CURRICULUM DOCUMENT
BACHELOR OF MATHEMATICS EDUCATION

FACULTY OF OF MATHEMATICS, NATURAL SCIENCES AND INFORMATION TECHNOLOGY EDUCATION
UNIVERSITY PGRI SEMARANG
2025

DOCUMENT

Development of the Higher Education Curriculum

Mathematics Education Study Programme

Semarang, 2025

Name of Team Leader : Dr Muhammad Prayito, S.Pd., M.Pd.
NIDN : 0625028602
Study Programme : Mathematics Education
Faculty : Mathematics, Natural Sciences and Information Technology Education

UNIVERSITAS PERSATUAN GURU REPUBLIK INDONESIA
SEMARANG 2025

Process	Person in Charge			Date
	Name	Position	Signature	
Formulator	Dr Muhammad Prayito, M.Pd Dr Lukman Harun, M.Pd	Head of the Mathematics Programme Secretary of the Mathematics Programme		10 September 2025
Reviewer	Dr Fenny Roshayanti, M.Pd. Nurina Happy, M.Pd.	Chair of the Professional Development Institute Head of the Curriculum, CoE, and MBKM Centre		10 September 2025
Approval	Eko Retno Mulyaningrum, M.Pd.	Vice Dean 1, Faculty of Mathematics, Natural Sciences and Information Technology Education		10 September 2025
Establishment	Dr Supandi, M.Si.	Dean of Faculty of Mathematics, Natural Sciences and Information Technology Education		10 September 2025
Supervision	Dr Ary Susatyo Nugroho, S.Si., M.Si	Head of Quality Assurance Institute		10 September 2025

TABLE OF CONTENTS

FOREWORD

We offer our deepest thanks and praise to the Almighty God for His grace and blessings, which have enabled the curriculum document for the Mathematics Education Study Programme at the Faculty of Teacher Training and Education (FMNSITE), Universitas Persatuan Guru Republik Indonesia Semarang, to be compiled and refined. The compilation of this document forms part of the institution's commitment to ensuring the quality of higher education and addressing the challenges of an era that continues to evolve dynamically, particularly in the transition from the 4th Industrial Revolution towards the Society 5.0 and Industry 5.0 eras.

The curriculum document has been compiled as a curriculum guide for the five-year period of the Mathematics Education Study Programme. This curriculum document has been designed in accordance with various national regulations, such as Law No. 12 of 2012 on Higher Education, the National Standards for Higher Education (SN-Dikti), and refers to the Indonesian National Qualifications Framework (KKNI) and Minister of Education, Culture, Research and Technology Regulation No. 53 of 2023 on Quality Assurance in Higher Education, which was subsequently updated by Minister of Higher Education, Science and Technology Regulation No. 39 of 2025. The curriculum is developed collaboratively and participatively, involving various stakeholders, including lecturers, students, alumni, employers, and partners from the business and industrial sectors (DUDI), to ensure alignment between graduate profiles, learning outcomes, and societal needs.

This curriculum not only emphasises the mastery of academic competencies in the fields of mathematics and education, but also the strengthening of character, 21st-century skills, digital literacy, and the ability to think critically, creatively, collaboratively, and communicatively. Through an Outcome-Based Education (OBE) approach and the flexibility afforded by the implementation of the Merdeka Belajar Kampus Merdeka (MBKM) programme as defined by Ministry of Education, Culture, Research and Technology Regulation No. 39 of 2025, which refers to the fulfilment of learning requirements outside the degree programme students are expected to develop themselves as adaptive, reflective, and contributory educators amidst rapid global change.

We would like to express our gratitude to the entire curriculum development team, lecturers, educational staff, and all those who have contributed to the preparation of this document. We hope that this curriculum document will serve as the primary guide for the delivery of high-quality, relevant and meaningful education for the entire academic community of the Mathematics Education Study Programme.

Semarang, September 2025

Dean of Faculty of Mathematics, Natural Sciences and Information Technology Education
Universitas Persatuan Guru Republik Indonesia Semarang

Dr. Supandi, S.Si., M.Si.
NPP 097401245

STUDY PROGRAMME IDENTITY

No	Name of Higher Education Institution	UNIVERSITAS PERSATUAN GURU REPUBLIK INDONESIA SEMARANG
1	Faculty	Faculty of Mathematics, Natural Sciences and Information Technology
2	Department	Mathematics Education
3	Accreditation Status	Excellent
4	Level of Education	Bachelor's
5	Graduate Qualification	S.Pd.
6	Academic Vision	To develop the academic discipline of mathematics education to produce graduates who excel in multimedia learning resources and data analytics, and possess a strong sense of identity
7	Number of Students	267
8	Number of Lecturers	31
9	Programme Address	Jl. Sidodadi Timur No. 24, Karangtempel, Semarang Timur District, Semarang City, Central Java 50232.
10	Telephone	(024) 8316377
11	Study Programme Website	https://pmat.upgris.ac.id/

1. Foundations of Curriculum Design and Development

1.1 University Values

In the UPGRIS Master Development Plan (RIP) for 2015–2034, the Universitas Persatuan Guru Republik Indonesia Semarang has established its long-term vision as 'The Meaning University', namely a university that serves as a provider, creator, and guardian of the meaning of life. This vision embodies the fundamental spirit of developing education that is not only academically excellent but also meaningful in terms of life values. Furthermore, through UPGRIS Rector's Decision No. 013.a/SK/UPGRIS/II/2025, it was established that the university's values (University Value) constitute one of the learning outcomes for UPGRIS graduates, namely:

"Demonstrating character and conduct that reflect adaptability, enthusiasm, and integrity as an expression of devotion to God Almighty."

As part of UPGRIS, the Mathematics Education Study Programme internalises these university values in all learning activities and in the character development of students. Furthermore, the study programme also incorporates distinctive values tailored to the graduate profile attributes, to cultivate professional, reflective, and transformative mathematics educators. These additional values include:

1. Thinking logically, critically, and systematically when solving mathematical and learning problems.
2. An open and collaborative attitude when facing technological developments and modern pedagogical approaches.
3. Upholding academic ethics and scientific integrity in all teaching and research practices.
4. Focused on meaningful learning, using mathematics as a means of developing students' reasoning skills and character.

Through the integration of University Values and the distinctive values of the programme, graduates of the Mathematics Education programme at UPGRIS are expected to become educators of character, who are professional and adaptable to the challenges of the times, whilst upholding the meaning of life in line with the vision of The Meaning University.

1.2 Philosophical Foundation

Mathematics Education at the UPGRIS Mathematics Education Programme is grounded in the belief that mathematics is not merely a collection of formal knowledge, but a means of logical, critical, creative, and reflective thinking in understanding the realities of life. Mathematical knowledge is studied and explored as a discipline that shapes reasoning, perseverance, and precision, as well as a tool for understanding and solving various real-world problems in society. Through active, contextual, and problem-solving-based learning approaches, students are encouraged to discover meaning in their learning and to connect mathematical concepts with everyday life.

Assessment and evaluation are conducted authentically and are oriented towards the development of students' competencies, character, and reflective abilities. With this philosophy, the programme aims to produce mathematics educators who not only master the subject matter but also possess an awareness of the nature of life and their social responsibility to improve the quality of life for both individuals and society. This philosophy was developed through discussions with stakeholders and is periodically reviewed to ensure its relevance to the challenges of the times.

1.3 Sociological Foundation

The Mathematics Education curriculum is viewed as a social construct that cannot be separated from the societal context in which education takes place. Therefore, the curriculum must be able to respond to social and cultural dynamics and the needs of society, whilst equipping students with learning experiences relevant to the realities of life. Mathematics Education serves not only to develop cognitive abilities but also to foster social attitudes, collaborative skills, and a sense of care for one's social environment.

The objectives, content, learning activities, and learning environment within the curriculum are designed to encourage students to develop their personal and social capacities in a balanced manner. Through contextual and meaningful mathematics learning, students are encouraged to understand the role of science in society and to be able to use it to address real-world problems wisely. Thus, the curriculum serves as a vehicle for social transformation, fostering the emergence of mathematics educators who are adaptable, inclusive, and globally competitive.

1.4 Psychological Foundations

The curriculum of the Mathematics Education Study Programme is developed on the understanding that learning mathematics is a gradual psychological process involving reasoning, conceptual construction, problem-solving, communication, and reflection. Mathematics contains abstract concepts, symbols, patterns, and logical structures; therefore, students need learning experiences that help them move from concrete and contextual situations towards formal mathematical thinking. For this reason, the curriculum encourages active, meaningful, and student-centred learning, in which students are guided to connect prior knowledge with new concepts, explore mathematical ideas, identify misconceptions, and develop confidence in solving mathematical and educational problems.

The psychological foundation of this curriculum also considers the diversity of learners' abilities, motivation, learning styles, and social backgrounds. As future mathematics educators, students are not only expected to master mathematical concepts, but also to understand how learners think, feel, interact, and develop during the learning process. This is reflected in the use of collaborative learning, problem-based learning, project-based learning, technology-supported learning, and authentic assessment to strengthen higher-order thinking skills, creativity, communication, collaboration, independence, and reflective attitudes. In line with the programme's academic vision, the integration of multimedia learning resources and data analytics supports students in designing adaptive, inclusive, and innovative mathematics learning that responds to learners' characteristics and contemporary educational challenges.

1.5 Historical Background

The Mathematics Education Study Programme at the Universitas Persatuan Guru Republik Indonesia Semarang was established on 12 June 1987 pursuant to Decree No. 143/K/14/Kop.VINl/1987 in response to the national need for professional, visionary, and adaptable mathematics educators capable of keeping pace with the times. Since its inception, the programme has undergone various changes and curriculum updates aligned with national higher education policy directions and advancements in science and technology.

Curriculum transformation has been carried out continuously, ranging from a competency-based curriculum (KBK), a curriculum based on the Indonesian National Qualifications Framework (KKNI), to an Outcome-Based Education (OBE) curriculum and the implementation of learning load fulfilment outside the study programme. Each curriculum change is designed not only to preserve cultural values and the scholarly heritage

of the past, but also to equip students to live better in the 21st century and play an active role in the era of the Fourth Industrial Revolution and now as we move towards the Fifth Industrial Revolution.

The current curriculum is designed to facilitate the development **of 21st-century skills**, which include cognitive skills such as critical thinking, problem-solving, literacy - digital literacy, and innovation; interpersonal skills such as communication, collaboration, leadership, and empathy; and intrapersonal skills such as responsibility, adaptability, work ethics, and lifelong learning. Through this approach, students are not only shaped into academically competent educators, but also into reflective individuals of integrity, ready to meet global challenges whilst remaining grounded in the nation's noble values.

1.6 Legal Basis

1. Law of the Republic of Indonesia Number 14 of 2005 concerning Teachers and Lecturers (State Gazette of the Republic of Indonesia Year 2005 Number 157, Supplement to the State Gazette of the Republic of Indonesia Number 4586).
2. Law of the Republic of Indonesia Number 12 of 2012 concerning Higher Education (State Gazette of the Republic of Indonesia Year 2012 Number 158, Supplement to the State Gazette of the Republic of Indonesia Number 5336).
3. Government Regulation No. 4 of 2014 on the Organisation of Higher Education and the Management of Higher Education Institutions.
4. Presidential Regulation of the Republic of Indonesia No. 8 of 2012 concerning the Indonesian National Qualifications Framework (KKNI).
5. Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 73 of 2013 concerning the Implementation of the KKNI in the Field of Higher Education.
6. Regulation of the Minister of Education and Culture No. 7 of 2020 concerning the Establishment, Amendment and Dissolution of State Higher Education Institutions, and the Establishment, Amendment and Revocation of Licences for Private Higher Education Institutions.
7. Regulation of the Minister of Education, Culture, Research, and Technology No. 13 of 2022 on Amendments to Regulation of the Minister of Education and Culture No. 22 of 2020 on the Strategic Plan of the Ministry of Education and Culture for the Years 2020–2024;

8. Regulation of the Minister of Education, Culture, Research and Technology No. 6 of 2022 concerning Diplomas, Competency Certificates, Professional Certificates, Degrees, and the Equivalence of Diplomas from Higher Education Institutions in Other Countries;
9. Regulation of the Minister of Education, Culture, Research and Technology No. 53 of 2023 on Quality Assurance in Higher Education;
10. Regulation of the Minister of Higher Education, Science and Technology No. 39 of 2025 on Quality Assurance in Higher Education;
11. Decision of the Minister of Research, Technology, and Higher Education No. 123 of 2019 on Internships and the Recognition of Semester Credit Units for Industrial Internships for Bachelor's and Applied Bachelor's Degree Programmes.
12. Decision of the YPLP PT PGRI Semarang No. 075/P.Y/U/Kpts/3.1/YPLP PT PGRI/V/2019 dated 10 May 2019 concerning the Statutes of UPGRIS of Semarang;
13. Regulation of the Rector of UPGRIS of Semarang No. 132.C/SK/UPGRIS/IV/2014 concerning Guidelines for the Formulation of the Vision, Mission, Objectives, and Targets of UPGRIS of Semarang.
14. Decision of the Rector of the Universitas Persatuan Guru Republik Indonesia Semarang, No. 056/SK/UPGRIS/IX/2024 regarding the Establishment of the Vision, Mission, and Objectives of the UPGRIS;
15. Decision of the Rector of the Universitas Persatuan Guru Republik Indonesia Semarang, No. 013.a/SK/UPGRIS/II/2025 regarding Learning Outcomes for Graduates of Study Programmes at the UPGRIS;
16. Decision of the Rector of UPGRIS, Number 012/SK/UPGRIS/II/2025 regarding the Establishment of the Structure and Distribution of Courses for Undergraduate Students at the UPGRIS
17. Decision of the Rector of the Universitas Persatuan Guru Republik Indonesia Semarang, Number 014/SK/UPGRIS/II/2025 regarding the Determination of Course Credits for Master's Degree Students at the UPGRIS.
18. Decision of the Rector of the Universitas Persatuan Guru Republik Indonesia Semarang, Number 034.a/SK/UPGRIS/IV/2025 regarding the Determination of the Distribution of General Courses/Compulsory Curriculum Courses and Distinctive Courses of UPGRIS within the UPGRIS

19. Dean's Decision No. 120/3/Faculty of Mathematics, Natural Sciences, and Information Technology Education/UPGRIS/III/2015 on the Approval of the Vision and Mission of Faculty of Mathematics, Natural Sciences, and Information Technology Education.
20. Dean's Decision No. 17.D/3.3/SK/ Faculty of Mathematics, Natural Sciences, and Information Technology Education /UPGRIS/IX/2022 regarding the Approval of the Academic Vision, Objectives and Strategies for achieving the academic vision of the Mathematics Education Study Programme.
21. Assignment Letter No. 75/SK/ Faculty of Mathematics, Natural Sciences, and Information Technology Education /UPGRIS/11/2020 regarding the drafting team for the Vision and Mission of Faculty of Mathematics, Natural Sciences, and Information Technology Education.
22. Assignment Letter No. 73.B/3.1/ Faculty of Mathematics, Natural Sciences, and Information Technology Education /UPGRIS/II/2022 regarding the drafting team for the Academic Vision, Objectives and Strategies for achieving the academic vision of the Mathematics Education Study Programme.

2. Curriculum Evaluation & Tracer Study

2.1 Curriculum Evaluation

The Mathematics Education study programme commenced in June 1987 and has the following accreditation history:

- Registered status by Ministerial Decree (SK) of the Ministry of Education and Culture of the Republic of Indonesia No. 143/K/14/Kop.VINl/1987
- Accredited B status was obtained via a Decision Letter from the National Accreditation Board for Higher Education (BAN-PT) No. 12/BAN-PT/Ak-IV/VI/2000
- Accredited B status obtained via a Decision Letter from the National Accreditation Board for Higher Education (BAN-PT) No. 020/BAN-PT/Ak-IX/SI/X/2005
- Accredited B status was obtained by Decision of the National Accreditation Board for Higher Education (BAN-PT) No. 032/BAN-PT/Ak-XIII/SI/XII/2010
- B Accreditation Status was granted by Decision of the National Accreditation Board for Higher Education (BAN-PT) No. 058/Ak/UPGRIS/IX/2015
- Accredited B status was obtained by Decision of the National Accreditation Board for Higher Education (BAN-PT) No. 3979/SK/BAN-PT/Ak-PPJ/S/VII/2020
- 'Excellent' accreditation from the Independent Education Accreditation Agency (LAMDIK) was obtained via Decision No. 202/SK/LAMDIK/Ak/s/III/2024.

This accreditation demonstrates national recognition of the quality of various aspects of the delivery of educational programmes within the study programme. Internally, the Mathematics Education Study Programme follows an academic quality assurance cycle through Internal Quality Audit (AMI) activities organised by UPGRIS on a regular annual basis.

In 2024, a major (biennial) evaluation of the Mathematics Education Study Programme curriculum was carried out to align with the government's Merdeka Belajar Kampus Merdeka (MBKM) policy or the fulfilment of learning requirements outside the study programme. The evaluation includes a review of the vision and mission ( ), the Independent Professional Profile (PPM), graduate learning outcomes (PLO), an update of study materials, and the establishment of the curriculum structure.

Fundamental changes to the Mathematics Education Study Programme curriculum for 2024

Evaluation of the implementation of the Mathematics Education Study Programme curriculum is carried out periodically to ensure its alignment with the institution's vision,

the needs of students, and developments in science and technology. This evaluation comprises two types: **formative** and **summative evaluation**, involving various stakeholders such as lecturers, students, alumni, employers of graduates, and partner organisations.

2.1.1. Formative Evaluation

Formative evaluation is carried out every semester through learning review meetings, discussion forums for lecturers, and student satisfaction surveys regarding courses and the learning process. The results of this evaluation have not yet led to changes in the overall curriculum structure, but have resulted in adjustments at the operational level, including:

- Increased use of project-based learning and problem-based learning approaches.
- The addition of subtopics or contexts for the application of digital technology in several courses.
- Adjustments to the workload, assessment rubrics, and authentic assessment models to support the development of higher-order thinking skills (HOTS).
- The use of a Learning Management System (LMS) and interactive digital media to support hybrid and asynchronous learning.

2.1.2. Summative Evaluation

Summative evaluation is conducted every 2–5 years through a **curriculum review** process involving the programme's academic staff, the faculty, the quality assurance unit, alumni, graduate employers, and industry/educational partners. This evaluation employs a tracer study approach, a graduate competency survey, and an analysis of the gap between learning outcomes and the needs of the workplace.

The results of the latest summative evaluation indicate the need for a comprehensive curriculum adjustment to accommodate:

- The integration of 21st-century skills (critical thinking, collaboration, digital literacy).
- Strengthening pedagogical aspects and field practice based on the Fulfilment of Learning Load Outside the Study Programme.
- The addition of elective courses relevant to global trends, such as Educational Data Analysis, Technology-Based Mathematics Learning, and Ethics and Educational Profession for Educators.
- The formulation of more explicit graduate learning outcomes (PLO) to support graduate profiles in the Industry 5.0 era.

