CURRICULUM 2022
MERDEKA BELAJAR - KAMPUS MERDEKA

BACHELOR OF MATHEMATICS

FACULTY OF MATHEMATICS AND NATURAL SCIENCE
UNIVERSITAS NEGERI YOGYAKARTA
2022

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FOREWORD

The Curriculum of Merdeka Belajar – Kampus Merdeka (MBKM) 2022 of the Mathematics Study Program FMIPA UNY was prepared as a part of efforts by UNY to follow up on the Merdeka Belajar-Kampus Merdeka policy launched by the Minister of Education and Culture in 2020. The preparation of the curriculum refered to the Presidential Regulation of the Republic of Indonesia No. 8 of 2012 on the Indonesian National Qualifications Framework (KKNI), the Regulation of the Minister of Education and Culture Number 3 of 2020 on National Standards for Higher Education, the Regulation of Rector No. 5 of 2020 on the Curriculum of MBKM for undergraduate and applied bachelor programs at Universitas Negeri Yogyakarta, and the Regulation of Rector No. 7 of 2020 on the Guidelines for the Implementation of MBKM for undergraduate and applied bachelor programs at Universitas Negeri Yogyakarta.

The curriculum MBKM 2022 accommodates students to have the opportunity for 1 (one) semester or equivalent to 20 (twenty) credits of studying outside the study program at the same University; and a maximum of 2 (two) semesters or equivalent to 40 (forty) credits of studying in the same study program at different universities, learning on different study programs in different universities; and/or learning outside the university. Based on this policy, the curriculum provides 3 alternatives of learning periods, namely 5-1-2, 6-1-1, and 6-0-2. The three numbers in a row mean the number of semesters during wich students study in their own study program, the number of semesters students get the opportunity to study in other study programs in the same university, and the number of semesters students get the opportunity to study in other study programs at different universities.

The curriculum of MBKM 2022 of the Mathematics Study Program contains the vision, mission, objectives, competence of graduates, graduate profiles, lists of compulsory and elective courses, distribution of courses each semester in accordance with three study period patterns, and course descriptions.

We hope that this curriculum will provide a considerable contribution in producing quality graduates at the national and international levels and provide convenience in providing education.

Yogyakarta, 30 July 2022
Curriculum Team
Mathematics Study Program
FMIPA UNY

INTRODUCTION

A. Background

Change of a curriculum is a natural process and should happen. The new development of science and technology, the changes in a society, and the new policies of the government require the curriculum to change. Life in the 21st century demands a fundamental change in the higher education system. The rapid changes in information and communication technology, the emergence of an era of disruption, have also caused changes at a high rate in the economic, social, and cultural fields. In this very dynamic time, learning transformation is needed to be able to equip and prepare higher education graduates to become a superior generation.

The demands of 21st century ask for competences in creativity and innovation of higher education graduates in order them to give the best contribution to Indonesia's development. The government through the Minister of Education and Culture has launched the Merdeka Belajar – Kampus Merdeka Policy in 2020, which is intended as a framework to prepare students to become strong scholars, relevant to the needs of the times, and ready to become leaders with a high national spirit. Therefore, universities must prepare a set of plans and arrangements regarding the objectives, content, and learning materials as well as the means used as guidelines for the implementation of learning activities to achieve these goals. The tool is hereinafter referred to as the Merdeka Belajar - Kampus Merdeka (MBKM) Curriculum 2022. This curriculum aims to encourage students to master various sciences that are useful for entering the world of work.

This MBKM policy is in accordance with the Regulation of Minister of Education and Culture Number 3 of 2020 on the National Standards for Higher Education. Article 18 states that the whole study period and load for undergraduate or applied bachelor students can be fulfilled by: 1) following the entire learning process in the study program at the university; or 2) following part of the learning processes within the study program and the rest processes are carried out outside the study program.

Within this curriculum students have the opportunity for 1 (one) semester or the equivalent of 20 (twenty) credits to study outside the study program at the same university, and a maximum of 2 (two) semesters or equivalent to 40 (forty) credits of studying in the same study program at different universities, learning in different study programs at different universities, and/or learning outside the university.

The minister regulation No. 3 of 2020 entitles students 3 semesters of study outside their study program. By this program, there are wide opportunities for students to enrich and increase their insights and competences in the real world. Learning can occur anywhere, not only in classrooms, libraries and laboratories, but also in villages, industries, workplaces, places of service, research centers, and in the community.

The preparation of the MBKM Curriculum has also referred to the other existing government's policy, namely the Presidential Regulation Number 8 of 2012 on the Indonesian National Qualifications Framework (KKNI). The KKNI is a competency qualification tiering framework that can juxtapose, equalize, and integrate the

education, job training, and work experience in order to provide recognition of working competencies in accordance with the structure of work in various sectors. The KKNI is consisting of nine levels that have implications for the higher education curriculum. Graduates of the diploma D3 must comply the KKNI level 5, those of bachelor comply the level 6, those of professional program graduates comply the level 7, those of master graduates comply the level 8, and doctoral graduates must comply the level 9.

The higher education curriculum is also outcome-based. The outcome of higher education, known as graduate's Learning Outcomes (LO), is a set of competences that a graduate must achieve through the learning processes at a university to be eligible and capable to carry out a set of intelligent actions with full responsibility in certain fields of work. The learning outcomes are acquired through the internalization of knowledge, attitudes, skills, competencies, and accumulated work experience (Presidential Regulation Number 8, 2012). The evaluation of higher education outcomes, in addition to be carried out by universities, is also carried out by the stakeholders.

UNY has the vision, mission, and goals that need to be actualized in the study program curriculum. The vision states that in 2025 UNY will become a superior, creative, and innovative world-class educational university with the foundation based on devotion, independence and intellectuality. In accordance with the vision of UNY, the Faculty of Mathematics and Natural Sciences (FMIPA) established its vision as "becoming a faculty which has superior quality in scientific, critical, creative and innovative attitudes with the foundation based on devotion, independence, and intellectuality, in the Southeast Asian region in 2025". The vision of UNY and the vision of the faculty are the basis for determining the vision of the Study Program.

The development of an innovative curriculum must be a mutual agreement in the management of universities. UNY has formulated a policy stated in the Rector's Regulation Number 5 of 2020 MBKM curriculum for undergraduate and applied bachelor programs of Universitas Negeri Yogyakarta. This is intended to ensure that the vision of UNY can be achieved in the implementation of learning activities for both educational and non-educational study programs. Therefore, UNY designs a curriculum that supports learning activities which are in accordance with national policies.

Curriculum development is a complex, multidimensional and multilevel process, and it starts from the existing curriculum. It must be based on past, present, and future analysis of various dimensions of life, as well as on a SWOT analysis of the existing curriculum and the results of a tracer study on graduate performance. Furthermore, each study program needs to revise its graduate profiles, learning outcomes, courses and their weights, curriculum structure and semester programs, learning and assessments standards. Curriculum improvement needs to be carried out systemically and thoroughly to include universiter, faculty, department and study program programs. In order for there to be a common pattern in the curriculum development for all study programs, the faculty coordinates the preparation of the study program curriculum. Furthermore, the Mathematics Study Program develops the curriculum by following the UNY's Guidelines for the Implementation of MBKM Curriculum.

