratory	*1*
	Herpetology	*2*
	Herpetology Laboratory	*1*
	Ichthyology	*2*
	Ichthyology Laboratory	*1*
	Mammalogy	*2*
	Mammalogy Laboratory	*1*
	Ornithology	*2*

Study Areas	Courses	Credit Hours
	Praktikum Ornitologi	*1*
B.3.7. Ecology	Ecology	2
	Ecology Laboratory	1
	Aquatic Ecology	2
	Aquatic Ecology Laboratory	1
B.4. Microbiology	Microbiology	2
	Microbiology Laboratory	1
	Applied Microbiology	2
	Applied Microbiology Laboratory	1
	Mycology	*2*
	Mycology Laboratory	*1*
C. Studies of Indonesian Biology (Mega Biodiversity)	Conservation Biology	1
	Conservation Biology Laboratory	2
	Biotropics	*2*
	Biotropics Laboratory	*1*
D. Institutional Biology Studies	Field Study / Excursion	3
	Mikroteknik	1
	Microtechniques Laboratory	2
	Bioinformatics	2
	Plant Cultivation	1
	Plant Cultivation Laboratory	2
	Animal Cultivation	1
	Animal Cultivation Laboratory	2
	Environmental Science	2
	Environmental Science Laboratory	1
	Plant Tissue Culture	1
	Plant Tissue Culture Laboratory	2
	Modern Biological Analysis	*2*
	Soil Biology	*2*
	Soil Biology Laboratory	*1*
	Bioremediation	*2*
	Bioremediation Laboratory	*1*
	Biospeleology	*2*
	Economic Botany	*2*
	Endocrinology	*2*
	Endocrinology Laboratory	*1*
	Enzymology	*2*
	Enzymology Laboratory	*1*
	Ethnobotany	*2*
	Ethnobotany Laboratory	*1*
	Phytohormones	*2*
	Phytohormones Laboratory	*1*
	Immunology	*2*
	Immunology Laboratory	*1*
	Food Safety	*2*
	Food Safety Laboratory	*1*
	Parasitology	*2*
	Parasitology Laboratory	*1*
	Environmental Management	*2*
	Environmental Management Laboratory	*1*
	Marine Biology	*2*
	Marine Biology Laboratory	*1*
	Human Biology and Nutrition	*2*
	Human Biology and Nutrition Laboratory	*1*
	Phytopharmacy	*2*

Study Areas	Courses	Credit Hours
	Phytopharmacy Laboratory	*1*
E. *Soft Skills and Competency Enhancement (MBKM)*	Fieldwork Practice	6
	Community Service Program	6
F. Scientific Reasoning Content	Basic Statistics	2
	Research Methodology	3
	Experimental Design in Biology	2
	Experimental Design Laboratory	1
	Seminar	2
	Final Project	8

* Italicized text indicates elective courses.

Table 11. Alignment of Graduate Learning Outcomes, Study Materials, and Courses

Study Materials	CPL								
	1	2	3	4	5	6	7	8	9
A	MWK60201 MWK60202 MWK60203 MWK60204 MWK60205 MWK60206 MWK60207 MWK60208 MWU60203 FMI60201	MWU60202 MWU60203 FMI60201			MWK60209 MWU60201				
B.1.		BLG60301	BLG60301	BLG60301					
B.2.			BLG60220	BLG60110	BLG60220		BLG60220		
B.3.1			BLG60201	BLG60101 BLG60104	BLG60201		BLG60201		
B.3.2			BLG60209 BLG60218 BLG60240	BLG60210 BLG60219 BLG60124	BLG60209 BLG60218 BLG60240	BLG60210 BLG60219	BLG60209 BLG60218 BLG60240		
B.3.3			BLG60214 BLG60246	BLG60106	BLG60214 BLG60246		BLG60214 BLG60246		
B.3.4			BLG60204 BLG60205 BLG60211 BLG60217 BLG60221	BLG60212 BLG60102 BLG60103 BLG60109 BLG60111	BLG60204 BLG60205 BLG60211 BLG60217 BLG60221	BLG60212	BLG60204 BLG60205 BLG60211 BLG60217 BLG60221		
B.3.5			BLG60231	BLG60120	BLG60231		BLG60231		
B.3.6.			BLG60202 BLG60207 BLG60216 BLG60242 BLG60247 BLG60248 BLG60251 BLG60253	BLG60203 BLG60208 BLG60108 BLG60126 BLG60130 BLG60131 BLG60134 BLG60136	BLG60202 BLG60207 BLG60216 BLG60242 BLG60247 BLG60248 BLG60251 BLG60253	BLG60203 BLG60208	BLG60202 BLG60207 BLG60216 BLG60242 BLG60247 BLG60248 BLG60251 BLG60253		
B.3.7			BLG60213 BLG60230	BLG60105 BLG60119	BLG60213 BLG60230		BLG60213 BLG60230		
B.4			BLG60222 BLG60215 BLG60252	BLG60107 BLG60112 BLG60135	BLG60215 BLG60252		BLG60215 BLG60252	BLG60222	BLG60222 BLG60112
C			BLG60238	BLG60229	BLG60118 BLG60238	BLG60229	BLG60118 BLG60238	BLG60229	
D			BLG60223 BLG60234 BLG60235 BLG60236 BLG60237 BLG60241 BLG60243 BLG60244 BLG60245 BLG60249 BLG60254 BLG60255 BLG60256 BLG60258	BLG60224 BLG60225 BLG60226 BLG60227 BLG60113 BLG60114 BLG60234 BLG60122 BLG60123 BLG60125 BLG60127 BLG60128 BLG60132 BLG60133	BLG60302 BLG60228 BLG60235 BLG60236 BLG60237 BLG60241 BLG60243 BLG60244 BLG60245 BLG60249 BLG60250 BLG60254 BLG60256 BLG60115	BLG60302 BLG60224 BLG60225 BLG60226 BLG60239	BLG60302 BLG60223 BLG60235 BLG60236 BLG60237 BLG60241 BLG60243 BLG60244 BLG60245 BLG60249 BLG60250 BLG60254 BLG60255 BLG60256	BLG60302 BLG60223 BLG60227 BLG60228 BLG60113 BLG60116 BLG60117 BLG60239 BLG60250 BLG60255 BLG60258	BLG60227 BLG60228 BLG60116 BLG60117 BLG60239 BLG60258

				BLG60136 BLG60137 BLG60138 BLG60139 BLG60140 BLG60141			BLG60115		
E	MLK60605	MLK60602 MLK60605			MLK60602 MLK60605	MLK60602 MLK60605	MLK60602 MLK60605	MLK60602 MLK60605	MLK60602 MLK60605
F		MKK60801	MKK60301 MKK60801 BLG60232 BLG60233 BLG60233	FMI60202 MKK60301 MKK60801 BLG60232 BLG60233 BLG60121 BLG60233	MKK60301 MKK60801	MKK60301 MKK60801 BLG60233 BLG60233	MKK60801	MKK60801 BLG60232 BLG60233 BLG60233	

Explanation

A. Personality Development
B. Core Studies of National Biology
   B.1. Basic Biology
   B.2. Introduction to Biotechnology
   B.3. Branches/Subfields of Biology
      B.3.1. Cell and Molecular Biology
      B.3.2. Physiology
      B.3.3. Genetics
      B.3.4. Structure and Development
      B.3.5. Evolution
      B.3.6. Biosystematics and Taxonomy
      B.3.7. Ecology
   B.4. Microbiology
C. Biological Studies of Indonesia (Mega Biodiversity)
D. Institutional Biology Studies
E. Soft Skills and Competency Enhancement (MBKM)
F. Scientific Reasoning Content

Table 12. Matrix of the Relationship between Graduate Learning Outcomes (CPL) and Courses, including Credit Hour Allocation

No	Code	Course Name	CPL									Kredit Hours
			CPL 1	CPL 2	CPL 3	CPL 4	CPL 5	CPL 6	CPL 7	CPL 8	CPL 9	
1	MWK60201	Islamic Religious Education *	√									2
2	MWK60202	Catholic Religious Education *	√									2
3	MWK60203	Protestant Christian Religious Education *	√									2
4	MWK60204	Hindu Religious Education *	√									2
5	MWK60205	Buddhist Religious Education *	√									2
6	MWK60206	Confucian Religious Education *	√									2
7	MWK60207	Civic Education	√									2
8	MWK60208	Pancasila	√									2
9	MWK60209	Indonesian Language					√					2
10	MWU60201	English for Specific Purposes					√					2
11	MWU60202	Physical Education and Fitness		√								2
12	MWU60203	Education and Sustainable Development	√	√								2
13	FMI60201	Perspective and Studies in Mathematics and Natural Sciences	√	√								2
14	FMI60202	Basic Statistics				√						2
15	MLK60602	Fieldwork Practice		√			√	√	√	√	√	6
16	MLK60605	Community Service Program	√	√			√	√	√	√	√	6
17	MKK60301	Research Methodology			√	√	√	√				3
18	MKK60801	Final Project		√	√	√	√	√	√	√		8
19	BLG60301	Basic Biology		√	√	√						3
20	BLG60302	Field Study / Excursion					√	√	√	√		3
21	BLG60201	Biochemistry			√		√		√			2
22	BLG60202	Invertebrate Biology			√		√		√			2
23	BLG60203	Invertebrate Biology Laboratory				√		√				2
24	BLG60204	Plant Morphology			√		√		√			2
25	BLG60205	Plant Anatomy			√		√		√			2
26	BLG60206	Cell and Molecular Biology			√		√		√			2
27	BLG60207	Vertebrate Biology			√		√		√			2
28	BLG60208	Vertebrate Biology Laboratory				√		√				2
29	BLG60209	Plant Physiology			√		√		√			2
30	BLG60210	Plant Physiology Laboratory				√		√				2
31	BLG60211	Animal Anatomy and Histology			√		√		√			2
32	BLG60212	Animal Anatomy and Histology Laboratory				√		√				2
33	BLG60213	Ecology			√		√		√			2
34	BLG60214	Genetics			√		√		√			2
35	BLG60215	Microbiology			√		√		√			2
36	BLG60216	Plant Systematics			√		√		√			2
37	BLG60217	Plant Developmental Biology			√		√		√			2
38	BLG60218	Animal Physiology			√		√		√			2
39	BLG60219	Animal Physiology Laboratory				√		√				2
40	BLG60220	Biotechnology			√		√		√			2