Table 2.1. Evaluation of the 2022 Curriculum and Follow-up Actions in the 2025 Curriculum

Evaluation Components	Review	Action Plan
Academic Vision – Educational Objectives – and Strategies for Achieving Educational Objectives		
a. Relevance of the Academic Vision, Educational Objectives, and Strategies for Achieving Educational Objectives to the Faculty's VMTS	The academic vision and educational objectives are already aligned with the Faculty's VMTS, emphasising the development of mathematics education based on values, academic rigour, and technology.	These need to be re-communicated to all lecturers and students through academic forums and visual media within the campus environment.
b. Relevance of the Academic Vision, Educational Objectives, and Strategies for Achieving Educational Objectives to learning outcomes	Learning outcomes already reflect the achievement of the programme's vision and mission, but not all lecturers understand the connection.	Workshops on aligning PLO-CLO-RPS are held regularly every year.
c. Relevance of the Academic Vision, Educational Objectives, and Strategies for Achieving Educational Objectives to the graduate profile	The graduate profile aligns with the academic vision, but some soft skills have not yet been clearly measured.	Specific indicators of graduate soft skills need to be formulated in the form of assessments.
d. Relevance of the Curriculum to the KKNI (according to level)	The curriculum has been aligned with KKNI level 6, with appropriate credit weightings and course descriptions.	Regular evaluation is required to make adjustments in the event of changes to national policy.
e. Relevance of the Curriculum to Ministerial Regulation No. 53 of 2023	The curriculum has not yet fully integrated Outcome-Based Education (OBE) and the fulfilment of study load requirements outside the degree programme in a comprehensive manner.	A curriculum revision has been carried out involving stakeholders and incorporating elements of the Fulfilment of Learning Load Outside the Study Programme in accordance with Ministerial Regulation No. 53 of 2023.
f. Relevance of the curriculum to the world of work	There is a gap between the needs of the world of work and graduate competencies in the areas of technology and learning innovation.	Add new elective courses that are adaptable to the needs of learning technology and teacher certification training.
g. Scope of competencies/skills (academic fields study programmes and the needs/demands of the world of work)	The curriculum covers the fundamentals of mathematics education, but has not yet fully addressed the practical needs of the workplace.	Increase field placements, training in innovative teaching tools, and collaboration with partner schools.
h. Clarity of competency/skill content	The formulation of competencies still requires further specification regarding the aspects of attitude,	Refine the PLO and CLO documents to make them more measurable and observable.

Evaluation Components	Review	Action Plan
	knowledge, general skills, and specific skills.	
Programme Graduate Profile		
Alignment of the Graduate Profile with the world of work	The profile is already geared towards professional educators, media developers, and early-career researchers, but students' understanding remains low.	There is a need for outreach activities regarding the graduate profile from the start of the programme and at graduation.
Programme Learning Outcomes		
a. Scope of Competencies	The Learning Outcomes (PLO) already include aspects of attitude, knowledge, and general and specific skills, but the interrelationships between these elements are sometimes not explicitly stated.	Revise the formulation of the PLO to make it more systematic and accompanied by guidelines for elaboration at the course level.
b. Clarity of references for formulating learning outcomes	Already references the KKNI, SN-Dikti, Ministerial Regulation 53, and the needs of the workplace.	Reference documentation and training for new lecturers are required.
c. Coherence of the formulation of learning outcomes	There is a logical relationship between the PLO statements, but not all courses explicitly map out their contributions.	Use the PLO-Course matrix in the RPS and monitor its implementation.
d. Quality of the statements (specific, measurable, and observable)	Some PLOs are too general and difficult to measure directly.	Conduct a review by the curriculum team and external partners (practitioners).
e. Relevance of learning outcomes to graduate profile statements	Already aligned, but needs to be reinforced in academic and extracurricular activities.	Integrate project assessment/graduate profile into final assessments and students' final projects.
Curriculum Structure		
a. Overall scope of courses at one level (learning outcomes, profile, and courses)	The course structure supports the achievement of the graduate profile as a mathematics educator, educational media developer, and mathematics education researcher. However, there are some courses where the content, CLO, and targeted PLO outcomes are not yet fully aligned.	Conduct a comprehensive curriculum remapping to ensure alignment between PLOs, graduate profiles, and courses. Increase lecturers' involvement in curriculum reviews and the development of OBE-based course outlines.
b. Inter-level linkages (Bachelor's and Master's, where applicable)	Currently, the Mathematics Education Study Programme only offers the Bachelor's degree and has recently launched the Master's programme. However, the majority of graduates proceed to the Master's level, either in the field of mathematics education or in other educational disciplines.	Develop graduate attributes compatible with the requirements of further study and integrate them into the formulation of PLOs and RPS.

Evaluation Components	Review	Action Plan
	The Bachelor's curriculum has been explicitly designed to facilitate the transition to the Master's level, particularly in terms of research skills and innovative teaching.	
c. Organisation of courses (University courses, faculty courses, programme courses (compulsory and optional))	Courses are organised into 4 groups: Compulsory Courses, Elective Courses, Curriculum Compulsory Courses, and UPGRIS Distinctive Courses The majority of courses are compulsory, with the proportion of elective courses still limited,	expanding the range of elective courses relevant to students' interests and the needs of the workplace
d. Relevance of the course structure to the policy on fulfilling study load requirements outside the degree programme (for Bachelor's degree)	The curriculum has provided scope for the implementation of the policy on fulfilling study load requirements outside the degree programme, but this has not yet been fully utilised by students. Not all lecturers understand the mechanism for converting credit points from activities outside the degree programme (internships, village projects, lecturer research, etc.).	Enhance cooperation with partner schools, educational institutions, and training organisations to accommodate students' activities for fulfilling the study load outside the degree programme.
Course Description		
a. Depth of learning material	Some courses have sufficient depth of material to meet graduate learning outcomes (PLO), particularly in core courses such as Calculus, Algebra, and Statistics. However, in some new or application-oriented courses, the depth of material remains superficial and lacks theoretical and practical depth.	Conduct a review and develop content to deepen the substance of the material, particularly by adding case studies, integrating field practice, and incorporating the latest literature. Lecturers will be encouraged to develop more comprehensive teaching materials.
b. Scope of learning materials	The scope of the material already covers pedagogical domains, mathematical content, and technology. However, some aspects, such as integration with data literacy and the context of the world of work, are still not widely covered, particularly in elective courses.	Review and expand the scope of study in elective courses to accommodate contemporary needs, such as computing, applied mathematics, and contextual problem-solving.
c. Relevance of CLO to PLO	Generally, CLO (Course Learning Outcomes) have been formulated	To re-map CLO-PLO across all courses, including strengthening

Evaluation Components	Review	Action Plan
	and linked to PLO. However, there are still some CLO that do not explicitly align with the programme's main PLO	the logical and hierarchical relationships between the two. A mapping workshop will be conducted involving the curriculum team and course lecturers.
d. Course formats (lectures/theory, seminars, practicals, fieldwork, etc.)	The variety of course formats already includes lectures, seminars, practicals and fieldwork. However, the implementation of non-theoretical formats (practicals/fieldwork) remains suboptimal, particularly in terms of the assessment system and documentation of student learning outcomes.	Develop standardised guidelines for the implementation of practical sessions and fieldwork. Adjust the Course Syllabus (RPS) so that assessment for non-theoretical course formats is more structured and evidence-based (portfolios, practical reports, reflections, etc.).
Distribution of Courses		
a. Sequence of academic courses	The sequence of courses has been arranged progressively from foundational to advanced levels, such as from Introduction to Mathematics to Calculus, then to Real and Complex Analysis.	Reviewing the structure of prerequisites and the sequence of courses to ensure a more logical learning pathway and support academic coherence. P
b. Proportion of compulsory courses, elective courses, and general education courses	Generally, the proportions comply with regulatory requirements: approximately 60–70% programme-specific courses, approximately 10–15% elective courses, and approximately 20% general education courses. However, the number of elective courses remains limited and is insufficient to provide flexibility and allow students to explore their interests in depth.	Increase the number and variety of elective courses, including those relevant to current trends. Involve lecturers in designing elective courses with practical scope and in line with labour market needs.
c. Credit load per semester	The distribution of credit hours per semester is relatively balanced, ranging from 18–22 credit hours.	Redistribute the credit load by taking into account the complexity of the material, field practice, and student readiness.
Human Resources (HR)		
a. Academic relevance	The majority of permanent lecturers hold relevant academic qualifications in the fields of education and pure mathematics, such as Master's or PhD degrees in Mathematics Education, Mathematics, and Statistics.	Encourage further study (PhD) for lecturers in a wider range of fields in line with curriculum strengthening needs, and recruit lecturers with interdisciplinary backgrounds
b. Experience and Expertise	Some lecturers have professional experience outside the university (for example, as guest speakers at teacher training sessions or as	Increase lecturers' involvement in teacher training activities, applied research, community service projects, and

Evaluation Components	Review	Action Plan
	curriculum developers), but this is not yet widespread. There are still lecturers with limited involvement in practical activities or external partnerships.	collaboration with partner schools or relevant institutions.
c. Qualifications and adequacy of educational support staff based on job type (administration, librarians, technicians, laboratory assistants, etc.)	The number of support staff, such as administrative staff and technicians, is sufficient for routine operations, but there are no specialist laboratory assistants to support practical learning	Re-mapping the needs for educational staff according to the type of academic service
Facilities and Infrastructure		
a. Laboratories (workshops/studios/field sites, etc.)	The Study Programme already has a Computer Laboratory used for technology-based courses. However, there is currently no dedicated laboratory for practical teaching aids or a Microteaching laboratory suitable for learning simulations.	Develop a plan for the integrated use of laboratories with practical courses and final projects.
b. Laboratory equipment and materials (workshops/workshops/studios/fields/etc.)	The equipment in the computer laboratory is adequate for learning needs, but some items are outdated due to their age.	Gradual procurement of physical and digital mathematics teaching aids.
c. Library	The collection of the latest books specifically in the field of mathematics education, reputable national/international journals, and e-books remains limited and is not sufficiently updated to reflect developments in the Merdeka Belajar curriculum and innovative learning trends.	Procurement of the latest mathematics education textbooks and reference materials in both print and digital formats. Improving access to scientific journal databases and national repositories.
d. Classrooms	There are a sufficient number of classrooms available, all of which are equipped with projectors. However, not all classrooms support flexible active learning.	Rearranging classrooms to support collaborative learning, discussions, and microteaching. Upgrading of audio-visual facilities and internet connectivity in all classrooms.
Curriculum flexibility	The current curriculum of the Mathematics Education Study Programme adheres to the MBKM policy (Fulfilment of Study Load Outside the Study Programme), with credit allocation for learning activities outside the study programme. However, implementation remains limited, particularly regarding the variety of activities available for the	Review and revise the curriculum structure to provide greater scope for activities to fulfil the study load outside the degree programme. Increase the variety of elective courses that are interdisciplinary and contextual.

Evaluation Components	Review	Action Plan
	Fulfilment of Study Load Outside the Programme and the mechanism for converting credit points. Furthermore, there are limitations in the choice of relevant elective courses that are popular with students.	
Learning Resources		
a. Semester Learning Plans	Most lecturers have prepared their Semester Learning Plans (RPS) in accordance with the SN-Dikti standard format and have included key elements such as learning outcomes, sub-outcomes, indicators, learning methods, and assessment. However, variations in the quality of RPS between lecturers were found, particularly regarding consistency between learning outcomes, learning methods, and forms of assessment.	Conduct regular workshops on the development and review of RPS based on learning outcomes and the OBE (Outcome-Based Education) approach. Encourage teaching teams to develop RPS collaboratively.
b. Teaching Materials	Most lecturers have been using self-developed teaching materials (modules, handouts, slides), but these have not all been documented as part of the curriculum documents.	Develop an integrated teaching materials repository within the university's LMS system.
c. Media (ICT)	The use of information technology in learning has developed considerably, such as the use of LMS (e-learning), Zoom, and interactive media.	Encourage the integration of ICT into project-based and portfolio-based assessment.
d. Support for efforts to achieve PLO	Most learning resources have been developed to support the achievement of PLO. However, the direct link between learning activities, assessment strategies, and graduate profiles is not yet fully and explicitly integrated into the learning documents.	Developing a map of the relationship between PLO-CLO-learning materials-learning activities-assessment in a standardised format. Conduct periodic evaluations of the alignment of learning materials with the achievement of PLOs.
Learning Process		
a. Transformation of the teaching and learning experience	The learning process has shifted from a teacher-centred model towards student-centred learning. Some students still play a passive role in the learning process.	Developing guidelines for pedagogical transformation towards active and participatory learning.
b. The use of case-based learning or team-based project learning, with such methods accounting for	There are not yet many courses that make the case-based learning method a dominant component of assessment.	Providing training in the development of case-study and project-based assessment.

Evaluation Components	Review	Action Plan
more than 50% of the assessment		
c. Alignment of the learning process with the Course Syllabus	In general, the delivery of learning has been in line with the RPS.	Conducting routine monitoring and evaluation of teaching implementation based on the RPS.
d. Compliance with the implementation of learning through SPADA UPGRIS	The use of SPADA UPGRIS as an e-learning platform has increased, particularly during the pandemic.	Requiring the uploading of all learning materials to SPADA UPGRIS.
e. The learning process is collaborative, involving interaction between individual learners	Most courses based on social skills and practical work have facilitated collaboration among students.	Providing training to lecturers on facilitating effective collaboration.
f. Implementation of character values (university values) in and outside the classroom	The internalisation of character values such as integrity and responsibility has been included in the Course Syllabus, but their application in the classroom has not yet been fully observed.	Providing training for lecturers to integrate character values into thematic learning.
g. Lecturer attendance	The majority of lecturers have a high attendance rate and are responsible in delivering their lectures.	Providing recognition for lecturers with 100% attendance.
h. Student attendance	Student attendance is quite good, particularly in practical and project-based classes.	Enhancing active participation through innovative teaching methods.
Learning assessment		
a. Assessment planning contracts	Most lecturers have included assessment plans in the Course Syllabus and explained them at the start of the course. However, the implementation of the assessment contract has not been fully documented or monitored, and not all students fully understand the assessment indicators and weightings in detail.	Require the assessment contract to be uploaded to SPADA UPGRIS to ensure open access.
b. Assessment procedures	Assessment procedures tend to vary between lecturers. Some have not involved students in the feedback and reflection process.	Integrate feedback and reflection into the final assessment process.
c. Scope of assessment (attitudes, knowledge, general and specific skills)	Assessment tends to focus predominantly on knowledge and cognitive skills.	Encouraging observation-based and portfolio-based assessment for attitude and skills.
d. Alignment of assessment techniques with assessment aspects	Assessment techniques such as quizzes, written tests, presentations, projects and observation have been used, but not all have been appropriately aligned with the aspects being assessed.	Conduct regular academic supervision to evaluate the suitability of assessment implementation.

Evaluation Components	Review	Action Plan
e. Verification of assessment instruments	Verification of assessment instruments is a structured practice at programme level, carried out by the programme's quality assurance sub-unit.	Developing a verified question bank and assessment rubrics at the programme level.
f. Grade processing in accordance with applicable regulations	The majority of lecturers have managed grades using the system; however, documentation for each grading component (formative, summative, attitude, skills) is not yet fully transparent and accessible to students.	Require lecturers to publish a summary of marks prior to final input for student validation.
g. Follow-up on assessment results (grade entry, enrichment, remedial work)	The final grade entry process has been carried out according to schedule, but the remedial mechanism has not yet been well structured in terms of the learning process.	Develop systematic enrichment and remedial policies to support effective learning at the programme level.
Graduates		
a. Cumulative Grade Point Average (CGPA)	The majority of graduates have a GPA >3.00, and this figure tends to increase with each cohort. However, these high grades do not fully reflect actual competencies, particularly practical skills and soft skills.	Balancing assessment between cognitive aspects and skills.
b. Duration of Study	The average duration of study for students is 4 years. Some students exceed the standard duration of study due to delays in completing their dissertations.	Optimising the study progress monitoring system (Thesis Plan Card, monthly evaluations).
c. Graduate Employment	Graduate employment in the labour market is relatively good, particularly as mathematics teachers. However, it remains limited to the formal education sector.	Developing a curriculum that is responsive to cross-sectoral needs. Strengthening partnerships with industry
d. Graduate waiting period	The average waiting period is between 3–6 months after graduation, which is relatively competitive.	Encouraging work placements or teaching assistantships as a bridge to employment.
e. Relevance of employment to the field of expertise	The majority of graduates work within the field of mathematics education. However, there is a challenge for graduates working outside the field, who feel they lack non-pedagogical skills.	Providing training tailored to the needs of the workplace.
f. Starting Salary	The average starting salary for graduates remains in the lower-	Offering additional certification training to enhance graduates' competitiveness.

Evaluation Components	Review	Action Plan
	middle range, particularly in private schools and non-formal institutions.	
g. Distribution of Graduates	The majority of graduates are employed in the regional area (Central Java) and the Greater Jakarta area ( ), with a small number working outside the province or abroad.	Establishing national networks for graduate placement.
h. User Satisfaction	Tracer study results indicate high satisfaction among graduate employers, particularly regarding work ethic and adaptability. However, there are still concerns regarding communication skills.	Aligning the curriculum with user feedback.
i. Academic achievements	Students demonstrate academic achievement at local and regional levels. However, participation in international competitions remains limited.	Organising competition training or workshops.
j. Professional Certification	Not all graduates hold professional teaching certification	Integrate PPG preparation training into programme activities.

2.2 Tracer Study

To design an appropriate curriculum, the Mathematics Education Study Programme conducts tracer studies and analyses feedback from stakeholders or industry partners. Feedback is gathered through surveys, tracer studies, questionnaires and hearings in discussion forums. The stakeholders or industry partners involved include internal stakeholders, namely lecturers, students, educational staff and alumni, and external stakeholders, namely users, programme associations and industry partners. A summary of the results of this data collection is presented in Table 2.2.

Table 2.2. Curriculum Input from Alumni and Curriculum Follow-up Plan

Curriculum Input	Action Plan
1. Please increase the competencies that support the world of work, particularly in education study programmes.	1. Discussions on adding supporting modules for the world of work
2. The curriculum during my time only encouraged students to be good at the course material. And upon graduation, they could look for a job. We were not taught how to create a job. Yet the reality in the field is very different; it is when students graduate that the real test begins.	2. The mathematics education curriculum already includes an Entrepreneurship module that teaches how to create jobs, so updates to the entrepreneurship material relating to contemporary employment will be discussed.
3. There should be more teaching on classroom management.	3. Updates will be made to course materials regarding classroom management, applied statistics, etc.

Curriculum Input	Action Plan
4. Since the field of education involves communication in the delivery of material, it is also quite relevant to how we, as customer service representatives, interact with clients. Furthermore, as the banking customer service sector requires knowledge of ‘ ’, there is still a slight overlap.	4. Communication skills will be incorporated into academic activities.
5. Courses Related to Data.	5. There is an elective module on data analytics
6. There should be more practical work than theory, as in the workplace practice is prioritised and discipline needs to be improved among both students and lecturers.	6. Student practical work is already accommodated within the ‘Fulfilment of Study Load Outside the Programme’ activities at UPGRIS.
7. The application of the material used in the current independent curriculum makes students passive.	7. The implementation of the independent curriculum is still in progress and undergoing refinement.
8. Teach more indoor or outdoor learning methods that do not solely rely on learning media, as not all schools have adequate facilities for learning methods that can make students realise that learning is a necessity.	8. Outdoor learning activities are already included in the Mathematics Exploration module. For other modules, project-based learning is being implemented.
9. Although I cannot currently apply this knowledge 100% in my workplace, I can apply some of the material on ethics and learning methods.	9. Enhancing ethical standards within the programme.
10. My hope for the future is to incorporate material on etiquette and topics that can be applied in everyday life."	10. The concept of etiquette at UPGRIS is in the process of being developed to be more practical.
11. Course content should be aligned with the current curriculum.	11. The curriculum is updated every two years, so it is hoped that this will bring fresh content to the course material within the curriculum.
12. Regarding the approach to students with very diverse characteristics.	12. The learning approach takes into account differentiated learning.
13. In my opinion, the course curriculum implemented is good and supports the world of work.	13. Ok
14. Student development is highly beneficial in the world of education, as the concepts covered in the course are widely used and applied in schools.	14. Ok
15. Evaluating and simplifying the process of converting course content from the old curriculum to the new one.	15. Guidance on the conversion process is already available from the Centre for Meeting Study
16. Administration.	