B. Legal Basis

1. Juridical Foundations

a. Law Number 20 of 2003 on the National Education System
b. Law Number 14 of 2005 on Teachers and Lecturers
c. Law Number 12 of 2012 on Higher Education
d. Presidential Regulation Number 8 of 2012 on the Indonesian National Qualifications Framework (KKNI)
e. Government Regulation Number 19 of 2005 on National Education Standards
f. Government Regulation Number 74 of 2008 on Teachers
g. Government Regulation Number 17 of 2010 on Management and Implementation of Education
h. Regulation of the Minister of National Education Number 16 of 2007 on Academic Qualification Standards and Teacher Competencies
i. Regulation of the Minister of National Education Number 27 of 2008 on Academic Qualification Standards and Competence of Counselors
j. Regulation of the State Minister of State Apparatus Empowerment and Bureaucratic Reform Number 16 of 2009 on The Functional Position of Teachers and Their Credit Numbers
k. Regulation of the Minister of Research, Technology and Higher Education Number 44 of 2015 on National Standards for Higher Education (SNPT)
l. Regulation of the Minister of Research, Technology and Higher Education Number 35 of 2017 on the Statute of UNY
m. Regulation of the Minister of Research, Technology and Higher Education Number 55 of 2017 on Teacher Education Standards
n. Higher Education Circular Letter Number 255 / B / SE / VIII / 2016 on Guidelines for The Preparation of Higher Education Curriculum
o. UNY Rector's Regulation Number 1 of 2019 on UNY Academic Regulations
p. Guideline 2019 for the Development of Study Program Curriculum within Universitas Negeri Yogyakarta.
q. Regulation of the Minister of Education and Culture Number 3 of 2020 on National Standards for Higher Education
r. UNY Rector's Regulation No. 5 of 2020 on the MBKM Curriculum for Undergraduate and Applied Bachelor Programs
s. UNY Rector's Regulation No. 7 of 2020 on Guidelines for the Implementation of the MBKM Curriculum for Undergraduate and Applied Bachelor Programs.

2. Philosophical Foundations

The development of UNY's bachelor of mathematics curriculum is based on various philosophies such as humanism, essentialism, parenialism, idealism, and social reconstructivism with the following thoughts.

a. Indonesian people as creatures of God have a good divine fitrah: able to learn and practice to acquire knowledge, skills, and form intelligent, scholarly, and independent attitudes.
b. Education builds the whole Indonesian people who are Pancasilais: devotion to God Almighty, humane, dignified, just, democratic, and high-end social values.
c. Education equips students with progressive knowledge, skills, and attitudes in order to exist and succeed in their lives.
d. Education pays attention to the characteristics and needs of students, the needs of society, the advances of science and technology, and the cultural culture of the Indonesian nation.
e. Educators have professional competencies that include personality, social, pedagogical, and expertise competencies that are in accordance with their scientific fields and work professionally with the principles of worship, *ing ngarso sung tuladha*, *ing madya mangun karsa*, and *tut wuri handayani*.
f. Educational institutions are a system that is independent, authoritative, dignified and full of responsibility to educate the nation's life.

1. Theoritical Foundations

The development of UNY's bachelor of mathematics curriculum is also based on the science and principles of curriculum development, as follows.

a. **Relevance**: curriculum and learning must be relevant to the development of science and technology, the needs of society, and up to date.
b. **Continuity**: the bachelor, master, and doctoral curricula must be continuous and have a clear linkage and tiering.
c. **Flexibility**: the curriculum should have horizontal and vertical flexibility in terms of both content and implementation process.
d. **Effectiveness and efficiency**: the curriculum is designed in such a way as to be effective and efficient in its implementation to achieve *the learning outcomes* that have been set. For example, the bachelor curriculum should enable students to be complete their study within four years.
e. **Pragmatic**: the prepared curriculum should be implemented properly in accordance with various conditions in the study program.

C. Curriculum Preparation Process

The objectives of developing the MBKM curriculum for bachelor of mathematics at UNY are as follows:

1. to improve the curriculum in accordance with the generic competence of the KKNI;
2. to establish the qualifications of graduates of bachelor of mathematics;
3. to develop the study program's learning outcomes in accordance with the generic description of KKNI;

4. to arrange the bachelor of mathematics curriculum structure that includes universiter, faculty, and study program courses within the learning period pattern as specified in the UNY Rector's Regulation No. 5 of 2020 on the MBKM Curriculum for Undergraduate and Applied Bachelor Programs;
5. to improve the learning system, learning facilities and infrastructure, as well as assessment.

The development of the MBKM curriculum for bachelor of mathematics at UNY is based on the following knowledge and principles of curriculum development.

1. Curriculum changes are seen as things that must happen due to the advancement in science, technology, art, and community culture.
2. Curriculum development is based on the previous curriculum through a process of self-evaluation, *tracer study*, and in-depth futuristic studies.
3. Curriculum development is a non-individual teamwork involving lecturers, students, *stakeholders*, and other related elements.
4. The development of the MBKM curriculum for study programs is based on the KKNI, which is a competency qualification leveling framework that can juxtapose, equalize, and integrate education, job training, and working experiences in order to provide recognition of working competencies in accordance with the structure of work in various sectors.
5. The development of a bachelor (undergraduate) curriculum is equivalent to KKNI level 6.

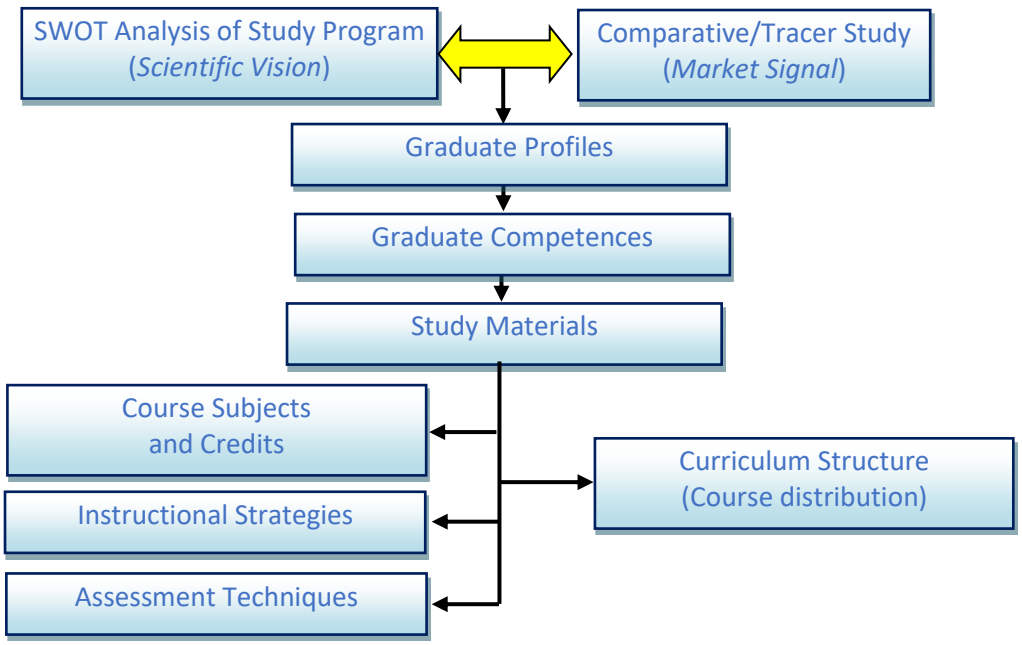

Figure 1. Steps in Curriculum Development

Development Procedure

The procedure for developing the MBKM curriculum for bachelor of mathematics at UNY is prepared by referring to rector's regulation No. 7 of 2020 on Guidelines for the Implementation of the MBKM Curriculum for undergraduate and applied bachelor programs of UNY. The curriculum development procedure consists of the following steps:

1. Determination of Graduate Profiles;
2. Formulation of main and additional *Learning Outcomes;*
3. Assessment of Competency Elements;
4. Determination of Study Materials;
5. Determination of Course Subjects;
6. Determination of Course Credits;
7. Distribution of courses on each semester according to the pattern of learning periods 5-1-2, 6-1-1, 6-0-2;
8. Determination of Learning Activities;
9. Determination of Assessment/Assessment Systems.

These steps are visualized in Figure 1.

CURRICULUM OF BACHELOR OF MATHEMATICS

A. Vision and Mission of the Study Program

1. Vision of Mathematics Study Program

In 2025, it will become a study program that excels at the international level in mastering, applying, and developing mathematical sciences and is able to produce graduates who are devout, independent, scholarly, superior, creative, and innovative.

