



Faculty of Mathematics and Natural Sciences
Universitas Negeri Yogyakarta

MERDEKA CURRICULUM BACHELOR OF BIOLOGY STUDY PROGRAM



20
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A. Vision, Mission and Objectives of the Biology Study Program FMIPA UNY

1. Vision of Biology Study Program FMIPA UNY:

In 2025, the Biology Study Program of FMIPA UNY will become an international biology institution and is aiming to produce Bachelors of Biology who are devout, independent, intellectual, creative, innovative, and globally insightful.

2. Mission of the Biology Study Program FMIPA UNY:

The Biology Study Program of FMIPA UNY carries out the mission of:

- 1) Organizing undergraduate Biology education based on devotion, independence, intellectuality, and global insight.
- 2) Carrying out research and development of Biology and its application.
- 3) Opening community service services in the field of Biology.
- 4) Developing entrepreneurship in the field of Biology.

3. Objectives of the Biology Study Program

The objective of the Biology Study Program of FMIPA UNY :

- 1) Graduates internalize and apply ecological awareness, religious values, and humanitarian principles in addressing biological issues and contributing to sustainable development Bachelor of Biology who has the qualifications and competence as an excellent, creative and innovative research assistant who can play a role in local, national, and global communities by upholding academic norms, values, and ethics.
- 2) Graduates demonstrate mastery of research competencies and qualifications, enabling them to serve as excellent, creative, and innovative research assistants who contribute meaningfully to local, national, and global communities while upholding academic norms, values, and ethics
- 3) Graduates contribute to advancing biological sciences and their applications by integrating knowledge and research skills to drive innovation, foster sustainable solutions that enhance human well-being and environmental quality, demonstrate leadership and professional integrity in diverse contexts, and actively engage in lifelong learning and international collaboration
- 4) Graduates demonstrate competence in building careers and creating entrepreneurial opportunities in the field of biology, contributing to the community in an accountable and credible manner.

B. Profile of Study Program Graduates

The profile of graduates of the Bachelor of Biology Study Program FMIPA UNY who are expected to be Bachelors who have 3 competencies:

- 1) Main competence is as a research assistant in the field of biology.
- 2) Additional competence as an Academic in the field of biology
- 3) Competence as an entrepreneur related to the field of biology.

Thus there are three occupational profiles that can be entered by graduates of the Biology Study Program FMIPA UNY, namely as Biologists, as Biology research assistants, and as entrepreneurs in the field of Biology.

The graduates profile for the Bachelor of Biology Study Program and the description of the graduate profile on each of the competencies that must be possessed is depicted in table 1.

Table 1. Profile of Undergraduate Graduates of Biology Study Program

No.	Graduate Profile	Description of Graduate Profile
1	Biologists	Having excellent qualifications and competencies, creative and innovative as Biologists while upholding the values of piety, independence, and intellectuality. Graduates in Biology can also work in government or private agencies or institutions related to the field of biology, such as in the Ministry of Forestry and Environment, Environmental NGOs, Health Offices, etc., or as educators
2	Biology research assistant	Able to conduct research that can contribute to solve biological problems with solutions based on local wisdom. Research assistants in various agencies or institutions related to the field of biology, such as BRIN
3	Entrepreneurs in the field of Biology.	Having insight and competence in entrepreneurship either independently or in team in the field of Biology also being in which able to contribute to the community in an accountable, credible, and transparent manner. Become an entrepreneur related to the field of biology, both in service, such as consultants for the preparation of scientific documents related to biology, as well as production of goods such as applied biological products in agriculture, fisheries, and health

C. Program Learning Outcomes (PLO) of Biology Study Program

Every Undergraduate Graduate of the Biology Study Program should achieve Program Learning Outcomes (PLO) which are presented in the following table.

Table 2. Learning Outcomes of Graduates of the Biology Study Program FMIPA UNY

Learning Outcomes domains according to SNPT	Main Learning Outcomes of the Biology Study Program	
Attitude	PLO 1	Apply religious values, humanity, and concern for the environment.
	PLO 2	Apply civic responsibility in societal life based on Pancasila.
	PLO 3	Apply discipline in social and state life, by internalizing academic values, norms, and ethics
	PLO 4	Apply adaptive, creative, and innovative in applying biological sciences and related sciences
Knowledge	PLO 5	Apply the core of biological sciences to analyze and solve biological problems
	PLO 6	Apply laboratory techniques and biological methodologies to generate valid scientific knowledge
General Skills	PLO 7	Apply managerial skills to supervise and evaluate work, fostering collaboration and professionalism
	PLO 8	Communicate scientific ideas effectively in national and international forums.
Special Skills	PLO 9	Apply biological techniques in laboratory and real-life contexts
	PLO 10	Elaborate local potential in specialized biology studies
	PLO 11	Create career and entrepreneurial opportunities in biology responsibly and credibly.

D. Structure and Distribution of the Biology Study Program Curriculum

Characteristics of the Study Program Curriculum are:

- 1) The structure of the biology curriculum covers the main areas and options/interests.
- 2) The main fields include university courses, faculty courses and study program courses.
- 3) Areas of choice/special interest include: zoology, botany, microbiology and biotechnology, and environmental fields. Elective courses can be chosen between fields with a greater number of credits in the field that is in accordance with the Final Thesis Project.
- 4) Number of credits: 146-156 credits (university courses: 16 credits, faculty courses: 4 credits, study program courses: 90-96 credits, and outside study program courses 36-40).
- 5) Lectures are in the form of theory which is separated from lab work with the same topics

The Merdeka Belajar-Kampus Merdeka curriculum has a structure in the following course groups.

1. The Main Course Group is a number of courses to meet the main Program Learning Outcomes (PLO) in the Study Program, which consists of basic university courses, basic professional courses, faculty courses and Study Program courses (field study). This course can also be taken outside of UNY by credit transfer scheme.
2. Additional Course Groups are a number of courses to meet additional Program Learning Outcomes (PLO consisting of advanced lectures and excellent lectures/characteristics/interest of study programs.
3. Courses outside the Study Program inside UNY and outside UNY are students' elective courses to meet the main and additional PLO achievements taken inside and outside UNY.

2. Curriculum Distribution

The curriculum of the Biology Study Program consists of 146 credits which are grouped into several groups of Learning Patterns courses with the following distribution.

No	Course Groups	Pattern (credits)		
		512	611	602
1	Compulsory University Course (MKU)	14	14	14
2	Elective University Course (MKU)	2	2	2
3	Faculty Courses	4	4	4
4	Study Program Courses	90-96	90-96	90-96
5	External Courses outside Biology Study Programs (inside UNY)	12-14	16-20	-
6	External Courses	24-26	20	36-40
	SUM	146-156	146-156	146-156

The following is described the name of the course along with the credits in each group of courses.

a. Compulsory University Course Group (MKU) (14 credits)

No	Code	Courses	Credits				Semester		Prerequisite
			T	P	F	S	ODD	EVEN	
1	MKU6201	Islamic Education ¹⁾	2	-	-	2	√		
2	MKU6202	Catholic Education ¹⁾							
3	MKU6203	Christian Education ¹⁾							
4	MKU6204	Hindu Education ¹⁾							
5	MKU6205	Buddhist Education ¹⁾							
6	MKU6206	Confucian Education ¹⁾							
7	MKU6207	Civic Education	2	-	-	2	√		
8	MKU6208	Pancasila	2	-	-	2		√	
9	MKU6209	Indonesian Language ²⁾	2	-	-	2		√	
10	MKU6211	English ²⁾	2	-	-	2		√	
11	MKU6212	Digital Transformation	2	-	-	2	√		
12	MKU6232	Creativity, Innovation and Entrepreneurship ²⁾	2	-	-	2	√		
		SUM	14	-	-	14			

Description:

1) = choose one according to the students' preferred religion

2) = competence adjusted to the characteristics of the study program

3) = the implementation of KKN is coordinated by LPPM and academic affairs.

Elective University Courses (MKU) (2 credits)

No	Code	Courses	Credits				Semester		Prerequisite
			T	P	F	S	ODD	EVEN	
1	MKU6216	Social Literacy and Humanity	2	-	-	2	√		
		SUM	2	-	-	2			

b. Faculty Courses (4 Credits)

No	Code	Courses	Credits				Semester		Prerequisite
			T	P	F	S	ODD	EVEN	
1	FMI6201	Insights and studies of mathematics and natural science	2	-	-	2		√	
2	FMI6202	Statistics	2	-	-	2	√		
		SUM	4	-	-	4			

c. Biology Study Program Courses

The Biology Study Program course consists of several groups of courses as follows.

1) Compulsory Biology Science Course (82 Credits)

No	Code	Courses	Credits	SEM		Prerequisite
				Odd	Even	
1	BIO6201	Plant Anatomy	2	√		
2	BIO6102	Lab Work of Plant Anatomy	1	√		
3	BIO6203	Plant Morphology	2	√		
4	BIO6104	Lab Work of Plant Morphology	1	√		
5	BIO6205	Invertebrates Biology	2	√		
6	BIO6106	Lab Work of Invertebrates Biology *)	1	√		
7	BIO6207	Biochemistry	2	√		
8	BIO6108	Lab Work of Biochemistry	1	√		
9	BIO6209	Animal Anatomy and Histology	2		√	
10	BIO6110	Lab work of Animal Anatomy and Histology	1		√	
11	BIO6211	Vertebrates Biology	2		√	
12	BIO6112	Lab Work of Vertebrates Biology *)	1		√	
13	BIO6213	Plant Systematics	2		√	
14	BIO6114	Lab Work of Plant Systematics	1		√	
15	BIO6215	Plant Physiology	2		√	
16	BIO6116	Lab Work of Plant Physiology	1		√	
17	BIO6217	Cell and Molecular Biology	2		√	
18	BIO6118	Lab Work of Cell and Molecular Biology	1		√	
19	BIO6219	Biometrics	2		√	
20	BIO6120	Lab Work of Biometrics	1		√	
21	BIO6221	Ecology	2	√		
22	BIO6122	Lab Work of Ecology	1	√		
23	BIO6223	Animal Physiology	2	√		
24	BIO6124	Lab Work of Animal Physiology	1	√		
25	BIO6225	Genetics	2	√		
26	BIO6126	Lab Work of Genetics	1	√		
27	BIO6227	Microbiology	2	√		
28	BIO6128	Lab Work of Microbiology	1	√		
29	BIO6229	Biotechnology	2	√		
30	BIO6130	Lab Work of Biotechnology	1	√		
31	BIO6231	Behavior of Organisms	2	√		
32	BIO6232	Philosophy of Science	2	√		
33	BIO6233	Environmental Science	2		√	
34	BIO6134	Lab Work of Environmental Science	1		√	
35	BIO6235	Plant Developmental Biology	2		√	
36	BIO6136	Lab Work of Plant Developmental Biology	1		√	
37	BIO6237	Bivariate Biological Research Methodology	2		√	
38	BIO6138	Lab Work of Bivariate Biological Research Methodology	1		√	
39	BIO6239	Marine Biology	2		√	
40	BIO6140	Lab Work of Marine Biology *)	1		√	
41	BIO6141	Plant Tissue Culture	1		√	
42	BIO6242	Lab Work of Plant Tissue Culture	2		√	
43	BIO6243	Human Biology and Nutrition	2		√	

44	BIO6144	Lab Work of Human Biology and Nutrition	1		√	
45	BIO6245	Animal Developmental Biology	2	√		
46	BIO6146	Lab Work of Animal Developmental Biology	1	√		
47	BIO6247	Multivariate Biological Research Methodology	2	√		
48	BIO6148	Lab Work of Multivariate Biological Research Methodology	1	√		
49	BIO6249	Soil Biology	2	√		
50	BIO6150	Lab Work of Soil Biology	1	√		
51	BIO6151	Microtechnique	1	√		
52	BIO6252	Lab Work of Microtechnique	2	√		
53	BIO6253	Evolution	2	√		
54	BIO6154	Lab Work of Evolution	1	√		
		SUM	82			

d. Elective Courses (101 credits)

This course is a **elective choice** course inside and outside the study program, including biology science courses, research courses and entrepreneurship courses.