Curriculum Input	Action Plan
17. "The Learning Media Development course needs to be more innovative, as it is frequently used in the world of education."	Load Requirements Outside the Degree Programme. 16. Administration is continuously improved and transparent.
18. Business Mathematics.	
19. The course/material I received from UPGRIS is very useful in my work as a tutor and as a trainee teacher for mathematics.	17. Efforts are being made to develop media courses using the latest technological advancements.
20. The material on learning (media, tools, etc.) could be explored in greater depth.	18. Business mathematics has been incorporated into the entrepreneurship module.
21. The PPL course that supports the world of work.	19. OK
22. Materials that remind students of the importance of good public speaking and the ability to remain composed and maintain good ethics, which are essential in the workplace (this is for those who do not wish to teach after graduating). Lecturers should always remind their students of the importance of public speaking and ethics, as HR departments prioritise candidates with strong public speaking skills and good ethics when recruiting.	20. Development of learning materials to ensure greater depth. 21. OK. 22. Organising academic activities that support public speaking
23. Communication, Excel.	23. The laboratory provides Excel training
24. The course content and lectures are highly relevant to the professional world. Perhaps a suggestion for the future would be to increase the number of courses related to educational media.	24. OK. 25. OK
25. Mathematics, statistics, accounting, economics.	26. OK
26. The curriculum needs to be revised; many students in the zoning system currently have low motivation to learn, particularly in remote areas.	27. OK 28. OK
27. Learning innovation and learning technology.	
28. Courses related to education.	29. OK
29. The development of comprehensive learning resources.	30. OK
30. Learning strategies and media development.	
31. Incorporating content related to the workplace beyond the teaching profession (e.g. practical SQL applications, financial applications, etc.) and office environments. After all, not all mathematics graduates go on to become teachers.	31. OK. 32. There is already material in the development of learning resources
32. Design.	33. OK 34. OK
33. The course I'm studying is very relevant to the world of work.	35. The ratio of theory to practice has been planned within the learning materials; implementation will subsequently be evaluated by SUPMPS.
34. More practical work so that our skills are further honed.	

Curriculum Input	Action Plan
35. Public Speaking. 36. Include more credits on skills outside the field of education 37. Communication skills should be further enhanced so that we can convey ideas and information clearly, both verbally and in writing. 38. Learning ethics and the ability to adapt effectively so that we can understand the feelings and needs of others, and build good relationships with colleagues." 39. It is already very closely aligned with the world of education, whilst maintaining synergy with the government and schools within the students' home cities to support where graduates will eventually settle. So far, I have observed that my fellow Mathematics Education graduates from UPGRIS are no less competitive than graduates from other universities; in fact, UPGRIS Mathematics Education graduates have become the benchmark for what constitutes a good TEACHER, in terms of teaching, subject matter and teaching methods. 40. All the course material is highly relevant to the profession. 41. Modern teaching methods should be enhanced to keep pace with technological developments, as in today's world, alongside mastering subject matter, we are also required to be proficient in computers, editing software and graphics. 42. Artificial intelligence is used to design learning activities and teaching materials. 43. Practical experience directly related to the workplace	36. OK 37. OK 38. OK. 39. OK 40. OK 41. There are already artificial intelligence courses available as part of the 'Fulfilment of Study Load Outside the Degree Programme' scheme, in conjunction with the Computer Science programme 42. OK 43. There is already an industry placement

Furthermore, the tracer study yielded the following information: (data from the ICT Unit)

1. Employment status
2. Average monthly income
3. Work Location
4. Field of work
5. Length of Service
6. Job Title
7. Relationship between field of study and job
8. Feedback on the Curriculum

9. Feedback on Programme Development
10. Follow-up on the Study Programme

Table 2.3. Programme Input from Alumni and Programme Follow-up Plans

Programme Input	Follow-up Plan
Please clarify the role of the academic tutor.	The role of the academic tutor will be updated
Curriculum conversion	Communication regarding curriculum conversion to students, particularly new students
Extracurricular and co-curricular activities	Mapping students' talents and interests with student clubs at UPGRIS

2.3 SWOT Analysis

Table 2.4 SWOT Matrix

SWOT Elements		Internal	
		Strengths / Potential	**Constraints / Weaknesses**
External	**Opportunities**	**SO Strategy**	**WO Strategy**
		a) Enhancing understanding and internalisation of VMTS achievements by the academic community and all stakeholders. b) Optimising the public leadership of lecturers as representatives of public duties in support of the vision and mission of the Faculty of Mathematics, Natural Sciences and Information Technology Education. c) Increasing the number of students participating in competitions, both at national and international levels d) Utilising the alumni network to help graduates secure employment more quickly e) Encouraging students to graduate on time. f) Updating the curriculum to focus on digital literacy g) Training for lecturers and students in the latest software skills. h) Encouraging lecturers to pursue PhD studies both domestically and abroad. i) Initiating joint curriculum activities with domestic and international universities. j) Encouraging lecturers to select research topics based on a research roadmap relevant to the mapped course clusters.	a) Strengthening synergies in the implementation of the UPGRIS VMTS within an integrated work programme. Strengthening international networks to support the strategic performance of study programmes (IKS), particularly international IKS. b) Involving students in all lecturers' research activities c) Recruiting students to participate in PKM d) Publishing students' final projects in seminars or journals e) Improving English language skills through English bridging courses f) Improving coordination between the Faculty and the Research and Community Service Office (LPPM) so that the management of research and PKM (Student Creativity Program) under the DTPS (Department of Technology and Product Development) is overseen by the Faculty. g) Requiring students to achieve a TOEFL score of 400 upon graduation. h) Updating the curriculum to meet the needs of the Industry 4.0 era. i) Increasing the publication of research results. j) Improving online learning
	Challenges / Threats	**ST Strategy**	**WT Strategy**
		a) Strengthening the understanding of VMTS implemented in the	a) Developing methods for socialisation and VMTS tracer studies for the entire

SWOT Elements		Internal	
		Strengths / Potential	**Constraints / Weaknesses**
		academic and non-academic activities of the academic community, as well as all programme stakeholders b) Expansion of networks and implementation of cooperation at both national and international levels to accelerate the realisation of the Faculty's excellence. c) Establishment of external advisory bodies at d) national and international levels e) Increased use of online media to enhance understanding of lectures f) Involvement of the industry in the curriculum or learning processes, research and community engagement g) Improving the quality of laboratory facilities to meet current technological needs h) Continuous improvement of learning materials to align with industry needs i) Consider involving civil engineering experts from leading ASEAN universities to evaluate all aspects of the study programme j) Developing the study programme's branding with a focus on educators proficient in IT. k) Updating the digital-based curriculum to keep pace with developments in science, technology, engineering and mathematics (STEM). l) Developing the academic environment on a regular and ongoing basis. m) Carry out mapping of programme activities by semester	academic community and all stakeholders. b) Utilising the alumni network to assist recent graduates in securing employment, finding work placement locations, internships, and final project materials. c) Promoting English language proficiency among lecturers d) Workshops (cyber pedagogy) or enhancing lecturers' ability to teach using online systems in line with Education 4.0 teaching and learning. e) Improving coordination among the academic community to enhance the quality of educational delivery. f) Enhancing motivation, cooperation, and mutual understanding among the entire academic community in the delivery of education. g) Providing training to equip students with Higher-Order Thinking Skills (HOTS) problem-solving abilities.

3. Vision, Mission and Educational Objectives of the University, Faculty, and Study Programme.

3.1 Vision, Mission and Objectives of the University

a. University Vision

To become an outstanding and distinctive university

b. University Mission

1. To provide education that produces outstanding and self-reliant intellectuals;
2. To conduct research as the foundation for the advancement of knowledge and the enhancement of the quality of learning;
3. To organise community service for the betterment of life and living; and
4. To set an example in the delivery of education, research and community service.

c. The University's Objectives

1. The realisation of outstanding and self-reliant intellectuals;
2. The realisation of research-based academic and learning quality;
3. The realisation of community service that benefits life and living; and
4. The implementation of exemplary leadership in the delivery of education, research and community service.

3.2 Vision, Mission and Objectives of the Faculty

a. Vision

To become a Faculty of Mathematics, Natural Sciences and Information Technology Education that is excellent and has a distinct identity.

b. Mission

1. To deliver education and exemplary practice to produce graduates in the fields of Mathematics, Natural Sciences and Information Technology who are outstanding and possess a strong sense of identity
2. To conduct innovative research to enhance the quality of learning in the fields of Mathematics, Natural Sciences, and Information Technology
3. To carry out community service as an implementation of research outcomes to improve the quality of life and well-being of the community
4. To engage in partnership activities with domestic and international institutions as a manifestation of the Tridharma of Higher Education

c. Objectives

1. To produce outstanding and distinctive graduates of the Bachelor's Programme in Mathematics, Science and Information Technology Education
2. To produce research outputs as a basis for improving the quality of learning, advancing knowledge, and enhancing professionalism in the fields of Mathematics, Science, and Information Technology Education
3. To produce high-quality community service work as an implementation of research outcomes to improve community welfare
4. To establish partnership networks with domestic and international institutions as a manifestation of the Tridharma of Higher Education

3.3 Vision, Academic Focus and Educational Objectives of the Study Programme

a. Academic Vision of the Study Programme

"To develop the academic discipline of Mathematics Education to produce graduates who excel in multimedia learning resources and data analytics, and possess a strong sense of identity"

b. Educational Objectives of the Study Programme

Table 3.1. Educational Objectives of the Study Programme

No	Programme Educational Objective Code	Description of Programme Educational Objectives
1	PEO-1	Graduates are able to master conceptual and methodological knowledge in the fields of mathematics and mathematics education, and integrate this into relevant, innovative teaching practices that are appropriate to the characteristics of the learners
2	PEO-2	Graduates possess the professional competence to design, implement, and evaluate mathematics teaching using effective pedagogical approaches, technology-based methods, and an inclusive approach to social and cultural diversity within the educational environment.
3	PEO-3	Graduates are able to conduct research in the field of mathematics education in a systematic and ethical manner, and to publish the results for the advancement of knowledge, improvement of learning quality, and resolution of educational problems.
4	PEO-4	Outstanding graduates who are capable of developing multimedia learning resources, conducting data analysis, and marketing educational products and innovative solutions in the field of mathematics education,

No	Programme Educational Objective Code	Description of Programme Educational Objectives
		both independently and collaboratively, whilst upholding Ethics and Educational Profession and an entrepreneurial spirit.

c. Strategies for Achieving the Programme's Educational Objectives

1. Strategic initiatives in the field of education are demonstrated through the development of a curriculum aligned with the National Higher Education Standards (SN-PT), the National Qualifications Framework (KKNI), the Programme's VMTS, and stakeholder needs. Furthermore, the programme encourages a significant number of students to secure opportunities or grants to participate in student exchange programmes and/or industrial placements both domestically and internationally. Graduates have been successfully absorbed into the workforce both domestically and internationally in fields relevant to their discipline.

2. Undertaking various collaborative efforts to produce innovative research to enhance the quality of learning, academic development, and professionalism, as well as publishing research outcomes recognised nationally and internationally. Collaborative strategies are applied in the research sector by increasingly fostering collaborative research, followed by joint and globally recognised publications. The quality and intensity of collaboration among lecturers are rising, with a focus on the commercialisation of inventions and intellectual property rights.

3. Undertaking various initiatives to produce Community Service (PkM) works as a follow-up to research outcomes to improve community welfare. An invention strategy is applied to lecturers' works in the form of reference books across various fields of study, published by the Universitas Persatuan Guru Republik Indonesia Semarang Press.

4. Developing partnership networks with domestic and international institutions to support the implementation of the Four Pillars of Higher Education. Consortium strategies through institutional cooperation with foreign partners are beginning to grow and develop, with an increasing number of students gaining opportunities for internships abroad.

5. A strategy of modelling and habit formation to ensure the instilling of noble character, creativity, critical thinking, independence, and synergy within diversity among students as a manifestation of the duty of setting a good example.

6. Sufficient funding, facilities and infrastructure, as well as ease of access and quality support for VMTS.

7. Implementing governance and management based on good and clean governance.

4. Graduate Profile, Programme Educational Objectives (PEO) & Programme Learning Outcomes (PLO)

4.1 Graduate Profile and Programme Educational Objectives

The graduate profile and programme educational objectives for the Mathematics Education programme are as follows.

Table 4.1. Graduate Profile and Description

No	Graduate Profile (PL)	Description of Graduate Profile
1	GP-1 Beginning Mathematics Educators who have mastered TPACK (Technological, Pedagogical, and Content Knowledge)	Capable of facilitating the process of changing the attitudes and behaviour of an individual or group of people in the endeavour to foster human development through teaching, guidance and training in mathematics, by mastering Mathematical Content Knowledge, Pedagogical Knowledge and Technological Knowledge that are competitive at both national and international levels. Professions: Primary and Junior High School Mathematics teachers, tutors
2	GP-2 Early-Career Researcher in Mathematics Education	Capable of systematically and objectively collecting, processing, analysing and presenting data to solve a problem or test a hypothesis in order to develop general principles Profession: Junior Researcher, Research Assistant
3	GP-3 Early-stage entrepreneur with a background in mathematics	Able to apply mathematical knowledge and entrepreneurial concepts in managing mathematics learning and launching a business to identify, develop, and then combine innovations, opportunities, and better methods to create greater value in problem-solving Profession: Entrepreneur (Tutoring Centre), Data Analyst, Media Developer

Note: The code for **the Graduate Profile** may be written as "GP"

The correlation between the Graduate Profile (Table 4.1) and the Programme's Educational Objectives (Table 2.1) is presented in Table 4.2 below

Table 4.2 Table of correlation between graduate profiles and programme educational objectives

No	Graduate Profile (GP)	Programme Educational Objectives (PPO)			
		PEO-1	PEO-2	PEO-3	PEO-4
1	GP-1	✓	✓		
2	GP-2			✓	
3	GP-3		✓		✓

4.2 Formulation of Graduate Learning Outcomes (PLO)
*

The formulation of the Graduate Learning Outcomes (PLO) for the Mathematics Education Study Programme at UPGRIS generally refers to national standards (KKNI) and the National Higher Education Standards (SN Dikti), which are then enriched by the distinctive characteristics of **the UPGRIS**, the requirements of professional **associations**, and the focus of the study programme's **Centre of Excellence**.

Table 4.3. Graduate Learning Outcomes of the Study Programme

Code	Description of Graduate Learning Outcomes (PLO)
PLO-1	Able to demonstrate character and conduct that reflect adaptability, enthusiasm, and integrity as a manifestation of devotion to God Almighty
PLO-2	Able to analyse educational theories, learner characteristics, and pedagogical principles underpinning effective, learner-centred mathematics learning
PLO-3	Able to design, implement, and evaluate innovative mathematics learning based on content knowledge, pedagogy, and technology (TPACK) that is responsive to the socio-cultural context and the needs of learners
PLO-4	Able to analyse mathematical concepts at primary, secondary and tertiary levels, as well as entrepreneurship, both conceptually and contextually, and present them using pedagogical approaches appropriate to learners' developmental stages
PLO-5	Able to apply advanced mathematical principles and advanced mathematics education to enhance readiness to face changes and challenges in the digital age
PLO-6	Able to conduct research and publish scholarly works in the field of mathematics education in accordance with academic standards and the needs of society.
PLO-7	Able to design and manage technology-based business ideas, as well as create creative solutions and educational products in the field of mathematics education
PLO-8	Able to make independent and responsible decisions in resolving complex problems in the fields of education, research, and professional development.
PLO-9	Able to analyse and visualise data using technology in accordance with the principles and procedures of data analytics to make evidence-based decisions
PLO-10	Able to develop creative and contextual multimedia mathematics learning materials
PLO-11	Evaluate and integrate concepts of religion, nationality, the constitution, language, and technology-based entrepreneurship with the 5A values (anti-violence, anti-drugs, anti-bullying, anti-intolerance, and anti-corruption) to support the development of professional knowledge and practice

Table 4.4. Alignment of PLOs with the KKNI

KKKNI Level for Bachelor's Degree Programmes	PLO Description										
	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11
S-a	✓										
S-b	✓										
S-c	✓										
S-d	✓										
S-e	✓										
S-f	✓										
PP		✓		✓							✓
Family Card			✓		✓	✓	✓		✓	✓	
KTJ-1								✓			
KTJ-2								✓			

4.3 Matrix of the relationship between PLO and Graduate Profile

Table 4.5. Matrix of the Relationship between Programme Profiles and PLOs

Code	Description of Programme PLO	GP1	GP2	GP3
PLO-1	Able to demonstrate character and conduct that reflect adaptability, enthusiasm, and integrity as an expression of devotion to God Almighty	✓	✓	✓
PLO-2	Able to analyse educational theories, learner characteristics, and pedagogical principles underpinning effective, learner-centred mathematics learning	✓	✓	
PLO-3	Able to design, implement, and evaluate innovative mathematics learning based on content knowledge, pedagogy, and technology (TPACK) that is responsive to the socio-cultural context and learners' needs	✓		
PLO-4	Able to apply mathematical concepts at primary and secondary education levels in a conceptual and contextual manner, and present them using pedagogical approaches appropriate to learners' developmental stages	✓	✓	
PLO-5	Able to apply the principles of continuous and independent competence development to enhance readiness to face changes and challenges in the digital age	✓		
PLO-6	Able to conduct research and publish scholarly works in the field of mathematics education in accordance with academic standards and the needs of society.	✓	✓	
PLO-7	Able to design and manage technology-based business ideas, as well as create creative solutions and educational products in the field of mathematics education			✓
PLO-8	Able to make independent and responsible decisions in resolving complex problems in the fields of education, research, and professional development.	✓	✓	✓
PLO-9	Able to analyse and visualise data using technology in accordance with the	✓	✓	✓

Code	Description of Programme PLO	GP1	GP2	GP%3
	principles and procedures of data analytics to make evidence-based decisions			
PLO-10	Able to develop creative and context-based multimedia mathematics learning materials	✓		✓
PLO-11	Evaluate and integrate concepts of religion, nationalism, the constitution, language, and technology-based entrepreneurship with the 5A values (anti-violence, anti-drugs, anti-bullying, anti-intolerance, and anti-corruption) to support the development of professional knowledge and practice	✓	✓	✓

4.4 Matrix of the relationship between the Programme's PLOs and the Programme's Educational Objectives

Table 4.6. Matrix of the relationship between the Programme's PLOs and the Programme's Educational Objectives

Code	Description of Programme PLO	PEO-1	PEO-2	PEO-2	PEO-2
PLO-1	Able to demonstrate character and conduct that reflect adaptability, enthusiasm and integrity as an expression of devotion to God Almighty	✓	✓		
PLO-2	Able to analyse educational theories, learner characteristics, and pedagogical principles underpinning effective, learner-centred mathematics learning	✓	✓		
PLO-3	Able to design, implement, and evaluate innovative mathematics learning based on content knowledge, pedagogy, and technology (TPACK) that is responsive to the socio-cultural context and learners' needs	✓	✓		
PLO-4	Able to apply mathematical concepts at primary and secondary education levels conceptually and contextually, and present them using pedagogical approaches appropriate to learners' developmental stages	✓	✓		
PLO-5	Able to apply the principles of continuous and independent competence development to enhance readiness to face changes and challenges in the digital age	✓	✓		
PLO-6	Able to conduct research and publish scholarly works in the field of mathematics education in accordance with academic standards and the needs of society.			✓	
PLO-7	Able to design and manage technology-based business ideas, as well as create creative solutions and educational products in the field of mathematics education				✓
PLO-8	Able to make independent and responsible decisions in resolving complex problems in the fields of education, research, and professional development.		✓		
PLO-9	Able to analyse and visualise data using technology in accordance with the principles and procedures of data analytics to make evidence-based decisions			✓	✓
PLO-10	Able to develop creative and contextual multimedia	✓			✓