2. Mission of Mathematics Study Program

1) to organize mathematics education and teaching programs synergistically to produce graduates who are able to compete in the global era and are ready to continue their studies to a higher level,
2) to carry out research to develop mathematics and its applications that are beneficial for the development of science and technology,
3) to conduct community services through the dissemination and application of mathematical science so as to increase public appreciation of mathematics, and
4) to organize a good and clean study program governance and to establish mutually beneficial cooperation with other parties, both at home and abroad, to improve the quality of mathematics education and research as well as community service.

B. Graduate Profile

The following is the profile of graduates of the Bachelor of Mathematics at FMIPA UNY.

No	Profile	Description
1	Academician	Graduates of bachelor of mathematics have a strong knowledge foundation to attend to postgraduate programs to become educators.
2	Research assistants	Graduates of bachelor of mathematics can become research assistants.
3	Practitioners of mathematics	Graduates of bachelor of mathematics can become practitioners in government and non-government areas.
4	Software developer	Graduates of bachelor of mathematics can become software developers.
5	Data architect	Graduates of bachelor of mathematics can create data architecture designs and data infrastructure.

C. Learning Outcomes of Graduates of Bachelor of Mathematics

The graduate learning outcomes (LO) of Bachelor of Mathematics at FMIPA UNY consists of main LO and additional LO.

1. Main LO

The graduate competencies include attitudes, knowledge and skills expressed in the learning outcomes of graduates as follows.

LO		LO according to SN DIKTI
C.1 Attitude:		
1.	Devotion to God Almighty and have a spirit of nationalism based on Pancasila	1. be devoted to God Almighty and be able to show a religious attitude
		2. uphold human values in carrying out duties based on religion, morals and ethics;
		3. contribute to improving the quality of life in society, nation, state, and civilization based on Pancasila;
		4. act as citizens who are proud and love the motherland, have nationalism and a sense of responsibility to the state and nation;
2.	Respect the diversity of cultures, views, religions, and beliefs, as well as the original opinions or findings of others	5. respect the diversity of cultures, views, religions, and beliefs, as well as the original opinions or findings of others;
		6. cooperate and have social sensitivity and concern for society and the environment;
		7. obey the law and discipline in social and state life
		8. internalizing academic values, norms, and ethics;
		9. demonstrate an attitude of responsibility for work in their field of expertise independently; and
		10. internalizes the spirit of independence, struggle, and entrepreneurship.
C.2. Being able to solve problems of science, technology, and/or art in their scientific fields through an inter or multidisciplinary approach (MASTERY OF KNOWLEDGE):		
3.	Mastering in depth the field of mathematics including analysis, algebra, geometry, statistics, applied mathematics, and computer science for the basis	1. mastering mathematical concepts and reasoning;
		2. mastering in depth one of the fields of mathematics, namely: algebra, analysis, geometry, statistics, applied mathematics, or computer science;

	of self-development at work and further studies	3. being able to develop mathematical thinking, which begins from procedural understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal evidence; and
		4. having sufficient basic knowledge to continue studies to a higher level.
C.3. Being able to develop knowledge, technology, and/or art in their scientific fields or professional practice through research, to produce innovative and tested works (WORK SKILLS):		
	C.3.1 General Skills:	
4.	Critical, creative, innovative and systematic thinking in the development of science and technology, both independently and in groups	1. being able to solve problems in various fields in a simple scope by utilizing a mathematical approach validly based on valid data by producing appropriate problem-solving models;
		2. being able to work in a team by utilizing mathematical knowledge either independently or in groups;
		3. being able to account for work that requires mathematical skills validly and honestly;
		4. having a high entrepreneurial spirit based on the value of honesty and intellectuality;
		5. being able to apply logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies humanities values in accordance with the field of mathematics;
		6. being able to show independent, quality, and measurable performance
5.	Conveying mathematical ideas orally and in writing based on the values of honesty	7. being able to examine the implications of the development or implementation of science and technology that pay attention to and apply humanities values in accordance with the field of mathematics based on scientific rules, procedures and ethics in order to produce solutions, ideas, or designs;
		8. being able to write a scientific description of the results of studies in the field of mathematics in the form of a thesis, and upload it on the college website;

		9. being able to make appropriate decisions in the context of solving problems in the field of mathematics based on the results of information and data analysis;
		10. being able to maintain and develop networks with mentors, colleagues, colleagues both inside and outside the institution; and
		11. being able to document, store, secure, and rediscover data to ensure validity and prevent plagiarism.
	C.3.2 Specific Skills:	
6.	Conducting exploration, generalization, and abstraction and prove the nature, lemma, simple mathematical theorem using logical reasoning.	1. being able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software;
7.	Formulating mathematical models of problems in various fields, solve them, and interpret them.	2. being able to reconstruct, modify, analyze in a structured way mathematical problems and interpret them;
8.	Applying algorithms using correct and efficient mathematical rules to form a quality software system by paying attention to ethical, legal and information security aspects.	3. being able to design and analyze algorithms using correct and efficient mathematical rules and implement them in various programming paradigms to form quality software systems by paying attention to ethical, legal and information security aspects;
9.	Analyzing information and data to make decisions appropriately and scientifically.	4. being able to take advantage of various mathematical problem-solving alternatives that have been available independently or in groups for appropriate decision making;
10.	Utilizing the development of mathematics, information technology, and communication to become a lifelong learner.	5. being able to master theoretically and be able to follow the development of information and communication technology; and
		6. being able to produce scientific papers in the field of mathematics and its application and present or publish them through seminar forums or scientific journals, which are based on the values of honesty and responsibility.

2. Additional LO

There are 3 additional LOs that include aspects of knowledge and skills to enrich the competence of mathematics study program graduates:

1) having insights about mathematics learning;
2) applying data management capabilities in accordance with the development of information technology more broadly; and
3) developing the power of creativity, independence and entrepreneurship.

D. Study Materials

The MBKM curriculum for Bachelor of Mathematics 2022 at UNY is prepared with a design that meet all the main and additional LOs, so that graduates have competencies according to the established profile. The curriculum consists of the following groups of courses:

1. University Mandatory and Elective Course Group (MKU),
2. Faculty Course Group (MKF),
3. Study Program Course Group (MKPS),
4. Group of Courses Outside study programs in UNY (LPdU), and
5. Outside UNY Course Group (LU).

The LOs of the bachelor of mathematics at UNY have been aligned with the Presidential Regulation number 8 of 2012 on the Indonesian National Qualifications Framework (KKNI) Level 6 and the minimum standards for Graduate Learning Outcomes (LO) formulated by the *Indonesian Mathematics Society* (IndoMS). The following is the relationship between LO and KKNI level 6.

Table 1. Relationship between LOs of bachelor of mathematics at UNY and KKNI Level 6

KKNI Level 6	Graduate Learning Outcomes (LO)									
	1	2	3	4	5	6	7	8	9	10
Being able to apply their field of expertise and utilize science and technology in their fields in solving problems and able to adapt to the situation at hand.				√	√	√	√			√
Mastering the theoretical concepts of certain fields of knowledge in general and theoretical concepts of special sections in the field of knowledge in depth and able to formulate procedural problem solving.					√		√	√	√	√
Being able to make the right decisions based on information and data analysis, and able to provide			√	√			√		√	

KKNI Level 6	Graduate Learning Outcomes (LO)									
	1	2	3	4	5	6	7	8	9	10
instructions in choosing various alternative solutions independently and in groups.										
Responsible for own work and can be given responsibility for the achievement of the results of the work of the organization.		√	√							√

To achieve that goals, it is needed study materials as the content of each course that meet all the LOs of the study program. Table 2 describes the study materials and the relationship among courses in the MBKM curriculum 2022.