41	BLG60221	Animal Developmental Biology			√		√		√			2
42	BLG60222	Applied Microbiology			√					√	√	2
43	BLG60223	Environmental Science			√				√	√		2
44	BLG60224	Microtechniques Laboratory				√		√				2
45	BLG60225	Plant Tissue Culture Laboratory				√		√				2
46	BLG60226	Bioinformatics				√		√				2
47	BLG60227	Plant Cultivation Laboratory				√				√	√	2
48	BLG60228	Animal Cultivation Laboratory				√				√	√	2
49	BLG60229	Conservation Biology Laboratory				√		√		√		2
50	BLG60230	Aquatic Ecology			√		√		√			2
51	BLG60231	Evolution			√		√		√			2
52	BLG60232	Experimental Design in Biology			√	√				√		2
53	BLG60233	Seminar			√	√		√		√		2
54	BLG60101	Biochemistry Laboratory				√						1
55	BLG60102	Plant Morphology Laboratory				√						1
56	BLG60103	Plant Anatomy Laboratory				√						1
57	BLG60104	Cell and Molecular Biology Laboratory				√						1
58	BLG60105	Ecology Laboratory				√						1
59	BLG60106	Genetics Laboratory				√						1
60	BLG60107	Microbiology Laboratory				√						1
61	BLG60108	Plant Systematics Laboratory				√						1
62	BLG60109	Plant Developmental Biology Laboratory				√						1
63	BLG60110	Biotechnology Laboratory				√						1
64	BLG60111	Animal Developmental Biology Laboratory				√						1
65	BLG60112	Applied Microbiology Laboratory				√					√	1
66	BLG60113	Environmental Science Laboratory				√				√		1
67	BLG60114	Microtechniques				√						1
68	BLG60115	Plant Tissue Culture					√		√			1
69	BLG60116	Plant Cultivation								√	√	1
70	BLG60117	Animal Cultivation								√	√	1
71	BLG60118	Conservation Biology					√		√			1
72	BLG60119	Aquatic Ecology Laboratory				√						1
73	BLG60120	Evolution Laboratory				√						1
74	BLG60121	Experimental Design Laboratory				√						1
75	BLG60234	Modern Biological Analysis			√	√						2
76	BLG60235	Soil Biology			√		√		√			2
77	BLG60236	Bioremediation			√		√		√			2
78	BLG60237	Biospeleology			√		√		√			2
79	BLG60238	Biotropics			√		√		√			2
80	BLG60239	Economic Botany						√		√	√	2
81	BLG60240	Plant Ecophysiology			√		√		√			2
82	BLG60241	Endocrinology			√		√		√			2
83	BLG60242	Entomology			√		√		√			2
84	BLG60243	Enzymology			√		√		√			2
85	BLG60244	Ethnobotany			√		√		√			2
86	BLG60245	Phytohormones			√		√		√			2
87	BLG60246	Molecular Genetics			√		√		√			2

88	BLG60247	Herpetology			√		√		√			2
89	BLG60248	Ichthyology			√		√		√			2
90	BLG60249	Immunology			√		√		√			2
91	BLG60250	Food Safety					√		√	√		2
92	BLG60251	Mammalogy			√		√		√			2
93	BLG60252	Mycology			√		√		√			2
94	BLG60253	Ornithology			√		√		√			2
95	BLG60254	Parasitology			√		√		√			2
96	BLG60255	Environmental Management			√				√	√		2
97	BLG60256	Marine Biology			√		√		√			2
98	BLG60257	Human Biology and Nutrition			√		√		√			2
99	BLG60258	Phytopharmacy			√					√	√	2
100	BLG60122	Soil Biology Laboratory				√						1
101	BLG60123	Bioremediation Laboratory				√						1
102	BLG60124	Plant Ecophysiology Laboratory				√						1
103	BLG60125	Endocrinology Laboratory				√						1
104	BLG60126	Entomology Laboratory				√						1
105	BLG60127	Enzymology Laboratory				√						1
106	BLG60128	Ethnobotany Laboratory				√						1
107	BLG60129	Phytohormones Laboratory				√						1
108	BLG60130	Herpetology Laboratory				√						1
109	BLG60131	Ichthyology Laboratory				√						1
110	BLG60132	Immunology Laboratory				√						1
111	BLG60133	Food Safety Laboratory				√						1
112	BLG60134	Mammalogy Laboratory				√						1
113	BLG60135	Mycology Laboratory				√						1
114	BLG60136	Ornithology Laboratory				√						1
115	BLG60137	Parasitology Laboratory				√						1
116	BLG60138	Environmental Management Laboratory				√						1
117	BLG60139	Marine Biology Laboratory				√						1
118	BLG60140	Human Biology and Nutrition Laboratory				√						1
119	BLG60141	Phytopharmacy Laboratory				√						1

G. Curriculum Structure and Course Distribution

1. Curriculum Structure

Table 13. Total Credit Hours for the Undergraduate Non-Education Program

No	Course	Minimum Credit Hours	Maksimum Credit Hours
1.	Mandatory Curriculum Courses (MKWK)	8	8
2.	Mandatory University Courses (MKWU)	6	6
3.	Faculty Courses (MKF)	4	10
4.	Program Scientific Foundation Courses (MKPKP)	100	97
5.	Off-Campus Learning Courses (MKPLK)	12	20
6.	Scientific Development Courses (MKPK)	11	11
7.	Additional Competency Courses (MKTK)	3	8
Total Credit Hours		144	160

Explanation:

a. In semesters 1 and 2, students may take a maximum study load of 20 credits per semester.

b. In subsequent semesters, students may take a study load based on their GPA, with a maximum of 24 credits.
c. During the inter-semester period, students may take a maximum of 9 credits.
d. Curriculum Compulsory Courses (MKWK) include Religious Education, Citizenship Education, Pancasila, and Indonesian Language.
e. University Compulsory Courses (MKWU) include English for Specific Purposes, Physical Education and Fitness, and Education for Sustainable Development.
f. Faculty Courses (MKF) are characteristic courses of the Faculty, including Basic Statistics and Studies and Insights of Mathematics and Natural Sciences.
g. Program Foundation Courses (MKPKP) are courses aligned with the academic discipline of the Study Program and relevant to the professional mastery in the field of education.
h. Off-Campus Learning Courses (MKPLK) refer to activities conducted outside the campus environment, such as Field Work Practice (PKL) and Community Service Program (KKN).
i. Non-Education Community Service (KKN Non-Kependidikan) requires a minimum of 272 working hours or the equivalent of 6 credits and is conducted in the 7th semester.
j. Scientific Development Courses (MKPK) focus on the advancement of knowledge within each Study Program.
k. The Bachelor's Final Project may take the form of a thesis, prototype, project, or other similar final assignments, completed individually or in groups, with a weight of 8 credits.
l. Additional Competency Courses (MKTK) provide supplementary skills beyond the core curriculum of a Study Program.
m. The maximum study duration is twice the regular curriculum period.

Table 14. Curriculum Compulsory Courses (MKWK)

No	Code	Course	Credit Hours				SEM*)	
			T	P	L	J	Gs	Gn
1	MWK60201	Islamic Religious Education*	2	-	-	2	1	-
2	MWK60202	Catholic Religious Education*	2	-	-	2	1	-
3	MWK60203	Protestant Christian Religious Education*	2	-	-	2	1	-
4	MWK60204	Hindu Religious Education*	2	-	-	2	1	-
5	MWK60205	Buddhist Religious Education*	2	-	-	2	1	-
6	MWK60206	Confucian Religious Education*	2	-	-	2	1	-
7	MWK60207	Civic Education	2	-	-	2	1	-
8	MWK60208	Pancasila	2	-	-	2	-	2
9	MWK60209	Indonesian Language	2	-	-	2	-	4

*) Fill in the number indicating semester 1, 2, 3, etc., according to the occurrence in the corresponding semester.

Table 15. University Compulsory Courses (MKWU)

No	Code	Course	Credit Hours				Semester	
			T	P	L	J	Gs	Gn
1	MWU60201	English for Specific Purposes	2	-	-	2	5	-
2	MWU60202	Physical Education and Fitness	-	2	-	2	-	4
3	MWU60203	Education and Sustainable Development	2	-	-	2	5	-
Total			4	2	-	6	-	-

Table 16. Faculty Courses (MKF)

No	Code	Course	Credit Hours				Semester	
			T	P	L	J	Gs	Gn
1	FMI60201	Perspective and Studies in Mathematics and Natural Sciences	2	-	-	2	3	-
2	FMI60202	Basic Statistics	2	-	-	2	1	-
Total			4	-	-	4	-	-

Table 17. Off-Campus Learning Courses (MKPLK)

No	Code	Course	Credit Hours				Semester	
			T	P	L	J	Gs	Gn
1	MLK60602	Fieldwork Practice	-	-	6	6	7	-
2	MLK60605	Community Service Program	-	-	6	6	7	-
Total			-	-	12	12	-	-

Table 18. Scientific Development Courses (MKPK)

No	Code	Course	Credit Hours				Semester	
			T	P	L	J	Gs	Gn
1	MKK60301	Research Methodology	3	-	-	3	-	4
2	MKK60801	Final Project	-	8	-	8	-	8
Total			3	8	-	11	-	-

Table 19. Program Foundation Courses (MKPKP) (Mandatory)

No	Code	Course	Credit Hours				SEM*)		Prerequisite Course
			T	P	L	J	Gs	Gn	
1	BLG60301	Basic Biology	3	-	-	3	1	-	-
2	BLG60201	Biochemistry	2	-	-	2	1	-	-
3	BLG60202	Invertebrate Biology	2	-	-	2	1	-	-
4	BLG60203	Invertebrate Biology Laboratory	-	2	-	2	1	-	-
5	BLG60204	Plant Morphology	2	-	-	2	1	-	-
6	BLG60205	Plant Anatomy	2	-	-	2	1	-	-
7	BLG60206	Cell and Molecular Biology	2	-	-	2	-	2	BLG60201 BLG60101
8	BLG60207	Vertebrate Biology	2	-	-	2	-	2	BLG60301
9	BLG60208	Vertebrate Biology Laboratory	-	2	-	2	-	2	BLG60301
10	BLG60209	Plant Physiology	2		-	2	-	2	BLG60301
11	BLG60210	Plant Physiology Laboratory	-	2	-	2	-	2	BLG60301
12	BLG60211	Animal Anatomy and Histology	2		-	2	-	2	BLG60301
13	BLG60212	Animal Anatomy and Histology Laboratory	-	2	-	2	-	2	BLG60301
14	BLG60213	Ecology	2	-	-	2	-	2	BLG60301
15	BLG60214	Genetics	2	-	-	2	3	-	BLG60301
16	BLG60215	Microbiology	2	-	-	2	3	-	BLG60206 BLG60104
17	BLG60216	Plant Systematics	2	-	-	2	3	-	BLG60204 BLG60205 BLG60102 BLG60103
18	BLG60217	Plant Developmental Biology	2	-	-	2	3	-	BLG60204 BLG60205 BLG60102 BLG60103
19	BLG60218	Animal Physiology	2	-	-	2	3	-	BLG60211 BLG60212
20	BLG60219	Animal Physiology Laboratory	-	2	-	2	3	-	BLG60211 BLG60211
21	BLG60220	Biotechnology	2	-	-	2	3	-	BLG60206
22	BLG60221	Animal Developmental Biology	2	-	-	2	-	4	BLG60202 BLG60203 BLG60207 BLG60208 BLG60218 BLG60219
23	BLG60222	Applied Microbiology	2	-	-	2	-	4	BLG60215 BLG60107
24	BLG60223	Environmental Science	2	-	-	2	-	4	BLG60213 BLG60301