Code	Description of Programme PLO	PEO-1	PEO-2	PEO-2	PEO-2
	mathematics learning materials				
PLO-11	Evaluate and integrate concepts of religion, nationalism, the constitution, language, and technology-based entrepreneurship with the 5A values (anti-violence, anti-drugs, anti-bullying, anti-intolerance, and anti-corruption) to support the development of professional knowledge and practice	✓	✓	✓	✓

5. Determination of Study Materials

5.1 Body of Knowledge (BoK)

Table 5.1. Study materials based on the programme's PLO

PLO	Description of Programme PLO	Study Materials
PLO-1	Able to demonstrate character and conduct that reflect adaptability, enthusiasm, and integrity as an expression of devotion to God the Almighty	BK 1.1 Islamic Religious Education BK 1.2 Christian Religious Education BK 1.3 Catholic Religious Education BK 1.4 Buddhist Religious Education BK 1.5 Hindu Religious Education BK 1.6 Confucian Religious Education BK 1.7 PGRI Studies BK 1.8 Pancasila Education BK 1.9 Civic Education BK 1.10 Ethics and Educational Profession BK 1.11 Microteaching Attitude BK 1.12 Attitude towards Internship BK 1.13 Attitude towards Mathematics Seminars BK 1.14 Attitude towards Community Service BK 1.15 Entrepreneurial Attitude BK 1.16 English BK 1.17 Indonesian Language
PLO-2	Able to analyse educational theories, learner characteristics, and pedagogical principles underpinning effective, learner-centred mathematics learning	BK 2.1 Educational Management BK 2.2 Mathematics Educational Psychology BK 2.3 Mathematics Education Curriculum Analysis BK 2.4 Mathematics Learning Strategies BK 2.5 Mathematics Learning Assessment BK 2.6 Mathematics Learning Innovation BK 2.7 Ethics and Educational Profession BK 2.8 Foundations of Education BK 2.9 Philosophy of Mathematics Education BK 2.10 Joyful Learning in Mathematics Education BK 2.11 Mathematical Thinking BK 2.12 Teaching Resources and Materials Development BK 2.13 Computational Thinking
PLO-3	Able to design, implement and evaluate innovative mathematics learning based on content knowledge, pedagogy and technology (TPACK) that is responsive to	BK 3.1 Mathematics Learning Planning BK 3.2 Joyful Learning in Mathematics Education BK 3.3 Mathematical Thinking BK 3.4 Educational Management BK 3.5 Ethics and Educational Profession

PLO	Description of Programme PLO	Study Materials
	the socio-cultural context and the needs of learners	BK 3.6 Mathematics Learning Innovation BK 3.7 Teaching Practice BK 3.8 Mathematics Learning Assessment BK 3.9 Mathematics Learning Strategies BK 3.10 English for Mathematics BK 3.11 Entrepreneurial Skills BK 3.12 Entrepreneurial Intention BK 3.13 Manipulative Teaching Aid Development BK 3.14 Development of Teaching Resources and Materials BK 3.15 Computational Thinking BK 3.16 Manipulative Teaching Aid Development BK 3.17 Mathematics Education Curriculum Analysis
PLO-4	Ability to apply mathematical concepts at primary and secondary education levels in a conceptual and contextual manner, and to present them using pedagogical approaches appropriate to the learners' developmental stage	BK 4.1 Calculus BK 4.2 Algebra BK 4.3 Geometry BK 4.4 Statistics BK 4.5 Probability Theory BK 4.6 Numbers BK 4.7 Linear Programming BK 4.8 Analysis BK 4.9 Graph BK 4.10 Numerical Methods BK 4.11 Differential Equations BK 4.12 Elementary School Mathematics BK 4.13 Junior High School Mathematics BK 4.15 Entrepreneurial Skills BK 4.16 Economics Mathematics BK 4.17 Research
PLO-5	Able to apply the principles of advanced competency development independently and continuously to enhance readiness to face changes and challenges in the era of digital ' '	BK 5.1 Calculus BK 5.2 Algebra BK 5.3 Geometry BK 5.4 Statistics BK 5.5 Probability Theory BK 5.6 Numbers BK 5.7 Linear Programming BK 5.8 Graphs BK 5.9 Numerical Methods BK 5.10 Differential Equations BK 5.11 Computational Thinking BK 5.12 Joyful Learning in Mathematics Education BK 5.13 Elementary School Mathematics BK 5.14 Junior High School Mathematics BK 5.15 Outdoor Mathematics BK 5.16 Discrete Mathematics
PLO-6	Able to conduct research and publish scientific works in the field of mathematics education in accordance with academic standards and the needs of society.	BK 6.1 Research Proposal Writing Techniques BK 6.2 Research Methods BK 6.3 Publication of Scientific Works BK 6.4 Seminar in Mathematics Education BK 6.5 Final Project
PLO-7	Able to design and manage technology-based business ideas, as well as create creative solutions and educational products in the field of mathematics education	BK 7.1 Technology-Based Entrepreneurship BK 7.2 Mathematics for Economics

PLO	Description of Programme PLO	Study Materials
PLO-8	Able to make independent and responsible decisions in resolving complex problems in the fields of education, research, and professional development.	BK 8.1 Community Service - Digital Literacy BK 8.2 Community Service - Problem Solving in the Community BK 8.3 Community Service Program – Inclusive and Exclusive Leadership BK 8.4 Community Service Program – Non-Formal Education BK 8.5 Teaching Practice BK 8.6 Entrepreneurial Skills BK 8.7 Entrepreneurial Skills BK 8.8 Entrepreneurial Intention BK 8.9 Entrepreneurial Intention BK 8.10 Learning Media Evaluation BK 8.11 Media Production Management* BK 8.12 Hypermedia* BK 8.13 3D Animation* BK 8.14 Outdoor Mathematics BK 8.15 Microteaching BK 8.16 Manipulative Teaching Aid Development BK 8.17 Algorithms and Programming BK 8.18 Mathematical thinking BK 8.19 Final Project
PLO-9	Ability to analyse and visualise data using technology in accordance with the principles and procedures of data analytics to make evidence-based decisions	BK 9.1 Algorithms and Programming BK 9.2 Data Analytics BK 9.3 Data analytics software BK 9.4 Data Visualisation BK 9.5 Business Intelligence
PLO-10	Ability to develop creative and contextual multimedia mathematics learning materials	BK 10.1 Development of digital learning materials BK 10.2 Educational Technology Applications BK 10.3 Graphic design BK 10.4 Teaching Resources and Materials Development BK 10.5 Learning Media Evaluation BK 10.6 Media Production Management* BK 10.7 Hypermedia* BK 10.8 3D Animation*
PLO-11	Evaluating and integrating concepts of religion, nationalism, the constitution, language, and technology-based entrepreneurship with the 5A values (anti-violence, anti-drugs, anti-bullying, anti-intolerance, and anti-corruption) to support the development of professional knowledge and practice	

5.2 Description of Study Materials

Table 5.2. Study Materials (BK)

No/Code	Study Material (BK)	Description of Study Materials
RM 1.1	Islamic Religious Education	1. Humanity and Religion 2. The concepts of faith, Islam and ihsan in shaping the perfect human being 3. Concepts of ethics, morals and character (anti-corruption, anti-bullying, anti-intolerance, anti-sexual violence, anti-drugs) 4. Grounding Islam in Indonesia 5. Islam fosters unity amidst diversity 6. Islam and the challenges of modernisation 7. Islam's contribution to the development of world civilisation 8. Democracy and Human Rights from an Islamic Perspective 9. Islamic Politics and Law
BK 1.2	Christian Religious Education	1. God the Creator: Creating, saving and accompanying. 2. Human beings, God's creation: Created in the image and likeness of the Creator. 3. Christian Ethics, Morals and Character: Against sexual harassment. 4. Human Rights and Responsibilities. 5. Faith, Knowledge and Service. 6. Christianity and Culture. 7. Interfaith Harmony: Building Tolerance. 8. Diversity as a Reality. 9. Human Rights: Humanising Humanity: Anti-Bullying, 10. Democracy. 11. Work as a Mandate from God: Anti-Corruption. 12. The Relationship Between Religion and the State According to Christianity. 13. The Law of Love: The foundation of Christian life in all aspects of life.
BK 1.3	Catholic Religious Education	1. Who is man according to the Bible? 2. Reasoning, exploring arguments, understanding and the nature of humanity as the image of God. 3. Communicating the calling and mission of humanity as the image of God. 4. Exploring the relationship of human beings with themselves, others, the environment and God. 5. Communicating the relationship of human beings with themselves, others, the environment and God. 6. Religion as the completion of the understanding of the macrocosm and microcosm. 7. The lived experience of religious life within the Catholic Church. 8. The meaning of religious pluralism. 9. Interfaith cooperation for the development of the whole person. 10. A personal encounter with Jesus in the Bible.

No/Code	Study Material (BK)	Description of Study Materials
		11. The meaning of the Passion, death and resurrection of Jesus Christ. 12. The Meaning of the Trinity. 13. The nature and mission of the Catholic Church for the preservation of life. 14. Living out the faith in a pluralistic society. 15. Faith for the creation of Pancasila-based builders.
BK 1.4	Buddhist Religious Education	1. A study of the concept of sāddha in the suttas (e.g. Sāleyyaka Sutta, Kalama Sutta), the typology of saddhā (buttika, ākāra, bala), the function of saddhā in the spiritual life of Buddhists, and the strengthening of faith through practice. 2. Contemporary issues such as secularism, spiritual crisis, and pluralism; the Buddhist approach to the concept of Divinity (without a creator), the relevance of nibbāna and brahmavihāra in addressing current spiritual needs. 3. Buddhist perspectives on anattā, dukkha, paṭiccasamuppāda, and nibbāna; the dignity of human beings as moral beings with the potential for enlightenment; the relevance of these teachings in addressing the questions of modern life. 4. Teachings on dāna, sīla, karuṇā, mettā, and samacariya; the role of the Buddhist community in social, economic, and educational development; Buddhist contributions to national values and public cooperation. 5. Historical studies of the role of Buddhists in the state; the principles of pañca-sīla and dasavidha-rājadhamma; the contribution of Buddhist values in fostering social justice, the rule of law, and a culture of compassion. 6. The ethics of dāna as the basis for public contribution; the teaching of lokasangraha (worldly maintenance); tax awareness as a form of secular dāna; the value of nationalism in Indonesian Buddhism. 7. Teachings on gender equality in the suttas (e.g. Therīgāthā, Sutta Nipāta); the principle of non-violence (ahiṃsā); lay participation in social movements and the strengthening of democracy based on Buddhist values. 8. Suttas on tolerance and dialogue (e.g. Kalama Sutta, Cūḷekasāla Sutta); the history of Buddhist pluralism in India and Southeast Asia; the concept of majjhima paṭipadā as the basis for religious moderation. 9. Interfaith education strategies; interfaith dialogue forums based on mettā-karuṇā; case studies of religious pluralism; legal analysis of religious freedom in the context of Indonesia and Buddhism.
BK 1.5	Hindu Religious Education	1. Study of the concept of śraddhā in the Vedas, Upaniṣads, and Bhagavad Gītā; typology of faith (trividha śraddhā in Gītā 17:2–3); the function of śraddhā in the spiritual growth of Hindus; strengthening of faith through the practice of yajña, tapa, and dharma. 2. Contemporary issues such as materialism, secularism, and popular spirituality; the Hindu approach to immanent-transcendent Divinity (Brahman and Īśvara); the relevance of mokṣa, ātman, and bhakti yoga in addressing modern spiritual needs.

No/Code	Study Material (BK)	Description of Study Materials
		3. Hindu perspectives on ātman, saṁsāra, karma, and mokṣa; the dignity of humanity as dharmic beings capable of attaining the highest consciousness; the relevance of these teachings in addressing the modern search for the meaning of life. 4. The teachings of dāna, seva, ahimsa, and kṣānti; the role of Hindus in social development and education; tangible contributions to economic development and national values in the spirit of dharma yuddha. 5. Historical studies of the role of Hindus in the states and kingdoms of the Nusantara; the principles of pañca yadnya and rājadharma in state governance; the contribution of Hindu values to the ethics of governance, law, and the culture of the Nusantara. 6. The ethics of dāna and yajña as forms of social responsibility; the concept of lokasaṁgraha in the Bhagavad Gītā (3:20–25); tax awareness as seva for the state; the value of patriotism in the practice of karma yoga among Indonesian Hindus. 7. Teachings on gender equality in the Vedas and the Mahābhārata (e.g. the stories of Sulabhā and Draupadī); the principle of non-violence (ahiṁsā) in social relations; the contribution of Hindus to social movements and dharma-based democracy. 8. Teachings on tolerance in the Vedas: ekaṁ sat viprā bahudhā vadanti; interfaith dialogue in the Upaniṣads and the Gītā; the history of Hindu pluralism in India and the Archipelago; the principles of madhyama mārga and sarva dharma sambhava in the practice of religious moderation. 9. Strategies for interfaith education and dharmic dialogue; forums for harmony based on the values of ṛta and satya; case studies of Hindu tolerance in Bali and Java; analysis of religious freedom according to the 1945 Constitution and the inclusive stance of Hindu teachings.
BK 1.6	Confucian Religious Education	1. Study of the concept of xin (faith) in the Analects, the Doctrine of the Mean, and the Mencius; typologies of xin in relation to zhong, shu, and cheng (sincerity); the function of faith in the moral and spiritual lives of the faithful; strengthening faith through the daily practices of li and xiu shen. 2. Contemporary issues such as hedonism, the ethical crisis, and secularism; the Confucian view of Tian (Heaven) as the source of moral order; the relevance of dao, ren, and ming in addressing the spiritual void of the modern age. 3. The Confucian view of human nature (xing) as inherently good; the value of the junzi as the noble potential of humanity; the interconnection between moral cultivation (xiu shen) and social harmony; the application of these teachings to address contemporary existential questions. 4. The teachings of ren, yi, li, zhong, shu and xin in social life; moral obligations towards family and state; the tangible contributions of Confucians in the social, educational and national spheres; the practices of gong (co-operation) and xiao (filial piety) in fostering harmony. 5. Historical study of the role of Confucian communities within the state; moral practices based on da xue (higher

No/Code	Study Material (BK)	Description of Study Materials
		education) and zhong yong (balance) as described in the * *; the contribution of the value of he (harmony) in realising a compassionate legal system and social culture. 6. The concept of li as civil order and public ethics; the value of dāna in social forms through gongde (collective virtue); taxation as a civic duty to ensure national harmony; patriotism as an expression of zhong (loyalty) to the state. 7. The doctrine of equality in classical Confucianism (e.g., Ren applies universally); the spirit of non-violence and wen (civilisation); the role of Confucian figures in education and social reform; the contribution of the faithful in strengthening democratic values. 8. The attitude of tolerance in the Zhong Yong and Lun Yu; the principle of he er bu tong (harmony without uniformity); the history of Confucian pluralism in East Asia and Southeast Asia; the practice of zhong-shu as the basis for interfaith dialogue and religious moderation. 9. Interfaith education strategies based on the values of Ren and Yi; the development of interfaith and humanitarian forums; case studies on the role of Confucian figures in religious harmony; analysis of the constitution and guarantees of religious freedom within the context of Confucian values.
BK 1.7	PGRI Studies	1. History and Dynamics of PGRI 2. Nature and Identity of PGRI 3. Profile of Pancasila Students 4. The Role of PGRI in Improving the Quality of Human Resources 5. PGRI Organisational Ethics 6. PGRI and Social Media 7. PGRI's Challenges in the Age of Disruption
BK 1.8	Pancasila Education	1. History and Objectives of Pancasila Education 2. Pancasila as the nation's identity 3. Pancasila in the Context of the 1945 Constitution 4. Pancasila as the foundation of the state 5. Pancasila as the ideology of the nation and state 6. Pancasila as a Philosophical System 7. Pancasila and state policy 8. Pancasila as an ethical system 9. The actualisation of Pancasila values in the 5A: Anti-Corruption, Anti-Intolerance, Anti-Bullying, Anti-Sexual Violence, and Anti-Drugs 10. The correlation between the state law of "Pancasila" and religious law 11. Pancasila as the foundation for the development of science 12. Pancasila as a paradigm of science 13. Pancasila as a paradigm for national life
BK 1.9	Civic Education	1. Introduction to Citizenship Education 2. Indonesian National Identity and Anti-Intolerance 3. National Integrity 4. The Constitution in Indonesia 5. The Duties and Rights of the State and Citizens 6. The Dynamics of Democracy in Indonesia 7. Law Enforcement in Indonesia 8. Archipelagic Outlook 9. National Resilience

No/Code	Study Material (BK)	Description of Study Materials
BK 1.10	Ethics and Educational Profession	1. Ethics in Educational Interactions (Ethics of communication between teachers and students; 2. Ethical relationships between teachers and fellow educators; 3. Professional interaction between teachers and parents and the community)
BK 1.11	Microteaching	1. Discipline 2. Responsibility 3. Ethics & Morals 4. Cooperation 5. Honesty 6. Enthusiasm 7. Openness to Feedback 8. Independence
BK 1.12	Internship Attitude	Theories of learning and teaching, approaches and models of learning, and teaching materials
BK 1.13	Attitude towards Mathematics Seminars	1. Academic responsibility 2. Ethics and Educational Profession
BK 1.14	Attitudes towards Community Service	1. Leadership 2. Community Empowerment 3. Digital Literacy
BK 1.15	Entrepreneurial Attitude	Design Thinking (Design Thinking Mastery)
BK 1.16	English	Simple present tense
BK 1.17	Indonesian Language	History of the Indonesian Language
BK 2.1	Educational Management	1. Management and the definition of educational management 2. Student management 3. Management of teachers and educational staff 4. Facilities and Infrastructure Management 5. Management of school-community relations 6. Educational leadership 7. The role of teachers as managers 8. Strategic management of educational quality improvement
BK 2.2	Mathematics Educational Psychology	1. Basic Concepts of Educational Psychology in the Context of Mathematics (The scope of educational psychology, the role of psychology in mathematics learning, and interdisciplinary studies between psychology and mathematics education) 2. Characteristics of Mathematics Learning in Learners Learning styles (visual, auditory, kinesthetic), Motivation and attitudes towards mathematics, Maths anxiety 3. Mathematical Thinking Processes and Representations (Visual, symbolic and verbal representations; Mathematical thinking processes: concrete–semi-concrete–abstract; Metacognition and reflection in solving mathematical problems) 4. Difficulties in Learning Mathematics Types of difficulties (dyscalculia, misconceptions), Internal and external factors causing difficulties, Diagnosis and management of difficulties in learning mathematics 5. Emotions, Motivation, and Self-Regulated Learning in Mathematics (The role of emotions in mathematical