No	Code	Courses	CREDITS				SEMESTER		Prerequisite
			T	P	F	S	Odd	Even	
Botany Elective Course									
1	BIM6201	Ethnobotany	2			2		√	
2	BIM6102	Lab Work of Ethnobotany		1		1		√	
3	BIM6203	Phytohormone	2			2		√	BIM6215
4	BIM6104	Lab Work of Phytohormone		1		1		√	BIM6116
5	BIM6205	Plant Ecophysiology	2			2		√	BIM6215
6	BIM6106	Lab Work of Plant Ecophysiology		1		1		√	BIM6116
7	BIM6207	Phytoplankton	2			2	√		
8	BIM6108	Lab Work of Phytoplankton		1		1	√		
9	BIM6209	Phytopharmaceuticals	2			2	√		BIO6208, BIM6215
10	BIM6110	Lab Work of Phytopharmaceuticals		1		1	√		BIO6109, BIM6116
11	BIM6211	Plant Cultivation	2			2	√		
12	BIM6112	Lab Work of Plant Cultivation		1		1	√		
13	BIM6213	Economic Botany	2			2	√		MKU6232
14	BIM6114	Lab Work of of Economic Botany		1		1	√		MKU6232
Zoology Elective Course									
15	BIM6215	Animal Reproduction Technology	2			2		√	
16	BIM6116	Lab Work of Animal Reproduction Technology		1		1		√	
17	BIM6217	Endocrinology	2			2		√	BIO6217
18	BIM6118	Lab Work of Endocrinology		1		1		√	BIO6118
19	BIM6219	Ichthyology	2			2		√	BIO6209
20	BIM6120	Lab work of Ichthyology		1		1		√	BIO6110
21	BIM6221	Ornithology	2			2		√	BIO6209
22	BIM6122	Lab Work of Ornithology		1		1		√	BIO6110
23	BIM6223	Herpetology	2			2		√	BIO6209
24	BIM6124	Lab Work of Herpetology		1		1		√	BIO6110
25	BIM6225	Animal Biosystematics	2			2	√		BIO627, BIO620

26	BIM6126	Lab Work of Animal Biosystematics		1		1	√		BIO6108, BIO6110
27	BIM6227	Parasitology	2			2	√		
28	BIM6128	Lab Work of Parasitology		1		1	√		
29	BIM6229	Entomology	2			2	√		BIO6207
30	BIM6130	Lab Work of Entomology		1		1	√		BIO6108
31	BIM6231	Animal Livestock Production	2			2	√		
32	BIM6132	Lab Work of Animal Livestock Production		1		1	√		
33	BIM6233	Natural Food Technology	2			2	√		
34	BIM6134	Lab Work of Natural Food Technology		1		1	√		
Microbiology and Biotechnology Elective Course									
35	BIM6235	Microbial Ecology	2			2	√		BIO6213
36	BIM6136	Lab Work of Microbial Ecology		1		1	√		BIO6114
37	BIM6137	Industrial Microbiology	1			1	√		BIO6213
38	BIM6238	Lab Work of Microbiology Industry		2		2	√		BIO6114
39	BIM6239	Food Safety	2			2		√	BIO6213
40	BIM6140	Lab Work of Food Safety		1		1		√	BIO6114
41	BIM6241	Applied Microbiology	2			2		√	BIO6213
42	BIM6142	Lab Work of Applied Microbiology		1		1		√	BIO6114
43	BIM6243	Molecular Genetics	2			2	√		BIO6220
44	BIM6244	Bioinformatics	2			2	√		
45	BIM6245	Immunology	2			2	√		BIO6210
46	BIM6146	Lab Work of Immunology		1		1	√		
47	BIM6247	Bioremediation	2			2		√	
48	BIM6148	Lab Work of Bioremediation		1		1		√	
49	BIM6249	Enzymology	2			2		√	BIO6208
50	BIM6150	Lab work of Enzymology		1		1		√	BIO6109
Ecology and Environment Elective Course									
51	BIM6251	Population and Environmental Education	2			2		√	BIO6214
52	BIM6252	Biotropics	2			2		√	BIO6214
53	BIM6253	Agroforestry	2			2		√	BIO6214
54	BIM6154	Lab Work of Agroforestry		1		1		√	BIO6115
55	BIM6255	Environmental Health	2			2		√	BIO6214
56	BIM6156	Lab Work of Environmental Health		1		1		√	BIO6115
57	BIM6257	Environmental Management	2			2	√		BIO6214
58	BIM6158	Lab Work of Environmental Management		1		1	√		BIO6115
59	BIM6259	Biogeography	2			2	√		BIO6214
60	BIM6260	Waste Management Technology	2			2	√		BIO6214
61	BIM6261	Environmental Conservation	2			2	√		BIO6214
62	BIM6262	Limnology	2			2	√		BIO6214
63	BIM6163	Lab Work of Limnology Practicum		1		1	√		BIO6115
64	BIM6264	Planktonology	2			2		√	BIO6214
65	BIM6165	Lab Work of Planktonology		1		1		√	BIO6115
		SUM				101			

e. UNY External Courses

Courses outside UNY **can be taken** by students to obtain additional competencies in Advanced/Excellent/Characteristic/Specialization of Study Programs (including Biology science, Biology research, entrepreneurship in the field of Biology, as well as courses other students need).

1) Compulsory Courses Outside UNY (20 credits)

No	Code	Courses	CREDITS				SEM		Prasyarat
			T	P	F	S	ODD	EVEN	
1	MKU6614	Community Service Program (KKN) 3)	-	-	6	6	√		
2	PKL6601	Work Practice ⁴⁾	-	-	6	6	√		
3	BIO6855	Undergraduate Thesis	-	-	8	8		√	
		SUM	-	-	20	20			

Description:

³⁾ = the implementation of KKN is coordinated by LPPM and academic affairs

⁴⁾ = implementation of Field Work Practices coordinated by LPPMP

Free Choice Courses Outside UNY (Advanced / Excellent Courses / Characteristics / Specialization (Biology or Biology Science))

No	Code	Courses	CREDITS	SEM		Prerequisite
				ODD	EVEN	
A	Advanced Course In Biological Sciences (Keilmuan Biologi)					
1		Molecular Genetics	2			
2		Virology	2			
3		Immunology	2			
4		Lab Work of Immunology	1			
5		Endocrinology	2			
6		Lab Work of Endocrinology	1			
7		Enzymology	2			
8		Lab work of Enzymology	1			
11		Phytohormone	2			
12		Lab Work of Phytohormone	1			
13		Bioremediation	2			
14		Lab Work of Bioremediation	1			
15		Bioprocess	2			
16		Lab Work of Bioprocess	1			
17		Ethnobotany	2			
18		Lab Work of Ethnobotany	1			
		SUM	25			
B	Additional Competencies Course (Biological Sciences/Biology/ Research/ Entrepreneurship in Field of Biology Additional Elective Course)					

PATTERN 512
SEMESTER I

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6201	Islamic Education ¹⁾	2			2
	MKU6202	Catholic Education ¹⁾				
	MKU6203	Christian Education ¹⁾				
	MKU6204	Hindu Education ¹⁾				
	MKU6205	Buddhist Education ¹⁾				
	MKU6206	Confucian Education ¹⁾				
2	MKU6216	Social Literacy and Humanity	2			2
3	MKU6212	Digital Transformation	2			2
4	MKU6207	Civic Education	2			2
5	FMI6202	Statistics	2			2
6	BIO6201	Plant Anatomy	2			2
7	BIO6102	Lab Work of Plant Anatomy		1		1
8	BIO6203	Plant Morphology	2			2
9	BIO6104	Lab Work of Plant Morphology		1		1
10	BIO6205	Invertebrates Biology	2			2
11	BIO6106	Lab Work of Invertebrates Biology *)		1		1
12	BIO6207	Biochemistry	2			2
13	BIO6108	Lab Work of Biochemistry		1		1
SUM			18	4	-	22

SEMESTER II

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6208	Pancasila	2			2
2	MKU6209	Indonesian Language	2			2
3	BIO6209	Animal Anatomy and Histology	2			2
4	BIO6110	Lab work of Animal Anatomy and Histology		1		1
5	BIO6211	Vertebrates Biology	2			2
6	BIO6112	Lab Work of Vertebrates Biology *)		1		1
7	BIO6213	Plant Systematics	2			2
8	BIO6114	Lab Work of Plant Systematics		1		1
9	BIO6215	Plant Physiology	2			2
10	BIO6116	Lab Work of Plant Physiology		1		1
11	BIO6217	Cell and Molecular Biology	2			2
12	BIO6118	Lab Work of Cell and Molecular Biology		1		1
13	BIO6219	Biometrics	2			2
14	BIO6120	Lab Work of Biometrics		1		1
SUM			16	6		22

SEMESTER III

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6213	Creativity, Innovation and Entrepreneurship	2			2
2	BIO6221	Ecology	2			2
3	BIO6122	Lab Work of Ecology		1		1
4	BIO6223	Animal Physiology	2			2
5	BIO6124	Lab Work of Animal Physiology		1		1
6	BIO6225	Genetics	2			2
7	BIO6126	Lab Work of Genetics		1		1
8	BIO6227	Microbiology	2			2
9	BIO6128	Lab Work of Microbiology		1		1
10	BIO6229	Biotechnology	2			2
11	BIO6130	Lab Work of Biotechnology		1		1
12	BIO6231	Behavior of Organisms	2			2
13	BIO6232	Philosophy of Science	2			2
SUM			16	5		21

SEMESTER IV

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6211	English	2			2
2	FMI6201	Insights and studies of mathematics and natural science	2			2
3	BIO6233	Environmental Science	2			2
4	BIO6134	Lab Work of Environmental Science		1		1
5	BIO6235	Plant Developmental Biology	2			2
6	BIO6136	Lab Work of Plant Developmental Biology		1		1
7	BIO6237	Bivariate Biological Research Methodology	2			2
8	BIO6138	Lab Work of Bivariate Biological Research Methodology		1		1
9	BIO6239	Marine Biology	2			2
10	BIO6140	Lab Work of Marine Biology *)		1		1
11	BIO6141	Plant Tissue Culture	1			1
12	BIO6242	Lab Work of Plant Tissue Culture		2		2
13	BIO6243	Human Biology and Nutrition	2			2
14	BIO6144	Lab Work of Human Biology and Nutrition		1		1
SUM			15	7		22