Table 2. Course materials and the relationship among courses in the MBKM curriculum for bachelor of mathematics 2022 at UNY

No	Field of Study	Details of the field of study	Course Name	credits	%
1	Common	University courses and Faculty Courses, among others, include: Religion, citizenship, entrepreneurship, ICT, MIPA insight, basic statistics	Religious Education	2	13,5
			Civic Education	2	
			Pancasila	2	
			Indonesian	2	
			Digital Transformation	2	
			English	2	
			Creativity, Innovation and Entrepreneurship	2	
			Social and Humanitarian Literacy	2	
			Insights and Studies of Mathematics and Natural Sciences	2	
			Statistics	2	
2	Basics of Mathematics	logic, proof method, quantor, set, relation, mapping	Logic and Set	3	3,4
			Number Theory	2	
3	Discrete Mathematics	combinations and permutations, the principle of inclusion, the principle of pigeon nest (pigeon hole), dasar-basis of graph theory.	Discrete Mathematics	3	4,1
			Graph Theory	3	
4	Differential and integral calculus	real number system, function, limit, continuity, torder, integral, row, series, vector function, two/three changer function, partial derivative, two/three changer f derivative, two/three folding integral.	Differential Calculus	3	6,1
			Integral Calculus	3	
			Multivariable Calculus	3	

No	Field of Study	Details of the field of study	Course Name	credits	%
5	Real Analysis and Complex Functions	Introduction to Real Analysis of Complex Functions	Introduction to Real Analysis	3	6,1
			Real Analysis	3	
			Complex analysis	3	
6	Matrix Vector Algebra over Real and Complex Numbers, and their application	Elementary Linear Algebra: Systems of linear equations, matrices, vector spaces, bases, linear transformations, representation matrices, inner multipliers, orthogonalization, eigenvalued values and vectors, diagonalization and decomposition, quadratic forms, Linear Programs, operations research	Elementary Linear Algebra	3	9,5
			Linear Algebra	3	
			Program Linear	3	
			Operations Research	3	
			Fuzzy Set Theory	2	
7	Algebraic Structure	Introduction to Group Theory and Ring Theory	Introduction to Ring Theory	3	4,11
			Introduction to Group Theory	3	
8	Surveyors	Geometry Analytic	Geometry	3	4,1
			Analytic Geometry	3	
9	Computing	Algorithms and Programming, Numerical Methods	Algorithms and Programming	3	6,1
			Numerical Methods	3	
			Computer Applications	3	
10	Differential Equations	Ordinary Differential Equations	Differential Equations	3	6,1
		Partial Differential Equation	Partial Differential Equation	3	
		Mathematical Modeling	Mathematical Modeling	3	
11	Statistics	Statistical Methods	Data analysis and visualization	3	6,1
		Probability Theory	Probability Theory	3	
		Introduction to Mathematical Statistics	Introduction to Mathematical Statistics	3	
12	Study Program Elective Courses	Elective courses for Mathematics study programs are provided in 5 fields	elective courses in algebra, analysis and geometry, applied, computational, and statistics	12	8,1
13	MK option LPdU	Meets Additional LO 1,2,3	According to the study program	14	9,5
14	Field Lectures and Final Projects	KKN	KKN	6	13,5
		PPL	PPL	6	
		Thesis	Thesis	8	
SUM				148	100

Table 3 describes the relationship between MKU, MKF and the LO of bachelor of mathematics.

Table 3. Relationship between LOs of bachelor of mathematics, MKU, and MKF

No	Course Name	Main Graduate Learning Outcomes (LO)									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	Religious Education	✓	✓								
2	Civic Education	✓	✓								
3	Pancasila	✓	✓								
4	Indonesian	✓		✓							
5	Digital Transformation		✓	✓		✓			✓		✓
6	English		✓								
7	Creativity, Innovation and Entrepreneurship			✓						✓	
8	Social and Humanitarian Literacy		✓								
9	Insights and Studies of Mathematics and Natural Sciences			✓			✓				
10	Statistics		✓	✓	✓		✓			✓	

The compulsory courses of the bachelor of mathematics consist of 71 credits of core MKPS and 20 credits of advanced MKPS (9 of which are only for the 6-0-2 scheme) and 20 credits of LU courses (KKN, PKL, Thesis) to support students' abilities in various fields of Mathematics. The distribution of compulsory courses and their relationship with LOs can be seen in the Table 4.

Table 4. The relationship between the LOs of the bachelor of mathematics of UNY and the compulsory courses of the Mathematics study program

No	Course Name	Main Graduate Learning Outcomes (LO)									
		1	2	3	4	5	6	7	8	9	10
1.	Logic and Set		✓		✓	✓	✓				
2.	Differential Calculus		✓	✓	✓	✓	✓				
3.	Geometry		✓		✓	✓	✓				
4.	Number Theory		✓		✓	✓	✓				
5.	Integral Calculus		✓	✓	✓	✓	✓				
6.	Elementary Linear Algebra	✓			✓	✓	✓	✓			✓
7.	Algorithms and Programming		✓		✓	✓			✓		✓
8.	Analytic Geometry		✓	✓		✓	✓				
9.	Discrete Mathematics		✓		✓	✓	✓				
10.	Data Analysis and Visualization		✓	✓	✓	✓				✓	
11.	Introduction to Group Theory		✓		✓	✓	✓				
12.	Multivariable Calculus		✓		✓	✓	✓				
13.	Differential Equations		✓	✓		✓		✓			
14.	Linear Programing		✓	✓		✓		✓			✓
15.	Probability Theory		✓	✓	✓	✓	✓	✓			
16.	Partial Differential Equation		✓	✓		✓		✓			✓
17.	Introduction to Mathematical Statistics		✓		✓	✓				✓	
18.	Introduction to Real Analysis		✓	✓	✓	✓	✓				
19.	Linear Algebra		✓	✓		✓	✓				
20.	Introduction to Ring Theory		✓	✓		✓		✓		✓	
21.	Numerical Methods		✓	✓		✓		✓			✓
22.	Real Analysis		✓	✓	✓	✓	✓				
23.	Complex Analysis		✓		✓	✓	✓				
24.	Mathematical Modeling		✓	✓		✓		✓		✓	✓
25.	Computer Applications		✓	✓			✓		✓		✓
26.	Introduction to Regression Analysis				✓	✓				✓	
27.	Information Systems And Databases			✓			✓		✓		✓
28.	Theory Graph	✓			✓	✓	✓	✓			✓
29.	Fuzzy Set Theory		✓	✓		✓		✓		✓	✓
30.	Object-Oriented Programming			✓			✓		✓		✓
31.	Operations Research		✓	✓		✓		✓		✓	✓
32.	KKN		✓	✓							
33.	PKL		✓	✓		✓					✓
34.	Thesis		✓		✓	✓	✓				

Meanwhile, the relationship between LO and elective courses for study programs is as follows.