No/Code	Study Material (BK)	Description of Study Materials
		problem-solving, Strategies for enhancing motivation to learn mathematics, The concepts of self-efficacy and student self-regulation) 6. Psychological Implications in Mathematics Learning Planning (Lesson design appropriate to developmental stages, Selection of media and approaches that consider psychological aspects, Assessment of learning processes and outcomes from a psychological perspective).
BK 2.3	Mathematics Education Curriculum Analysis	1. Basic concepts, nature, functions and the role of the curriculum in education 2. History and Development of the Mathematics Curriculum in Indonesia 3. Foundations of curriculum development (philosophical, psychological, sociological, epistemological) 4. Curriculum development models and approaches (Tyler, Taba, OBE, etc.) 5. Comparing curriculum development approaches (top-down, bottom-up, backward design, spiral curriculum) 6. Analysis of curriculum structure and elements in mathematics learning (CP, content elements, TP, ATP for primary to upper secondary levels) 7. Analysing mathematics curricula in Singapore, Japan, Finland and China compared with Indonesia 8. Curriculum components: objectives, content, methods, assessment 9. Identification of core competencies (CP, Pancasila Student Profile) 10. Principles for formulating objectives across the three domains of learning (affective, cognitive, psychomotor) 11. Criteria for operational and measurable learning indicators 12. Analysing mathematics textbooks (alignment of textbooks with CPs, content elements & approaches) 13. Reviewing curriculum implementation challenges (Current issues: national assessment, teacher workload, teacher CPD)
BK 2.4	Mathematics Learning Strategies	1. The Nature of Mathematics Learning Strategies (Definition of strategies, methods, techniques, and learning approaches; Objectives and urgency of strategies in mathematics teaching; Characteristics of mathematics learning: abstraction, symbolism, and systematicity) 2. General Strategies in Mathematics Learning (Direct instruction strategies, Interactive strategies (discussion, question and answer), Inductive and deductive strategies, Exploratory and reflective strategies, and inquiry-based strategies) 3. Subject-Specific Strategies in Mathematics (concrete manipulatives, storytelling, number talks (Arithmetic & Numbers); visual analogies, bar models, balance method (Algebra); 3D models, GeoGebra (Geometry), shape exploration; data simulation, real-world data processing, simple experiments (Statistics & Probability); graphical visualisation, animations of limit/derivative/integral concepts (Calculus). 4. Collaborative and Student-Centred Strategies (Cooperative Learning (STAD, Jigsaw, TAI, Numbered

No/Code	Study Material (BK)	Description of Study Materials
		Heads Together); Integrative Thematic Learning; Think-Pair-Share and mathematical discussion strategies; Project-Based Learning (Mathematics Projects)) 5. Strategies for Integrating Literacy and Numeracy (Strengthening mathematical literacy through contextual problems; Developing reasoning skills 6. Differentiation Strategies in Mathematics Learning (Differentiation of content, process, and products; Adapting strategies based on students' learning styles and readiness; Examples of applying differentiation to specific topics, communication, and problem-solving; Integration of the Pancasila learner profile into learning)
BK 2.5	Mathematics Learning Assessment	1. Basic Concepts of Assessment (Definitions of assessment, measurement, and evaluation; Functions and objectives of mathematics learning assessment) 2. Types and Approaches to Assessment (Diagnostic assessment, Formative assessment, Summative assessment, Authentic and competence-based assessment 3. Mathematics Learning Assessment (Authentic assessment and digital portfolios; Project-based and performance-based assessment; Use of technology for formative and summative assessment; Peer assessment and self-assessment in innovation-based learning) 4. Principles & Characteristics of Assessment (Validity, Reliability, Objectivity, Feasibility) 5. Assessment Planning (Formulating learning objectives (KKA, TP, ATP), Developing question matrices, Writing question indicators) 6. Instrument Development (Multiple-choice, essay, and fill-in-the-blank questions; HOTS and contextual questions; non-test instruments (observation, portfolios, rubrics, projects)) 7. Instrument Analysis (Analysis of item quality (discriminatory power, difficulty level, effectiveness of distractors), Testing of instrument validity & reliability) 8. Criterion-Referenced Assessment (CRA) and Norm-Referenced Assessment (NRA) 9. Processing and Interpretation of Results (Scoring and processing of marks, Interpretation of evaluation results, Mapping of learning outcomes)
BK 2.6	Innovation in Mathematics Learning	1. Basic Concepts of Learning Innovation (Definition and characteristics of learning innovation, Differences between innovation, modification, and improvisation in learning, The urgency of innovation in mathematics education in the digital age, The relationship between innovation and creativity, problem-solving, and critical thinking) 2. New Paradigms in 21st-Century Mathematics Learning (The Pancasila learner profile and 21st-century skills, the concept of 'future-ready learners' in a mathematical context, the role of the teacher as an innovator and facilitator of learning, transformative and humanistic mathematics education) 3. Innovation in Approaches and Models of Mathematics Learning (Project-Based Learning: Enhancing conceptual understanding through tangible products; Problem-Based Learning: Encouraging students to solve open-ended

No/Code	Study Material (BK)	Description of Study Materials
		problems to construct mathematical concepts); Inquiry- and discovery-based learning; Realistic Mathematics Education (RME): Linking mathematics to real-world contexts; STE(A)M in mathematics learning: Integration of mathematics, science, technology, and the arts within a single activity; The Scientific Approach (5M: Observing, Asking, Reasoning, Experimenting, , Concluding); Expository vs Discovery Approach, Contextual Approach (CTL)); Discovery Learning & Inquiry-Based Learning: Students actively discover concepts through exploration; Flipped Classroom: Students study the material at home and discuss/practise in class. 4. Innovations in the Use of AI in the Mathematics Learning Process 5. Innovations Based on Local Wisdom and Social Context (Mathematics learning based on local culture (ethnomathematics); Contextualisation of mathematics in daily life; Integration of social, cultural, and environmental values into learning
BK 2.7	Ethics and Educational Profession	1. The Nature of Ethics and Morality in Education (Definitions of ethics, morality, and etiquette; Differences between general ethics and Ethics and Educational Profession ; Fundamental ethical values in academic and educational life; Ethical implications in the mathematics teaching and learning process) 2. Teacher Ethics and Educational Profession (Characteristics of a profession and professionalism; Teaching as a profession: competencies, qualifications, and code of ethics; The Indonesian Teachers' Code of Ethics (PGRI) and Ministry of Education Regulation No. 16 of 2007; Teachers' ethical responsibilities towards pupils, parents, schools, and the community) 3. Characteristics of the Teaching Profession (The teaching profession from pedagogical, social, and cultural perspectives; Characteristics of a professional mathematics teacher; The role of the teacher as a facilitator, motivator, and lifelong learner; Self-reflection and continuous professional development) 4. Ethical Commitment in Educational Practice (Commitment to justice, honesty, and equality in learning; Anti-discrimination and inclusion in education; Protection of children's rights and ethical treatment of students; Ethics in assessment and evaluation of learning outcomes) 5. Professionalism of Mathematics Teachers (Development of pedagogical, professional, social, and personal competencies; Enhancing professionalism through subject-specific teacher working groups (MGMP), training, and further study; The role of teachers in advancing community-based mathematics education; Professional responsibility for the quality of mathematics learning) 6. Code of Ethics in the Digital Context and the 4.0 Era (Social media ethics for educators; Teacher professionalism in the digital space (learning platforms, LMS, etc.); Protection of students' personal data; Ethics of technology use in mathematics learning)

No/Code	Study Material (BK)	Description of Study Materials
		7. Contemporary Challenges and Issues in the Teaching Profession (Contract teachers, certification, and teachers' workload; Demands for professionalism amidst changing education policies; Ethical issues in the zoning system, examinations, and assessment; The crisis of integrity and how to rebuild public trust in the teaching profession) 8. Development of Educators' Identity and Integrity (Mapping personal values and individual ethical orientation; Self-reflection as a prospective mathematics teacher; Designing a personal vision as a professional and ethical educator; Compiling an ethics and professionalism portfolio)
BK 2.8	Foundations of Education	1. The Nature and Foundations of Education (Definition and objectives of national education; The role of education in the lives of individuals and society; Historical, legal, sociological, cultural, and technological foundations of education in Indonesia) 2. The National Education System and Educational Policy (The structure and levels of formal education in Indonesia; National Education Standards (SNP), including standards for content, process, and assessment; Educational quality and efforts to improve it at secondary school level, particularly in the context of mathematics education; Comparison of the Indonesian education system with other countries (globally)) 3. Educational Issues (Challenges in the classroom: inequalities in access, facilities and infrastructure, and learning management; National issues: quality equity, regional disparities, teacher quality and curriculum; International issues: the quality of mathematics education in global assessments (e.g. PISA, TIMSS)) 4. Education in the Context of Social Culture and Local Values (The influence of culture, local values, and religion on educational practices; Character education and multiculturalism in mathematics learning; Local wisdom as a source of contextualisation in learning) 5. Innovation and Technology in Education (The role of information and communication technology in mathematics learning; 21st-century education and the development of numeracy literacy competencies; Implications of the Fourth Industrial Revolution and Society 5.0 for the secondary education system) 6. Designing a High-Quality Secondary Education System (Principles and components of educational system design; Approaches based on the national curriculum and local needs; Strategies for improving the quality of mathematics learning in secondary schools; Integration of assessment, teacher development, and the role of the community in the school education system)
BK 2.9	Philosophy of Mathematics Education	1. The scope of the Philosophy of Mathematics Education 2. History of the development of mathematical thought 3. Mathematical Ontology 4. Epistemology of Mathematics 5. Axiology of Mathematics 6. Schools of thought in the Philosophy of Mathematics Education

No/Code	Study Material (BK)	Description of Study Materials
		7. The perspective of mathematics as a language 8. Mathematics and reality 9. Mathematics in culture and civilisation 10. Philosophy of Mathematics Education and education 11. Contemporary issues (AI and mathematics) 12. Mathematical argumentation and logic 13. Case studies of mathematical thinkers 14. Critical Philosophy of Mathematics Education 15. Personal reflection
BK 2.10	Joyful Learning in Mathematics Education	1. Basic Concepts of Joyful Learning in Mathematics Education in Mathematics Education (The nature of enjoyable and meaningful learning; Principles and characteristics of Joyful Learning in Mathematics Education in a mathematical context; The impact of positive emotions on enhancing participation and understanding of mathematical concepts; The relationship between motivation, active engagement, and learning achievement) 2. Outdoor Mathematics Learning (Definition and basic principles of outdoor-based mathematics learning; Benefits of outdoor learning: contextualisation, physical and social engagement, and real-world problem-solving; Strategies and examples of outdoor mathematics activities: Measurement in the surrounding environment (length, area, volume); Geometry in architecture and nature (buildings, gardens, roads); Mathematics in traditional games (congklak, engklek, etc.); Simple statistics based on environmental observation; Challenges and solutions in implementing outdoor mathematics) 3. Integrating STEAM into Enjoyable Mathematics Learning (STEAM concepts: Science, Technology, Engineering, Arts, Mathematics; Characteristics of exploratory and integrated STEAM learning; Examples of contextual STEAM projects in mathematics learning: Designing a school garden (geometry, measurement, aesthetics); Designing and building simple tools (integration of mathematics and engineering); The art of symmetry, fractals, and mathematical batik; Data and graphs in simple science experiments; The role of the teacher in facilitating enjoyable STEAM learning) 4. Designing Project- and Experiment-Based Joyful Learning in Mathematics Education Activities (Lesson planning based on project-based learning and inquiry-based learning; Designing collaborative, creative, and problem-based mathematics projects; Application of game-based learning in outdoor and STEAM projects; Alternative task formats and assessments for project-based learning) 5. Media, Technology, and Creativity in Joyful Learning in Mathematics Education (Utilisation of simple tools and homemade tools from the surrounding environment; Technology as an enhancement for outdoor activities (GeoGebra AR, measuring apps, scientific calculators, interactive videos); Gamification and the use of interactive apps in outdoor tasks; Creativity in creating enjoyable STEAM learning materials)

No/Code	Study Material (BK)	Description of Study Materials
		6. Local Wisdom and Social Context as Sources of Enjoyable Learning (Ethnomathematics approach: exploring mathematical concepts from local culture and environment; Integration of social, cultural, and environmental sustainability values into outdoor learning; Case study: design of a locally-based mathematics project; Community-based learning: student–community collaboration)
BK 2.11	Mathematical Thinking	1. The Nature and Characteristics of Mathematical Thinking (The concept of mathematical thinking in an educational context; The role of mathematical thinking in enhancing numeracy literacy and 21st-century skills; Characteristics and elements of mathematical thinking: logical, structured, systematic, and evidence-based; The distinction between mathematical thinking and ordinary or scientific thinking) 2. Types and Components of Mathematical Thinking (This section explicitly outlines critical thinking, creative thinking, and reasoning as core components of mathematical thinking: a. Critical Thinking in Mathematics: The ability to evaluate information, assess arguments, and make decisions based on mathematical logic; Indicators of critical thinking: clarity of reasoning, identification of assumptions, validity of logic, and reflection on solutions; Examples of application: analysis of problem-solving strategies, assessing the truth of a claim or pattern. b. Creative Thinking in Mathematics: The ability to generate new ideas or approaches to a mathematical problem; Indicators: fluency, flexibility, originality, and elaboration of ideas in problem-solving; Examples of application: answering open-ended questions, creating one's own patterns, discovering multiple solution strategies. c. Mathematical Reasoning: Encompasses deductive, inductive, analytical, and proportional reasoning; The use of logical arguments to make generalisations, construct proofs, or deduce solutions; Examples of application: proving theorems, deducing number patterns, constructing mathematical arguments 3. Representations in Mathematical Thinking (Types of representation: visual (pictures, diagrams), symbolic (formulas), verbal (narratives), and numerical (numbers); The role of representations in supporting understanding and problem-solving; Linking representations to enhance students' critical and analytical thinking skills) 4. Application of Mathematical Thinking in School Learning (Designing learning that fosters students' critical, creative, and reasoning skills; Examples of activities: Open-ended questions, Pattern exploration, Argumentative discussions, Analysis of students' errors and thinking patterns, Development of mathematical thinking assessment tools) 5. The Relationship Between Mathematical Thinking and 21st-Century Skills (Links to the 4C competencies (critical thinking, creativity, collaboration, communication); The role of mathematical thinking in strengthening numeracy

No/Code	Study Material (BK)	Description of Study Materials
		literacy; Metacognitive skills: reflection on one's own thinking processes; Implications for the national curriculum and assessment (AKM, PISA))
BK 2.12	Teaching Resources and Materials Development	1. Design of learning modules 2. Types of innovative worksheets (project-based, contextual, digital)
BK 2.13	Computational Thinking	1. The Nature of Computational Thinking (CT) (Definition and scope of Computational Thinking; History and development of the CT concept in education; Differences and relationships between CT and critical, logical, and algorithmic thinking; The urgency of CT in 21st-century learning and Merdeka Belajar) 2. Core Components of Computational Thinking (Decomposition: Breaking down complex problems into smaller parts; Pattern Recognition: Analysing similarities or patterns in data and problems; Abstraction: Filtering out important information and eliminating irrelevant details; Algorithmic Thinking: Formulating logical steps to solve problems) 3. CT and Digital Literacy in Education (The relationship between CT and programming, coding, and technological literacy; CT as the foundation for developing ICT and STEM skills; Educational tools and platforms (Scratch, Blockly, Bebras, etc.) 4. CT in School Learning and Curricula (Integration of CT into the curriculum (primary, lower secondary, upper secondary schools); CT-based learning strategies: problem-based learning, project-based learning, inquiry-based learning; CT in the design of learning tasks and assessments) 5. Challenges and Opportunities for CT Implementation in Indonesian Education (Barriers to CT integration: teacher readiness, resources, and curriculum; Opportunities to strengthen CT through the Merdeka Belajar policy and digital literacy; The role of teachers as facilitators of higher-order thinking skills
BK 3.1	Mathematics Learning Planning	1. Development of Lesson Plans (RPP) using the Problem-Based Learning (PBL) Model 2. Development of Lesson Plans (RPP) using the Project-Based Learning (PjBL) Model 3. Development of Lesson Plans (RPP) using the Discovery Learning Model 4. Development of Lesson Plans (RPP) using the Inquiry-Based Learning Model 5. Development of Lesson Plans (RPP) using Cooperative Learning Models (Jigsaw, STAD, Think Pair Share, etc.) 6. Development of Lesson Plans (RPP) using the Contextual Teaching and Learning (CTL) Model 7. Development of Differentiated Lesson Plans (RPP) 8. Development of Lesson Plans (RPP) based on TPACK (Technological Pedagogical Content Knowledge)
BK 3.2	Joyful Learning in Mathematics Education	1. Designing Outdoor Mathematics Learning 2. Designing the Integration of STEAM in Enjoyable Mathematics Learning 3. Designing Project- and Experiment-Based Joyful Learning in Mathematics Education

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No/Code	Study Material (BK)	Description of Study Materials
		4. Designing joyful mathematics learning using an ethnomathematics approach through case studies: designing mathematics projects based on local culture and 5. Designing community-based learning: student–community collaboration)
BK 3.3	Mathematical Thinking	1. Application of Mathematical Thinking in School Learning (Designing learning that fosters students' critical, creative, and reasoning skills; Example activities: Open-ended questions, Pattern exploration, Argumentative discussions, Analysis of students' errors and thinking patterns, Development of mathematical thinking assessment instruments) 2. Development of Mathematical Thinking-Based Questions and Activities (Characteristics of questions that stimulate higher-order thinking; Techniques for constructing HOTS-based questions that measure critical, creative, and reasoning skills; Practice in constructing and testing questions, as well as creating assessment rubrics; Lesson plans that focus on the thinking process, not just the final outcome)
BK 3.4	Educational Management	Case Analysis 1. Case Study 1: School financial management; 2. Case Study 2: Special needs management 3. Case Study 3: Educational supervision
BK 3.5	Ethics and Educational Profession	1. Case Studies and Ethics and Educational Profession Practice (Discussion of real-life cases of ethical breaches or dilemmas faced by teachers; Simulation of ethical decision-making in classroom situations; Professional communication practice (e.g. providing feedback, managing conflict); Assessment of professionalism based on observation and reflection) 2. Case studies of ethical breaches in education and alternative resolutions
BK 3.6	Mathematics Learning Innovation	1. Designing a Project-Based Learning (PBL) model for school mathematics curriculum to enhance conceptual understanding through tangible outcomes; 2. Designing a Problem-Based Learning (PBL) model for school mathematics curriculum to encourage students to solve open-ended problems to construct mathematical concepts; 3. Designing Discovery Learning & Inquiry-Based Learning models for school mathematics to support students in actively discovering concepts through exploration; 4. Designing a Realistic Mathematics Education (RME) model: linking mathematics to real-world contexts; 5. Designing STE(A)M Learning Models in mathematics education: Integrating mathematics, science, technology, and the arts into a single activity; 6. Designing the Scientific Approach (5M: Observing, Questioning, Reasoning, Experimenting, Concluding) in school mathematics learning; 7. Designing an Expository Approach in school mathematics teaching 8. Designing a Contextual Approach (CTL); 9. Designing the Flipped Classroom: Students study the material at home and discuss/practise in class.