SEMESTER V

No	Code	Courses	Credits			
			T	P	F	S
1	BIO6245	Animal Developmental Biology	2			2
2	BIO6146	Lab Work of Animal Developmental Biology		1		1
3	BIO6247	Multivariate Biological Research Methodology	2			2
4	BIO6148	Lab Work of Multivariate Biological Research Methodology		1		1
5	BIO6249	Soil Biology	2			2
6	BIO6150	Lab Work of Soil Biology		1		1
7	BIO6151	Microtechnique	1			1
8	BIO6252	Lab Work of Microtechnique		2		2
9	BIO6253	Evolution	2			2
10	BIO6154	Lab Work of Evolution		1		1
		Sub Total	9	6		15
11		Elective courses in study program				0-2
12		Elective Courses outside the Study Program in UNY				7
SUM						22-24

SEMESTER VI

No	Code	Courses	Credits			
			T	P	F	S
1		Elective Courses outside the Study Program in UNY				9-10
2		Elective Courses outside UNY				8-12
		SUM				17--22

*Mata Kuliah Pilihan Prodi Biologi

SEMESTER VII

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6614	Community Service Program			6	6
2	PKL6601	Work Practice			6	6
		Elective Courses outside the Study Program in UNY				2--3
SUM					12	14-15

SEMESTER VIII

No	Code	Courses	Credits			
			T	P	F	S
1	BIO6855	Undergraduate thesis		8		8
SUM				8		8

PATTERN 611
SEMESTER I

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6201	Islamic Education ¹⁾	2			2
	MKU6202	Catholic Education ¹⁾				
	MKU6203	Christian Education ¹⁾				
	MKU6204	Hindu Education ¹⁾				
	MKU6205	Buddhist Education ¹⁾				
	MKU6206	Confucian Education ¹⁾				
2	MKU6216	Social Literacy and Humanity	2			2
3	MKU6212	Digital Transformation	2			2
4	MKU6207	Civic Education	2			2
5	FMI6202	Statistics	2			2
6	BIO6201	Plant Anatomy	2			2
7	BIO6102	Lab Work of Plant Anatomy		1		1
8	BIO6203	Plant Morphology	2			2
9	BIO6104	Lab Work of Plant Morphology		1		1
10	BIO6205	Invertebrates Biology	2			2
11	BIO6106	Lab Work of Invertebrates Biology *)		1		1
12	BIO6207	Biochemistry	2			2
13	BIO6108	Lab Work of Biochemistry		1		1
SUM			18	4	-	22

SEMESTER II

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6208	Pancasila	2			2
2	MKU6209	Indonesian Language	2			2
3	BIO6209	Animal Anatomy and Histology	2			2
4	BIO6110	Lab work of Animal Anatomy and Histology		1		1
5	BIO6211	Vertebrates Biology	2			2
6	BIO6112	Lab Work of Vertebrates Biology *)		1		1
7	BIO6213	Plant Systematics	2			2
8	BIO6114	Lab Work of Plant Systematics		1		1
9	BIO6215	Plant Physiology	2			2
10	BIO6116	Lab Work of Plant Physiology		1		1
11	BIO6217	Cell and Molecular Biology	2			2
12	BIO6118	Lab Work of Cell and Molecular Biology		1		1
13	BIO6219	Biometrics	2			2
14	BIO6120	Lab Work of Biometrics		1		1
SUM			16	6		22

SEMESTER III

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6213	Creativity, Innovation and Entrepreneurship	2			2
2	BIO6221	Ecology	2			2
3	BIO6122	Lab Work of Ecology		1		1
4	BIO6223	Animal Physiology	2			2
5	BIO6124	Lab Work of Animal Physiology		1		1
6	BIO6225	Genetics	2			2
7	BIO6126	Lab Work of Genetics		1		1
8	BIO6227	Microbiology	2			2
9	BIO6128	Lab Work of Microbiology		1		1
10	BIO6229	Biotechnology	2			2
11	BIO6130	Lab Work of Biotechnology		1		1
12	BIO6231	Behavior of Organisms	2			2
13	BIO6232	Philosophy of Science	2			2
SUM			16	5		21

SEMESTER IV

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6211	English	2			2
2	FMI6201	Insights and studies of mathematics and natural science	2			2
3	BIO6233	Environmental Science	2			2
4	BIO6134	Lab Work of Environmental Science		1		1
5	BIO6235	Plant Developmental Biology	2			2
6	BIO6136	Lab Work of Plant Developmental Biology		1		1
7	BIO6237	Bivariate Biological Research Methodology	2			2
8	BIO6138	Lab Work of Bivariate Biological Research Methodology		1		1
9	BIO6239	Marine Biology	2			2
10	BIO6140	Lab Work of Marine Biology *)		1		1
11	BIO6141	Plant Tissue Culture	1			1
12	BIO6242	Lab Work of Plant Tissue Culture		2		2
13	BIO6243	Human Biology and Nutrition	2			2
14	BIO6144	Lab Work of Human Biology and Nutrition		1		1
SUM			15	7		22

SEMESTER V

No	Code	Courses	Credits			
			T	P	F	S
1	BIO6245	Animal Developmental Biology	2			2
2	BIO6146	Lab Work of Animal Developmental Biology		1		1
3	BIO6247	Multivariate Biological Research Methodology	2			2
4	BIO6148	Lab Work of Multivariate Biological Research Methodology		1		1
5	BIO6249	Soil Biology	2			2
6	BIO6150	Lab Work of Soil Biology		1		1
7	BIO6151	Microtechnique	1			1
8	BIO6252	Lab Work of Microtechnique		2		2
9	BIO6253	Evolution	2			2
10	BIO6154	Lab Work of Evolution		1		1
		Sub Total	9	6		15
11		Elective courses in study program				2-3
12		Elective Courses outside the Study Program in UNY				5-6
SUM						22-24

SEMESTER VI

No	Code	Courses	Credits			
			T	P	F	S
1		Elective courses in study program				11-12
2		Elective Courses outside the Study Program in UNY				3-10
		SUM				14-22

*Mata Kuliah Pilihan Prodi Biologi

SEMESTER VII

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6614	Community Service Program			6	6
2	PKL6601	Work Practice			6	6
		Elective courses in study program				3
SUM					12	15

SEMESTER VIII

No	Code	Courses	Credits			
			T	P	F	S
1	BIO6855	Undergraduate thesis		8		8
SUM				8		8

PATTERN 602**SEMESTER I**

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6201	Islamic Education ¹⁾	2			2
	MKU6202	Catholic Education ¹⁾				
	MKU6203	Christian Education ¹⁾				
	MKU6204	Hindu Education ¹⁾				
	MKU6205	Buddhist Education ¹⁾				
	MKU6206	Confucian Education ¹⁾				
2	MKU6216	Social Literacy and Humanity	2			2
3	MKU6212	Digital Transformation	2			2
4	MKU6207	Civic Education	2			2
5	FMI6202	Statistics	2			2
6	BIO6201	Plant Anatomy	2			2
7	BIO6102	Lab Work of Plant Anatomy		1		1
8	BIO6203	Plant Morphology	2			2
9	BIO6104	Lab Work of Plant Morphology		1		1
10	BIO6205	Invertebrates Biology	2			2
11	BIO6106	Lab Work of Invertebrates Biology *)		1		1
12	BIO6207	Biochemistry	2			2
13	BIO6108	Lab Work of Biochemistry		1		1
SUM			18	4	-	22

SEMESTER II

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6208	Pancasila	2			2
2	MKU6209	Indonesian Language	2			2
3	BIO6209	Animal Anatomy and Histology	2			2
4	BIO6110	Lab work of Animal Anatomy and Histology		1		1
5	BIO6211	Vertebrates Biology	2			2
6	BIO6112	Lab Work of Vertebrates Biology *)		1		1
7	BIO6213	Plant Systematics	2			2
8	BIO6114	Lab Work of Plant Systematics		1		1
9	BIO6215	Plant Physiology	2			2
10	BIO6116	Lab Work of Plant Physiology		1		1
11	BIO6217	Cell and Molecular Biology	2			2
12	BIO6118	Lab Work of Cell and Molecular Biology		1		1
13	BIO6219	Biometrics	2			2
14	BIO6120	Lab Work of Biometrics		1		1
SUM			16	6		22

SEMESTER III

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6213	Creativity, Innovation and Entrepreneurship	2			2
2	BIO6221	Ecology	2			2
3	BIO6122	Lab Work of Ecology		1		1
4	BIO6223	Animal Physiology	2			2
5	BIO6124	Lab Work of Animal Physiology		1		1
6	BIO6225	Genetics	2			2
7	BIO6126	Lab Work of Genetics		1		1
8	BIO6227	Microbiology	2			2
9	BIO6128	Lab Work of Microbiology		1		1
10	BIO6229	Biotechnology	2			2
11	BIO6130	Lab Work of Biotechnology		1		1
12	BIO6231	Behavior of Organisms	2			2
13	BIO6232	Philosophy of Science	2			2
SUM			16	5		21

SEMESTER IV

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6211	English	2			2
2	FMI6201	Insights and studies of mathematics and natural science	2			2
3	BIO6233	Environmental Science	2			2
4	BIO6134	Lab Work of Environmental Science		1		1
5	BIO6235	Plant Developmental Biology	2			2
6	BIO6136	Lab Work of Plant Developmental Biology		1		1
7	BIO6237	Bivariate Biological Research Methodology	2			2
8	BIO6138	Lab Work of Bivariate Biological Research Methodology		1		1
9	BIO6239	Marine Biology	2			2
10	BIO6140	Lab Work of Marine Biology *)		1		1
11	BIO6141	Plant Tissue Culture	1			1
12	BIO6242	Lab Work of Plant Tissue Culture		2		2
13	BIO6243	Human Biology and Nutrition	2			2
14	BIO6144	Lab Work of Human Biology and Nutrition		1		1
SUM			15	7		22

SEMESTER V

No	Code	Courses	Credits			
			T	P	F	S
1	BIO6245	Animal Developmental Biology	2			2
2	BIO6146	Lab Work of Animal Developmental Biology		1		1
3	BIO6247	Multivariate Biological Research Methodology	2			2
4	BIO6148	Lab Work of Multivariate Biological Research Methodology		1		1
5	BIO6249	Soil Biology	2			2
6	BIO6150	Lab Work of Soil Biology		1		1
7	BIO6151	Microtechnique	1			1
8	BIO6252	Lab Work of Microtechnique		2		2
9	BIO6253	Evolution	2			2
10	BIO6154	Lab Work of Evolution		1		1
		Sub Total	9	6		15
11		Elective courses in study program				2-3
12		Elective Courses outside of UNY				5-6
SUM						22-24

SEMESTER VI (luar UNY)

No	Code	Courses	Credits			
			T	P	F	S
1		Elective courses in study program				6-8
2		Elective Courses outside of UNY				11-14
		SUM				17-22

SEMESTER VII

No	Code	Courses	Credits			
			T	P	F	S
1	MKU6614	Community Service Program			6	6
2	PKL6601	Work Practice			6	6
		Elective courses in study program				0-3
SUM					12	12-15

SEMESTER VIII

No	Code	Courses	Credits			
			T	P	F	S
1	BIO6855	Undergraduate thesis		8		8
SUM				8		8

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- Peraturan Presiden Republik Indonesia Nomor 8 Tahun 2012 tentang Kerangka Kualifikasi Nasional Indonesia
- Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia No. 73 tahun 2013 tentang Penerapan Kerangka Kualifikasi Nasional Indonesia Bidang Pendidikan Tinggi
- Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia No.81 Tahun 2014 tentang Ijazah, Sertifikat Kompetensi, dan Sertifikat Profesi Pendidikan Tinggi
- Peraturan Menteri Pendidikan dan kebudayaan Nomor 50 Tahun 2014 tentang Sistem Penjaminan Mutu Pendidikan Tinggi
- Peraturan Menteri Riset dan Pendidikan Tinggi Nomor 44 Tahun 2015 tentang Standar Nasional Pendidikan Tinggi
- Peraturan Menteri Riset, Teknologi, dan Pendidikan Tinggi Nomor 35 Tahun 2017 tentang Statuta Universitas Negeri Yogyakarta
- Peraturan Rektor UNY Nomor 01 tahun 2014 tentang Panduan Pengembangan Kurikulum Program Studi

COURSES DESCRIPTION

1. Environmental Science

This course discusses the awareness of environmental problems, interaction between biophysic environment and its function in sustainable development, wasteless technology, new paradigm on environment management and short term solution for environmental problems.