25	BLG60224	Microtechnique Laboratory	-	2	-	2	-	4	BLG60217 BLG60221 BLG60109 BLG60111
26	BLG60225	Plant Tissue Culture Laboratory	-	2	-	2	-	4	BLG60209 BLG60210 BLG60217 BLG60109
27	BLG60226	Bioinformatics	2	-	-	2	-	4	BLG60220
28	BLG60227	Plant Cultivation Laboratory	-	2	-	2	5	-	BLG60225 BLG60115
29	BLG60228	Animal Cultivation Laboratory	-	2	-	2	5	-	BLG60221 BLG60111
30	BLG60229	Conservation Biology Laboratory	-	2	-	2	5	-	BLG60202 BLG60203 BLG60207 BLG60208 BLG60213 BLG60105 BLG60216 BLG60108
31	BLG60230	Aquatic Ecology	2	-	-	2	5	-	BLG60213 BLG60105
32	BLG60231	Evolution	2	-	-	2	-	6	BLG60221 BLG60111 BLG60312 BLG60105
33	BLG60232	Biological Experiment Design	2	-	-	2	-	6	MKK60301
34	BLG60233	Seminar	-	2	-	2	-	6	MKK60301
35	BLG60101	Biochemistry Laboratory	-	1	-	1	1	-	BLG60201 BLG60101
36	BLG60102	Plant Morphology Laboratory	-	1	-	1	1	-	BLG60301
37	BLG60103	Plant Anatomy Laboratory	-	1	-	1	1	-	BLG60301
38	BLG60104	Cell and Molecular Biology Laboratory	-	1	-	1	-	2	BLG60206 BLG60104
39	BLG60105	Ecology Laboratory	-	1	-	1	-	2	BLG60204 BLG60205 BLG60102 BLG60103
40	BLG60106	Genetics Laboratory	-	1	-	1	3	-	BLG60204 BLG60205 BLG60102 BLG60103
41	BLG60107	Microbiology Laboratory	-	1	-	1	3	-	BLG60206
42	BLG60108	Plant Systematics Laboratory	-	1	-	1	3	-	BLG60202 BLG60203 BLG60207 BLG60208 BLG60218 BLG60219
43	BLG60109	Plant Developmental Biology Laboratory	-	1	-	1	3	-	BLG60215 BLG60107
44	BLG60110	Biotechnology Laboratory	-	1	-	1	3	-	BLG60213 BLG60301
45	BLG60111	Animal Developmental Biology Laboratory	-	1	-	1	-	4	BLG60217 BLG60221 BLG60109 BLG60111
46	BLG60112	Applied Microbiology Laboratory	-	1	-	1	-	4	BLG60209 BLG60210 BLG60217 BLG60109
47	BLG60113	Environmental Science	-	1	-	1	-	4	BLG60225

		Laboratory							BLG60115
48	BLG60114	Microtechnique	1	-	-	1	-	4	BLG60221 BLG60111
49	BLG60115	Plant Tissue Culture	1	-	-	1	-	4	BLG60202 BLG60203 BLG60207 BLG60208 BLG60213 BLG60105 BLG60216 BLG60108
50	BLG60116	Plant Cultivation	1	-	-	1	5	-	BLG60213 BLG60105
51	BLG60117	Animal Cultivation	1	-	-	1	5	-	BLG60221 BLG60111 BLG60312 BLG60105
52	BLG60118	Conservation Biology	1	-	-	1	5	-	MKK60301
53	BLG60119	Aquatic Ecology Laboratory	-	1	-	1	5	-	BLG60201 BLG60101
54	BLG60120	Evolution Laboratory	-	1	-	1	-	6	BLG60301
55	BLG60121	Biological Experiment Design Laboratory	-	1	-	1	-	6	BLG60301
Total						90			

Table 20. Program Foundation Courses (MKPKP)(Elective)

No	Code	Course	Credit Hours				SEM*)		Prerequisite Course
			T	P	L	J	Gs	Gn	
1	BLG60234	Modern Biological Analysis	2	-	-	2		√	BLG60220 BLG60110 BLG60226
2	BLG60235	Soil Biology	2	-	-	2	√		BLG60202 BLG60203 BLG60213 BLG60105
3	BLG60236	Bioremediation	2	-	-	2		√	BLG60209 BLG60210 BLG60215 BLG60107 BLG60223 BLG60113
4	BLG60237	Biospeleology	2	-	-	2		√	BLG60231 BLG60120 BLG60207 BLG60208
5	BLG60238	Biotropics	2	-	-	2	√		BLG60202 BLG60203 BLG60207 BLG60208 BLG60216 BLG60108 BLG60213 BLG60105
6	BLG60239	Economic Botany	2	-	-	2		√	BLG60209 BLG60210 BLG60213 BLG60105 BLG60228 BLG60116
7	BLG60240	Plant Ecophysiology	2	-	-	2		√	BLG60209

									BLG60210 BLG60213 BLG60105
8	BLG60241	Endocrinology	2	-	-	2	√		BLG60218 BLG60219
9	BLG60242	Entomology	2	-	-	2		√	BLG60202 BLG60203 BLG60213 BLG60105 BLG60231 BLG60120
10	BLG60243	Enzymology	2	-	-	2		√	BLG60201 BLG60101 BLG60209 BLG60210 BLG60215 BLG60107 BLG60218 BLG60219
11	BLG60244	Ethnobotany	2	-	-	2		√	BLG60216 BLG60108 BLG60223 BLG60113
12	BLG60245	Phytohormones	2	-	-	2	√		BLG60209 BLG60210
13	BLG60246	Molecular Genetics	2	-	-	2		√	BLG60214 BLG60106
14	BLG60247	Herpetology	2	-	-	2	√		BLG60231 BLG60120 BLG60207 BLG60208 BLG60213 BLG60105
15	BLG60248	Ichthyology	2	-	-	2		√	BLG60231 BLG60120 BLG60207 BLG60208 BLG60213 BLG60106
16	BLG60249	Immunology	2	-	-	2		√	BLG60218 BLG60219 BLG60211 BLG60212
17	BLG60250	Food Safety	2	-	-	2	√		BLG60215 BLG60107
18	BLG60251	Mammalogy	2	-	-	2	√		BLG60231 BLG60120 BLG60207 BLG60208 BLG60213 BLG60106
19	BLG60252	Mycology	2	-	-	2	√		BLG60215 BLG60107
20	BLG60253	Ornithology	2	-	-	2		√	BLG60231 BLG60120 BLG60207 BLG60208 BLG60213 BLG60106

21	BLG60254	Parasitology	2	-	-	2	√		BLG60202 BLG60203 BLG60207 BLG60208 BLG60115 BLG60225
22	BLG60255	Environmental Management	2	-	-	2		√	BLG60223 BLG60113
23	BLG60256	Marine Biology	2	-	-	2	√		BLG60230 BLG60119
24	BLG60257	Human Biology and Nutrition	2	-	-	2		√	BLG60218 BLG60219
25	BLG60258	Phytopharmaceuticals	2				√		BLG60209 BLG60210
26	BLG60122	Soil Biology Laboratory	-	1	-	1	√		BLG60202 BLG60203 BLG60213 BLG60105
27	BLG60123	Bioremediation Laboratory	-	1	-	1		√	BLG60209 BLG60210 BLG60215 BLG60107 BLG60223 BLG60113
28	BLG60124	Plant Ecophysiology Laboratory	-	1	-	1		√	BLG60209 BLG60210 BLG60213 BLG60105
29	BLG60125	Endocrinology Laboratory	-	1	-	1	√		BLG60218 BLG60219
30	BLG60126	Entomology Laboratory	-	1	-	1		√	BLG60202 BLG60203 BLG60213 BLG60105 BLG60231 BLG60120
31	BLG60127	Enzymology Laboratory	-	1	-	1		√	BLG60201 BLG60101 BLG60209 BLG60210 BLG60215 BLG60107 BLG60218 BLG60219
32	BLG60128	Ethnobotany Laboratory	-	1	-	1		√	BLG60216, BLG60108, BLG60223, BLG60113
33	BLG60129	Phytohormones Laboratory	-	1	-	1	√		BLG60209 BLG60210
34	BLG60130	Herpetology Laboratory	-	1	-	1	√		BLG60231 BLG60120 BLG60207 BLG60208 BLG60213 BLG60105
35	BLG60131	Ichthyology Laboratory	-	1	-	1		√	BLG60231 BLG60120 BLG60207

									BLG60208 BLG60213 BLG60106
36	BLG60132	Immunology Laboratory	-	1	-	1		√	BLG60218 BLG60219 BLG60211 BLG60212
37	BLG60133	Food Safety Laboratory	-	1	-	1	√		BLG60215 BLG60107
38	BLG60134	Mammalogy Laboratory	-	1	-	1	√		BLG60231 BLG60120 BLG60207 BLG60208 BLG60213 BLG60106
39	BLG60135	Mycology Laboratory	-	1	-	1	√		BLG60215 BLG60107
40	BLG60136	Ornithology Laboratory	-	1	-	1		√	BLG60231 BLG60120 BLG60207 BLG60208 BLG60213 BLG60106
41	BLG60137	Parasitology Laboratory	-	1	-	1	√		BLG60231 BLG60120 BLG60207 BLG60208 BLG60213 BLG60106
42	BLG60138	Environmental Management Laboratory	-	1	-	1		√	BLG60223 BLG60113
43	BLG60139	Marine Biology Laboratory	-	1	-	1	√		BLG60230 BLG60119
44	BLG60140	Human Biology and Nutrition Laboratory	-	1	-	1		√	BLG60218 BLG60219
45	BLG60141	Phytopharmaceuticals Laboratory		1			√		BLG60209 BLG60210
Total						70			

Table 21. Additional Competency Courses (MKTK)

No	Code	Course	Credit Hours				SEM*)		Prerequisite Course
			T	P	L	J	Gs	Gn	
1	BLG60302	Field Study / Excursion	0	-	3	3		√	BLG60213 BLG60215 BLG60217 BLG60221
Total						3			

Next, the list of courses will be detailed according to their respective groups, as in the Bachelor's degree program.