Table 5. The relationship between the LOs of the bachelor of mathematics of UNY and elective courses

No	Course Name	Main Graduate Learning Outcomes (LO)									
		1	2	3	4	5	6	7	8	9	10
1.	Fuzzy Logic		✓		✓	✓	✓				
2.	Cryptography		✓	✓	✓	✓			✓		✓
3.	Matrix Theory		✓	✓		✓	✓				
4.	Coding Theory		✓	✓	✓	✓	✓		✓		
5.	Module Theory		✓	✓		✓	✓				
6.	Applied Linear Algebra		✓		✓	✓		✓			✓
7.	Introduction to Functional Analysis		✓	✓		✓	✓				
8.	Geometry Systems		✓	✓		✓	✓				
9.	Introduction to Dynamical Systems		✓	✓		✓	✓				✓
10.	Introduction to Measure Theory and Lebesque's Integrals		✓	✓		✓	✓				
11.	Introduction to Topology		✓	✓		✓	✓				
12.	Differential Geometry		✓	✓		✓	✓				
13.	Financial Mathematics	✓	✓			✓		✓		✓	
14.	Engineering Mathematics		✓	✓		✓	✓	✓			
15.	The Initial Value and Boundary Problems		✓	✓		✓		✓			
16.	Biological Mathematics		✓	✓		✓		✓			
17.	Optimization and Control Theory		✓	✓		✓		✓			✓
18.	Queueing Theory		✓	✓		✓		✓		✓	
19.	Decision Support System		✓	✓		✓			✓		
20.	Web Programming		✓			✓	✓		✓		✓
21.	Digital Image Processing		✓	✓		✓			✓		
22.	Mobile Devices Programming		✓			✓	✓		✓		✓
23.	Artificial Intelligence		✓	✓		✓			✓		
24.	Artificial Neural Network		✓	✓		✓			✓		
25.	Nonparametric Statistics		✓	✓	✓	✓				✓	
26.	Experiment Design		✓		✓	✓		✓		✓	
27.	Statistical Computing		✓	✓		✓		✓		✓	
28.	Categorical Data Analysis		✓	✓	✓	✓		✓		✓	
29.	Time-Series Analysis		✓	✓		✓		✓		✓	
30.	Introduction to Multivariate Statistics		✓	✓		✓		✓		✓	

E. Curriculum Structure

1. Characteristics of Mathematics Study Program Curriculum

Merdeka Belajar-Kampus Merdeka (MBKM) curriculum of mathematics' study program consist 148-152 credits which is provided in 3 study period patterns, which are 5-1-2, 6-1-1, and 6-0-2. The three numbers respectively indicate the total semesters that a students studied in his/her own study program, the total semesters that a student had the opportunity to study in another study program in the same university, and the total semesters that a student had the opportunity to study in another study program in a different university.

The curriculum is structured in groups of courses as follows:

Table 6. The Curriculum Structure of the Mathematics Study Program

No	Kelompok Mata Kuliah	Total credits according to study period pattern		
		5-1-2	**6-1-1**	**6-0-2**
1	Compulsory University Courses	14	14	14
2	Elective University Courses	2	2	2
3	Faculty Courses	4	4	4
4	Study Program Courses			
	a. Mathematics' Core Courses	71	71	71
	b. Extended Courses	12	14	20
	c. Elective Courses	0	12	0
5	Courses Outside study programs in UNY	17-19	12-16	0
6	Outside UNY Course	29-31	20	38-42
	Total	**149-153**	**149-153**	**149-153**

a. **Compulsory Course** is a number of courses to fulfill the main Graduate Learning Outcomes (LO) in the study program. This group of courses consists of:
   - University courses (compulsory and elective) 16 credits
   - Faculty Courses 4 credits
   - Study Program Courses (compulsory, advanced, and elective) 71-94 credits
   - PKL, KKN, and Final Thesis 20 credits

   Study program courses are possible to be taken outside UNY with a credit transfer scheme.

b. **Mathematics' Extended/ Advanced level Course** is a number of courses to fulfill Additional Graduate Learning Outcomes (LOT), consisting of additional ability courses that can be taken in other study programs within UNY, and outside UNY. Courses outside UNY can be carried out in eight alternative forms of activity, and can be carried out in the community, industry, company, etc. The number of credits for this group of courses varies according to the study period pattern.

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

a. Compulsory University Courses (14 credits)

Table 7. University Courses

No	Code	Courses	CREDITS				SEM		Prerequisite
			T	P	L	J	Gs	Gn	
1	MKU6201	Islamic Education [1)]	2	-	-	2	1		-
	MKU6202	Catholic Education [1)]							
	MKU6203	Christianity Education [1)]							
	MKU6204	Hinduism Education [1)]							
	MKU6205	Buddhism Education [1)]							
	MKU6206	Confucianism Education [1)]							
2	MKU6207	Civic Education	2	-	-	2	1		-
3	MKU6208	Pancasila	2	-	-	2		2	-
4	MKU6209	Indonesian Language [2)]	2	-	-	2		2	-
5	MKU6211	English [2)]	2	-	-	2	1		-
6	MKU6212	Digital Transformation	2	-	-	2	1		-
7	MKU6213	Creativity, Innovation and Entrepreneurship [2)]	2	-	-	2	3		-
		TOTAL	14	-	-	14			-

Keterangan :
1) = choose one according to the religion professed
2) = competence adjusted to the characteristics of the study program

b. Elective University Courses (2 credits)

Table 8. Elective University Courses

No	Code	Courses	CREDITS				SEM		Prerequisite
			T	P	L	J	Gs	Gn	
1	MKU6216	Social Literacy and Humanity	**2**	**-**	**-**	**2**	**3**	-	**-**
		Total	**2**	**-**	**-**	**2**	**-**	-	**-**

C. Faculty Courses (4 credits)

Table 9. Faculty Courses

No	Code	Courses	CREDITS				SEM		Prerequisite
			T	P	L	J	Gs	Gn	
1	FMI6201	Insight and study of Mathematics and Natural Sciences	2	**-**	**-**	2	-	4	**-**
2	FMI6202	Statistics	2	**-**	**-**	2	**1**	-	**-**
		Total	**4**	**-**	**-**	**4**	**-**	-	**-**

d. Study Program Courses

Mathematics study program courses consist of Mathematics' Core Courses (71 credits), Advanced Level Courses (11 credits), and Specialization/Elective Courses (12 credits for the 611 scheme, and 9 credits for the 602 scheme).

i) Mathematics' Core Courses

This course is prepared by taking into account the recommendations of the IndoMS (Indonesian Mathematics Society) regarding the core competencies of the S1 Mathematics study program.

Table 10. Mathematics' Core Courses

No	Code	Courses	CREDITS				SEM		Prerequisite*
			T	P	L	J	Gs	Gn	

1.	MAT6301	Logic and Set	3			3	**1**		
2.	MAT6302	Differential Calculus	3			3	**1**		
3.	MAT6303	Geometry	3			3	**1**		
4.	MAT6204	Number Theory	2			2	**1**		
5.	MAT6305	Integral Calculus	3			3		2	MAT6302
6.	MAT6306	Elementary Linear Algebra	3			3		2	MAT6301
7.	MAT6307	Algorithm and Programming	2	1		3		2	MAT6301 MKU6212
8.	MAT6308	Analytic Geometry	3			3		2	MAT6303
9.	MAT6309	Discrete Mathematics	3			3		2	MAT6301
10.	MAT6310	Data Analysis and Visualization	3			3		2	FMI6202
11.	MAT6311	Introduction to Group Theory	3			3	**3**		MAT6301
12.	MAT6312	Multivariable calculus	3			3	**3**		MAT6305
13.	MAT6313	Differential Equations	3			3	**3**		MAT6305
14.	MAT6314	Linear Programming	3			3	**3**		MAT6306
15.	MAT6315	Probability Theory	3			3	**3**		MAT6301
16.	MAT6316	Partial Differential Equations	3			3		4	MAT6313
17.	MAT6317	Introduction to Mathematical Statistics	3			3		4	MAT6315
18.	MAT6318	Introduction to Real Analysis	3			3		4	MAT6312
19.	MAT6319	Linear Algebra	3			3		4	MAT6306
20.	MAT6320	Introduction to Ring Theory	3			3		4	MAT6311
21.	MAT6321	Numerical Methods	2	1		3	**5**		MAT6319
22.	MAT6322	Real Analysis	3			3	**5**		MAT6318
23.	MAT6323	Complex Analysis	3			3	**5**		MAT6312
24.	MAT6324	Mathematical Modeling	3			3	**5**		MAT6316

- ever taken

ii) Mathematics' Extended/ Advanced level Course

Table 11. Mathematics' Extended/ Advanced level Course

No	Code	Courses	CREDITS				SEM		Prerequisite*
			T	P	L	J	Gs	Gn	
1.	MAT6325	Computer Application	2	1	-	3	3	-	MAT6307
2.	MAT6326	Introduction to Regression Analysis	3	-	-	3	-	4	MAT6310
3.	MAT6327	Information System and Database	2	1	-	3	-	4	MAT6307
4.	MAT6328	Graph Theory	3	-	-	3	5	-	MAT6309
5.	MAT6229	Fuzzy Set Theory	2	-	-	2	5	-	MAT6301
6.	MAT6330	Object Oriented Programming	2	1	-	3	5	-	MAT6307
7.	MAT6331	Operation Research	3	-	-	3	-	6	MAT6314

- ever taken

iii) Mathematics' Specialization/ Elective course

The courses of this mathematics' elective group are divided into 5 specialization groups, namely Algebra, Analysis and Geometry, Applied Mathematics, Computers, and Statistics.