No/Code	Study Material (BK)	Description of Study Materials
BK 3.7	Teaching Practice	1. Teaching Skills 2. Questioning Skills 3. Reinforcement Skills 4. Skills in Introducing Variation 5. Skills in Opening and Closing Lessons 6. Classroom Management Skills 7. Skills in Facilitating Group Discussions 8. Skills in Teaching Small Groups or Individuals
BK 3.8	Mathematics Learning Assessment	1. Designing authentic assessments and digital portfolios for school mathematics learning; 2. Designing project-based and performance-based assessments; 3. Designing problem-based assessments 4. Designing the use of technology for formative and summative assessment; 5. Designing peer assessment and self-assessment for innovation-based learning in school mathematics 6. Formulating learning objectives (KKA, TP, ATP) for school mathematics content 7. Developing question frameworks and indicators 8. Developing multiple-choice, essay, fill-in-the-blank, Higher-Order Thinking Skills (HOTS) and contextual questions 9. Developing non-test instruments (observation, portfolios, rubrics, projects) 10. Testing test and non-test instruments in schools (validity, reliability, objectivity, practicability) 11. Analysing instruments (question quality analysis (discriminatory power, difficulty level, distractor effectiveness), 12. Conducting Criterion-Referenced Assessment (CRA) and Norm-Referenced Assessment (NRA) 13. Processing and interpreting results (scoring and processing marks, interpreting evaluation results, mapping learning outcomes) 14. Follow-up & Feedback (Reflection on pupils' learning outcomes, Strengthening the learning process, Improving learning strategies)
BK 3.9	Mathematics Learning Strategies	1. Designing Collaborative and Student-Centred Strategies (Cooperative learning (STAD, Jigsaw, TAI, Numbered Heads Together); Integrative thematic learning; Think-Pair-Share and mathematical discussion strategies; Project-based learning (Mathematics Projects)) 2. Designing Strategies to Integrate Literacy and Numeracy (Strengthening mathematical literacy through contextual problems; Developing reasoning skills) 3. Designing Differentiation Strategies in Mathematics Learning (Differentiation of content, process and products; Adapting strategies based on students' learning styles and readiness; Examples of applying differentiation to specific topics, communication and problem-solving; Integrating the Pancasila learner profile into learning)
BK 3.10	English for Mathematics	1. Mathematical vocabulary, 2. Reading and writing mathematical texts, 3. Speaking and listening in the academic presentation of mathematical concepts,

No/Code	Study Material (BK)	Description of Study Materials
		4. Translating and compiling mathematics teaching materials in English
BK 3.11	Entrepreneurial Skills	1. Human Resources & Operational Management: Job Analysis and Supply Chain (Planning and Strategising)
BK 3.12	Entrepreneurial Intention	1. Financial Management: Financial Projections & Working Capital Requirements (Unit Product Cost and Pricing Method)
BK 3.13	Manipulative Teaching Aid Development	1. Needs Analysis 2. Analysis of Tools and Materials 3. Design of manipulative teaching aids tailored to the characteristics of the learners
BK 3.14	Development of Teaching Resources and Materials	1. Design of learning modules 2. Types of innovative worksheets (project-based, contextual, digital)
BK 3.15	Computational Thinking	1. Designing Computational Thinking-based Learning in Everyday Life and the World of Education (CT in non-computational contexts (social issues, logistics, management, etc.); CT in cross-curricular learning: mathematics, science, language, social studies; Case studies of CT use in real-world problem-solving) 2. Design of Computational Thinking Activities and Assessment (Designing CT activities according to learning levels and contexts; Examples of worksheets, educational games, and CT simulations; CT assessment rubrics and methods for measuring students' computational thinking skills)
BK 3.16	Design and creation of manipulative teaching aids	1. Theoretical foundations of the design and creation of manipulative teaching aids 2. Basic concepts of manipulative teaching aids 3. Characteristics of effective manipulative teaching aids 4. Types of manipulative teaching aids
BK 3.17	Mathematics Education Curriculum Analysis	1. Designing and implementing contextual, innovative, and learner-centred mathematics learning that aligns with the development of the mathematics curriculum within the context of national and global education. 2. Evaluating the relationship between objectives, content, methods, assessment, and the suitability of textbooks, as well as the challenges of curriculum implementation, to design integrative and TPACK-based mathematics learning strategies.
BK 4.1	Calculus	1. Real number systems, absolute value, and graphs of equations; 2. Functions and limits; 3. Derivatives; 4. Indefinite integrals 5. Definite integrals 6. Functions of two variables, partial derivatives and field equations 7. Chain rule, total and directed derivatives, Lagrange multipliers 8. Double integrals 9. Two-dimensional vector fields, line integrals and the curl 10. Green's theorem 11. Triple integrals 12. 3-dimensional vector fields

No/Code	Study Material (BK)	Description of Study Materials
		13. 3-dimensional flux 14. divergence theorem 15. 3-dimensional line integral 16. Stokes' theorem
BK 4.2	Algebra	1. Mathematical Logic 2. Number Systems: integers, rational numbers, real numbers, complex numbers 3. Basic algebraic operations on real and complex numbers: addition, subtraction, multiplication, division 4. Functions and Relations 5. Equations and Inequalities: linear, quadratic, absolute value 6. Systems of Linear Equations 7. Sequences and Series 8. Exponents and Logarithms 9. Polynomial and Rational Functions 10. Systems of Linear Equations 11. Matrices 12. Determinants of matrices 13. Vectors in R^2 and R^3 14. Euclidean Vector Space 15. General Vector Spaces 16. Inner Product Space 17. Eigenvalues 18. Eigenvector 19. Linear Transformations 20. Ring Theory 21. Group Theory
BK 4.3	Geometry	1. Points and lines in the plane 2. Triangles, quadrilaterals, polygons and circles 3. Points and lines in space 4. Relationships between lines and lines, lines and planes, planes and planes, 5. Relationships of parallelism and perpendicularity between lines and planes, and between planes and planes, 6. Angles between lines, Angles between a line and a plane, Angles between two planes, 7. Distance between a point and a plane, 8. Prisms and cubes, 9. Polyhedra 10. Pyramids 11. Rotational solids 12. Cones and truncated cones, 13. Spheres 14. Cartesian 15. Circle 16. Parabola 17. Ellipse 18. Hyperbola 19. Parametric Equations 20. Rotation 21. Reflection 22. Isometry 23. Product of Transformations 24. Inverse Transformation 25. Half-turn

No/Code	Study Material (BK)	Description of Study Materials
		26. Translation 27. Rotation 28. Dilation
BK 4.4	Statistics	1. Measures of central tendency 2. Measures of dispersion 3. Data presentation 4. Discrete and Continuous Random Variables 5. Discrete and Continuous Distributions 6. Joint and Conditional Distributions 7. Expectation 8. Variance 9. Moment-generating functions 10. Hypothesis testing for means 11. Proportions Hypothesis Test 12. Variance hypothesis test 13. Analysis of Variance 14. Regression analysis 15. Correlation Analysis 16. Forecasting methods: linear trend, non-linear, seasonal dummy, Naive, Simple Average, Moving Average 17. Exponential Smoothing Model 18. Decomposition Models 19. Box-Jenkins Model
BK 4.5	Probability Theory	1. Sets 2. Permutations 3. Combinations 4. Pigeonhole 5. Probability 6. Bayesian 7. Conditional 8. Generating Function 9. Recursive Relations
BK 4.6	Numbers	1. Mathematical induction 2. Divisibility Relations 3. GCD 4. LCM 5. Number bases 6. Prime numbers 7. Simple factorisation 8. Congruence relations and their applications 9. Fermat and Wilson 10. Arithmetic functions 11. Euler 12. Primitive roots and indices
BK 4.7	Linear Programming	1. Definitions and principles of linear programming 2. Mathematical Models and Linear Inequalities 3. Solutions to Linear Programming 4. Simplex Method 5. Primal-Dual Method
BK 4.8	Analysis	1. Mathematical Induction 2. Real Numbers 3. Sequences of Real Numbers 4. Limit Theorem for Functions 5. Theorem on Continuous Functions 6. Complex numbers: definition, algebraic properties, geometric meaning

No/Code	Study Material (BK)	Description of Study Materials
		7. Polar coordinates, Euler's formula 8. Roots of complex numbers 9. Analytic functions: functions of a complex variable, mappings, 10. Limits and continuity of complex numbers, 11. Derivatives: derivatives of polynomial functions, 12. Cauchy-Riemann equations (CRE), 13. Polar form of the CREs, 14. Analytic functions, harmonic functions,
BK 4.9	Graph	1. Concepts of Graphs 2. Graph algorithms
BK 4.10	Numerical Methods	1. Error; 2. Roots of Non-linear Equations; 3. Solutions to Linear Systems via LU Decomposition, Jacobi Iteration, Gauss-Seidel Iteration; 4. Function Approximation; 5. Interpolation
BK 4.11	Differential Equations	1. First-order differential equations, 2. Second-order differential equation, 3. nth-order differential equation, 4. D operator
BK 4.12	Elementary School Mathematics	1. Characteristics of Mathematics Learning in Primary School 2. Identifying and addressing pupils' misconceptions
BK 4.13	Junior High School Mathematics	1. Characteristics of Mathematics Learning in Secondary School 2. Common student misconceptions & how to address them
BK 4.15	Entrepreneurial Skills	1. Business Model Canvas Theory (Business Models) 2. Basic Concepts of Business Intelligence 3. Big Data in Education 4. Business Intelligence Tools 5. Data-Driven Decision Making 6. Business Models for Mathematics Education 7. Market Research & Competitive Analysis 8. Monetisation Strategies for Educational Products 9. The CRISP-DM and OSEMN Processes 10. Definition & Characteristics of Big Data 11. Hadoop, Spark and NoSQL Ecosystems 12. Distributed storage (HDFS), distributed computing (MapReduce) 13. Data lake architecture vs data warehouse 14. Streaming data vs batch data 15. Data pipelines & ingestion (Kafka, Flume) 16. Cloud platforms: AWS, GCP, Azure (overview) 17. Scalability, security, and privacy issues with big data 18. Tools: Apache Hadoop, Spark (introduction), MongoDB, Google BigQuery (overview)
BK 4.16	Mathematical Economics	1. Classify, analyse, and interpret financial data, including break-even point calculations, the preparation of financial statements (profit and loss, balance sheet), and simple tax calculations. 2. Supply and Demand 3. Annuities 4. Insurance 5. Savings and Loans (Credit and Savings) 6. Subsidies

No/Code	Study Material (BK)	Description of Study Materials
BK 4.17	Research	1. Quantitative Research Design, 2. Qualitative Research Design, 3. Research and Development, 4. Design Research, 5. Realistic Mathematics Approach, 6. Quantitative Data Collection Techniques, 7. Qualitative Data Collection Techniques, 8. Quantitative Data Analysis Techniques, 9. Qualitative Data Analysis Techniques
BK 5.1	Calculus	1. Application of derivatives in solving mathematical and contextual problems 2. Application of integral concepts in solving mathematical and contextual problems 3. Application of higher-order derivative concepts in solving mathematical and contextual problems 4. Application of multiple integrals in solving mathematical and contextual problems
BK 5.2	Algebra	1. Application of linear equations and inequalities in determining speed, distance, time, profit in sales, and other fields. 2. Application of quadratic functions in physics and engineering problems 3. The application of rational and irrational functions in economics, engineering and other fields 4. Application of logarithms and exponentials in modelling phenomena across various fields 5. Application of sequences and series in compound interest calculations, economic growth, instalments, savings, population, bacteria, floor patterns, and so on. 6. The application of polynomials in modelling 7. The application of systems of linear equations in economics, physics and other fields 8. The application of matrices in the presentation of systems of linear equations with multiple variables, in data management and other fields 9. Application of elementary linear algebra in cryptography, Markov chains, and so on.
BK 5.3	Geometry	1. The application of geometry in architectural engineering design and other contextual problems 2. The application of transformational geometry in architectural engineering and other contextual problems. 3. Applications of Analytical Geometry in various fields
BK 5.4	Statistics	1. Applying measures of central tendency to contextual problems 2. Application of measures of data dispersion to contextual problems 3. Presenting data in contextual problems 4. Using hypothesis testing of means to make decisions 5. Using proportion hypothesis tests to make decisions 6. Using variance hypothesis tests to make decisions 7. Using analysis of variance to make decisions 8. Using regression analysis to make decisions 9. Using correlation analysis to make decisions 10. Using forecasting methods to solve contextual problems

No/Code	Study Material (BK)	Description of Study Materials
BK 5.5	Probability Theory	1. Application of permutations, combinations and the pigeonhole principle to combinatorial problems 2. Application of probability in determining contextual probability problems
BK 5.6	Numbers	1. Applying GCD and LCM to various contextual problems 2. Applying congruence relations in various contextual problems
BK 5.7	Linear Programming	Applying linear programming methods to optimisation, transport and scheduling problems
BK 5.8	Graphs	Applications of graphs in mapping, navigation, networks, routing and other fields.
BK 5.9	Numerical Methods	Applying numerical methods to contextual problems
BK 5.10	Differential Equations	Applying differential equations in engineering and other fields
BK 5.11	Computational Thinking	1. The Application of Computational Thinking Instructional Design in Everyday Life and the World of Education 2. The Application of Computational Thinking Activity and Assessment Design in Mathematics Teaching in Schools
BK 5.12	Joyful Learning in Mathematics Education	1. Designing Outdoor Mathematics Learning 2. Designing the Integration of STEAM in Enjoyable Mathematics Learning 3. Designing Project-Based and Experimental Joyful Learning in Mathematics Education Activities 4. Designing enjoyable mathematics learning using an ethnomathematics approach through case studies: designing mathematics projects based on local culture and 5. Designing community-based learning: student–community collaboration)
BK 5.13	Elementary School Mathematics	Strategies for teaching place value, number operations, basic geometry, mathematical patterns, simple data, and measurement
BK 5.14	Junior High School Mathematics	Strategies for teaching algebra and functions, equations and inequalities; plane and solid geometry; geometric transformations, statistics and probability, basic calculus
BK 5.15	Outdoor Mathematics	1. Application of Geometry in Traditional Architecture (Building Structures, Traditional Houses) 2. Application of Patterns and Numbers in Traditional Ceremonies (Calendar Systems, Ceremonial Cycles) 3. Application of Data and Statistics in Community Life (Craft Production, Cultural Tourism) 4. Application of Linear Programming in Entrepreneurship
BK 5.16	Discrete Mathematics	1. Application of Recursive Relations in Solving Contextual Problems 2. Application of Generating Functions to Solve Contextual Problems
BK 6.1	Techniques for Drafting Research Proposals	1. Compiling a Literature Review, 2. Techniques for Finding References, 3. Citation Techniques, 4. Techniques for Presenting Simple Data 5. Writing Paragraphs in accordance with Indonesian language

No/Code	Study Material (BK)	Description of Study Materials
		conventions, 6. Producing Academic Papers in accordance with Indonesian Spelling Rules 7. More complex data presentation techniques
BK 6.2	Research Methods	1. Quantitative Research Design, 2. Qualitative Research Design, 3. Research and Development, 4. Design Research, 5. The Realistic Mathematics Approach, 6. Quantitative Data Collection Techniques, 7. Qualitative Data Collection Techniques, 8. Quantitative Data Analysis Techniques, 9. Qualitative Data Analysis Techniques, 10. Application of data analytics software in research
BK 6.3	Publication of Scientific Papers	1. Presentation of Scientific Work in Indonesian, 2. Presentation of Scientific Work in English, 3. Presenting research findings or critical analysis of mathematics education in the form of a scientific article in Indonesian, 4. Presenting research findings or critical analysis of mathematics education in the form of a scientific article in English.
BK 6.4	Seminar in Mathematics Education	1. Examination of current issues in mathematics education 2. Trends and Mathematics Learning Innovation 3. Rules for writing scientific articles 4. Problems examined in depth; 5. Conceptual and theoretical frameworks forming the basis for theoretical problem-solving. 6. The methodology selected to address the research problem
BK 6.5	Final Project	1. Writing of scientific research results related to mathematics or mathematics education. 2. Writing the Introduction 3. Writing the Theoretical Review 4. Writing the Research Methodology 5. Writing of Results and Discussion 6. Writing the Conclusion
BK 7.1	Technology-Based Entrepreneurship	1. Market Analysis 2. Technology in the Education Business 3. Product and Service Design Digital Mathematics Business 4. Finance and Funding 5. Product Development 6. Digital Marketing Strategies for Educational Products
BK 7.2	Mathematical Economics	1. Application: a. Classify, analyse and interpret financial data, including break-even point calculations, the preparation of financial statements (profit and loss, balance sheet) and simple tax calculations b. Supply and Demand c. Annuities d. Insurance e. Savings and Loans (Credit and Savings) f. Subsidies in business and banking
BK 8.1	Community Service Program – Digital Literacy	Digital Literacy

No/Code	Study Material (BK)	Description of Study Materials
BK 8.2	Community Service Program – Problem Solving in the Community	Community Empowerment
BK 8.3	Community Service Program – Inclusive and Exclusive Leadership	Inclusive and Exclusive Leadership
BK 8.4	Community Service Program – Non-Formal Education	Knowledge of POS PAUD, PAUD, Kindergarten, Madin, Islamic Boarding Schools, Places of Worship
BK 8.5	Teaching Practice	1. Curriculum analysis; 2. Teaching Resources and Materials Development (lesson plans, media, worksheets, teaching materials, assessment tools); 3. Conducting learning activities using a variety of teaching strategies and learning media; 4. Classroom management; 5. Use of information and communication technology in teaching; 6. Conducting assessment and evaluation of learning; 7. Management of co-curricular and extra-curricular activities; and 8. Teachers' administrative duties.
BK 8.6	Entrepreneurial Skills	1. Presentation and Review of the Business Model Canvas (Business Idea Creation) 2. Creating a business analysis project using Data Analytics 3. Business analysis project using data visualisation 4. Business analysis project using big data 5. Business analysis project using forecasting methods 6. Business analysis project development using business intelligence 7. Development of business analysis projects using various data analytics software
BK 8.7	Entrepreneurial Skills	Presentation and Review of the Business Model Canvas (Business Idea Creation)
BK 8.8	Entrepreneurial Intention	Marketing Management: STP, Marketing Mix, and SWOT Analysis (Marketing Plan and Channels)
BK 8.9	Entrepreneurial Intention	Marketing Management: Digital Marketing, Branding (Marketing Plan and Channel)
BK 8.10	Learning Media Evaluation	Ethics in learning evaluation
BK 8.11	Media Production Management*	Programme planning & media programme evaluation
BK 8.12	Hypermedia*	Hypermedia Project Development
BK 8.13	3D Animation*	3D Animation Project Development
BK 8.14	Outdoor Mathematics	Activity Reporting
BK 8.15	Microteaching	Teaching Resources and Materials Development , learning resources, and educational videos
BK 8.16	Design and creation of manipulative teaching aids	1. Design and Development of Manipulative Teaching Aids 2. Stages of designing manipulative teaching aids 3. Tools and materials for making manipulative teaching aids 4. Production of a manual for the creation and use of manipulative teaching aids 5. Integration of teaching aids into lesson plans 6. Production of manipulative teaching aids

No/Code	Study Material (BK)	Description of Study Materials
BK 8.17	Programming algorithms	Creating programmes to solve mathematical problems using 7. the basics of programming logic, 8. the use of data types and variables, 9. control structures (branching and loops), 10. functions, 11. array processing and 12. simple data structures, 13. application of basic algorithms to solve mathematical problems
BK 8.18	Mathematical thinking	1. Case study analysing the implementation of instructional design that fosters mathematical thinking skills in schools 2. Case study analysing the implementation of question development and activities based on mathematical thinking in schools
BK 8.19	Final Project	Making independent and responsible decisions in solving complex problems in the field of mathematics education
BK 9.1	Programming algorithms	1. Data collection 2. Data Pre-processing (Data Cleaning & Preparation) 3. Data Exploration and Visualisation (EDA) 4. Statistical Analysis and Machine Learning
BK 9.2	Data Analytics	1. Identifying data analysis needs in business 2. Case studies based on types of data analytics 3. Data cleaning 4. Data validation 5. Data collection 6. Data classification 7. Data clustering 8. Data exploration 9. Data frame 10. The use of software in decision-making by applying: Forecasting methods including linear trend models, non-linear models, seasonal dummy models, Naive models, Simple Average models, and Moving Average models; Exponential Smoothing models; Decomposition models; Box-Jenkins models 11. The application of Big Data in determining business strategies or decisions 12. Ability to apply inferential statistics to make data-driven decisions in a business
BK 9.3	Data analytics software	Introduction to data analytics software, including: installation, introduction to features or menus within the software, advantages of the software, disadvantages of the software, and its uses. 1. Microsoft Excel 2. Tableau 3. Power BI 4. SPSS 5. Minitab 6. R 7. SAS
BK 9.4	Data Visualisation	1. Introduction to Data Visualisation 2. Basic Principles of Effective Visualisation 3. Representation Techniques Based on Data Types 4. Types of Charts (Bar, Line, Pie, Histogram, Scatter, Boxplot, etc.)