Course Distribution Per Semester

Semester 1

No	Code	Course	T	P	L	Total
1	MWK60201	Islamic Religious Education*	2	-	-	2
2	MWK60202	Catholic Religious Education*	2	-	-	-
3	MWK60203	Protestant Christian Religious Education*	2	-	-	-
4	MWK60204	Hindu Religious Education*	2	-	-	-
5	MWK60205	Buddhist Religious Education*	2	-	-	-
6	MWK60206	Confucian Religious Education*	2	-	-	-
7	FMI60202	Basic Statistics	2	-	-	2
8	BLG60301	Basic Biology	3	-	-	3
9	BLG60201	Biochemistry	2	-	-	2
10	BLG60202	Invertebrate Biology	2	-	-	2
11	BLG60203	Invertebrate Biology Laboratory	-	2	-	2
12	BLG60204	Plant Morphology	2	-	-	2
13	BLG60205	Plant Anatomy	2	-	-	2
14	BLG60101	Biochemistry Laboratory	-	1	-	1
15	BLG60102	Plant Morphology Laboratory	-	1	-	1
16	BLG60103	Plant Anatomy Laboratory	-	1	-	1
Total credit hours (*maximum 20 credit hours*)			15	5	-	20

Semester 2

No	Code	Course	T	P	L	Total
1	MWK60208	Pancasila	2	-	-	2
2	BLG60206	Cell and Molecular Biology	2	-	-	2
3	BLG60207	Vertebrate Biology	2	-	-	2
4	BLG60208	Vertebrate Biology Laboratory	-	2	-	2
5	BLG60209	Plant Physiology	2	-	-	2
6	BLG60210	Plant Physiology Laboratory	-	2		2
7	BLG60211	Animal Anatomy and Histology	2	-	-	2
8	BLG60212	Animal Anatomy and Histology Laboratory	-	2	-	2
9	BLG60213	Ecology	2	-	-	2
10	BLG60104	Cell and Molecular Biology Laboratory	-	1	-	1
11	BLG60105	Ecology Laboratory	-	1	-	1
Total credit hours (*maximum 20 credit hours*)			12	8	-	20

Semester 3

No	Code	Course	T	P	L	Total
1	FMI60201	Perspectives and Studies in Mathematics and Natural Sciences (MIPA)	2	0	-	2
2	MWK60207	Civic Education	2	-	-	2
3	BLG60214	Genetics	2	-	-	2
4	BLG60215	Microbiology	2	-	-	2
5	BLG60216	Plant Systematics	2	-	-	2
6	BLG60217	Plant Developmental Biology	2	-	-	2
7	BLG60218	Animal Physiology	2	-	-	2
8	BLG60219	Animal Physiology Laboratory	-	2	-	2
9	BLG60220	Biotechnology	2	-	-	2
10	BLG60106	Genetics Laboratory	-	1	-	1
11	BLG60107	Microbiology Laboratory	-	1	-	1
12	BLG60108	Plant Systematics Laboratory	-	1	-	1
13	BLG60109	Plant Developmental Biology Laboratory	-	1	-	1
14	BLG60110	Biotechnology Laboratory	-	1	-	1
Total credit hours			16	7	-	23

Semester 4

No	Code	Course	T	P	L	Total
1	MWU60202	Physical Education and Fitness	0	2	-	2
2	MWK60209	Indonesian Language	2	0	-	2
3	MKK60301	Research Methodology	3	-	-	3
4	BLG60221	Animal Developmental Biology	2	-	-	2
5	BLG60222	Applied Microbiology	2	-	-	2
6	BLG60223	Environmental Science	2	-	-	2
7	BLG60224	Microtechnique Laboratory	-	2	-	2
8	BLG60225	Plant Tissue Culture Laboratory	-	2	-	2
9	BLG60226	Bioinformatics	2	-	-	2
10	BLG60111	Animal Developmental Biology Laboratory	-	1	-	1
11	BLG60112	Applied Microbiology Laboratory	-	1	-	1
12	BLG60113	Environmental Science Laboratory	-	1	-	1
13	BLG60114	Microtechnique	1	-	-	1
14	BLG60115	Plant Tissue Culture	1	-	-	1
Total credit hours			15	9	-	24

Semester 5

No	Code	Course	T	P	L	Total
1	MWU60203	Education and Sustainable Development	2	0	-	2
2	MWU60201	English for Specific Purposes	2	0	-	2
3	BLG60227	Plant Cultivation Laboratory	-	2	-	2
4	BLG60228	Animal Cultivation Laboratory	-	2	-	2
5	BLG60229	Conservation Biology Laboratory	-	2	-	2
6	BLG60230	Aquatic Ecology	2	-	-	2
7	BLG60116	Plant Cultivation	1	-	-	1
8	BLG60117	Animal Cultivation	1	-	-	1
9	BLG60118	Conservation Biology	1	-	-	1
10	BLG60119	Aquatic Ecology Laboratory	-	1	-	1

11		Elective Courses*				6-8
Total credit hours			9	7	-	22-24

* Elective courses totaling between 6 to 8 credit hours

Semester 6

No	Code	Course	T	P	L	Total
1	BLG60302	Field Study / Excursion	-	-	3	3
2	BLG60231	Evolution	2	-	-	2
3	BLG60232	Biological Experimental Design	2	-	-	2
4	BLG60233	Seminar	-	2	-	2
5	BLG60120	Evolution Laboratory	-	1	-	1
6	BLG60121	Biological Experimental Design Laboratory	-	1	-	1
7		Elective Courses*				4-13
Total credit hours			4	4	3	15-24

* Elective courses totaling between 4 and 13 credit hours

Semester 7

No	Code	Course	T	P	L	Total
1	MLK60602	Field Work Practice	-	-	6	6
2	MLK60605	Community Service Program	-	-	6	6
Total credit hours			-	-	12	12

Semester 8

No	Code	Course	T	P	L	Total
1	MKK60801	Final Project*	-	8	-	8
Total credit hours			-	8		8

* Can be taken starting from semester 7
T = Theory
P = Laboratory (Practicum)
L = Fieldwork
Prerequisite = completion of the relevant course(s)

Specialized Elective Courses in Botany

No	**Code**	**Course**	**Credit Hours**				**SEM*)**	
			T	**P**	**L**	**J**	**Gs**	**Gn**
1	BLG60239	Economic Botany	2	-	-	2		√
2	BLG60240	Plant Ecophysiology	2	-	-	2		√
3	BLG60124	Plant Ecophysiology Laboratory	-	1	-	1		√
4	BLG60244	Ethnobotany	2	-	-	2		√
5	BLG60128	Ethnobotany Laboratory	-	1	-	1		√
6	BLG60245	Phytohormones	2	-	-	2	√	
7	BLG60129	Phytohormones Laboratory	-	1	-	1	√	
8	BLG60258	Phytopharmacy	2				√	
9	BLG60141	Phytopharmacy Laboratory		1			√	
Total								

Specialized Elective Courses in Zoology

No	Code	Course	Credit Hours				SEM*)	
			T	P	L	J	Gs	Gn
1	BLG60242	Entomology	2	-	-	2		√
2	BLG60126	Entomology Laboratory	-	1	-	1		√
3	BLG60247	Herpetology	2	-	-	2	√	
4	BLG60130	Herpetology Laboratory	-	1	-	1	√	
5	BLG60248	Ichthyology	2	-	-	2		√
6	BLG60131	Ichthyology Laboratory	-	1	-	1		√
7	BLG60251	Mammalogy	2	-	-	2	√	
8	BLG60134	Mammalogy Laboratory	-	1	-	1	√	
9	BLG60253	Ornithology	2	-	-	2		√
10	BLG60136	Ornithology Laboratory	-	1	-	1		√
11	BLG60254	Parasitology	2	-	-	2	√	
12	BLG60137	Parasitology Laboratory	-	1	-	1	√	
13	BLG60257	Human Biology and Nutrition	2	-	-	2		√
14	BLG60140	Human Biology and Nutrition Laboratory	-	1	-	1		√
Total								

Specialized Elective Courses in Microbiology and Biotechnology

No	Code	Course	Credit Hours				SEM*)	
			T	P	L	J	Gs	Gn
1	BLG60234	Modern Biological Analysis	2	-	-	2		√
2	BLG60236	Bioremediation	2	-	-	2		√
3	BLG60123	Bioremediation Laboratory	-	1	-	1		√
4	BLG60241	Endocrinology	2	-	-	2	√	
5	BLG60125	Endocrinology Laboratory	-	1	-	1	√	
6	BLG60243	Enzymology	2	-	-	2		√
7	BLG60127	Enzymology Laboratory	-	1	-	1		√
8	BLG60246	Molecular Genetics	2	-	-	2		√
9	BLG60249	Immunology	2	-	-	2		√
10	BLG60132	Immunology Laboratory	-	1	-	1		√
11	BLG60250	Food Safety	2	-	-	2	√	
12	BLG60133	Food Safety Laboratory	-	1	-	1	√	
13	BLG60252	Mycology	2	-	-	2	√	
14	BLG60135	Mycology Laboratory	-	1	-	1	√	
Total								

Specialized Elective Courses in Environmental Science

No	Code	Course	Credit Hours				SEM*)	
			T	P	L	J	Gs	Gn
1	BLG60235	Soil Biology	2	-	-	2	√	
2	BLG60122	Soil Biology Laboratory	-	1	-	1	√	
3	BLG60237	Biospeleology	2	-	-	2		√
4	BLG60238	Biotropics	2	-	-	2	√	
5	BLG60255	Environmental Management	2	-	-	2		√
6	BLG60138	Environmental Management Laboratory	-	1	-	1		√
7	BLG60256	Marine Biology	2	-	-	2	√	
8	BLG60139	Marine Biology Laboratory	-	1	-	1	√	

Total	

A. Learning Process

The learning process in the Biology Study Program is conducted by referring to the National Higher Education Standards, which encompass the characteristics of the learning process, learning process planning, implementation of the learning process, and students' study load. The characteristics of the learning process include being interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative, and student-centered. The planning of the learning process is prepared for each course and presented in a Semester Learning Plan (RPS) developed independently by lecturers or collaboratively within a specific expertise group.

The implementation of the learning process takes place through interactions between lecturers, students, and learning resources within a certain learning environment. The learning process is carried out using various teaching methods such as group discussions, simulations, case studies, collaborative learning, cooperative learning, project-based learning, problem-based learning, or other effective methods that facilitate achieving graduate learning outcomes. Each course may employ one or a combination of these methods and is organized into various learning formats, including: (1) lectures, (2) recitations and tutorials, (3) seminars, (4) laboratory or field practicum, (5) internships, (6) research, (7) humanitarian projects, (8) entrepreneurship, (9) student exchanges, and/or (10) other forms of community service. These learning formats accommodate students' interests and potential for self-development as part of the freedom to learn aimed at achieving the desired learning outcomes.

The Biology Study Program has utilized technological advancements in learning. Several courses have developed fully online or blended learning classes accessible through the Learning Management System (BeSmart UNY) at http://besmart.uny.ac.id/v2/. Students are also required to utilize technology through various available applications.

Student study load is expressed in semester credit units (sks). One sks for lecture activities is equivalent to 45 hours per semester. This corresponds to 170 minutes per week per semester, consisting of 50 minutes of face-to-face learning, 60 minutes of structured assignments, and 60 minutes of independent activities. Each course carries a minimum weight of 1 (one) sks. A semester is an effective learning period of 16 (sixteen) weeks.

The learning process aims to fulfill the program's competency outcomes in accordance with the Graduate Learning Outcomes and Course Learning Outcomes. These competency outcomes require the learning process to be organized with a student-centered system (student learning center). The learning emphasizes strengthening competencies in personality, social skills, pedagogy, and professionalism.

Learning can be conducted face-to-face, including e-learning with structured assignments, independent tasks, and other equivalent activities, seminars, practical work, research, and community service. Learning may also be delivered through blended learning or fully online e-learning models. Overall, learning activities consist of 16 meetings per semester. Students are required to attend at least 75% of the face-to-face sessions.