This course is also offered to be taken by students from other study programs, both from inside and outside UNY.

Table 12. Mathematics' Specialization/ Elective course

No	Code	Courses	CREDITS				SEM		Prerequisite
			T	P	L	J	Gs	Gn	
Bidang : Algebra									
1.	MAT6332	Module Theory	3			3	5		MAT6320
2.	MAT6333	Cryptography	3			3	5		MAT6204
3.	MAT6334	Matrix Theory	3			3	5		MAT6319
4.	MAT6335	Coding Theory	3			3		6	MAT6320
5.	MAT6336	Fuzzy Logic	3			3		6	MAT6229
6.	MAT6337	Applied Linear Algebra	3			3		6	MAT6319
Bidang : Geometry and Analysis									
7.	MAT6338	Introduction to Functional Analysis	3			3	5		MAT6322
8.	MAT6339	Geometry Systems	3			3	5		MAT6308
9.	MAT6340	Introduction to Dynamical System	3			3	5		MAT6324
10.	MAT6341	Introduction to Measure Theory and Lebesque Integral	3			3		6	MAT6321
11.	MAT6342	Introduction to Topology	3			3		6	MAT6321
12.	MAT6343	Differential Geometry	3			3		6	MAT6312
Bidang : Applied Mathematics									
13.	MAT6344	Financial Mathematics	3			3	5		MAT6305
14.	MAT6345	Engineering Mathematics	3			3	5		MAT6313
15.	MAT6346	Initial and Boundary Value Problems	3			3	5		MAT6324
16.	MAT6347	Mathematical Biology	3			3		6	MAT6324
17.	MAT6348	Optimization Theory and Control	3			3		6	MAT6324
18.	MAT6349	Queuing Theory	3			3		6	MAT6315
Bidang : Computer									
19.	MAT6350	Decision Support Systems	2	1		3	5		MAT6307
20.	MAT6351	Web Design Programming	2	1			5		MAT6307
21.	MAT6352	Digital Image Processing	2	1		3	5		MAT6307
22.	MAT6353	Mobile Device Programming	2	1		3		6	MAT6307
23.	MAT6354	Artificial Intelligence	2	1		3		6	MAT6307
24.	MAT6355	Artificial Neural Network	2	1		3		6	MAT6307
Bidang : Statistics									
25.	MAT6356	Nonparametric Statistics	3			3	5		FMI6202
26.	MAT6357	Experimental Design	3			3	5		MAT6310
27.	MAT6358	Statistical Computing	3			3	5		MAT6307
28.	MAT6359	Categorical Data Analysis	3			3		6	MAT6326
29.	MAT6360	Time Series Analysis	3			3		6	MAT6326
30.	MAT6361	Introdcution to Multivariate Statistics	3			3		6	MAT6326

a. Courses Outside Study Programs in UNY

Courses outside Study Programs in UNY (LPdU) are are **free elective courses** outside the original study program to fulfill additional LO taken from similar study programs or different study programs within UNY. There are 3 additional LO that are determined to enrich the competence of Mathematics Study Program graduates, which are as follows.

1). **Students have insight into mathematics learning**

This competency can be fulfilled by students taking courses in the Mathematics Education Study Program at UNY or other Education Study Programs at UNY that offer mathematics learning enhancement courses.

2).Students are able to apply data management skills in accordance with the development of information technology more extensively.

This competency can be fulfilled by students taking courses in UNY Mathematics Study Program or other study programs at UNY that offer courses related to enrichment of data analysis and management, including big data.

3). Students are able to develop creativity, independently and entrepreneurship.
This competency can be fulfilled by students taking courses in other UNY study programs that offer courses related to the development of creativity, independently and entrepreneurship

In the types of courses outside Prodi in UNY, students can take courses that fulfill additional LOs or that have competencies that are similar to the suggested courses listed in the course distribution table.

b. Outside UNY Courses

Outside UNY Courses (LU) taken by students to fulfill the main LO, which are compulsory, and to fulfill additional LO, which are electives. The 20 credits of compulsory OU courses are applicable across all period schemes, while the elective courses vary across the three schemes.

1) Compulsory Course Outside UNY (20 credit)

Table 13. Compulsory Course Outside UNY

No	Code	Courses	SKS				SEM		Prerequisite
			T	P	L	J	Gs	Gn	
1.	PKL6601	Field Work Practices			6	6	7		
2.	MKU6614	Community Services			6	6	7		
3.	MAT6862	Undergraduate thesis			8			8	
		TOTAL			20				

2) Specializatioin/ Elective Courses Outside UNY (8 – 20 credits)

This course is a free elective course to fulfill additional LO which are taken outside UNY. This course can be fulfilled with 8 alternative lectures, namely:

1) Internship/industry practice,
2) projects in the village,
3) student exchange,
4) research
5) entrepreneurship,
6) independent study/project,
7) charity projects, and
8) Teaching in schools.

In the course of student exchange activities, students can take courses at partner universities (there are 12 partner universities, Attachment to UNY Rector Regulation No. 7 of 2020) via online. The number of courses recommended to fulfill additional LO that can be taken at PT Mitra is as follows.

In the type of courses outside UNY free choice, the study program directs students to take courses that meet additional LO or that have competencies that are allied to the study program elective courses.

2. Course Distribution Per Semester

The curriculum of the Mathematics Study Program consists of 148 credits - 152 credits, with The distribution of courses per semester is divided into 3 learning period patterns,

namely 5-1-2, 6-1-1, and 6-0-2.. The following table shows the number of semesters from the three study period patterns offered (UNY Rector's Regulation No. 7 of 2020).

No	Sum of Credits			Total Semester
	Inside Study Program	Outside Study Program in UNY	Outside UNY	
1	5	1	2	8
2	6	1	1	8
3	6	0	2	8

In the following distribution of courses per semester, the number of semesters outside the study program in each study period pattern is designed to be met from the number of credits that must be fulfilled by students outside the study program and outside UNY.

The following is the distribution of courses per semester on three study period.