No/Code	Study Material (BK)	Description of Study Materials
		5. Mapping Data to Visuals (Encoding Position, Colour, Shape, Size) 6. Visualisation of Categorical, Numerical, and Time Data 7. Visualisation of Multivariate and Complex Data 8. Dashboards and Data Storytelling 9. Common Errors in Visualisation and Data Presentation Ethics 10. Use of Visualisation Software (Excel, Tableau, Power BI) 11. Visualisation with Programming Languages (Python – Matplotlib, Seaborn, Plotly) 2. Interactive Visualisation for the Web (D3.js, Dash) 3. Geospatial Data Visualisation (Maps, Heatmaps) 4. Data Visualisation Projects and Presentation of Analysis Results
BK 9.5	Business Intelligence	Application of business intelligence concepts and theories in business management and organisation.
BK 10.1	Digital Learning Media Development	1. Creation of proposals and storylines for learning media 2. Development of Interactive Learning Media (Adobe Animate) 3. Development of Augmented Reality (AR) and Virtual Reality (VR) Media
BK 10.2	Educational Technology Applications	1. Design of a Learning Management System (LMS): Google Classroom, Moodle, or Edmodo 2. Use of Spreadsheet Software: Microsoft Excel (Spreadsheet) or similar applications used for data calculation and analysis. 2. Use of Presentation Software: Microsoft PowerPoint, CANVA or similar applications used to create learning presentations. 3. Creating Educational Videos: CANVA, Capcut, Animaker. 4. Gamification in mathematics learning (Kahoot, Quizizz, Math Games)
BK 10.3	Graphic design	1. 2D Asset Creation (using Adobe Animate) 2. 3D Asset Creation (with Blender) 3. Basic 2D animation 4. Basic 3D Animation
BK 10.4	Teaching Resources and Materials Development	1. Development of mathematics teaching materials for various learning models based on TPACK and UDL (Universal Design for Learning) 2. Design of innovative worksheets (project-based, contextual, digital)
BK 10.5	Learning Media Evaluation	1. Basic Concepts of Learning Media Evaluation 2. Types and Approaches to Evaluation 3. Criteria and Instruments for Evaluating Learning Media 4. Stages of Learning Media Evaluation 5. Techniques for Collecting and Analysing Evaluation Data 6. Validation and Reliability of Evaluation Instruments 7. Reporting the Results of Learning Media Evaluation
BK 10.6	Media Production Management*	1. Basic concepts of media production management 2. Planning and organising media production 3. Management of production resources 4. Creativity and content management 5. Media distribution and utilisation 6. Ethics, law and regulation 7. Trends and innovations in media production

No/Code	Study Material (BK)	Description of Study Materials
BK 10.7	Hypermedia*	1. Basic Concepts of Hypermedia 2. Hypermedia Structure and Architecture 3. Hypermedia Technologies and Platforms (Hypermedia development software (e.g. Adobe Director, H5P, Unity), Web and markup technologies (HTML, CSS, XML) 4. Interactive Design and User Experience (UX) 5. Multimedia Integration in Hypermedia 6. Hypermedia in an Educational Context
BK 10.8	3D Animation*	1. Introduction to 3D Animation 3. Fundamentals of 3D Modelling 4. Texturing and Material Techniques 5. Lighting in 3D Animation 6. Camera and Perspective 7. Basics of Rigging and Skinning 8. Basic Animation Techniques

6. Course Structure and Credit Allocation

Table 6.1 Matrix of PLO alignment with course content

PLO	Course Content
PLO 1 – Able to demonstrate character and conduct that reflect adaptability, enthusiasm, and integrity as an expression of devotion to God the Almighty	BK 1.1 Islamic Religious Education BK 1.2 Christian Religious Education BK 1.3 Catholic Religious Education BK 1.4 Buddhist Religious Education BK 1.5 Hindu Religious Education BK 1.6 Confucian Religious Education BK 1.7 PGRI Studies BK 1.8 Pancasila Education BK 1.9 Civic Education BK 1.10 Ethics and Educational Profession BK 1.11 Microteaching BK 1.12 Internship Attitude BK 1.13 Attitudes towards Mathematics Seminars BK 1.14 Community Service Attitude BK 1.15 Entrepreneurial Attitude BK 1.16 English BK 1.17 Indonesian Language
PLO 2 – Able to analyse educational theories, learner characteristics, and pedagogical principles underpinning effective, learner-centred mathematics learning	BK 2.1 Educational Management BK 2.2 Mathematics Educational Psychology BK 2.3 Mathematics Education Curriculum Analysis BK 2.4 Mathematics Learning Strategies BK 2.5 Mathematics Learning Assessment BK 2.6 Mathematics Learning Innovation BK 2.7 Ethics and Educational Profession BK 2.8 Foundations of Education BK 2.9 Philosophy of Mathematics Education BK 2.10 Joyful Learning in Mathematics Education BK 2.11 Mathematical Thinking BK 2.12 Teaching Resources and Materials Development BK 2.13 Computational Thinking
PLO 3 – Able to design, implement, and evaluate innovative mathematics learning based	BK 3.1 Mathematics Learning Planning BK 3.2 Joyful Learning in Mathematics Education

PLO	Course Content
on content knowledge, pedagogy, and technology (TPACK) that is responsive to the socio-cultural context and the needs of learners	BK 3.3 Mathematical Thinking BK 3.4 Educational Management BK 3.5 Ethics and Educational Profession BK 3.6 Mathematics Learning Innovation BK 3.7 Teaching Practice BK 3.8 Mathematics Assessment BK 3.9 Mathematics Learning Strategies BK 3.10 English for Mathematics BK 3.11 Entrepreneurial Skills BK 3.12 Entrepreneurial Intention BK 3.13 Manipulative Teaching Aid Development BK 3.14 Development of Teaching Resources and Materials BK 3.15 Computational Thinking BK 3.16 Manipulative Teaching Aid Development BK 3.17 Mathematics Education Curriculum Analysis
PLO 4 – Able to apply mathematical concepts at primary and secondary education levels in a conceptual and contextual manner, and present them using pedagogical approaches appropriate to the learners' development	BK 4.1 Calculus BK 4.2 Algebra BK 4.3 Geometry BK 4.4 Statistics BK 4.5 Probability Theory BK 4.6 Numbers BK 4.7 Linear Programming BK 4.8 Analysis BK 4.9 Graphs BK 4.10 Numerical Methods BK 4.11 Differential Equations BK 4.12 Elementary School Mathematics BK 4.13 Junior High School Mathematics BK 4.15 Entrepreneurial Skills BK 4.16 Mathematical Economics BK 4.17 Research
PLO 5 – Able to independently and continuously apply the principles of advanced competency development to enhance readiness to face changes and challenges in the digital age	BK 5.1 Calculus BK 5.2 Algebra BK 5.3 Geometry BK 5.4 Statistics BK 5.5 Probability Theory BK 5.6 Numbers BK 5.7 Linear Programming BK 5.8 Graphs BK 5.9 Numerical Methods BK 5.10 Differential Equations BK 5.11 Computational Thinking BK 5.12 Joyful Learning in Mathematics Education BK 5.13 Elementary School Mathematics BK 5.14 Junior High School Mathematics BK 5.15 Outdoor Mathematics BK 5.16 Discrete Mathematics
PLO 6 – Able to conduct research and publish scholarly works in the field of mathematics education in accordance with academic standards and the needs of society.	BK 6.1 Techniques for Drafting Research Proposals BK 6.2 Research Methods BK 6.3 Publication of Scientific Works BK 6.4 Seminar in Mathematics Education BK 6.5 Final Project
PLO 7 – Able to design and manage technology-based business ideas, as well as	BK 7.1 Technology-Based Entrepreneurship BK 7.2 Mathematics for Economics

PLO	Course Content
create creative solutions and educational products in the field of mathematics education	
PLO 8 – Able to make independent and responsible decisions in resolving complex problems in the fields of education, research, and professional development.	BK 8.1 Community Service Program – Digital Literacy BK 8.2 Community Service - Problem Solving in the Community BK 8.3 Community Service Program – Inclusive and Exclusive Leadership BK 8.4 Community Service Program – Non-Formal Education BK 8.5 Teaching Practice BK 8.6 Entrepreneurial Skills BK 8.7 Entrepreneurial Skills BK 8.8 Entrepreneurial Intention BK 8.9 Entrepreneurial Intention BK 8.10 Learning Media Evaluation BK 8.11 Media Production Management* BK 8.12 Hypermedia* BK 8.13 3D Animation* BK 8.14 Outdoor Mathematics BK 8.15 Microteaching BK 8.16 Manipulative Teaching Aid Development BK 8.17Algorithms and Programming BK 8.18 Mathematical thinking BK 8.19 Final Project
PLO 9 – Able to analyse and visualise data using technology in accordance with the principles and procedures of data analytics to make evidence-based decisions	BK 9.1Algorithms and Programming BK 9.2 Data Analytics BK 9.3 Data analytics software BK 9.4 Data Visualisation BK 9.5 Business Intelligence
PLO 10 – Able to develop creative and contextual multimedia mathematics learning materials	BK 10.1 Development of digital learning materials BK 10.2 Educational Technology Applications BK 10.3 Graphic design BK 10.4 Teaching Resources and Materials Development BK 10.5 Learning Media Evaluation BK 10.6 Media Production Management* BK 10.7 Hypermedia* BK 10.8 3D Animation*
PLO 11 – Evaluating and integrating concepts of religion, nationalism, the constitution, language, and technology-based entrepreneurship with the 5A values (anti-violence, anti-drugs, anti-bullying, anti-intolerance, and anti-corruption) to support the development of professional knowledge and practice	BK 11.1 Community Service BK 11.2 PGRI Studies Studies BK 11.3 Pancasila Education BK 11.4 Citizenship Education BK 11.5 Islamic Religious Education BK 11.6 Christian Religious Education BK 11.7 Catholic Religious Education BK 11.8 Buddhist Education BK 11.9 Hindu Religious Education BK 11.10 Confucian Religious Education BK 11.11 English BK 11.12 Indonesian Language BK 11.13 Communication & Negotiation Skills

Table 6.2 Determination of Course Modules through Study Materials in the PLO Descriptors

Study Materials	Elements in BK	Formation of Course Modules	Course Name
1.1 Islamic Religious Education	1. Humanity and Religion 2. The concepts of faith, Islam and ihsan in shaping the perfect human being 3. Concepts of ethics, morals and character (anti-corruption, anti-bullying, anti-intolerance, anti-sexual violence, anti-drugs) 4. Grounding Islam in Indonesia 5. Islam fosters unity amidst diversity 6. Islam and the challenges of modernisation 7. Islam's Contribution to the Development of World Civilisation 8. Democracy and Human Rights from an Islamic Perspective 9. Islamic Politics and Law	1.1.1 1.1.2 1.1.3 1.1.4 1.1.5 1.1.6 1.1.7 1.1.8 1.1.9	1. Islamic Religious Education
1.2 Christian Religious Education	1. God the Creator: Creating, saving and accompanying. 2. Human beings, God's creation: Created in the image and likeness of the Creator. 3. Christian Ethics, Morals and Character: Against sexual harassment. 4. Human Rights and Responsibilities. 5. Faith, Knowledge and Service. 6. Christianity and Culture. 7. Interfaith Harmony: Building Tolerance. 8. Diversity as a Reality. 9. Human Rights: Humanising Humanity: Anti-Bullying, 10. Democracy. 11. Work as a Mandate from God: Anti-Corruption. 12. The Relationship Between Religion and the State According to Christianity. 13. The Law of Love: The foundation of Christian life in all aspects of life.	1.2.1 1.2.2 1.2.3 1.2.4 1.2.5 1.2.6 1.2.7 1.2.8 1.2.9 1.2.10 1.2.11 1.2.12 1.2.13	2. Christian Religious Education
1.3 Catholic Religious Education	1. Who is man according to the Bible? 2. Reasoning, exploring arguments, understanding and the nature of humanity as the image of God.	1.3.1 1.3.2 1.3.3 1.3.4 1.3.5 1.3.6	3. Catholic Religious Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	3. Communicating the calling and mission of humanity as the image of God. 4. Exploring the relationship of human beings with themselves, others, the environment and God. 5. Communicating the relationship of human beings with themselves, others, the environment and God. 6. Religion as the completion of the understanding of the macrocosm and microcosm. 7. The lived experience of religious life within the Catholic Church. 8. The meaning of religious pluralism. 9. Interfaith cooperation for the development of the whole person. 10. A personal encounter with Jesus in the Bible. 11. The meaning of the Passion, death and resurrection of Jesus Christ. 12. The Meaning of the Trinity. 13. The nature and mission of the Catholic Church for the preservation of life. 14. Living out faith in a pluralistic society. 15. Faith for the creation of Pancasila-based builders.	1.3.7 1.3.8 1.3.9 1.3.10 1.3.11 1.3.12 1.3.13 1.3.14 1.3.15	
1.4 Buddhist Religious Education	1. A study of the concept of sāddha in the suttas (e.g. Sāleyyaka Sutta, Kalama Sutta), the typology of saddhā (buttika, ākāra, bala), the function of saddhā in the spiritual life of Buddhists, and the strengthening of faith through practice. 2. Contemporary issues such as secularism, spiritual crisis, and pluralism; the Buddhist ‘ ’ approach to the concept of divinity (without a creator), and the relevance of nibbāna and the brahmavihāras in addressing contemporary spiritual needs. 3. Buddhist perspectives on anattā, dukkha, paṭiccasamuppāda, and nibbāna; the dignity of human beings as moral beings with the potential for enlightenment; the relevance of these teachings in addressing the questions of modern life.	1.4.1 1.4.2 1.4.3 1.4.4 1.4.5 1.4.6 1.4.7 1.4.8 1.4.9	4. Buddhist Religious Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	4. Teachings on dāna, sīla, karuṇā, mettā, and samacariya; the role of the Buddhist community in social, economic, and educational development; Buddhist contributions to national values and public cooperation. 5. Historical studies of the role of Buddhists in the state; the principles of pañca-sīla and dasavidha-rājadhamma; the contribution of Buddhist values in fostering social justice, the rule of law, and a culture of compassion. 6. The ethics of dāna as the basis for public contribution; the teaching of lokasangraha (worldly maintenance); tax awareness as a form of secular dāna; the value of nationalism in Indonesian Buddhism. 7. Teachings on gender equality in the suttas (e.g. Therīgāthā, Sutta Nipāta); the principle of non-violence (ahiṃsā); lay participation in social movements and the strengthening of democracy based on Buddhist values. 8. Suttas on tolerance and dialogue (e.g. Kalama Sutta, Cūḷekasāla Sutta); the history of Buddhist pluralism in India and Southeast Asia; the concept of majjhima paṭipadā as the basis for religious moderation. 9. Interfaith education strategies; interfaith dialogue forums based on mettā-karuṇā; case studies of religious pluralism; legal analysis of religious freedom in the context of Indonesia and Buddhism.		
1.5 Hindu Religious Education	1. A study of the concept of śraddhā in the Vedas, Upaniṣads, and Bhagavad Gītā; typologies of faith (trivida śraddhā in Gītā 17:2–3); the function of śraddhā in the spiritual growth of Hindus; strengthening of faith through the practice of yajña, tapa, and dharma. 2. Contemporary issues such as materialism, secularism, and popular spirituality; the Hindu	1.5.1 1.5.2 1.5.3 1.5.4 1.5.5 1.5.6 1.5.7 1.5.8 1.5.9	5. Hindu Religious Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	approach to immanent-transcendent Divinity (Brahman and Īśvara); the relevance of mokṣa, ātman, and bhakti yoga in addressing modern spiritual needs. 3. Hindu perspectives on ātman, saṁsāra, karma, and mokṣa; the dignity of humanity as dharmic beings capable of attaining the highest consciousness; the relevance of these teachings in addressing the modern search for the meaning of life. 4. The teachings of dāna, seva, ahimsa, and kṣānti; the role of Hindus in social development and education; tangible contributions to economic development and national values in the spirit of dharma yuddha. 5. Historical studies of the role of Hindus in the states and kingdoms of the Nusantara; the principles of pañca yadnya and rājadharma in state governance; the contribution of Hindu values to the ethics of governance, law, and the culture of the Nusantara. 6. The ethics of dāna and yajña as forms of social responsibility; the concept of lokasaṁgraha in the Bhagavad Gītā (3:20–25); tax awareness as seva for the state; the value of patriotism in the practice of karma yoga among Indonesian Hindus. 7. Teachings on gender equality in the Vedas and the Mahābhārata (e.g. the stories of Sulabhā and Draupadī); the principle of non-violence (ahiṁsā) in social relations; the contribution of Hindus to social movements and dharma-based democracy. 8. Teachings on tolerance in the Vedas: ekaṁ sat viprā bahudhā vadanti; interfaith dialogue in the Upaniṣads and the Gītā; the history of Hindu pluralism in India and the Archipelago; the principles of madhyama mārga and sarva dharma sambhava in the practice of religious moderation.		