2. Industrial Microbiology

This course discusses the concept of industrial microbiology, the history and development of industrial microbiology, and the functions of microorganisms related to industrial process especially in fermentation.

3. Laboratory Work of Environmental Sciences

This course discusses the components of environmental system and its relationship, real problems and solutions including studying about natural and artificial environmental systems, water pollution and group projects.

4. Biochemistry

This course discusses the structure and functions of biomolecules, especially carbohydrates, protein and lipids, nucleic acid, coenzyme and vitamin, substances that contribute to the changes of enzyme and its products, as well as metabolism and chemical reaction inside the cell.

5. Biotechnology

The course discusses the fundamental issues on biotechnology, recombinant DNA technologies and techniques for molecule analyses, biotechnology application, as well as biosafety and bioethics.

6. Laboratory Work of Biochemistry

This course dicusses qualitative and quantitative tests of carbohydrates, protein, lipid, vitamin, and digestive enzyme activities.

7. Plant Tissue Culture

This coursediscusses the basic concept of plant tissue culture, including the history of development,lab facilities for tissue culture, the principles of sterilization, the types and purposes of tissue culture, preparation and composition of medium nutrition, explant and tool sterilization, internal influence of explant-source plant to growth and tissue development, influence of physical factors to tissue growth and development, embrio and protoplasm culture.

8. Laboratory Work of Plant Tissue Culture

This course discusses the types and functions of each tool needed for tissue culture lab; room and tool sterilization; planning to make stock and media for plant tissue culture; the germination of seeds using in vitro culture; and embryo culture from orchid seeds.

9. Bivariate Research Methodology for Biology

This course discusses the nature, principles and procedure of research in biology including normal distribution or random distribution in the forms of monovariate and bivariate descriptive research.

10. Animal Developmental Biology

This course discusses the history and the scope of animal development including variations of reproduction organs, the mechanism of gametogenesis, fertility, blastula, gastrula, differentiation, organogenesis, morphogenesis, as well as teratogenesis.

11. Laboratory Work of Genetics

This course discusses the genetic variation of human and *Drosophila sp.*, using phenotype observation, crossovers to analyze the monohybrid and dihybrid inheritance in long beans and *Drosophila sp.*, simulation of chromosome behavior in meiosis, and crossovers to analyze the phenotype ratio of progenies which do not follow Mendelian Laws.

12. Genetics

This course discusses the concept of gene, chromosome theory, patterns of inheritance, the structure and characteristics of genes as well as the application.

13. Mycology

This course discusses the structure of mycology, the characteristics and structure of fungi, fungi diversity, classification, nutrition, metabolism, growth and roles of fungi in the life of human.

14. Plant Systematics

The course discusses the history of plant taxonomy; plant nomenclature; the concept of taxonomy; and the description, identification, classification and phylogeny of plant.

15. Laboratory Work of Developmental Biology of Animals

This course discusses the structure and functions of reproduction organs in male and female animals, the histology of testicles and ovary, the structure of gamete, and the roles of reproduction hormones.

16. Laboratory Work of Mycology

This course discusses some basic techniques in learning the object of mycology including aseptic technique; fungus development; tools and materials for practicum; fungus isolation, characterization and identification; and fungus calculation.

17. Soil Biology

This course discusses soil as a living ecosystem including its composition, organic substances, fertility, nutrients, as well as the interaction and organisms under the soil as an attempt to manage and preserve soil and water.

18. Laboratory Work of Mycology

This course discusses some basic techniques in learning the object of mycology including aseptic technique; fungus development; tools and materials for lab work; fungus isolation, characterization and identification; and fungus calculation.

19. Human and Nutrition Biology

This course discuss the human body using systematic approach including the structure, function and biology variation, growth, adaptation and human nutrition index in terms of supporting the process and the function of physiology and organs to interact with various organs in running the homeostatic system.

20. Microbiology

This course discusses the structure of microbiology, groups of microorganisms and their main characteristics, the cell structure of microorganisms and virus, classification, nutrition, metabolism, microbial genetics and growth, as well as the roles of microorganisms in the human life.

21. Cellular and Molecular Biology

This course discusses the history of cell development and ways to study it, general characteristics of cells, variation of bacterium cells, archaea and eucariot, the caharacteristics of virus, procariotic cells, eucariotic cells and Schleiden and Schwann theory of cell, cell chemical composition, structures and functions of cell membrane and many others.

22. Ecology

The course emphasizes on the understanding of organism existence as a biological system in maintaining its existence. The strategy of maintaining the existence of bio system at various levels of the organizational structure of life through the mechanism of interaction with the internal environment of the population and its external environment. The phenomenon of bio system as an expression of the uniqueness integration of biological structure level of living things in supporting life function. Survivalship is supported by the balance of input and energy availability through the food chain obtained in the food web of life. The food web of life is built on the unique structure and function of ecosystem. The uniqueness of the abiotic and biotic components of structure that build function of ecosystem. The ecosystem functions are

based on the biodiversity, food chain, food web, energy flow, and biogeochemical cycle. The uniqueness of every organism in trophic levels ranging from producer, consumer and decomposer that builds trophic structure and ecological pyramid. Various associations and interactions of organisms determine the stability of ecosystem through cybernetic mechanism. Ecosystem classification is categorized by its energy input characteristic. The population size and population dynamic of ecosystem become a variant of ecosystem stability as the realization of their position and function in the ecosystem.

23. Laboratory Work of Soil Biology

This course discusses physical properties and chemistry of soil, biological nature of soil and important soil microorganism, and soil and water conservation.

24. Laboratory Work of Human and Nutrition Biology

This course discuss the human anatomy, anthropobiology including somatoscopy and fingerprints, and tools to detect irregularities in the human body such as ECG and Spirometry.

25. Insights and Review on Science

The nature of Science, the objects and problem to learn, the relation among science and mathematics, Scientific method, Scientific attitudes, and ethics, and its application, Scientific presentation and writing style

26. Endocrinology

This course discusses the awareness of endocrinology problems, interaction between structures and its function in biology system, and its application in our daily lives.

27. Laboratory Work of Endocrinology

This course discusses the awareness of endocrinology problems, interaction between structures and its function in biology system, and its application in our daily lives.

28. Immunology

This course discusses the awareness of immunology problems, interaction between the biophysical environment and its function in sustainable development, zero waste technology, new paradigm on environment management and short term solution for environmental problems.

29. Laboratory Work of Immunology

This laboratory work of immunology provide the problems, interaction between biophysical environment and its function in sustainable development, technology, new paradigm on immunology and short term solution in daily live.

30. Anatomy and Histology of Animals

This course discusses the awareness structure and function of tissue (epithelial, connective, muscle and nerve), organ and systemic, homeostasis process and systemic disorder mechanism.

31. Animals Physiology

This course discusses the awareness of homeostasis, regulatory mechanism, mechanism physiology mechanism in systems such as the respiratory system, digestive system, circulatory system, endocrine system, immune system, and also to understand the mechanism of systemic disorder.

32. Laboratory work of Animal Anatomy and Histology

This course discusses the awareness of the main tissue : epithelial, connective tissue, muscle and nerve, all body system and organ ; body system disorder.

33. Laboratory work of Animals Physiology

This course discusses the awareness and skillful to analyze blood component, urine component, gas in respiratory, blood pressure and how to analyze the results.

34. Animal Ecology

The course emphasizes the understanding of animal existence in an ecosystem; and the strategy of maintaining the existence at various levels of the organizational structure of life through the mechanism of interaction with the internal environment of the population and its external environment. Various associations and interactions of animals with other organisms determine the stability of ecosystem through cybernetic mechanism. The population size and population dynamic of ecosystem become a variant of ecosystem stability as the realization of their position and function in the ecosystem.

35. Ecology of Microorganism

This course discusses the concept of microbial ecology and the role of microorganisms related to the environment and daily life so students can have the provision to develop microbiology in various fields.

36. Plant Anatomy

This subject discuss about the structure and development of cells and the organelles, meristem, epidermis, parenchyma, strengthening, and vascular tissues of Spermatophytes. The understanding about these structures will be the basic knowledge to discuss more and compare among the structure of organs and compare between the organ structures in Dicots/Gymnosperms and the ones in Monocots. The anomalous structure of organs will be elaborated and compared with the normal ones. The structural response to environmental conditions, and the roles of plant anatomy in daily life will be presented and discussed through group project or journal studies.

37. Laboratory Work of Biotechnology

Bioethanol production through bio-material fermentation, Recombinant DNA Technology, DNA analysis and amplification, bioinformatics.

38. Food Safety

This course discusses safe food and the purpose of its supervision, food classification, food

quality, food damage in subtropical and tropical regions, explains food borne diseases, and vector control of foodborne diseases.

39. Parasitology

This course discusses protozoa, nemathelminthes, cestoda, trematodes, and anthropods, both in terms of characteristics, groupings, and their role in daily life.

40. Laboratory Work of Plant Anatomy

This subject mostly recognising the structure and development of cells and some observed organelles, meristem, epidermis, parenchyme, strengthening, and vascular tissues of Spermatophytes. The understanding about these structures will be the basic knowledge to compare among the structure of organs, between the organ structures in Dicots/Gymnosperms and the ones in Monocots, between the anomalous structural of organs with the normal ones, and among the adaptive structures, and some selected subjects.

41. Laboratory Work of Food Safety

Food safety lab work consist of conducting chemical tests in the form of borax, organoleptic tests, and food service feasibility tests and developing problem solving principleskills in food safety issues in the community using the group project method.

42. Laboratory Work of Parasitology

This course discusses the problems caused by parasites and develops the principle of problem solving skills in food safety problems in the community using the group project method.

43. Enzimology

Enzymology study the structure and function of the enzyme. This subject covering topics relevant to enzyme structure and function. Selected topics include: Enzymes and Catalytic Mechanisms, Kinetics of Enzymatic Reactions, Classification of Enzymes, Coenzymes, Enzyme Inhibition, Regulation of Enzyme Activity, Application of Enzyme.

44. Laboratory Work of Cell and Molecular Biology

This course is to demonstrate and do experiment about preparation of chemicals for DNA isolation, microbia and plant DNA isolation, DNA quantification, and animal cell culture.