a. SEMESTER I

No	Code	Courses	Credit Details			Total credits		
			T	P	L	5-1-2	6-1-1	6-0-2
1	MKU6201	Islamic Education	2	-	-	2	2	2
	MKU6202	Catholic Education		-	-			
	MKU6203	Christianity Education		-	-			
	MKU6204	Hinduism Education		-	-			
	MKU6205	Buddhism Education		-	-			
	MKU6206	Confucianism Education		-	-			
2	MKU6207	Civic Education	2	-	-	2	2	2
3	FMI 6202	Statistics	2	-	-	2	2	2
4	MKU6211	English	2	-	-	2	2	2
5	MKU6212	Digital Transformation	1	1	-	2	2	2
6	MAT6301	Logic and Set	3	-	-	3	3	3
7	MAT6302	Differential Calculus	3	-	-	3	3	3
8	MAT6303	Geometry	3	-	-	3	3	3
9	MAT6204	Number Theory	2	-	-	2	2	2
Total			**20**	**1**	**-**	**21**	**21**	**21**

b. SEMESTER II

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
1	MKU6208	Pancasila	2	-	-	2	2	2
2	MKU6209	Indonesian Language	2	-	-	2	2	2
3	MAT6305	Integral Calculus	3	-	-	3	3	3
4	MAT6306	Elementary Linear Algebra	3	-	-	3	3	3
5	MAT6307	Algorithm and Programming	2	1	-	3	3	3
6	MAT6308	Analytic Geometry	3	-	-	3	3	3
7	MAT6309	Discrete Mathematics	3	-	-	3	3	3
8	MAT6310	Data Analysis and Visualization	2	1	-	3	3	3
Total			**20**	**2**	**-**	**22**	**22**	**22**

c. SEMESTER III

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
1	MKU6213	Creativity, Innovation and Entrepreneurship	1	-	1	2	2	2
2	MKU6216	Social Literacy and Humanity	2	-	-	2	2	2
3	MAT6311	Introduction to Group Theory	3	-	-	3	3	3
4	MAT6312	Multivariable calculus	3	-	-	3	3	3
5	MAT6313	Differential Equations	3	-	-	3	3	3
6	MAT6314	Linear Programming	3	-	-	3	3	3
7	MAT6315	Probability Theory	3	-	-	3	3	3
8	MAT6325	Computer Application	2	1	-	3	3	3
Total			**20**	**1**	**1**	**22**	**22**	**22**

d. SEMESTER IV

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
Course Packages for All Patterns of Study Period								
1	FMI6201	Insight and study of Mathematics and Natural Sciences	2	-		2	2	2
2	MAT6316	Partial Differential Equations	3	-	-	3	3	3
3	MAT6317	Introduction to Mathematical Statistics	3	-	-	3	3	3
4	MAT6318	Introduction to Real Analysis	3	-	-	3	3	3
5	MAT6319	Linear Algebra	3	-	-	3	3	3
6	MAT6320	Introduction to Ring Theory	3	-	-	3	3	3
Pattern 5-1-2 and 6-1-1								
	Outside study programs' courses in UNY (6 credits) *)							
7	study programs' code	Introduction to Regression Analysis	3	-	-	3	3	-
8		Information System and Database	2	1	-	3	3	-
Pattern 6-0-2								
7	MAT6326	Introduction to Regression Analysis	3	-	-	-	-	3
8	MAT6327	Information System and Database	2	1	-	-	-	3
Total			**22**	**1**	**-**	**23**	**23**	**23**

e. SEMESTER V

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
Course Packages for All Study Periods								
1	MAT6321	Real Analysis	3	-	-	3	3	3
2	MAT6322	Complex Analysis	3	-	-	3	3	3
3	MAT6328	Graph Theory	3	-	-	3	3	3
4	MAT6229	Fuzzy Set Theory	2	-	-	2	2	2
5	MAT6330	Object Oriented Programming	2	1	-	3	3	3
Pattern 5-1-2								

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
6	Outside study programs' courses in UNY (3-5 credits)*)							
	study programs' code	Transformation Geometry	2	-	-	2	-	-
6	*Courses outside UNY* (6- 8 credits)**)							
	study programs' code	*Elective courses outside UNY*	3	-	-	3	-	-
		Elective courses outside UNY	3	-	-	3	-	-
Pattern 6-1-1								
6	MAT63xx#)	*Elective Study Mathematics Program 1*	-	-	-	-	3	-
7	MAT63xx#)	*Elective Study Mathematics Program 2*	-	-	-	-	3	-
8	Outside study programs' courses in UNY (3-5 credits)*)							
	study programs' code	Transformation Geometry	-	-	-	-	2	-
Pattern 6-0-2								
6	*Courses outside UNY* (6- 8 credits)**)							
	study programs' code	Transformation Geometry	-	-	-	-	-	2
		Elective courses outside UNY	-	-	-	-	-	3
		Elective courses outside UNY	-	-	-	-	-	3
Total			**19-21**	**1**	**-**	**20-22**	**20-22**	**20-22**

f. SEMESTER VI

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
Course Packages for All Study Periods								
1	MAT6323	Numerical Methods	2	1		3	3	3
2	MAT6324	Mathematical Modeling	3			3	3	3
3	MAT6331	Operation Research	3			3	3	3
Patters 5-1-2								
4	Outside study programs' courses in UNY (8 credits) *)							
	study programs' code	Data Mining	2	1	-	3	-	-
		History of Mathematics	2	-	-	2		
		Elective Courses in Other Programs	*3*			3	-	-
5	Outside UNY courses (3-5 credits) **)							
	study programs' code	Mathematics in English	2	-	-	2		
		Outside UNY elective course	3	-	-	3	-	-
Pattern 6-1-1								
4	MAT63xx#)	*Elective Study Mathematics Program 1*	3	-	-	-	3	-

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
5	MAT63xx[#)]	*Elective Study Mathematics Program 2*	3	-	-	-	3	-
6	Outside study programs' courses in UNY (5-7 credits)*)							
	study programs' code	Data Mining	2	1	-	-	3	-
		History of Mathematics	2	-	-	-	2	-
		Mathematics in English	2	-	-	-	2	-
Pattern 6-0-2								
4	Outside UNY courses (11-13 credits)**)							
	study programs' code	Data Mining	2	1	-	-	-	3
		History of Mathematics	2	-	-	-	-	2
		Mathematics in English	2	-	-	-	-	2
		Elective Study Mathematics Program 1	*3*	-	-	-	-	3
		Elective Study Mathematics Program 2	*3*	-	-	-	-	3
Total			**18-20**	**2**		**20-22**	**20-22**	**20-22**

g. SEMESTER VII

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
1	MKU6614	Community Services	-	-	6	6	6	6
2	PKL6601	Field Work Practices	-	-	6	6	6	6
Total			**-**	**-**	12	**12**	**12**	**12**

h. SEMESTER VIII

No	Code	Courses	Credit Details			Total Credits		
			T	P	L	5-1-2	6-1-1	6-0-2
1	MAT6862	Undergraduate thesis	8	-	-	8	8	8
Total			**8**	**-**	**-**	**8**	**8**	**8**

*) Students can take courses in other study programs at UNY that fulfill additional LOs, or courses suggested in this Table or whose competencies are similar.

**) Students can take courses OUTSIDE UNY that fulfill the additional LOs, or courses suggested in this Table, or whose competencies are similar to the Elective courses in Table 12.

[#)] As per the Math elective course code in Table 12.

F. Learning System

The learning process is carried out to achieve predetermined graduate learning outcomes (LO). Learning activities are carried out based on religious values, nationality, and academic ethics. Learning activities are carried out interactively by prioritizing two-way interaction between students and lecturers and between students by utilizing various learning

resources and relevant information technology to foster creativity, capacity, personality, independence, and the ability to solve problems, as well as foster a logical, broad, and comprehensive mindset. Learning activities can be in the form of face-to-face lectures, responses and tutorials, seminars, practicums, or field practices.

To achieve predetermined learning outcomes, students are required to take a minimum study load of 148 semester credit units (credits) which are completed within 4 to 5 years or 8 to 10 semesters. One semester is equivalent to 16 weeks. One credit is equivalent to 160 minutes of learning activities per week per semester with details for each form of learning activity being as follows.

- One credit in the form of lecture learning, response, and tutorials includes face-to-face learning activities of 50 minutes per week per semester, structured assignments of 60 minutes per week per semester, and independent learning activities of 60 minutes per week per semester.
- One credit in the form of seminar learning includes face-to-face learning activities of 100 minutes per week per semester and independent learning activities per week per semester.
- One credit in the form of practicum learning and field practice is 170 minutes per week per semester.

G. Assessment

Learning assessment is carried out to measure the achievement of predetermined learning outcomes. The assessment is carried out with the following principles.