The implementation of learning fundamentally involves three stages: preliminary, main activity/presentation, and closing. Related to the principle of mastery learning, the learning activity facilitates students in gaining learning experiences and achieving mastery according to predetermined competency outcomes. Therefore, a contextual approach that encourages students to be active, innovative, creative, inspiring, and fosters a pleasant atmosphere is continuously developed. The perspectives of character building, national values, and entrepreneurial spirit are integral in creating meaningful learning. Through the developed learning process,

student success is determined not only by hard skills and intellectual abilities (grade point average) but also by soft skills, including cognitive abilities, character, personality, and morality.

B. Learning Assessment

Learning assessment is a crucial part of the curriculum to evaluate students' success in achieving the predetermined learning outcomes. In accordance with the Ministry of Education and Culture Regulation Number 53 of 2023 concerning the Quality Assurance System for Higher Education, related to assessment standards, the Biology Study Program conducts assessments based on educational, authentic, objective, accountable, and transparent principles. Learning assessment includes two aspects: process assessment and learning outcome assessment. Process assessment is used to understand how students engage in the learning activities, including aspects of personality and character. Outcome assessment aims to provide an overview of competency achievement (CPL mastery) after completing the learning process.

Process assessment is used to observe student involvement in lectures, covering soft skills such as participation in class activities, ability to articulate ideas, fostering responsibility and independence, promoting solidarity and teamwork skills, and encouraging increased student motivation. Process assessment is conducted through observation, peer assessment, and portfolios. This assessment occurs throughout the learning process and is a component in determining the final grade.

Outcome assessment evaluates students' abilities in achieving the competencies that constitute the learning outcomes. This is conducted through competency tests for each sub-competency or sub-CPMK taught, midterm exams, practical exams, and final semester exams. Outcome assessment methods include written exams, essay/paper writing, oral exams, practical exams, and portfolios.

Various assessment techniques can be employed, such as observation, participation, performance demonstrations, written tests, oral tests, and questionnaires. Instruments for process assessment may include rubrics and/or outcome assessments in the form of portfolios. The final assessment result is an integration of various assessment techniques and instruments used.

Measurement and assessment should aim to cover all domains of abilities developed in each course, including knowledge, attitudes, and skills. Assessments are conducted through various methods, both tests and non-tests, ensuring authenticity and alignment with the type of ability or course learning outcomes, including the possibility of non-test assessments covering the 4Ps (Performance, Product, Project, and Portfolio). In accordance with National Higher Education Standards (SN-Dikti), measurement and assessment at all higher education levels must consider aspects of validity, reliability, comprehensiveness, character, and sustainability.

Assessment reporting includes the qualification of students' success in completing a course, expressed in numerical and letter grades according to applicable academic regulations. High-achieving students are those with a Semester Grade Point Average (IPS) greater than 3.50 (three point five zero) and who uphold academic ethics.

Notes:
The measurement of CPL (Graduate Learning Outcomes) is conducted using an **outcome-based assessment (OBA)** approach to ensure that every student attains the established competencies.

a) CPL is not measured directly but through **CPMK (Course Learning Outcomes)**, which are more specific.
b) Each course must have **CPMK that contribute to certain CPL**.
c) **Each CPMK must have measurable and relevant assessments aligned** with CPL.

d) Assessment forms must be varied according to **competency levels (attitudes, knowledge, general skills, specific skills)**.
e) **Cumulative evaluation is conducted after students complete all courses related to a specific CPL.**
f) **Methods used include:**
   - **Student Portfolio** → Assessing student learning achievements from assignments, projects, and reports during study**.**
   - **Final Competency (Capstone Project, Thesis, or Comprehensive Exam)** → Students undertake a major project reflecting mastery of CPL**.**
   - **Tracer Study and User Satisfaction Surveys** → Evaluating CPL after graduation, involving industry and academic stakeholders.
g) **CPL scoring** is done by **converting individual student achievements in relevant courses.**

$$\text{CPL Score} = \sum \frac{Course\ Grade \times Contribution\ Weight}{\Sigma Contribution\ Weight}$$

Example: Contribution Weight of CPMK to CPL

MK	CPL	CPMK	Cognitive					Participative		CPL (%)	Contribution Weight
			Attendance (%)	Quiz (%)	Assignments (%)	UTS (%)	UAS (%)	Case Study (%)	Team Based Project (%)		
MK1	CPL-1	CPMK01	10							60	100
		CPMK02						20	30		
	CPL-2	CPMK03					20			40	
		CPMK04		10		10					
MK2	CPL-3	CPMK05	10							40	100
		CPMK06						10			
		CPMK07				10	10				
	CPL-4	CPMK08						10		20	
		CPMK09				10					
	CPL-5	CPMK10					10			20	
		CPMK11						10			

Contoh:

No	Jenis Penilaian	Bobot (%)	CPMK 1	CPMK 2	CPMK 3
1	Partisipasi Kelas	10	Lembar penilaian partisipasi kelas (setiap pertemuan): a. Kehadiran b. Kedisiplinan c. Partisipasi kelas d. Inisiatif	-	-
2	Kepemimpinan, kedisiplinan, kemandirian , profesionalitas, mengembangkan jejaring	5	Lembar Observasi Kepemimpinan, kedisiplinan, kemandirian , profesionalitas, mengembangkan jejaring (pertemuan ke 3, (9-10), (12-16)	-	-
2	Penugasan Mandiri	5	-	Penugasan mandiri 1 (minggu ke 4); 5%	
3	Penugasan Mandiri Studi Kasus	10	-	1. Penugasan Mandiri Studi Kasus 1 (minggu ke 2); 5%	-
			-	2. Penugasan Mandiri studi kasus 2 (minggu ke 11); 5%	-
4	Penugasan Kelompok Studi Kasus	30	-	1. Penugasan kelompok studi kasus-PBL 1 (minggu ke 3); 5%	-
			-	2. Tugas kelompok studi kasus 2 (minggu ke 6-7) 10%	
			-	3. Tugas kelompok studi kasus 3 (minggu ke 8) 10%	
			-	4. Tugas kelompok studi kasus 4 (minggu ke 9-10); 5%	
5	Kuis-tes tulis	5	-	Kuis 1 (minggu ke. 5); 5%	-
6	Group Project	20	-	-	Penugasan Project (minggu ke 12-16); 20%
7	Ujian Akhir Semester	15	-	Tes Tettulis; 10%	Tes Tertulis; 5%

C. Curriculum Quality Assurance

The quality assurance system implemented is an outcome-based quality assurance system, which is a monitoring and evaluation system designed to ensure continuous quality improvement and to guarantee the achievement of standards and learning outcomes established by the educational program. The Outcome-Based Quality Assurance System is a framework that initially sets the standards/learning outcomes and concludes by systematically and continuously ensuring the achievement and enhancement of these standards/learning outcomes.

In alignment with the implementation of the Internal Quality Assurance System of Higher Education Institutions, curriculum quality assurance in the Biology Study Program is conducted in accordance with the quality assurance system applied at the Faculty of Mathematics and Natural Sciences (MIPA) level, utilizing a quality assurance cycle consisting of establishment, implementation, evaluation, control, and improvement (PPEPP). The following are the steps for curriculum quality assurance consistent with the university's quality assurance system:

1. **Curriculum Establishment**
   - The curriculum is established by the leadership of the higher education institution (at least every 4–5 years) by defining the program profile, objectives, learning outcomes (CPL), courses along with their credits, and an integrated curriculum structure.
   - Curriculum establishment involves the formulation and validation of standard documents. Additional guidelines, manuals, operational procedures (POB), and forms may also be included.
2. **Curriculum Implementation**
   - Curriculum implementation refers to the execution of the established standards.
   - It is carried out through the learning process, with attention to the achievement of CPL, including graduate learning outcomes (CPL), course learning outcomes (CPMK), and learning outcomes at each stage of the course (Sub-CPMK).
   - Curriculum implementation is guided by the Course Learning Plan (RPS), prepared by lecturers or a team of lecturers, with consideration for achieving CPL at the course level (MK), CPMK, and Sub-CPMK levels.

- The Sub-CPMK and CPMK at the course level must support the achievement of CPL assigned to each course.

3. **Curriculum Evaluation**
   - Curriculum evaluation is conducted against the established standards.
   - Formative evaluation is carried out to assess the achievement of CPL. This evaluation is based on the achievement of CPMK and Sub-CPMK set at the beginning of the semester by lecturers or teaching teams and the study program.
   - Evaluation also covers teaching methods, assessment methods, the RPS, and supporting learning materials.
   - Summative evaluation is conducted periodically every 4–5 years involving internal and external stakeholders, reviewed by experts in the study program's field, industry representatives, associations, and aligned with developments in science and technology (IPTEKS) and user needs.
4. **Curriculum Control**
   - Curriculum control is conducted each semester using indicators derived from the measurement of CPL achievement.
   - Curriculum control is managed by the Study Program and monitored and assisted by the quality assurance unit or institution of the higher education institution.
5. **Curriculum Improvement**
   - Curriculum improvement is based on the results of both formative and summative curriculum evaluations.

D. Course Description

No	Code	Course	Course Description
1	MWK60201	Islamic Religious Education*	The Islamic Religious Education course aims to strengthen faith and devotion to Allah SWT, cultivate noble morals (character), and broaden scientific knowledge and religious life perspectives. The goal is to develop Muslim students who possess exemplary character, philosophical thinking, rational and dynamic attitudes, and broad viewpoints, while emphasizing the importance of fostering harmony among fellow human beings, both within the same religious community and with people of other faiths.
2	MWK60202	Catholic Religious Education*	The Catholic Religious Education course aims to strengthen faith and devotion to Almighty God, cultivate noble morals (character), and broaden scientific knowledge and religious life perspectives. The goal is to develop Christian students who possess exemplary character, philosophical thinking, rational and dynamic attitudes, and broad viewpoints, while emphasizing the importance of fostering harmony among fellow human beings, both within the same religious community and with people of other faiths.
3	MWK60203	Protestant Christian Religious Education*	The Protestant Christian Religious Education course aims to strengthen faith and devotion to Almighty God, cultivate noble morals (character), and broaden scientific knowledge and religious life perspectives. The goal is to develop Christian students who possess exemplary character, philosophical thinking, rational and dynamic attitudes, and broad viewpoints, while emphasizing the importance of fostering harmony among fellow human beings, both within the same religious community and with people of other faiths.
4	MWK60204	Hindu Religious Education*	The Hindu Religious Education course aims to strengthen faith and devotion to Almighty God, cultivate noble morals (character), and broaden scientific knowledge and religious life perspectives. The goal is to develop