45. Laboratory Work of Enzimology

Lab Work of Enzymology study the mechanism of the enzyme activity. Selected topics include: Enzymes activity from plant, Enzymes activity from animal, Enzymes activity from microbes.

46. Molecular Genetics

This course develops science in a more profound way in the molecular field specifically related to genetics or inheritance in living things. The material covered includes: (1) Proof of DNA as Carrier of Genetic Material (2) Genes and Biological Information (3) Structure of DNA and RNA (4) Changes in Genetic Material (5) Function of

Genes (6) Molecular Mendelic Genetics (7) DNA Replication (8) Genomes in prokaryotes and eukaryotes (9) Human Genomes (10) Transcription (11) Translations (12) Regulation of Gene Expression in Prokaryotes and (13) Regulations for Gene Expression in Eukaryotes.

47. Plant Physiology

Plant physiology study about the processes that occur in plants. The process includes the mechanism of absorption and loss of water in plants, metabolic processes which include photosynthesis, respiration, and photosynthate transport in plants, the role of enzymes and hormones in plants, as well as seed germination and seed dormancy.

48. Bioremeditation

Bioremediation is the use of organisms to repair environmental damage, ie organisms play a role in changing toxic pollutants to become simpler and non-toxic, so that they can be used as a foundation in waste treatment and environmental management. In this course, the principles of bioremediation are discussed; the use of microorganisms (bacteria, fungi, consortia and symbiosis), microalgae, macroalgae, macrophytes and high plants (phytoremediation) for the improvement of aquatic and terrestrial environments; and the development of bioremediation in environmental management.

49. Environmental Management

This course develops the ability to analyze environmental management instruments that are applied in a particular ecosystem / region through exploratory activities, as well as being able to put it in portfolios and self-reflection. In addition, it also develops the ability to work in a team work to determine environmental management instruments that will be applied in a particular area / ecosystem.

50. Industrial Microbial Laboratory Work

This course will discuss about the isolation, selection and identification of industrial microorganisms and the factors effecting the productivity of those microbes and also the quality of the product.

51. Laboratory Work of Ecology of Microorganism

This course trains the skills of applying basic techniques for applications in the field of microbial ecology and designing experimental designs related to the role of microorganisms in biotic and abiotic environments.

52. Laboratory Work of Environmental Management

This course develops the ability to explore and analyze environmental management instruments that are applied in various environmental conditions through field activities and develop the ability to work in a team work to determine environmental management instruments that will be applied in various regions with different environmental conditions.

53. Laboratory work of bioremediation

This course emphasizes the practice of utilizing organisms to repair environmental damage, namely in changing toxic pollutants to be simpler and non-toxic, so that they can be used as a foundation in waste treatment and environmental management. In this practicum, students conduct bioremediation practices with microorganisms (bacterial consortium), molds, and plants.

54. Multivariate Biology Research Methodology

Multivariate Methodology courses include the study of principles, scope, and procedures for the design of research implementation and reporting involving more than two variables (more than one independent variable with one dependent variable, one independent variable with more than one dependent variable, and more than one variable free with more than one variable hanging). The multivariate research study deals with the aim of investigating the patterns of stimulus response relationships and with the aim of investigating differences in response due to the influence of independent variables in the design of observations, exposures, experiments, and nested.

55. Population and Environmental Education

This course material emphasizes personality development through discussion of the relationship between population factors (human) and environmental factors that are manifested in real topics (topics) in daily life, namely human life in relation to energy and natural resources, water, air, and land. Subsequent developments in the discussion of environmental damage caused by human behavior, what should be done by humans as accountability for sustainable life (sustainability life) and the preservation of nature in the discussion of environmental ethics. As the culmination of development is a discussion of the problems facing the Indonesian people in their interactions with the regional and global environment.

56. Waste Management Technology

This course material emphasizes personality development through discussion of the relationship between environmental pollution caused by waste and the continuity of human life, so waste needs to be managed with strategies and technologies that are appropriate to the nature and characteristics of the waste. This insight needs to be applied in everyday life in order to manage the environment for the sake of the sustainability of life support systems for humans.

57. Work Practice

This course is a field course which is one of the specific characteristics / expertise of a biology study program, in the context of practicing and testing the knowledge gained during lectures. This course can be used by students in the framework of the preparation / completion of the final project (undergraduate thesis) as well as adding insight into employment. Students carry out work experience in accordance with the number of credits of the course (3 credits) which implies that students are required to carry out street vendors activities at the location of work experience for 3 (credits) x 170 minutes per week x 16 weeks or equivalent to 136 hours conducted for 1 month. While at the location of work experience, students carry out practical activities in the world of work in accordance with the field of biological science while applying the knowledge they have gained while in college. Students follow an activity in the form of an internship at an institution where work experience so as to obtain certain knowledge and skills. The theme of work experience is adjusted to the interests of students and the availability of jobs

in work experience. Thus, students gain experience in the world of work that is relevant to the field of biology.

58. Kuliah Kerja Nyata (KKN)

KKN is a field course that develops student soft skills in community life, organizes, manages resources, manages differences, builds empathy and concern for the community, formulates plans and implements activities in groups and independently, in order to improve community welfare.

59. Ornithology

This course examines the scientific history, variety and important role of birds in the equilibrium of ecosystems, knowing the process of identifying birds from their morphological, anatomical and behavioral characteristics and then applying these characteristics to the taxa system. Another study is the distribution of birds affected by biogeography that is part of speciation and evolution. Each bird species has a unique type of marker that has its own behavior, this uniqueness requires safeguards that depend on research and the condition of birds in the field.

60. Organism Behaviors

This course contains studies on organism behavior. It includes the scope of organism's behavior, the approach to study and development of scientific behavior of organisms, patterns of organism's behavior and organism's behavior research methodology. The behavior patterns of the organisms examined include: biorhythms, orientation and navigation behavior, reproductive behavior, eating and predation behavior, self-defense behavior, migration and dispersal behavior, social and group behavior. Students also study organism behavior research through the latest journals. Students observe behavior using video and also direct observation.

61. Laboratory Work of Evolution

This course contains a study of the evolutionary processes in living things and their environment. It includes the initial study of the universe, the evolution of the earth and the environment, especially about sea water, the patterns of evolution of humans and primates, the patterns of evolution of mammals, the patterns of evolution of reptiles and amphibians, the patterns of evolution of Aves and the patterns of evolution of invertebrates. Study of the fossilization process and how to measure fossil age, study of Sangiran and its ancient formations, the study of Homo erectus migration and dispersal in the world. Students also study the evidence of evolution in the museum. Students observe evidence of evolution in the field through direct observation.

62. Laboratory Work of Ornithology

This course covers the process of identifying birds from their morphological, anatomical and behavioral characteristics and then applies these characteristics to the taxa system. Each type of bird has a unique type of marker that has its own behavior, research is conducted to observe the typical behavior of one species of bird. Compile ethograms from observational data and compile them into scientific articles.

63. Laboratory Work of Invertebrate Biology

This course mainly develops scientific abilities and skills so that the lab work emphasizes the skills of students in finding, observing, identifying, and comparing the diversity of invertebrate animals, including in ecological diversity and life habits.

64. Marine Biology

This course develops scientific and analytical skills in the estuarine and marine ecology ecosystems through discussion, observation, and presentation.

65. Laboratory Work of Marine Biology

This course develops scientific and analytical skills in the estuarine and marine ecology ecosystems through discussion, observation, and presentation.

66. Laboratory work of Plant Physiology

This course is to demonstrate and do experiment about water absorption and loss of water in plants; nutritional needs and deficiency in plants; the principles of photosynthesis and respiration; the factors that play a role in seed germination and seed dormancy; and design an experiment and implement it based on given understanding.

67. Evolution

In this course, students learn the notions, the concepts of the theory of evolution and the development of theories from Pre-Darwin to the Post Darwinism. Variations of living things as raw materials for evolution, phylogeny, species and speciation are material whose discussion is inseparable from the mechanism of evolution in a holistic manner. As a supporting fact to better understand the evolution of living things, evolutionary clues are also discussed. The evolution of invertebrates, plant evolution, primate evolution and humans are the topics that are associated with discussions of technological developments. To broaden the horizons of students, it is also necessary to discuss the pros and cons of the evolution theory.

68. Laboratory Work of Animal Biosystematics

This course provides practical application in Animal Biosystematics including : commonly used technical terms in animal biosystematics, OTUs sampling in invertebrates and vertebrates, Numeric Phenetic analysis using UPGMA, standard Bioinformatics procedure using BLAST.

69. Animal Biosystematics

This course provide students with the advanced knowledge in Biological Systematics particularly in animals. Students will learn about fundamentals of animal systematics, species and species concepts, Macrotaxonomy, and systematics analysis including numeric phenetics and cladistics.

70. Animal Husbandry

This course discusses various factors that influence the success of animal farming, namely seeds, cages, food, maintenance and product marketing.

71. Laboratory Work of Ecotoxicology

This lab work consists of hands on experience for students to perform ecotoxicological experiment in aquatic environment. The experiments includes : preparation and handling of animals, xenobiotics dilutions, preliminary test, definitive test and data analysis.

72. Ecotoxicology

This course studies the effects of xenobiotics in Biological system including affected organism and their environment. Topics covered in this course include : the definition and history of ecotoxicology, toxicokinetics and toxicodynamics of xenobiotics, toxicity detection and measurements.

73. English

This course is designed for first year students to acquire and improve their English language knowledge and skills. It also aimed to prepare them to use English for their professional studies in the university and for their needs in real life and work. This preparatory course will further give the students the opportunity to speak on general topics as well as to communicate in academic environment.

74. Laboratory Work of Herpetology

This lab work provides opportunities for student to study the anatomy, morphology and diversity of amphibian and reptiles. Students will also learn how to identify reptiles and amphibian species based on their morphological, anatomical and meristic characteristics.

75. Herpetology

This course provides an introduction to Herpetofaunal (Amphibians and Reptilians) Biology and covers the following topics: diversity, systematics, functional anatomy, physiology, ecology, evolution and conservation.

76. Laboratory Work of Ichthyology

This lab work provides opportunities for student to study the diversity, anatomy and morphology of fish. Students will also learn how to identify fish species based on their morphological and meristic characteristics.

77. Ichthyology

This course provides an introduction to fish biology and covers the following topics: diversity, systematics, functional anatomy, physiology, ecology, evolution and conservation.

78. Phytohormone

This course will discuss about the structure, biosynthesis, transport and metabolism of plant hormone for the plant growth and development. The discussion also include the application of the plant hormone in the agricultural field and their regulation.

79. Phytohormone Laboratory Work

This course will discuss about the structure, biosynthesis, transport and metabolism of plant hormone for the plant growth and development. The discussion also include the application of the plant hormone in the agricultural field and their regulation.

80. Laboratory Work of Animal Husbandry

This course increases the skills in selecting stocks, determining the composition of feed, maintenance and disease management and marketing management of animal products.

81. Laboratory Work of Vertebrate Biology

Vertebrate Biology Lab Work covers laboratory session and field work. This lab work studies anatomical and morphological structures for 5 major groups in vertebrates including Osteichthyans, Amphibians, Reptiles, Birds and Mammals also their diversity and skeletal adaptation in particular.