- Educational, namely assessment is intended to motivate students to improve planning and learning methods to achieve learning outcomes
- Authentic, namely assessment oriented to a continuous learning process and learning outcomes that reflect the ability of students during learning activities
- Objective, that is, the assessment is based on agreed standards between lecturers and students and from the influence of subjectivity
- Accountable, that is, the assessment is based on clear procedures and criteria, agreed upon at the beginning of the lecture, and understood by the student
- Transparent, that is, an assessment whose procedures and results are accessible to all stakeholders.

The assessment is carried out by several techniques. Attitude assessment is carried out with observation techniques, questionnaires, self-assessment, and assessment between friends. Attitude assessment is carried out during the learning activities. Assessment of knowledge and skills is carried out by written tests, oral tests, or assignments in the form of portfolios or projects. In terms of time and scope, the written test is divided into a Midterm exam (UTS) to measure student learning outcomes in the first half of learning activities and a Final Semester exam (UAS) to measure student learning achievement in the second half of learning activities. The final value of the knowledge and skills aspect is an accumulation of the value of the assignment, UTS, and UAS whose formulation is agreed between lecturers and students provided that the assignment value weighs at least 20% of the total

score. The final score of students in a course is an accumulation of the values of attitudes, attitudes, knowledge, and skills whose formulation is agreed between lecturers and students.

The final score of the course uses a scale of 0 to 100 with a graduation limit of 56. The final grades are converted into letters A, A-, B+, B, B-, C+, C, C-, D, and E whose standards and weights are set in accordance with the UNY Academic Regulations of 2019, as follows.

Table 6. Conversion of Values in the Form of Letters and Numbers

Score (Scale 0 – 100)	Nilai	
	Huruf	Angka
86 – 100	A	4,00
81 – 85	A-	3,67
76 – 80	B+	3,33
71 – 75	B	3,00
66 – 70	B-	2,67
61 – 65	C+	3,33
56 – 60	C	2,00
41 – 55	D	1,00
0 – 40	E	0,00

The value or learning outcomes of students in each semester are expressed by the Semester Achievement Index (IPS) obtained by summing the multiplication between the number value of each course and the weight of the credits of the course concerned divided by the number of credits of the course taken in one semester. The results of the assessment of graduate learning outcomes at the end of the study program are stated by the cumulative achievement index (GPA) obtained by summing the multiplication between the number value of each course and the weight of the credits of the course concerned divided by the number of all credits that have been taken to complete the study. Students are declared to have passed if they have taken all the specified learning loads and have graduate learning outcomes set by the study program with a GPA greater than or equal to 2.00. The student's graduation predicate is determined as follows.

- It is satisfactory to achieve a GPA of 2.76 to 3.00.
- It is very satisfying to achieve a GPA of 3.01 to 3.50.
- With praise for achieving a GPA of more than 3.50.

H. Course Description

1. Group of Compulsory and Elective Universitary Courses (MKU)

1) MKU6201 Islamic Education

The subject of Islamic Education is compulsory for every Muslim student in all study programs at Yogyakarta State University. This course is designed with the intention of strengthening students' faith and piety to Allah SWT. and have noble character and broaden the horizons of their religious life, so as to form Muslim students who have noble character, think philosophically, are rational and dynamic, and have broad views, taking into account the demands to establish harmony among human beings both within one religion and with people of other religions.

MKU6202 Catholic Education

The Catholic Education course is compulsory for every Catholic student in all study programs, weighing 3 credits. This course is designed with the intention of strengthening faith and piety to

God Almighty, as well as broadening the horizons of religious life, so as to form students who have noble character, think philosophically, behave rationally and dynamically and have broad views, taking into account the demands for respect within one community. , and in the relationship of inter-religious harmony. Lecture activities are carried out with lecture models, dialogues, and paper presentations. Evaluation is done through writing, assignments, and reports, as well as presentations.

MKU6203 Christian Education

The Christian Education course is compulsory for every Christian student in all study programs, weighing 3 credits. This course is designed with the intention of strengthening faith and piety to God Almighty, as well as broadening the horizons of religious life, so as to form students who have noble character, think philosophically, behave rationally and dynamically and have broad views, taking into account the demands for respect within one community. , and in the relationship of inter-religious harmony. Lecture activities are carried out with lecture models, dialogues, and paper presentations. Evaluation is done through writing, assignments, and reports, as well as presentations.

MKU6204 Hindu 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 *sradha*, 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.

MKU6205 Buddhist Education

The subject of Buddhist Education is compulsory for every Buddhist student in all study programs, weighing 3 credits. This course is designed with the intention of strengthening faith and piety to God Almighty, as well as broadening the horizons of religious life, so as to form students who have noble character, think philosophically, behave rationally and dynamically and have broad views, taking into account the demands for respect within one community. , and in the relationship of inter-religious harmony. Lecture activities are carried out with lecture models, dialogues, and paper presentations. Evaluation is done through written notes, assignments, and reports, as well as presentations.

MKU6206 Confucian Education

The Confucian Religion Education course covers the urgency of religion in everyday life with the right attitude. This course includes an understanding of the sources of Confucian law, knowing the history of Confucianism, being able to carry out the Holy Way brought by the Great Teachings (Thai Hak), and the role of Confucianism in the development of science and technology.

2) **MKU6207 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, and (7) National Politics and Strategy as the implementation of Indonesian Geostrategy.

3) **MKU6208 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.

4) **MKU6209 Bahasa Indonesia**
   This course aims to equip students to have the competence to use Bahasa Indonesia in writing scientific papers. The topics covered include Bahasa Indonesia historically, the position and function of Bahasa Indonesia, Bahasa Indonesia writing grammar, paragraph development, paragraph types, reasoning in paragraphs, types of scientific papers, scientific writing formats, reference writing, bibliography writing. Learning activities in the form of face-to-face lectures, discussions, giving structured assignments. Evaluation is carried out by written tests and structured assignments.
5) **MKU6211 English**
   This course covers four skills in English, namely listening, reading, speaking, and writing. This course includes the rules of English grammar, communication in mathematics orally, communication in mathematics in writing, listening mathematics video, presenting mathematics video, translating mathematics texts from English to Indonesian and vice versa, and rewriting mathematics articles. In addition, students also get the knowledge and practice of TOEFL exercises.

6) **MKU6212 Digital Transformation**
   This course contains the latest development of digital technology, general concepts of computer programming, describing syntax, semantics, and runtime environment Python Programming Language, general concepts of computer programming (using the Python programming language), the role of IoT, Big Data, and AI in the Industrial Age. 4.0, Big Data concepts, Artificial Intelligence concepts and applications, and examples of Machine Learning applications
7) **MKU6213 Creativity, Innovation, and Entrepreneurship**
   This course discusses about entrepreneurship which includes the role of entrepreneurs in the state, the reasons undergraduates are required to be entrepreneurs, the role of the government in creating entrepreneurship, the definition of entrepreneurship, the skills needed for entrepreneurship, entrepreneurial attitudes and profiles, entrepreneurship as a complete human being, the causes of business failure. The course also examines techniques for developing creativity, issues, and problems encountered in entrepreneurial practice.
8) **MKU6216 Social Literacy and Humanity**
   This course contains a general education perspective. The topics of this course include: (1) Humans as cultural creatures; (2) Humans and civilization; (3) Humans as individuals and social beings; (4) Multiculturalism and equality; (5) Morality and law; (6) Humans and technology; (7) Humans and the environment; (8) ISBD in the challenges of globalization.

2. Faculty Course Group (MKF)

1) **FMI6201 Insights and Studies of Mathematics and Natural Sciences**
   This course discusses the basic methods of mathematics and natural sciences (scientific methods) in problem solving and ways / techniques for compiling conclusions based on the rules of reasoning (mathematical logic) that are correct. This study also covers the basic concepts of science and its latest developments.

2) **FMI6202 Statistics**
   This course contains an introduction to statistical investigation, significance, generalization, estimation, causation, comparison of two proportions, comparison of two averages, data in pairs, comparison of more than two proportions, comparison of more than two averages, two quantitative variables.