			students who possess exemplary character, philosophical thinking, rational and dynamic attitudes, and broad viewpoints, while emphasizing the importance of fostering harmony among fellow human beings, both within the same religious community and with people of other faiths.
5	MWK60205	Buddhist Religious Education*	The Buddhist Religious Education course aims to strengthen faith and devotion to Almighty God, cultivate noble morals (character), and broaden scientific knowledge and perspectives on religious life. It seeks to develop students who possess exemplary character, philosophical thinking, rational and dynamic attitudes, and broad viewpoints, with attention to fostering harmony among human beings both within the same religious community and across different faiths.
6	MWK60206	Confucian Religious Education*	The Confucian Religious Education course aims to strengthen faith and devotion to Almighty God, cultivate noble morals (character), and broaden scientific knowledge and perspectives on religious life. It seeks to develop students who possess exemplary character, philosophical thinking, rational and dynamic attitudes, and broad viewpoints, with attention to fostering harmony among human beings both within the same religious community and across different faiths.
7	MWK60207	Civic Education	Civic Education is a compulsory course worth 2 credits. This course equips students with fundamental knowledge and skills regarding the relationship between citizens and the state, as well as preliminary education in national defense, aimed at producing citizens who can be relied upon by their nation and country. The course covers: (1) Rights and duties of citizens; (2) Preliminary education in national defense; (3) Indonesian democracy; (4) Human rights; (5) The Archipelagic Insight and Indonesian national identity; (6) Indonesian national resilience; and strategies for national resilience.
8	MWK60208	Pancasila	This course discusses the foundations and objectives of Pancasila, Pancasila as the result of scientific thought, Pancasila in the context of the Indonesian national struggle, Pancasila as a system of values and national ideology, the Constitution and its Amendments, and Pancasila as a paradigm for societal, national, and state life.
9	MWU60201	English for Specific Purposes	This course develops English language skills relevant and applicable within the context of biological sciences. The primary focus is to enhance reading, writing, listening, and speaking skills using biological terminology and concepts accurately and effectively. Students will learn to comprehend scientific articles, research reports, and English-language biological literature, as well as improve their ability to write abstracts, laboratory reports, and scientific presentations in English. Additionally, the course emphasizes the development of academic and professional communication skills to support research activities and international collaboration in biology. Upon completion, students are expected to competently use English in academic and professional biological contexts, thereby enhancing their competitiveness and opportunities to contribute to the global scientific community.
10	MWU60202	Physical Education and Fitness	This course is designed to equip students with knowledge, understanding, and basic skills related to physical activity, sports, and physical fitness. The material includes concepts of physical fitness, training principles, the health benefits of sports, and an introduction to various types of sports and fitness activities. Students will also engage in regular physical exercise to improve cardiovascular fitness, muscular strength, flexibility, and endurance. Through this course, students are expected to adopt a healthy and active lifestyle and develop awareness of the importance of sports in maintaining quality of life.
11	MWU60203	Education and Sustainable Development	This course discusses the concepts, principles, and implementation of Education for Sustainable Development (ESD) in various contexts. Students will study the interconnections between environmental, social,

			and economic issues and sustainable development, as well as the role of education in shaping awareness, attitudes, and sustainable behaviors. The course emphasizes an interdisciplinary and participatory approach, including the integration of sustainability values into the learning process. It aims to equip students with critical understanding and practical skills to become agents of change in creating a just and sustainable future.
12	FMI60201	Perspectives and Studies in Mathematics and Natural Sciences (MIPA)	Insight and Study of MIPA is a faculty-level course designed to provide students with an integrated scientific perspective of mathematics and natural sciences. The lectures cover theories on the integration of various scientific disciplines for the advancement of chemistry, including photosynthesis and food chains, philosophy of science, logic, decision-making principles, the scientific method, scientific attitudes and character development, the relationship between mathematics and natural sciences, biology and the integration of various systems, as well as the role of MIPA in research and technological development.
13	FMI60202	Basic Statistics	This course covers: (1) Statistical literacy; (2) methods of data collection and presentation; (3) calculation and interpretation of measures of central tendency, position, and data dispersion; (4) fundamentals of probability theory; (5) distribution of random variables; (6) sampling theory; (7) parameter estimation; and (8) hypothesis testing with applications in biology.
14	MLK60602	Field Work Practice	This practical course involves students undertaking internships or work practices in an industry, business, or workplace (DUDIKA) for a specified period. The Field Work Practice program is part of the Merdeka Belajar - Kampus Merdeka (MBKM) initiative, providing opportunities for students to develop and enrich competencies outside the campus. This course offers experiential learning that allows students to apply and develop hard skills (such as complex problem solving and analytical skills) and soft skills (such as professional ethics, communication, teamwork), as well as entrepreneurial insight.
15	MLK60605	Community Service Program	This course prepares students to implement the knowledge they have acquired according to their field of study at the Community Service Program (KKN) location. Preparation before deployment includes competencies relevant to the study program to address various community issues at the KKN site. Students are expected to collaborate with various groups and peers from different study programs at UNY to effectively carry out multidisciplinary programs to solve community problems.
16	MKK60301	Research Methodology	This course consists of both theoretical and practical components. It covers the essence, principles, and procedures of research in biology for populations with normal or non-normal distributions. Students will design experimental and descriptive research methods for different numbers of variables (univariate, bivariate, and multivariate).
17	MKK60801	Final Project	The final project for the undergraduate degree may take the form of a thesis, prototype, project, or other similar assignments, either individually or in groups. The thesis guides students to understand and apply basic research concepts. Students are directed to prepare a research proposal by analyzing problems from a condition (background), identifying the problem, defining the scope, formulating the research questions, and stating the research objectives. This is followed by a literature review, review of relevant studies, development of a conceptual framework for problem-solving, and proposing tentative solutions (hypotheses) or detailed research questions. Subsequently, students select research methods, populations and samples, data collection instruments, and appropriate data analysis techniques aligned with the research questions. Once the research instruments are prepared, students conduct research, analyze data, interpret the results, draw conclusions, and report their

			findings in a final thesis. The thesis must be written in accordance with proper guidelines and be free from plagiarism.
18	BLG60301	Basic Biology	The Basic Biology course serves as an introduction for students to understand the fundamental principles of biology as a foundation for studying other branches of biology. The material covered includes cell structure and function, basics of genetics, evolution, biodiversity, ecology, and the relationship between organisms and their environment. Students will also be introduced to the scientific method and basic laboratory skills to support practical understanding of biological concepts. This course aims to develop scientific thinking and foster an appreciation for life in its various forms.
19		Biotechnology	This course covers both theoretical and practical aspects. It studies technologies involving or utilizing organisms, biological systems, or processes to produce goods and services beneficial to humans, other living beings, and the environment, as well as its applications in various fields. Topics include: (1) Fundamental issues in biotechnology; (2) Recombinant DNA technology and various molecular analysis techniques; (3) Applications of biotechnology (both conventional and modern) in fields such as agriculture (food, clothing, housing), environment (bioremediation and bioenergy), and medicine (production of monoclonal antibodies, animal cloning, transgenic animals); and (4) biosafety and bioethics in biotechnology.
20		Biochemistry	This course includes both theory and practice. It primarily covers the structure and function of biomolecules (carbohydrates, proteins, lipids, nucleic acids), coenzymes and vitamins, substances supporting transformation (enzymes) and their products, metabolism, and chemical reactions occurring within cells. Additionally, the course discusses metabolic disorders related to cellular metabolism.
21		Cell and Molecular Biology	This theoretical and practical course studies the structure and function of cells and viruses, the components within cells and their macromolecular composition; the structure and function of organelles; and the similarities and differences between prokaryotic cells (bacteria and fungi) and eukaryotic cells (yeast, animal cells, and plant cells). It also covers cell communication, the immune system, and cancer cells.
22		Plant Physiology	This course involves theory and practice related to water absorption and loss processes, nutrition, metabolism including photosynthesis, nitrogen-phosphorus-sulfur metabolism, respiration, assimilate translocation, enzymes and hormones, growth and development, and seed physiology.
23		Animal Physiology	This theoretical and practical course covers physiological processes in invertebrate and vertebrate animals, focusing on the regulation of systems such as homeostasis and internal environment, digestion, cardiovascular, respiration, excretion, and control systems.
24		Genetics	This course includes both theory and practice on DNA, gene concepts, chromosome theory, Mendelian crosses as the initial step in discovering inheritance patterns in living organisms and subsequent developments. It covers inheritance patterns, including linked genes, crossing over, calculating gene distances, applying mathematical formulas to predict trait inheritance probabilities, and determining whether observed traits from crosses are genetically based. The course studies gene properties and inheritance through pedigree analysis, applies the Hardy-Weinberg law to understand allele and genotype frequencies and changes due to non-random mating, investigates causes of chromosomal number and structure changes and related disorders, and explores extranuclear inheritance patterns involving mitochondria and chloroplasts.
25		Animal Anatomy and Histology	This course covers both theory and practice regarding the definition and scope of microscopic anatomical structures in animals, including cells, tissues, systems, and organs. Topics include epithelial tissue, connective

			tissue, muscle tissue, nervous tissue, digestive system, respiratory system, urinary system, reproductive system, and nervous coordination system, among others. Students are expected to summarize the relationships between structure and function at the cellular and tissue levels, types of structural damage, and basic concepts of tissue structure in animal bodies.
26		Plant Anatomy	This theoretical and practical course focuses on the structure and function of cells, meristematic tissues, parenchyma, collenchyma, sclerenchyma, epidermis, and vascular tissues in Spermatophyta plants. Understanding cell and tissue structure serves as a foundation for studying the anatomical structure of stems, roots, and leaves. Students are also introduced to organ anomalies and plant structural responses to environmental conditions. The course develops students' awareness of the applications of plant anatomy knowledge in other scientific fields and human life.
27		Plant Morphology	This course involves theory and practice on the external morphological structures of plants, covering the shapes and surfaces of main plant organs such as roots, stems, and leaves, as well as their modifications including flowers, fruits, seeds, tubers, rhizomes, and stolons. The course also discusses fruit development reconstruction, tree architecture, and various morphological responses of stems, roots, and leaves to environmental factors.
28		Plant Developmental Biology	This course covers theory and practice of key stages in structural and functional development at the cellular, tissue, and organ levels throughout the life cycle of plants, particularly Angiosperms, and the influencing factors. Topics include development of sexual reproductive organs, pollination, embryo and endosperm development, fruit and seed development, seedling development, vegetative organs, meristematic region structure and function at shoot and root tips, flowering initiation and production, regression of vegetative organs, and factors affecting morphogenesis. These factors include internal genetic, hormonal, and nutritional status, as well as external environmental factors, all regulated through mechanisms involving multiple genes.
29		Animal Developmental Biology	his theoretical and practical course covers animal development starting from variability in reproductive organ systems, gametogenesis, fertilization, blastulation, gastrulation, differentiation, organogenesis, morphogenesis, and teratogenesis. It also relates to post-embryonic development processes such as metamorphosis and regeneration of damaged tissues and organs. The study spans organizational levels from molecular to individual. At the individual level, hormonal regulation and control of reproductive mechanisms, reproductive cycles, pregnancy, and lactation are discussed. Basic concepts of fertility, infertility, and sterility in both male and female animals are introduced.
30		Evolution	This course consists of theory and practice about the existence and development of living organisms in nature. It is more accurately described as an Evolution Hypothesis rather than a definitive Evolution Theory. The course traces the development of evolutionary theory from Pre-Darwinian times, through Darwinian theory, to Post-Darwinian perspectives. It covers biological variation as raw material for evolution, phylogeny, species, and speciation, alongside a holistic view of evolutionary mechanisms. Supporting evidence for evolution is discussed, including the evolution of primates and humans, linked to technological development, as well as the evolution of plants, invertebrates, and microbes.
31		Vertebrate Biology	This course covers theory and practice concerning the subphylum Vertebrata, including biodiversity (with emphasis on Indonesian biodiversity), systematics, morphology, functional anatomy, physiology, ecology, evolution, and biogeography.
32		Invertebrate Biology	This theoretical and practical course focuses on invertebrate animals, covering biodiversity (including Indonesian species), systematics,