82. Vertebrate Biology

This course comprises the study of characteristics of the major groups of vertebrates, their ancestry, history and their relationship to one another. Topics covered will include : Vertebrates' origins and evolutionary history, basic features of vertebrates' body plans (morphology, anatomy, physiology) , the early branching of vertebrates such as Agnathans as well as groups of vertebrates that appear later in the geological timeline.

83. Biometry

This course contains the application of statistics to analyze biological research data which includes the application of data analysis using descriptive statistical analysis techniques, inferential statistical analysis parametric and nonparametric.

84. Laboratory Work of Bivariate Biology Research Methodology

The application of research principles and procedures in the field of Biology, both based on the characteristics of populations that are normally distributed and unknown distribution in the form of descriptive and experimental research designs and their reporting.

85. Laboratory Work of Reproduction Technology

This course mainly develops skills (MKK) in the field of animal reproduction technology including reproductive technology in aquatic animals, artificial insemination, embryotransfer, and reproductive bioethics.

86. Laboratory Work of Biometry

Implementing statistics to analyze biological research data includes the application of descriptive statistical analysis techniques, parametric and nonparametric inferential statistics.

87. Reproduction Technology

This course mainly develops science and skills (MKK) in animal reproduction technology including reproduction technology in aquatic animals, artificial insemination, embryo transfer, in vitro fertilization, genetic cloning and reproductive bioethics.

88. Anatomy and Histology of Animals

This course discusses the awareness structure and function of tissue (epithelial, textus conectivus, muscle and nerve), organ and systemic, homeostasis process and sistemic disorder mechanism.

89. Animal Physiology

This course discusses the awareness of homeostasis, regulatory mechanism, mechanism physiology to all system such as respiratory system, digestiv system, circulatoric system, endocrin system, imunologic system, and understand sistemic disorder mechanism.

90. Laboratory work of Anatomy and Histology OF Animals

This course discusses the awareness of main tissue : epithelial, textus conectivus, muscle and nerve, all body system and organ ; body system disorder.

91. Laboratory work of Animal Physiology

This course discusses the awareness and skillfull to analize of blood component, urine component , gas respiratory system, blood pressure and able to analyze the results.

92. Agroforestry

This course discusses the boundaries, background and development history, goals and role of agroforestry systems, agroforestry system principles in increasing land and forest productivity, agroforestry strengths and weaknesses, classification of agroforestry systems, selection of agroforestry system component types, soil aspects , economic and social agroforestry systems, and the development and application of agroforestry systems in various ecological zones.

93. Biotropic

This course discusses the scope and basic concepts of tropical biology, the structure and function of tropical forests in terms of the flora, fauna and microbiota of tropical forests, the characteristics and characteristics of tropical forests, the dynamics of tropical forest ecosystems, the interaction of flora, fauna and microbiota. Analysis of vegetation, classification and classification systems of tropical forests, problems of tropical forests and their use, exploitation in tropical forests, management and preservation of tropical forests as life support.

94. Economic Botany

Economic botany discusses plants with economic value, including plants: food, vegetables & fruit, fiber, wood, tannins & dyes, rubber, oil, essential oils, fats, sugar, gum & resins, drugs, drinks, ornamental plants; the use of each plant, product, method of processing products, processed products, and their cultivation. Able to identify plants of economic value.

95. Plant Cultivation

Plant cultivation courses develop the ability and skills of the principles of crop cultivation, plant growth requirements, the influence of environmental factors on crop production, land management, plant nurseries, planting, irrigation, fertilization, pest control, plant diseases and weeds, plant propagation through pollination and tissue culture, harvesting and post-harvest handling.

96. Plant Ecology

Plant ecology includes the development of plant ecology, the degree of integration and approach to plant ecology, organisms (living things) with their interactions, response strategies, response talents and natural selection, populations (patterns of distribution, growth and density), plant communities (basic principles, community patterns, climax community), Vegetation (Vegetation Structure, Vegetation Zone, Dynamic Relationships between Vegetation, Soil and Climate and vegetation type) and vegetation analysis, interaction of plant communities with biotic environments (Competition, Stratification, Dependency or Alliance Relations); the interaction of plant communities with the biotic environment (concept of limiting factors, minimum laws, tolerance laws) ecosystems (Ecosystem components, energy flow, material cycles, food chains, pyramids, thermodynamic laws), terrestrial biomes, productivity and succession.

97. Environmental Conservation

Environmental Conservation studies the notion of environmental conservation, principles of conservation, conservation goals, soil and water conservation, energy conservation, conservation of biological resources (species, population and community level), conservation policies and practices in Indonesia, conservation and sustainable development.

98. Laboratory Work of Agroforestry

Laboratory Work in Agroforestry Identify agroforestry systems based on their characteristics, complexity and constituent components, tree interaction with the soil and its environment, potential economic benefits from agroforestry systems and ecological benefits of agroforestry systems.

99. Laboratory Work of Economical Botany

Laboratory Work in Economic Botany identify plants of economic value from food crops including cereals, vegetables & fruits, fiber, wood, tannins & dyes, rubber, oil, essential oils, & resins, medicines, plants that can produce drinks, plants ornamental; the use of plant parts, by designing and analyzing its economy, making one of the products of the plant with its business analysis, communicating the results of the analysis and practice in the form of presentations and making articles both in individual and group activities.

100. Laboratory Work of Plant Cultivation

Plant cultivation practice develop the ability and skills of the land management, plant nurseries, planting, irrigation, fertilization, pest control, plant diseases and weeds, plant propagation through pollination and tissue culture, harvesting and post-harvest handling.

101. Laboratory Work of Ecology

Laboratory Work in Ecology Identifying and analyzing ecosystem components, interacting between ecosystem components, analyzing vegetation using quadrat sampling techniques and point centered quarter techniques and making interpretation of plant community functions in a stand, analyzing plant distribution patterns, recognizing types of organisms in aquatic habitats (rivers , ponds, rice fields, wells, beaches) and study the succession (community change) of protozoa in an artificial system in the laboratory.

102. Laboratory Work of Entomology

This course develops an understanding of insect objects, the role of insects that are beneficial and harmful ecologically, agriculture, health, and industry, as well as skills in dealing with insects directly and interpretations, predictions about the dynamics of insect populations based on secondary data.

103. Entomology

This course develops an understanding of insects, the role of insects that are beneficial and harmful ecologically, agriculture, health, and industry, as well as skills in dealing with insects directly and interpretations, predictions about the dynamics of insect populations based on secondary data.

104. Laboratory Work of Limnology

This course develops scientific and analytical skills in the aquatic ecosystems through discussion, observation, and presentation.

105. Limnology

This course develops scientific and analytical skills in the aquatic ecosystems through discussion, observation, and presentation.

106. Laboratory work of Plant Physiology

This course is to demonstrate and do experiment about water absorption and loss of water in plants; nutritional needs and deficiency in plants; the principles of photosynthesis and respiration; the factors that play a role in seed germination and seed dormancy; and design an experiment and implement it.

107. Laboratory Work of Microtechniques

This course will conduct the students have the skills to use laboratory equipment and recognize the properties of chemicals used in biology laboratories, understand the use of microscopes correctly, and are skilled at making semipermanent and permanent microtechniques preparations.

108. Microtechniques

This course discuss about a variety of simple laboratory equipment both made of metal and glass and how to use them, the introduction and handling of chemicals, safety and security in the laboratory, how to work in the laboratory, the introduction of the microscope and its maintenance, the manufacture of wholemount preparations, squash, pollen, cuticles and diatoms, and how to measure microscopic objects.

109. Plant Ecophysiology

Discusses the morphological, anatomical, selular and molecular adaptation of plants and its characteristics in relation to the role of regulation and homeostatic function of the plant, through theoretical and analitical studies connected to the environmental factors (adaptation).

110. Laboratory Work of Plant Ecophysiology

Lab work of ecophysiology discusses the morphological, anatomical, cellular and molecular adaptation of plants and its characteristics in relation to the role of physiological activities of the plant, through theoretical and analitical studies connected to the plant adaptation processes.

111. Undergraduate Thesis Writing

This course develops a skill to design and carry out a research, analyze the data obtained, write the research report, defense the thesis, and publish the research work/thesis.

112. Sociocultural Education

This course seeks to assist students to grow their awareness of education for encouraging: critical power, creativity, appreciation, and sensitivity of students towards social and cultural values in order to strengthen their personalities as individual and social beings who: (a) are democratic, civilized, and uphold human values, be dignified and care for the preservation of natural resources and the environment; (b) have the ability to master the basic foundations of science, technology ,and art; (c) have the ability to master basic concepts of human, culture, value, moral, and law, science, technology, art, and the environment; and (d) play a role in wisely seeking solutions for social, cultural, and environmental problems.

113. Buddhism Education

Buddhism Education contains the concepts and philosophies of Buddhism, the concepts of deity, human happiness, basic moral values, science and technology, politics, and universal laws in Buddhism perspective, exercises on soul development; and scientific paper writing which is in accordance with the fields of study. The materials include: the essence of Saddha and Sanghyang Adi Buddha, The One Almighty God, humans and Buddhism moral foundation, science, technology, and art in the perspective of Buddhism, society, culture, and politics in the perspective of Buddhism.

114. Catholic Education

The Catholic education course directs students to be scholars who believe in Allah according to the Pattern of Jesus Christ who is able to account for their faith and always make it happen in church living and community, becoming 100% Indonesian and 100% Catholic, and embodying Catholicism in harmony with basic values Yogyakarta State University. Students are expected to have an adequate understanding of faith, in accordance with the subjects of the material studied, so that they are able to account for and realize their faith, as Christians who are inclusive, social, and congregational.

115. Christian Education

Christian Education in Higher Education aims for students to consciously make religion as a source of values and guidelines in the development of Christians' personality by upholding human dignity and to realize Christian values in fighting for love, justice, and truth in the family and all aspects of life.

116. Civic Education

Civic Education is a compulsory course for all YSU students taking Bachelor's and Diploma degrees. The course is worth two credits. It provides students with the knowledge and basic skills related to the relationship between citizens and the nation as well as preliminary education to defend the country in order to become reliable citizens for the nation. This course discusses:

- (1) Citizen rights and obligations
- (2) Introduction to Country Defense Education
- (3) Indonesian Democracy
- (4) Human Rights
- (5) Archipelago insights as Indonesian Geopolitics
- (6) National defense as Indonesia Geostrategy
- (7) National Politics and Strategy as the implementation of Indonesian Geostrategy.

117. Hinduism Education

The Hinduism Education is a compulsory pass course for all Hindu students in all study programs. It has 3 credits, with 2 credits of face to face meeting, and 1 credit of practice of Yoga Asanas, and Bhagavad Gita, Sarasamuscaya reading. This course is designed to strengthen *sraddha*, as well as expand the perspectives of religious life in order to produce broad-minded students with good characters who think in philosophical, rational, and dynamic manners, and practice what must be done accordingly to respect both Hinduism and the harmony of inter religious relation. The learning activities are done through lecture, dialog, presentation, and case study. Assessment is done in the form of written test, mid-term examination (UTS), final examination (UAS), independent assignment, group assignment, as well as presentation.

118. **Islam Education**
Islam Education is a 3-credits compulsory course for every Muslim student in all YSU study programs. This course is designed to strengthen their faith and piety to ALLAH The Sacred and The Mighty, as well as broadening the horizons of religious life, so that students formed with virtuous characters, philosophical thinking, rational, dynamic, and broad-minded attitude, paying attention to the demands to respect intra people in one people, and foster harmonious relationship among religious believers. Lecture activities are conducted through lectures, dialogues, and paper presentations. Evaluations are carried out through written assignments, reports, as well as presentations.
119. **Pancasila**
This lecture discusses the basis and objectives of Pancasila, Pancasila as a result of scientific thinking, Pancasila in the context of the nation's struggle history, Pancasila as a system of values and national ideology, constitution and amendments of Pancasila, and Pancasila as a paradigm of social and nation life.
120. **Laboratory Work of Environmental Health**
This course contains general knowledge and materials such as: Surveillance of mosquito epidemics, Food hygiene and sanitation, Clean Waters and Group Work project in field activities.
121. **Environmental Health (Theory)**
This course consists of general materials as follow: Healthy Concept, Drinking water, Food Hygiene and Sanitation, Disease Vector, School health Unit, First aid kit, Sanitation in Housing and Public Places, Environmental Pollution and Disease
122. **Laboratory work of Plant Morphology**
Plant morphology lab work is the activity of observing the outer structure of plants which includes roots, stems and leaves and its modification, namely rhizomes, stolons, bulbs, flowers, fruits and seeds; analysis of modified forms of the main structure of plants; analysis of the development of flowers into both true and pseudo fruit; identifying the tree construction and architecture forms, and observing some examples of the morphological response of the stem, roots and leaves to the environment.
123. **Laboratory Work of Plants Systematic**
This course contains studies on plants systematic in practice, which includes 1). Identifying the plants, 2). Classifying the plants, 3). Describing the kinship, 4). Explaining the correct nomenclature, 5). Recognizing the plant diversity, 6). Calculating the diversity index associated with environmental balance, 7). Identifying the benefits of each type of plant, 8). Developing an ecosystem with another ecosystem or one place with another place with a different environment, for example, different height, edaphic, climate, and many others.

124. Laboratory work of Developmental Biology of Plants

In this practicum, students doing the identification of the structure and function of flower parts; observe the structure and development of male and female reproductive organs of Angiosperms plants; recognize and understand the processes that occur in plant development; recognize various structures that help spread seeds/fruit; recognize the events of polyembryony; and recognize the ways plants do asexual reproduction.

125. Laboratory Work of Ethnobotany

This course will include:

- Assignments of field observation and communicating in an integrated manner,
- Expertise between fields of practical life and application through the study of various ethnicities in productive scientific perspectives,
- Analyzing the relationship between various ethnic groups according to their culture in the utilization of plant resources,
- Exploration of the relationship between the benefits of plants of various ethnic groups in Indonesia according to their cultural characteristics,
- Mapping the use values of various types of plants, community groups, starting with general and specific benefits,
- Assessment and analysis of the value of practical benefits for the benefit of food, medicine, building materials, traditional ceremonies, culture, coloring agents and others,
- Synthesis of ethno-botanical knowledge in qualitative descriptive is combined with the ability of quantification according to scientific development as an independent task,
- Analyzing the relationship between the diversity of plants of various ethnic groups in Indonesia according to their culture as an effort to develop ethnobotany science in a culturally sustainable way,
- Construction of community cultural relations with plant resources according to their beliefs, knowledge, goals, experiences.

126. Laboratory Work of Phytoplankton

This course studies phytoplankton in practice, which includes 1). Identifying the phytoplankton, 2). Recognizing the types of phytoplankton in two ecosystems, 3). Classifying phytoplankton, 4). Characterizing various phytoplankton in two ecosystems by calculating the index variation, 5). Explaining the level of eutrophication by calculating the index of dominance and various indices, 6). Categorizing various phytoplankton, 7). Explaining the role of phytoplankton in the ecosystem, and 8). Developing one type of phytoplankton to be cultivated as a natural feed.

127. Laboratory Work of Phytopharm

This course studies about Phytopharm in practice, which includes 1). Identifying medicinal plants, 2). Differentiating the medicinal plants with other plants, 3). Classifying the medicinal plants, 4). Describing the kinship, 5). Defining the correct nomenclature, 6). Describing the diversity of medicinal plants, 7). Explaining the benefits of each type of medicinal plant, and 8). Developing an ecosystem with another ecosystem or one place with another place a different environment, for example, different height, edaphic, climate, and many others.

128. **Laboratory Work of Parasitology**
This course discusses about the problems caused by parasites and develops the principle of problem solving skills in food safety problems in the community using the group project method.
129. **Laboratory Work of Ecology of Microorganism**
This course trains the skills of applying basic techniques for applications in the field of microbial ecology and designing experimental designs related to the role of microorganisms in biotic and abiotic environments.
130. **Laboratory Work of Food Safety**
Food safety practicum courses consist of conducting chemical tests in the form of borax, organoleptic tests, and food service feasibility tests and developing problem solving principle skills in food safety issues in the community using the group project method.
131. **Laboratory Work of Environmental Management**
This course develops the ability to explore and analyze environmental management instruments applied in various environmental conditions through field activities and develop the ability to work in teamwork to determine environmental management instruments that will be applied in various regions with different environmental conditions.
132. **Laboratory Work of Bioremediation**
This course emphasizes the practice of utilizing organisms to repair environmental damage, namely in changing toxic pollutants to become simpler and non-toxic, so that they can be utilized as a foundation in waste treatment and environmental management. In this practicum, students conduct bioremediation practices with microorganisms (bacterial consortium), molds, and plants.
133. **Laboratory Work of Planktonology**
This course studies phytoplankton in practice, which includes 1). Identifying the plankton, 2). Differentiating the types of plankton in the two ecosystems, 3). Classifying the plankton, 4). Analyzing the diversity of plankton in two ecosystems by calculating the diversity index, 5). Explaining the level of eutrophication by calculating the index of dominance and diversity index, 6). Describing the diversity of plankton, 7). Explaining the role of plankton in the ecosystem and 8). Developing a type of plankton to be cultivated as a natural feed.
134. **Laboratory Work of Applied Microbiology**
Practicing skills in applying various techniques in studying the application of microbes in various fields.
135. **Laboratory Work of Natural Feed Technology**
This course studies the natural feed technology in practice, which includes 1). Identifying the plankton from Rotifers, 2). Differentiating the types of plankton in the two ecosystems, 3). Classifying the plankton from Rotifers, 4). Comparing the diversity of plankton in two ecosystems by calculating the diversity index, 5). Explaining the level of eutrophication by calculating the index of dominance and diversity index, 6). Describing the diversity of plankton

from Rotifers, 7). Explaining the role of plankton in the ecosystem, 8). Describing the life cycle of *Chlorella vulgaris*, 9). Identifying the dynamics of the plankton population (Rotifers), and 10). Describe the succession of plankton populations (Rotifers).

136. Plant Morphology

This course explains the morphological structure of plants including the shape, surface, types of plant main organs, namely roots, stems and leaves and its modification, namely flowers, fruits and seeds, tubers, rhizomes, stolons. This course also discusses tree construction and architecture, as well as some forms of stem, root and leaf morphological responses to the environment.

137. Plant Physiology

Plant physiology learns about the processes that occur in plants. The process includes the mechanism of absorption and loss of water in plants, metabolic processes which include photosynthesis, respiration, and photosynthate transport in plants, the role of enzymes and hormones in plants, as well as seed germination and seed dormancy.

138. Developmental Biology of Plants

This course discusses about the plant life cycle, structure and development of Angiosperms generative and vegetative reproductive organs, discusses the regulation of plant development processes.

139. Laboratory Work of Multivariate Biology Research Methodology

The Multivariate Methodology course includes reviewing the principles and procedures for the design of research's implementation and reporting involving more than two variables (more than one independent variable with one dependent variable, one independent variable with more than one dependent variable, and more than one independent variable with more than one dependent variable). The multivariate research study deals with investigating the patterns of stimulus-response relationships and intending to investigate differences in response due to the influence of independent variables in the design of observations, exposures, experiments, and nested.

140. Multivariate Biology Research Methodology

The Multivariate Methodology course includes the study of principles, scope, and procedures for the design of research implementation and reporting involving more than two variables (more than one independent variable with one dependent variable, one independent variable with more than one dependent variable, and more than one independent variable with more than one dependent variable). The multivariate research study is intending to investigate the patterns of stimulus-response relationships and to investigate differences in response due to the influence of independent variables in the design of observations, exposures, experiments, and nested.

141. Seminar and Scientific Paper Writing

This course consists of general knowledge and materials as follow: Articles from biological research and not biological research results, Biological problems, Compilation of biological

research proposals, Practice as a presenter of a biology research proposal, The practice of improving biological research proposals is in accordance with the results of the seminar.

142. Etnobotany

This course includes:

- understanding and developing and applying ethnobotany through local ethnic studies in a scientific perspective and global dimension,
- analysis of the relationship of various ethnic groups according to their cultural characteristics in the utilization of plant resources,
- exploration the relationship between the value of plant benefits and the cultural characteristics of the community,
- mapping the use-value of plants, ranging from general benefits and specific benefits, various kinds of plant values for the benefit of food, medicine, building materials, traditional ceremonies, culture, coloring matter and others,
- integration of descriptive qualitative knowledge with the ability to quantify according to scientific development in independent assignments,
- analysis of the uniqueness of Indonesia's biodiversity wealth with the cultural diversity of the community in the inheritance of the value of plant benefits in sustainable culture.
- description of the depth relationship between community culture and plant resources directly or indirectly,
- exploration of people's perceptions of the benefits of plants according to their beliefs, knowledge, goals, experiences, with aspects of anthropology, agronomy, ecology

143. Phytoplankton

This course covers material about: (1) Phytoplankton scope, (2) Environmental factors affecting phytoplankton, (3) Freshwater phytoplankton in ponds, (4) Freshwater phytoplankton in reservoirs and lakes, (5) Phytoplankton water freshwater in the river, (6) Freshwater phytoplankton in the reservoir, (7) Freshwater phytoplankton in the cave, (8) Freshwater phytoplankton in the swamp, (9) Brackish water / estuary phytoplankton in the mangrove, (10) Brackish / estuary phytoplankton in the lagoon, (11) Phytoplankton in seawater, (12) Phytoplankton in salt water lakes, (13) Phytoplankton in low pH, (14) Phytoplankton related to aquatic ecosystems, (15) Diversity index and dominance index of phytoplankton to determine water quality, and (16) Types of phytoplankton that can be cultivated.

144. Phytopharmaca This course teaches:

(1) The scope of phytopharmaca, (2) Phytopharmaca from microscopic algae plants, (3) Phytopharmaca from macroscopic algae plants, (4) Phytopharmaca from mosses, (5) Phytopharmaca from nail plants, (6) Phytopharmaca from the plant Gymnosperms, (7) Phytopharmaca from the plant Angiosperms (dicot), (8) Phytopharmaca from the plant Angiosperms (monocots), (9) Phytopharmaca from the Zingiberaceae plant, (10) Phytopharmaca from epiphytic and parasitic plants, (11) Phytopharmaca plant (monocotyledonous), (12) Phytopharmaca from the Zingiberaceae plant, (13) Phytopharmaca from epiphytic and parasitic plants, (14) Distribution of phytopharmaca, (15) Environmental factors affecting phytopharmaca, (16) Phytopharmaca genetic diversity, (17) Phytopharmaca cultivation, and (18) Phytopharmaca products.