			morphology, functional anatomy, physiology, ecology, evolution, and biogeography.
33		Plant Systematics	This course includes theory and practice of classical and experimental taxonomy and systematics, biodiversity and supporting factors, classification and related challenges, nomenclature, taxonomic evidence, phenotypic modifications, research procedures in taxonomy, data analysis, and herbarium preparation. It covers taxonomic objects including Schizophyta, Thallophyta, Bryophyta, Pteridophyta, Gymnospermae, and Angiospermae.
34		Ecology	This course includes theory and practice on fundamental ecology concepts such as ecology as a science, ecosystems as ecological units, limiting factors and regulation, community ecology, population ecology, habitat ecology, applications of ecology in agriculture, vegetation analysis, biodiversity, evolution and ecosystem changes, and natural/artificial ecosystems.
35		Environmental Science	This course covers theoretical and practical aspects of integrated environmental issues and student responsibilities toward creating a scholarly, ecological, and humanistic society. It emphasizes sensitivity to interactions between biophysical environmental quality and sustainable development utilization. Topics include the Rio de Janeiro Agenda 21, eco-efficiency, clean technology, zero-waste technology concepts, new environmental management paradigms, conservation strategies, environmental impact analysis, ecolabeling in production systems, environmental ethics integrated with environmental law, and various human efforts to solve environmental problems with short-, medium-, and long-term solutions. Local environmental issues are addressed within national and global perspectives.
36		Microbiology	This course includes theory and practice on the scope and historical development of microbiology (from Leeuwenhoek's era to molecular microbiology), microbial groups and their main characteristics, microbial cell structure, viruses, basic microbial metabolism and metabolic diversity, microbial molecular biology and genetics, microbial growth and regulation, microbial systematics, and the roles of microbes in human life.
37		Seminar	This course provides a platform for students to prepare, present, and discuss research proposals as an initial step in their thesis writing process. Students are guided to formulate background, problem statements, objectives, literature reviews, research methodologies, and systematic proposal writing. Additionally, students are trained to communicate ideas scientifically and receive constructive feedback. The course aims to develop critical thinking, analytical skills, and communication abilities in scientific research.
38		Field Study / Excursion	This course covers both theory and practice in designing, implementing, evaluating, and further developing scientific biological curation activities. It includes planning, field data collection (specimen collection, field identification, temporary preservation), advanced laboratory identification, permanent preservation, specimen storage, and specimen data management in the laboratory.
39		Microtechnique	Theory and practice about various laboratory tools made of metal and glass and their correct use, chemical handling and safety (Laboratory K3), microscope introduction and maintenance, preparation of animal specimens using paraffin and whole mount methods, and plant specimen preparations including squash, pollen, cuticle, diatoms, and bioresin.
40		Plant Tissue Culture	Theory and practice on the basic principles and techniques of plant tissue culture, including scope, history, culture media types and compositions, growth regulator modifications, laboratory standards, equipment, and materials. Covers planting, subculturing, acclimatization techniques, and applications such as haploid, dihaploid, triploid plant production, secondary metabolites, somaclonal variation, and protoplast culture.

41		Bioinformatics	This course covers the definition, scope, and development of bioinformatics, examples of its application in species research, online databases and their use, primer design using online tools for DNA and methylated DNA, analysis and comparison of sequencing results, polymorphism analysis, and phylogenetic tree construction.
42		Conservation Biology	Theory and practice about conservation concepts with biological principles and new approaches to biodiversity management and preservation in Indonesia. Topics include biodiversity crises, human impacts on population, community, ecosystem, and landscape ecology. Practical approaches for species extinction prevention, ecological restoration, ecosystem management, conservation, sustainable development, One Health, and practical ecological regulations are discussed.
43		Biological Experimental Design	Theory and practice in designing biological research, conducting quantitative experiments according to methodological and statistical analysis principles for decision-making. Designs include single factor and factorial designs for Completely Randomized Design (RAL), Randomized Block Design (RAKL), Latin Square Design (RBSL), and Split Plot design. Statistical tests such as ANOVA, normality and homogeneity tests, correlation, and covariance analysis are also covered.
44		Plant Cultivation	Theory and practice about principles of sustainable plant cultivation with scientific and modern technological approaches. Topics include growth requirements, environmental influences, land management, seedling production, planting, irrigation, fertilization, pest, disease, and weed control, propagation via pollination and tissue culture, harvesting and post-harvest handling. Covers conventional and innovative techniques such as hydroponics, aeroponics, precision agriculture, biotechnology applications for productivity, environmental management, resource efficiency, climate change impacts, and adaptive cultivation systems.
45		Animal Husbandry	Theory and practice covering concepts, methods, and modern technologies in efficient, sustainable, and environmentally friendly animal farming. Includes maintenance techniques, nutrition management, animal health, reproduction, and environmental management using innovations like precision livestock farming, biotechnology, and automation. Addresses global issues such as animal welfare, biosecurity, and livestock impact on climate change.
46		Applied Microbiology	Theory and practice on the role and application of microorganisms in fields such as fermentation industries, agriculture/livestock, food, biological control, health, waste processing (bioremediation), and renewable energy production. Also covers bioethics, biosecurity, and regulations related to microbial use in industry and research. Encourages exploration of microbial biotechnology potentials via accredited journal reviews.
47		Endocrinology	Theory and practice about hormonal control of physiological functions, including hormone definitions, classification, biochemistry, mechanisms, and functions of hormones from hypothalamus, pituitary, adrenal cortex, thyroid, parathyroid, pancreas, reproductive organs, digestive tract, and endocrine glands in some invertebrates such as insects and crustaceans.
48		Mammalogy	Theory and practice on mammalian biology covering biodiversity (including Indonesian), systematics, functional anatomy, physiology, ecology, evolution, biogeography, and conservation.
49		Ichthyology	Theory and practice on the diversity, systematics, and biology of fishes. Topics include basic systematics and phylogeny of Agnatha, Chondrichthyes, Chondrostei, Holostei, Teleostei, Sarcopterygii, and key taxonomic characters like morphology, physiology, ecology, biogeography, and conservation status.
50		Ornithology	Theory and practice on the evolutionary origins of class Aves from the Jurassic period through embryonic development to modern birds. Anatomical features distinguishing birds from other vertebrates are

			discussed. Ecologically, the role and function of birds in ecosystems, their adaptation patterns from ancient to modern times, and behavior studies are included. Human intervention and bird conservation efforts conclude the course.
51		Herpetology	Theory and practice on diversity, systematics, and biology of herpetofauna—reptiles and amphibians. Covers basic systematics and phylogeny concepts of these classes.
52		Parasitology	Theory and practice on parasitic protozoa, nematodes, cestodes, trematodes, and arthropods, including their characteristics, classification, vectors, reservoirs, and zoonotic disease potentials from ecosystem cross-contact. Introduces the One Health concept.
53		Entomology	Theory and practice on insect biology covering biodiversity (including Indonesia), systematics, functional anatomy, physiology, ecology, evolution, biogeography, and conservation.
54		Ethnobotany	Theory and practice on the utilization of plants for daily needs and traditional customs. The material includes taxonomic botanical data, regional botanical knowledge, and interpretation of human-plant relationships focused on cultural and natural resource sustainability. Covers ethnobotany through local ethnic studies from scientific and global perspectives, analysis of ethnic group relationships in plant resource use, exploration of plant value and cultural characteristics, mapping of general and specific plant uses (food, medicine, construction, rituals, dyeing, etc.), integration of qualitative and quantitative knowledge with scientific development, analysis of Indonesia's rich biodiversity and cultural diversity in sustainable cultural value inheritance, in-depth cultural and plant resource relationships, and community perceptions on plant benefits with anthropological, agronomic, and ecological aspects.
55		Phytohormones	This course consists of theoretical and practical components covering the scope of phytohormone studies, including types of phytohormones, mechanisms of action, sites of synthesis and biosynthesis pathways, transport mechanisms, physiological roles, deactivation processes, and applications of plant hormones in agriculture.
56		Plant Ecophysiology	This course includes theory and practice on the physiological mechanisms of plant adaptation or response to various environmental stress factors, including biotic and abiotic stresses, as efforts by plants to sustain life. These physiological mechanisms cover how plants regulate and/or maintain growth responses, metabolism, resource acquisition, survival under environmental stress, and geographic distribution influenced by physical, chemical, and biological environmental factors. Biotic stresses include competition and parasitism, chemical stresses include excessive or deficient nutrients, soil sickness, salinity, extreme pH, and presence of toxic chemicals. Physical stresses include temperature extremes, drought, flooding, light intensity, and radiation such as UV, X-rays, and gamma rays.
57		Food Safety	This course covers theoretical and practical aspects of the principles and application of food safety systems from upstream to downstream in the food supply chain. It includes identification of potential biological, chemical, and physical hazards in food materials, control and prevention methods for contamination, as well as national and international food safety standards and regulations (such as HACCP, GMP, and ISO 22000). The course emphasizes the role of technology and risk management in ensuring food quality and safe consumption. Students will develop the ability to identify risks, apply food safety principles, and contribute to providing safe, healthy, and suitable food for consumption.
58		Molecular Genetics	This course advances knowledge in molecular biology specifically related to genetics or heredity in living organisms. Topics include: (1) DNA as the carrier of genetic material, (2) genes and biological information, (3) DNA and RNA structure, (4) genetic mutations, (5) gene function, (6)

			epigenetics, (7) DNA replication, (8) prokaryotic and eukaryotic genomes, (9) the human genome, (10) transcription, (11) translation, (12) regulation of gene expression in prokaryotes, and (13) regulation of gene expression in eukaryotes.
59		Bioremediation	This course includes theory and practice on the use of organisms to remediate environmental damage by transforming toxic pollutants into simpler, non-toxic forms, providing a basis for waste treatment and environmental management. Topics cover the principles of bioremediation; use of microorganisms (bacteria, fungi, consortia, and symbioses), microalgae, macroalgae, macrophytes, and higher plants (phytoremediation) for restoring aquatic and terrestrial environments; and the development of bioremediation techniques in environmental management.
60		Enzymology	This course covers the structure and function of enzymes, including enzyme structure and function, catalytic mechanisms, enzyme kinetics, enzyme classification, coenzymes, enzyme inhibition, regulation of enzyme activity, and enzyme applications in various fields.
61		Mycology	This course covers theoretical and practical aspects of fungal biology comprehensively, including fungal diversity, classification, morphology, physiology, reproduction, relationships with other organisms (including symbiosis and pathogenicity), and ecological and economic roles, including applications in agriculture, industry, food, and health.
62		Biospeleology	This course explores life within cave ecosystems and their environments, covering biodiversity in Indonesia, systematics, functional anatomy, physiology, ecology, evolution, biogeography, and conservation.
63		Environmental Management	This course focuses on environmental conservation principles, objectives, and practices including soil and air conservation, energy conservation, natural resource conservation, conservation policies and practices in Indonesia, and conservation-related development. Emphasis is placed on an anthropocentric perspective.
64		Modern Biological Analysis	This course introduces basic concepts and integrative approaches in modern biological research. It covers the working principles of various approaches, technologies used, and data analysis. The focus is on how integrating data across different organizational levels provides a comprehensive understanding of biological systems, health, disease, and applications in biology. Theoretical foundations and basic skills are provided to understand and apply analytical approaches in modern biological research.
65		Aquatic Ecology	This course includes theory and practice on the structure, function, and dynamics of aquatic ecosystems, including freshwater (lakes, rivers, swamps) and marine environments. Topics cover interactions between aquatic organisms and their environment, including physical, chemical, and biotic factors affecting productivity and biodiversity; zonation of aquatic ecosystems; food chains; nutrient cycles; and human impacts such as pollution, eutrophication, and climate change on aquatic ecology.
66		Soil Biology	This course includes theory and practice on soil as a living ecosystem, including soil composition, soil organisms, interactions among soil organisms, soil organic matter, soil fertility, nutrient cycling, composting technology, and biopores for soil and water conservation. It also addresses current issues in soil biology and provides alternative solutions through relevant innovations and technologies.
67		Biotropics	This course covers the scope and basic concepts of tropical biology, structure and function of tropical forests in terms of flora, fauna, and microbiota, characteristics of tropical forests, ecosystem dynamics, interactions among flora, fauna, and microbiota. Topics include vegetation analysis, classification systems of tropical forests, issues related to tropical

			forests and their utilization, exploitation, management, and conservation of tropical forests as life support systems.
68		Economic Botany	This course covers theoretical and practical aspects of the utilization of plants by humans from botanical, economic, and cultural perspectives. It focuses on plant groups with high economic value, such as food crops, medicinal plants, fibers, spices, essential oils, natural dyes, and industrial plants. Topics include classification, plant parts used, bioactive compounds, pharmacological benefits, and conservation potential. The course also examines the relationship between plant diversity and sustainable development and bioeconomy.
69		Immunology	This course covers the history and basic concepts of immunology, hematopoiesis, components of innate and adaptive immune systems, lymphoid organs and lymphocyte maturation (lymphatic circulation), mediators of immune responses (cytokines, complement, and antimicrobial proteins), pathogen recognition and activation of innate immunity, innate immune responses (inflammation and phagocytosis), antigen and antibody concepts, antigen recognition and receptor formation, antigen presentation and activation of adaptive immunity, cellular and humoral immune responses, as well as natural and synthetic active and passive immunity transfers. The course also examines immune system disorders and diseases such as immunity against pathogens, immunodeficiency (HIV/AIDS), hypersensitivity (allergy), autoimmune diseases, blood group incompatibility, and transplantation.
70		Marine Biology	This course covers key topics on the marine environment, including physical and chemical properties of seawater, and biology including taxonomy, structure, function, growth, development, evolution, ecology, and geographical distribution of marine organisms. Organism groups discussed include phytoplankton, seaweeds and seagrasses, zooplankton, invertebrates, fish, and other marine organisms.
71		Human Biology and Nutrition	This course facilitates mastery of biological concepts of the human body systematically and develops skills for health case analysis related to human body system pathology. It covers human growth and aging processes, biological variation and adaptation, and nutritional fulfillment to support physiological functions and maintain homeostasis. The course is designed to help biology students develop talents, skills, and competencies related to applied human biology and nutrition in professional fields such as nutrition, pharmaceuticals, health laboratories, and medicine.
72		Phytopharmacy	This course covers the development and utilization of medicinal plants in Indonesia, including various plants as natural sources of medicines, active compounds, pharmacological benefits, and mechanisms of bioactivity of active compounds.

E. Semester Teaching and Learning Plan

Contoh RPS

MINISTRY OF EDUCATION, CULTURE, RESEARCH, AND TECHNOLOGY
YOGYAKARTA STATE UNIVERSITY
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNDERGRADUATE PROGRAM IN BIOLOGY – S1

Semester Learning Plan (RPS)

Study Program	:	BIOLOGY- S1
Course / Code	:	Bioremediation
Number of Credits	:	3
Academic Year	:	2024
Semester	:	2
Prerequisite Course(s)	:	Microbiology, Environmental Science, and Plant Physiology
Course Lecturer(s) / Instructor(s)	:	1. Dr. Anna Rakhmawati S.Si., M.Si. 2. Risma Wiharyanti M.Si.
Language of Instruction	:	Indonesian Language

A. COURSE DESCRIPTION

Bioremediation refers to the utilization of organisms to restore or improve environmental quality. In this process, organisms play a role in transforming toxic pollutants into simpler, non-toxic compounds, thereby providing a scientific foundation for waste treatment and environmental management. This course discusses the principles of bioremediation; the use of microorganisms (bacteria, fungi, microbial consortia, and their symbioses), microalgae, macroalgae, macrophytes, and higher plants (phytoremediation) for the restoration of both aquatic and terrestrial environments; as well as recent developments in bioremediation within the context of environmental management.

B. GRADUATE LEARNING OUTCOMES (CPL) AND COURSE LEARNING OUTCOMES (CPMK)

No	Course Learning Outcomes (CPMK)	Graduate Learning Outcomes (CPL)
1	Understand the concept of environmental pollution and its relationship with bioremediation	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
2	Understand the latest developments regarding environmental pollution issues	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
3	Explain the concepts, methods, and benefits of bioremediation in various fields, as well as the environmental factors that influence it	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
4	Explain the different types of bioremediation	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both

		general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
5	Explain the main mechanisms involved in bioremediation	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
6	Identify groups of microorganisms with potential for bioremediation of heavy metals or other pollutants	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
7	Explain the bioremediation mechanisms employed by microorganisms	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
8		Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge

	Select groups of aquatic plants with potential as hyperaccumulators of heavy metals or pollutants, and explain the mechanisms by which these plants neutralize contaminants	Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
9	Select groups of terrestrial plants with potential as hyperaccumulators of heavy metals or pollutants, and explain the mechanisms by which these plants neutralize contaminants.	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context
10	Work independently or collaboratively in group discussions and communicate the results of group work effectively	Demonstrate adaptive, critical, creative, collaborative, and innovative attitudes in applying biological knowledge
		Master the principles and applications of biology, biological resources, and the environment.
		Master the principles and applications of software, basic instruments, and methods for analysis and synthesis in both general and specialized fields of biology
		Apply logical, critical, systematic, and innovative thinking in the development or implementation of scientific knowledge and/or technology, leveraging local potential in their area of expertise
		Formulate solutions to biological problems through the application of relevant biological knowledge, methods, and technology in a mono-disciplinary context

C. LEARNING ACTIVITIES

Week	CPMK	Topics / Subject Matter	Learning Methods / Approaches	Learning Experiences	Assessment Indicators	Assessment Methods / Techniques	Time Allocation	References
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	1, 2, 3	Presentation of the course syllabus and course introduction	1. Lecture 2. Discussion			Attendance / Participation	2 x 50 minutes	
2	1, 2, 3	Environmental pollution, pollutants, and bioremediation	1. Lecture 2. Discussion			Attendance / Participation	2 x 50 minutes	9, 10, 11, 12, 13, 14
3	4, 8, 9	The role of bioremediation in aquatic and terrestrial environments	1. Lecture 2. Discussion			Attendance / Participation	2 x 50 minutes	1, 7, 8, 15, 16
4	2, 3	The role of bioremediation in industry and education	1. Lecture 2. Discussion			Attendance / Participation	2 x 50 minutes	9, 13
5	4, 5	Phytoremediation	1. Lecture 2. Discussion 3. Practical			Attendance / Participation	6 x 50 minutes	1, 7, 8, 15, 16
6	4, 5	Microremediation	1. Lecture 2. Discussion 3. Practical			Attendance / Participation	6 x 50 minutes	9, 10, 11, 12, 13
7	4, 5, 10	Combination of microremediation and phytoremediation; remediation using animals	1. Lecture 2. Discussion 3. Practical			1. Attendance / Participation 2. Presentation	2 x 50 minutes	1, 8, 9, 10, 11, 12, 13, 14, 15
8	1, 2, 3, 4, 5, 6, 7	Midterm Examination	Quiz / Evaluation			Midterm Examination	2 x 50 minutes	1, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
9	3, 4	Bioremediation application techniques (In Situ)	1. Lecture 2. Discussion 3. Practical			Attendance / Participation	6 x 50 minutes	9, 17
10	3, 4	Bioremediation application techniques (Ex Situ)	1. Lecture 2. Discussion 3. Practical			Attendance / Participation / Assignments	6 x 50 minutes	9, 13, 17

11	5	Main mechanisms in bioremediation	1. Discussion 2. Practical			Attendance / Participation / Assignments	6 x 50 minutes	9, 10, 17
12	6, 7	Bioremediation of inorganic waste using microorganisms	1. Lecture 2. Discussion 3. Practical			Attendance / Participation	6 x 50 minutes	2, 3, 4, 5, 6, 18
13	6, 7	Bioremediation of organic waste using microorganisms	1. Lecture 2. Discussion 3. Practical			Attendance / Participation	6 x 50 minutes	6, 9, 10, 17
14	8	Types of aquatic plants with potential as bioremediation agents and their mechanisms	1. Discussion 2. Demonstration 3. Practical			1. Attendance / Participation 2. Presentation	6 x 50 minutes	1, 5, 7, 8, 15, 16
15	9	Types of terrestrial plants with potential as bioremediation agents and their mechanisms	1. Discussion 2. Demonstration 3. Practical			1. Attendance / Participation 2. Presentation	6 x 50 minutes	1, 7, 8, 15, 16
16	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Final Examination	Quiz / Evaluation			Final Examination	2 x 50 minutes	

D. ASSESSMENT COMPONENTS

Number	Assessment Method / Technique	Assessment Weight (%)	Description / Remarks
1.	Cognitive	50	Maximum cumulative assessment weight: 50%
	a. Attendance	10	
	b. Quiz	5	
	c. Assignment	5	
	d. Midterm Examination	15	
	e. Final ExaminationUAS	15	
2.	Participative	50	Minimum cumulative assessment weight: 50%
	a. Case Study	25	
	b. Team-Based Project	25	
TOTAL		**100**	

E. REFERENCES

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Acknowledged by,
Head of Department / Program Coordinator

[digitally approved in the RPS system]

Bachelor’s Degree Program in Biology (S1)
Program Code : 30814

Yogyakarta, January 1, 2025
Course Lecturer / Instructor,

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