145. **Parasitology**
This course discusses about protozoa, nemathelminthes, cestoda, trematodes, and anthropods, both in terms of characteristics, groupings, and their role in daily life.
146. **Ecology of Microorganism**
This course teaches the concept of microbial ecology and the role of microorganisms related to the environment and daily life so students can have the provision to develop microbiology in various fields.
147. **Food Safety**
This course discusses about safe food and the purpose of its supervision, food classification, food quality, food damage in subtropical and tropical regions, explains food borne diseases, and vector control of foodborne diseases.
148. **Environmental Management**
This course develops the ability to analyze environmental management instruments that are applied in a particular ecosystem/region through exploratory activities, as well as being able to put it in portfolios and self-reflection. In addition, it also develops the ability to work in teamwork to determine environmental management instruments that will be applied in a particular area/ecosystem.
149. **Biogeography**
This course requires the students to be able to explain:
(1) the scope of biogeography, (2) the division of biogeographic areas, (3) the dispersal of organisms and their agents, (4) the relationship of dispersal and centers of diversity with the diversity of organisms, (5) the relationship of dispersal and diversity with edafic factors, latitude, altitude, and climate with diversity of living things, (6) Distribution and diversity of biomes, (7) Selection of modification, adaptation, isolation, speciation and evolution with the distribution and diversity of organisms, (8) Organism strategy, (9) Relationship between selection of modification, adaptation, isolation, speciation and evolution with species distribution and extinction, (10) Relationship of local species, alien species, invasive species and endemism, (11) Distribution of flora and fauna in Indonesia, (12) Relationships species extinctions and global warming, (13) Agricultural origins, distribution of cultivated plants and their uses in everyday life, (14) Relationship of invasive species with changes biome and ecosystem balance, (15) Flora malesiana, (16) Germplasm and species rarity.
150. **Waste Management Technology**
This course emphasizes the development of personality through discussion of the relationship between environmental pollution caused by waste and the continuity of human life, so waste needs to be managed with strategies and technologies that are appropriate to the nature and characteristics of the waste. This insight needs to be applied in daily life in order to manage the environment for the sake of the sustainability of life support systems for humans.
151. **Bioremediation**
Bioremediation is the use of organisms to repair environmental damage, ie, organisms play a role in changing toxic pollutants to become simpler and non-toxic, so that they can be used as

a foundation in waste treatment and environmental management. In this course, the principles of bioremediation are discussed; the use of microorganisms (bacteria, fungi, consortia, and symbiosis), microalgae, macroalgae, macrophytes and higher plants (phytoremediation) for the improvement of aquatic and terrestrial environments; and the development of bioremediation in environmental management.

152. Planktonology

This course studied the following materials: (1) The scope of planktonology, (2) Environmental factors that affect plankton, (3) Freshwater plankton in a pond (Pond algae), (4) Freshwater plankton in reservoirs and lakes, (5) Freshwater plankton in the river, (6) Freshwater plankton in the reservoir, (7) Freshwater plankton in the cave, (8) Freshwater plankton in the swamp, (9) Brackish water plankton/estuary in the mangrove, (10) Brackish / estuary water plankton in the lagoon, (11) Plankton in seawater, (12) Plankton in a saltwater lake, (13) Plankton which is at low Ph, (14) Plankton has to do with aquatic ecosystems, (15) Plankton as a waters bioindicator, (16) Types of plankton that can be cultivated.

153. Applied Microbiology

This course studies the concepts of applied microbiology and the role of microorganisms associated with daily life.

154. Natural Feed Technology

This course studies the natural feed technology, which includes 1). The scope of natural feed technology, 2). *Chlorella vulgaris* cultivation, 3). Cultivation of *Chironomus* sp., 4). Cricket cultivation (*Gryllus* sp.), 5). *Spirogyra* sp., 6). *Daphnia* sp., 7). Culture of *Moina* sp., 8). *Tubifex* sp., 9). *Brachionus plicatilis* cultivation, 10). Mosquito cultivation (*Culex* sp.), 11). Grasshopper Cultivation (*Caelifera*), 12). Crystal worm cultivation (*Lumbricus rubellus*), 13). Orange gaster cultivation (*Oecophylla smaragdina*), 14). Diatom Cultivation (*Chaetoceros* sp.), 15). Rotifera Cultivation and, 16). Black flies cultivation (*Hermetia illucens*).

155. Laboratory Work of Evolution

This course contains a study of the evolutionary processes in living things and their environment. It includes the initial study of the universe, the evolution of the earth and the environment, especially about sea water, the patterns of evolution of humans and primates, the patterns of evolution of mammals, the patterns of evolution of reptiles and amphibians, the patterns of evolution of Aves and the patterns of evolution of invertebrates. Study of the fossilization process and how to measure fossil age, study of Sangiran and its ancient formations, the study of *Homo erectus* migration and dispersal in the world. Students also study the evidence of evolution in the museum. Students observe evidence of evolution in the field through direct observation.

156. Laboratory Work of Ornithology

This practicum course examines the process of identifying birds from morphological, anatomical and also behavioral characteristics and then applies these characteristics to the taxa system. Each type of bird has a unique type of marker that has its own behavior, research is conducted to observe the typical behavior of one species of bird. Compile ethograms from observational data and compile them into scientific articles.

157. Philosophy of Science

This course teaches: (1) The position of knowledge, habits, beliefs of community groups, as a source of knowledge, (2) Integration and application of knowledge resources into scientific principles, according to scientific methods, knowledge building and scientific attitude formation, (3) Analysis, the synthesis of the source of truth and limitations of knowledge, and the role of science and technology in the development of human civilization, and (4) Position and role of thinking logically, critically, comprehensively, and contemplatively and creatively in understanding, constructing the linkages of various sources of knowledge in the past with the present and future in the development of science and technology

158. Organism Behaviors

This course contains studies on organism behavior. This includes the scope of organism's behavior, approaches to study and scientific development of organism's behavior, organism's behavior patterns and, organism's behavior research methodology. The behavior patterns of the organisms studied include: Biorhythms, Orientation and navigation behavior, Reproductive behavior, Eating and predation behavior, Self-defense behavior, Migration and dispersal behavior, Social and group behavior. Students also study organism behavior research through the latest journals. Students observe behavior using video and also direct observation.

159. Population and Environmental Education

This course material emphasizes personality development through discussion of the relationship between population factors (human) and environmental factors that are manifested in real topics in daily life, namely human life to energy and natural resources, water, air, and land. Subsequent developments in the discussion of environmental damage caused by human behavior, what should be done by humans as accountability for sustainable life (sustainability life) and the preservation of nature in the discussion of environmental ethics. As the culmination of development is a discussion of the problems facing the Indonesian people in their interactions with the regional and global environment

160. Ornithology

This course examines the scientific history, variety and important role of birds in the equilibrium of ecosystems, knowing the process of identifying birds from their morphological, anatomical and behavioral characteristics and then applying these characteristics to the taxa system. Another study is the distribution of birds affected by biogeography that is part of speciation and evolution. Each bird species has a unique type of marker that has its own behavior, this uniqueness requires safeguards that depend on research and the condition of birds in the field

161. Laboratory Work of Microbial Diversity

This course contains studies on practicing skills in applying basic techniques in studying microorganisms. The topics include aseptic techniques, isolation techniques from a mixed culture of microorganisms, phenotypic characterization and bacterial identification; counting bacteria, and designing experimental designs related to the role of microorganisms, especially bacteria

162. **Laboratory Work of Human Biology**
This course studies human biology in practice, which includes 1). Diversity of human morphology / somatoscopy & dermatoglyphics, 2). Eye vision, 3). Skeleton & reflexes, 4). Earing, 5). Olfaction, 6). Thermoregulation, 7) Tactile, 8). Blood pressure measurements, 9). Uptake, 10). Nerves & hormones, 11) Pyrometry, and 12). Electro radiograph
163. **Laboratory Work of Nutrient and Health**
This course discusses the development of work skills in solving nutrition and environmental health problems in the community using the group project method. Also, it will discuss the implementation of a diet record and the introduction of the top ten diseases in the community health center where each student lives.
164. **Microbial Diversity**
This subject studies the scientific structure of microbial variety, groups of microorganisms, their evolutionary history, and their main characteristics, cell structure of microorganisms, and viruses, classification, nutrition, metabolism, microbial genetics and the growth and role of microorganisms in human life
165. **Nutrient and Health**
This course discusses the fulfillment of human nutrition in order to maintain health and improve health by managing the environment. This course is also to assist the development of problem-solving abilities related to the application of Nutrition and Health in the analysis of health cases relating to the conditions of nutrition acquisition and various diseases that often occur in the population of Indonesia.
166. **Outdoor Learning**
This course contains the study of biology learning outside the classroom. This learning carries Adventure Based Learning Progress (ABLP) and Experiential Learning (EL) as the basis for learning and is supported by Technology Pedagogic and Content Knowledge (TPACK) in its implementation. Train and provide experience in conducting field studies that require the introduction of specific biological objects.
167. **Occupational Health and Safety (OHS) in Biology Laboratory**
This course consists general subject such as: (1) Understanding and Function of OHS in laboratory, (2) The government law of OHS in laboratory, (3) Potential hazards at work in the laboratory, (4) Work accident in the laboratory, (5) Personal protective equipment in the laboratory, (6) First aid for accidents in the laboratory, (7) Disease due to work in a laboratory, (8) Application of OHS in laboratory
168. **Occupational Health and Safety (OHS)**
This course consists of general materials such as: (1) Definition and function of OHS, (2) Government Law regarding to OHS, (3) Potential hazards at work, (4) Work accident, (5)

Personal protective equipment, (6) First aid, (7) Occupational illness, (8) Application of OHS in field working.

169. Entrepreneurship

This course contains a brief description of entrepreneurship, the basic concepts of entrepreneurship, entrepreneurial processes, functions and role models of entrepreneurship, ideas and opportunities in entrepreneurship, steps in starting a new business and its development, ethics, norms and the spirit of an entrepreneur, strategies and business management, types of business entities, business entity licenses

170. Community Service Program

KKN is a field course that develops student soft skills in community life, organizes, manages resources, manages differences, builds empathy and concern for the community, formulates plans and implements activities in groups and independently, in order to improve community welfare. The course consists of: (1) Work program matrix, (2) Community ethics, (3) Local potential, (4) Leadership, (5) Community service report

171. Work Practice

This course is a field course which is one of the exceptional characteristics/expertise of a biology study program, in the context of practicing and testing the knowledge gained during lectures. Students can use this course to prepare/complete their final project (undergraduate thesis) as well as gain their knowledge about employment. Students carry out internships by the weight three credits which imply that students are required to carry out internship activities at the location for three credit semester x 170 minutes per week for 16 weeks or equivalent to 136 hours conducted for one month. While at the location of the internship program, students carry out practical activities in the real-job following the field of biological science while applying the knowledge they have gained while in college. Students conduct an activity in the form of an on-site internship to obtain specific knowledge and skills. The theme of the internship is adjusted to students' interests and job vacancies in institutions. Thus, students gain experience in the real-job that is relevant to the field of biology.

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