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	9. Strategies for interfaith education and dharmic dialogue; forums for harmony based on the values of ṛta and satya; case studies of Hindu tolerance in Bali and Java; analysis of religious freedom according to the 1945 Constitution and the inclusive stance of Hindu teachings.		
1.6 Confucian Religious Education	1. A study of the concept of xin (faith) in the Analects, the Doctrine of the Mean, and the Mencius; the typology of xin in relation to zhong, shu, and cheng (sincerity); the function of faith in the moral and spiritual life of the faithful; the strengthening of faith through the daily practices of li and xiu shen. 2. Contemporary issues such as hedonism, the ethical crisis, and secularism; the Confucian view of Tian (Heaven) as the source of moral order; the relevance of dao, ren, and ming in addressing the spiritual void of the modern age. 3. The Confucian view of human nature (xing) as inherently good; the value of the junzi as humanity's noble potential; the interconnection between moral cultivation (xiu shen) and social harmony; the application of these teachings to address contemporary existential questions. 4. The teachings of ren, yi, li, zhong, shu, and xin in social life; moral obligations towards family and state; the tangible contributions of Confucians in the social, educational, and national spheres; the practices of gong (co-operation) and xiao (filial piety) in fostering harmony. 5. Historical study of the role of Confucian communities within the state; moral practices based on da xue (great learning) and zhong yong (balance); the contribution of the value of he (harmony) in realising a compassionate legal system and social culture. 6. The concept of li as a civil order and public ethics; the value of	1.6.1 1.6.2 1.6.3 1.6.4 1.6.5 1.6.6 1.6.7 1.6.8 1.6.9	6. Confucian Religious Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	dāna in social forms through gongde (collective virtue); taxation as a civic duty to ensure national harmony; patriotism as an expression of zhong (loyalty) towards the state. 7. The doctrine of equality in classical Confucianism (e.g., Ren applies universally); the spirit of non-violence and wen (civilisation); the role of Confucian figures in education and social reform; the contribution of the faithful in strengthening democratic values. 8. The attitude of tolerance in the Zhong Yong and Lun Yu; the principle of he er bu tong (harmony without uniformity); the history of Confucian pluralism in East Asia and Southeast Asia; the practice of zhong-shu as the basis for interfaith dialogue and religious moderation. 9. Interfaith education strategies based on the values of Ren and Yi; the development of interfaith and humanitarian forums; case studies on the role of Confucian figures in religious harmony; analysis of constitutions and guarantees of religious freedom within the context of Confucian values.		
1.7 PGRI Studies	1. History and Dynamics of PGRI 2. The Nature and Identity of PGRI 3. Profile of Pancasila Students 4. The Role of PGRI in Improving the Quality of Human Resources 5. PGRI Organisational Ethics 6. PGRI and Social Media 7. Challenges Facing PGRI in the Age of Disruption	1.7.1 1.7.2 1.7.3 1.7.4 1.7.5 1.7.6 1.7.7	7. PGRI Studies matters
1.8 Pancasila Education	1. History and objectives of Pancasila Education 2. Pancasila as the nation's identity 3. Pancasila in the context of the 1945 Constitution 4. Pancasila as the foundation of the state 5. Pancasila as the ideology of the nation and state 6. Pancasila as a philosophical system	1.8.1 1.8.2 1.8.3 1.8.4 1.8.5 1.8.6 1.8.7 1.8.9 1.8.10 1.8.11 1.8.12	8. Pancasila Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	7. Pancasila and state policy 8. Pancasila as an ethical system 9. The actualisation of Pancasila values in the 5A: Anti-Corruption, Anti-Intolerance, Anti-Bullying, Anti-Sexual Violence, and Anti-Drugs 10. The correlation between the state law of "Pancasila" and religious law 11. Pancasila as the foundation for the development of science 12. Pancasila as a paradigm of science 13. Pancasila as a paradigm for national life	1.8.13	
1.9 Civic Education	1. Introduction to Citizenship Education 2. Indonesian National Identity and Anti-Intolerance 3. National Integrity 4. The Constitution in Indonesia 5. The Duties and Rights of the State and Citizens 6. The Dynamics of Democracy in Indonesia 7. Law Enforcement in Indonesia 8. Archipelagic Outlook 9. National resilience	1.9.1 1.9.2 1.9.3 1.9.4 1.9.5 1.9.6 1.9.7 1.9.8 1.9.9	9. Citizenship Education
1.10 Ethics and Educational Profession	1. Ethics in Educational Interactions (Ethics of communication between teachers and learners; 2. Ethical relationships between teachers and fellow educators; 3. Teachers' professional interactions with parents and the community)	Section 2.7	
1.11 Microteaching	Discipline Responsibility Ethics & Morals Cooperation Honesty Enthusiasm Openness to Feedback Independence		1.11 Microteaching Attitude
1.12 Internship Attitude	Theories of learning and teaching, approaches and models of learning, and teaching materials	1.12.1 2.17.1 3.20.1 8.17.1	1.12 Internship_Attitude
1.13 Attitude_Mathematics Seminar	1. Academic responsibility 2. Ethics and Educational Profession		1.13 Attitudes_Mathematics Seminar
1.14 Community Service Attitude	1. Leadership 2. Community Empowerment 3. Digital Literacy		1.14 Attitudes_KKN

Study Materials	Elements in BK	Formation of Course Modules	Course Name
1.15 Entrepreneurial Attitude	Design Thinking (Design Thinking Mastery)		1.15 Entrepreneurial Attitude
1.16 English	Simple present tense	1.16.1 11.11.1	1.16 English
1.17 Indonesian Language	History of the Indonesian language	1.17.1 11.12.1 11.12.2 11.12.3 11.12.4	1.17 Indonesian Language
1.18 Internship - Curriculum analysis	The character of integrity in conducting an analysis of the school's operational curriculum	1.18.1 2.14.1 3.17.1 8.14.1	1.18 Internship – Curriculum analysis
1.19 Internship - Development of Lesson Plans	integrity in carrying out the development of lesson plans	1.19.1 2.15.1 3.18.1 8.15.1	1.19 Internship - Development of Learning Plans
2.0 Internship - Development of Learning Media	Demonstrating integrity in the development of learning materials	1.20.1 2.16.1 3.19.1 8.16.1	2.0. Internship - Development of Learning Media
2.1 Educational Management	1. Management and the definition of educational management 2. Student management 3. Management of Educators and Educational Staff 4. Facilities and Infrastructure Management 5. Management of school-community relations 6. Educational leadership 7. The role of teachers as managers 8. Strategic management for improving educational quality	2.1.1 2.1.2 2.1.3 2.1.4 2.1.5 2.1.6 2.1.7 2.1.8 3.4.1 3.4.2 3.4.3	2.1 Educational Management
2.2 Mathematics Educational Psychology	1. Basic Concepts of Educational Psychology in the Context of Mathematics (The scope of educational psychology, the role of psychology in mathematics learning, and interdisciplinary studies between psychology and mathematics education) 2. Characteristics of Mathematics Learning in Learners Learning styles (visual, auditory, kinesthetic), Motivation and attitudes towards mathematics, Maths anxiety 3. Mathematical Thinking Processes and Representations (Visual, symbolic and verbal representations; Mathematical thinking processes: concrete–	2.2.1 2.2.2 2.2.3 2.2.4 2.2.5 2.2.6	2.2 Mathematics Educational Psychology

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	semi-concrete–abstract; Metacognition and reflection in solving mathematical problems) 4. Difficulties in Learning Mathematics Types of difficulties (dyscalculia, misconceptions), Internal and external factors causing difficulties, Diagnosis and management of difficulties in learning mathematics 5. Emotions, Motivation, and Self-Regulated Learning in Mathematics (The role of emotions in mathematical problem-solving, Strategies for enhancing motivation to learn mathematics, The concepts of self-efficacy and student self-regulation) 6. Psychological Implications in Mathematics Instructional Planning (Instructional design appropriate to developmental stages, Selection of media and approaches that consider psychological aspects of the ‘ ’, Assessment of learning processes and outcomes from a psychological perspective).		
2.3 Mathematics Education Curriculum Analysis	1. Basic Concepts, Nature, Functions and Role of the Curriculum in Education 2. The History and Development of the Mathematics Curriculum in Indonesia 3. Foundations of curriculum development (philosophical, psychological, sociological, epistemological) 4. Curriculum development models and approaches (Tyler, Taba, OBE, etc.) 5. Comparing curriculum development approaches (Top-down, bottom-up, backward design, spiral curriculum) 6. Analysis of curriculum structure and elements in mathematics education (CP, content elements, TP, ATP for primary to upper secondary levels) 7. Analysing mathematics curricula in Singapore, Japan, Finland and China compared with Indonesia	2.3.1 2.3.2 2.3.3 2.3.4 2.3.5 2.3.6 2.3.7 2.3.8 2.3.9 2.3.10 2.3.11 2.3.12 2.3.13 3.14.1 3.14.2	2.3 Mathematics Education Curriculum Analysis

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	8. Curriculum components: objectives, content, methods, assessment 9. Identification of core competencies (CP, Pancasila Student Profile) 10. Principles for formulating objectives across the three domains of learning (affective, cognitive, psychomotor) 11. Criteria for operational and measurable learning indicators 12. Analysing mathematics textbooks (alignment of textbooks with CPs, content elements & approaches) 13. Reviewing curriculum implementation challenges (Current issues: national assessment, teacher workload, teacher CPD)		
2.4 Mathematics Learning Strategies	1. The Nature of Mathematics Learning Strategies (Definition of strategies, methods, techniques, and approaches to learning; Objectives and importance of strategies in mathematics teaching; Characteristics of mathematics learning: abstraction, symbolism, and systematicity) 2. General Strategies in Mathematics Learning (Direct instruction strategies, Interactive strategies (discussion, question and answer), Inductive and deductive strategies, Exploratory and reflective strategies, and inquiry-based strategies) 2. Subject-Specific Strategies in Mathematics (concrete manipulatives, storytelling, number talks (Arithmetic & Numbers); visual analogies, bar models, balance method (Algebra); 3D models, GeoGebra (Geometry), shape exploration; data simulation, real-world data processing, simple experiments (Statistics & Probability); graphical visualisation, animations of limit/derivative/integral concepts (Calculus). 3. Collaborative and Student-Centred Strategies (Cooperative Learning		2.4 Mathematics Learning Strategies

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	(STAD, Jigsaw, TAI, Numbered Heads Together); Integrative Thematic Learning; Think-Pair-Share and mathematical discussion strategies; Project-based Learning (Mathematics Projects) 4. Strategies for Integrating Literacy and Numeracy (Strengthening mathematical literacy through contextual problems; Developing reasoning skills) 5. Differentiation Strategies in Mathematics Learning (Differentiation of content, process, and products; Adapting strategies based on students' learning styles and readiness; Examples of applying differentiation to specific topics, communication, and problem-solving; Integration of the Pancasila learner profile into learning)		
2.5 Mathematics Learning Assessment	1. Basic Concepts of Assessment (Definition of assessment, measurement, and evaluation; Functions & objectives of mathematics learning assessment) 2. Types and Approaches to Assessment (Diagnostic assessment, Formative assessment, Summative assessment, Authentic and competence-based assessment 2. Mathematics Learning Assessment (Authentic assessment and digital portfolios; Project-based and performance-based assessment; Use of technology for formative and summative assessment; Peer assessment and self-assessment in innovation-based learning) 3. Principles & Characteristics of Assessment (Validity, Reliability, Objectivity, Feasibility) 4. Assessment Planning (Formulating learning objectives (KKA, TP, ATP), Developing question matrices, Writing question indicators) 5. Instrument Development (Multiple-choice, essay, and fill-		2.5 Mathematics Learning Assessment

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	in-the-blank questions; HOTS and contextual questions; non-test instruments (observation, portfolios, rubrics, projects)) 6. Instrument Analysis (Analysis of item quality (discriminatory power, difficulty level, effectiveness of distractors), Testing of instrument validity & reliability) 7. Criteria-Referenced Assessment (CRA) and Norm-Referenced Assessment (NRA) 8. Processing and Interpretation of Results (Scoring and processing of marks, Interpretation of evaluation results, Mapping of learning outcomes)		
2.6 Innovation in Mathematics Learning	1. Basic Concepts of Learning Innovation (Definition and characteristics of learning innovation, Differences between innovation, modification, and improvisation in learning, The urgency of innovation in the of mathematics education in the digital age, The relationship between innovation and creativity, problem-solving, and critical thinking) 2. A New Paradigm for 21st-Century Mathematics Education (The Pancasila learner profile and 21st-century skills; The concept of future-ready learners in the context of mathematics; The role of teachers as innovators and facilitators of learning; Transformative and humanistic mathematics education) 2. Mathematics Learning Innovation Approaches and Models (Project-Based Learning: Enhancing conceptual understanding through tangible products; Problem-Based Learning: Encouraging students to solve open-ended problems to construct mathematical concepts); Inquiry- and discovery-based learning; Realistic Mathematics Education (RME): Linking mathematics to real-world contexts; STE(A)M in mathematics learning: Integration	2.6.1 2.6.2 2.6.3 2.6.4 2.6.5 2.6.6 3.6.1 3.6.2 3.6.3 3.6.4 3.6.5 3.6.6 3.6.7 3.6.8 3.6.9	2.6 Mathematics Learning Innovation

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	of mathematics, science, technology, and the arts within a single activity; The Scientific Approach (5M: Observing, Asking, Reasoning, Experimenting, Concluding); Expository vs Discovery Approach, Contextual Approach (CTL)); Discovery Learning & Inquiry-Based Learning: Students actively discover concepts through exploration; Flipped Classroom: Students study the material at home and discuss/practise in class. 3. Innovations in the Use of AI in the Mathematics Learning Process 4. Innovations Based on Local Wisdom and Social Context (Mathematics learning based on local culture (ethnomathematics); Contextualisation of mathematics in daily life; Integration of social, cultural, and environmental values into learning		
2.7 Ethics and Educational Profession	1. The Nature of Ethics and Morality in Education (Definitions of ethics, morality, and etiquette; Differences between general ethics and Ethics and Educational Profession ; Fundamental ethical values in academic and educational life; Ethical implications in the mathematics teaching and learning process) 2. Teacher Ethics and Educational Profession (Characteristics of a profession and professionalism; Teaching as a profession: competencies, qualifications, and codes of ethics; The Indonesian Teachers' Code of Ethics (PGRI) and Ministry of Education Regulation No. 16 of 2007; Teachers' ethical responsibilities towards pupils, parents, schools, and the community) 3. Characteristics of the Teaching Profession (The teaching profession from pedagogical, social, and cultural perspectives; Characteristics of a professional mathematics teacher; The role of the teacher as a facilitator, motivator, and lifelong learner;	1.10.1 1.10.2 2.7.1 2.7.2 2.7.3 2.7.4 2.7.5 2.7.6 2.7.7 2.7.8 3.5.1 3.5.2	17. Ethics and Educational Profession

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	Self-reflection and continuous professional development) 4. Ethical Commitment in Educational Practice (Commitment to justice, honesty, and equality in learning; Anti-discrimination and inclusion in education; Protection of children's rights and ethical treatment of students; Ethics in assessment and evaluation of learning outcomes) 5. Professionalism of Mathematics Teachers (Development of pedagogical, professional, social, and personal competencies; Enhancing professionalism through subject-specific teacher working groups (MGMP), training, and further study; The role of teachers in advancing community-based mathematics education; Professional responsibility for the quality of mathematics learning) 6. Code of Ethics in the Digital Context and the 4.0 Era (Social media ethics for educators; Teacher professionalism in the digital space (learning platforms, LMS, etc.); Protection of students' personal data; Ethics of technology use in mathematics learning) 7. Contemporary Challenges and Issues in the Teaching Profession (Contract teachers, certification, and teachers' workload; Demands for professionalism amidst changing education policies; Ethical issues in the zoning system, examinations, and assessment; The crisis of integrity and how to rebuild public trust in the teaching profession) 8. Development of Educators' Identity and Integrity (Mapping personal values and individual ethical orientation; Self-reflection as a prospective mathematics teacher; Designing a personal vision as a professional and ethical educator; Compiling a portfolio of ethics and professionalism)		
2.8 Foundations of Education	1. The Nature and Foundations of Education (Definition and objectives of national education;	2.8.1 2.8.2 2.8.3	2.8 Foundations of Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	The role of education in the lives of individuals and society; Historical, legal, sociological, cultural and technological foundations of education in Indonesia) 2. The National Education System and Education Policy (The structure and levels of formal education in Indonesia; National Education Standards (SNP), including standards for content, process, and assessment; The quality of education and efforts to improve it at secondary school level, particularly in the context of mathematics education; A comparison of the Indonesian education system with those of other countries (globally)) 3. Educational Issues (Challenges in the classroom: inequalities in access, facilities and infrastructure, and learning management; National issues: equity in quality, regional disparities, teacher quality and curriculum; International issues: the quality of mathematics education in global assessments (e.g. PISA, TIMSS)) 4. Education in the Context of Social Culture and Local Values (The influence of culture, local values, and religion on educational practices; Character education and multiculturalism in mathematics learning; Local wisdom as a source of contextualisation in learning) 5. Innovation and Technology in Education (The role of information and communication technology in mathematics learning; 21st-century education and the development of numeracy literacy competencies; Implications of the Fourth Industrial Revolution and Society 5.0 for the secondary education system) 6. Designing a High-Quality Secondary Education System (Principles and components of educational system design; Approaches based on the national curriculum and local needs;	2.8.4 2.8.5 2.8.6	

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	Strategies for improving the quality of mathematics learning in secondary schools; Integration of assessment, teacher development, and the role of the community in the school education system)		
2.9 Philosophy of Mathematics Education	1. The scope of the Philosophy of Mathematics Education 2. History of the Development of Mathematical Thought 2. Mathematical Ontology 3. Epistemology of Mathematics 4. Axiology of Mathematics 5. Schools of thought in the Philosophy of Mathematics Education 6. The perspective of mathematics as a language 7. Mathematics and reality 8. Mathematics in culture and civilisation 9. Philosophy of Mathematics Education and Education 10. Contemporary issues (AI and mathematics) 11. Mathematical argumentation and logic 12. Case studies of mathematical thinkers 13. Critical Philosophy of Mathematics Education 14. Personal reflection	2.9.1 2.9.2 2.9.3 2.9.4 2.9.5 2.9.6 2.9.7 2.9.8	2.9 Philosophy of Mathematics Education
2.10 Joyful Learning in Mathematics Education	1. Basic Concepts of Joyful Learning in Mathematics Education in Mathematics Education (The nature of enjoyable and meaningful learning; Principles and characteristics of Joyful Learning in Mathematics Education in the context of mathematics; The impact of positive emotions on enhancing participation and understanding of mathematical concepts; The relationship between motivation, active engagement, and learning achievement) 2. Outdoor Mathematics Learning (Definition and basic principles of outdoor-based mathematics learning; Benefits of outdoor learning: contextualisation, physical and social engagement, and real-world problem-solving; Strategies and examples of outdoor	2.10.1 2.10.2 2.10.3 2.10.4 2.10.5 2.10.6 3.2.1 3.2.2 3.2.3 3.2.4 3.2.5 5.12.1 5.12.2 5.12.3 5.12.4 5.12.5	2.10 Joyful Learning in Mathematics Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	mathematics activities: Measurements in the surrounding environment (length, area, volume); Geometry in architecture and nature (buildings, gardens, roads); Mathematics in traditional games (congklak, engklek, etc.); Simple statistics based on environmental observation; Challenges and solutions in the implementation of outdoor mathematics) 2. Integrating STEAM into Enjoyable Mathematics Learning (STEAM Concepts: Science, Technology, Engineering, Arts, Mathematics; Characteristics of exploratory and integrated STEAM learning; Examples of contextual STEAM projects in mathematics learning: Designing a school garden (geometry, measurement, aesthetics); Designing and building simple tools (integration of mathematics and engineering); The art of symmetry, fractals, and mathematical batik; Data and graphs in simple science experiments; The role of the teacher in facilitating enjoyable STEAM learning) 3. Designing Project- and Experiment-Based Joyful Learning in Mathematics Education Activities (Lesson planning based on project-based learning and inquiry-based learning; Designing collaborative, creative, and problem-based mathematics projects; Application of game-based learning in outdoor and STEAM projects; Alternative task formats and assessments for project-based learning) 4. Media, Technology and Creativity in Joyful Learning in Mathematics Education (The use of simple and homemade tools from the local environment; Technology as an enhancement to outdoor activities (GeoGebra AR, measuring apps, scientific calculators, interactive videos); Gamification and the use of interactive apps in outdoor		

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	tasks; Creativity in developing engaging STEAM learning materials) 5. Local Wisdom and Social Context as Sources of Enjoyable Learning (Ethnomathematics approach: exploring mathematical concepts from local culture and environment; Integration of social, cultural, and environmental sustainability values into outdoor learning; Case study: design of a locally-based mathematics project; Community-based learning: student–community collaboration)		
2.11 Mathematical Thinking	1. The Nature and Characteristics of Mathematical Thinking (The concept of mathematical thinking in an educational context; 2. The role of mathematical thinking in improving numeracy literacy and 21st-century skills; Features and elements of mathematical thinking: logical, structured, systematic, and evidence-based; Differences between mathematical thinking and ordinary and scientific thinking) 3. Types and Components of Mathematical Thinking (This section explicitly outlines critical thinking, creative thinking, and reasoning as core components of mathematical thinking: a. Critical Thinking in Mathematics: The ability to evaluate information, assess arguments, and make decisions based on mathematical logic; Indicators of critical thinking: clarity of reasoning, identification of assumptions, validity of logic, and reflection on solutions; Examples of application: analysis of problem-solving strategies, assessing the truth of a claim or pattern. b. Creative Thinking in Mathematics: The ability to generate new ideas or approaches to a mathematical problem; Indicators: fluency, flexibility, originality, and	2.11.1 2.11.2 2.11.3 2.11.4 2.11.5 3.3.1 3.3.2 8.12.1 8.12.2	2.11 Mathematical Thinking

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	elaboration of ideas in problem-solving; Examples of application: answering open-ended questions, creating one's own patterns, discovering multiple solution strategies. c. Mathematical Reasoning: Encompasses deductive, inductive, analytical, and proportional reasoning; The use of logical arguments to make generalisations, construct proofs, or deduce solutions; Examples of application: proving theorems, deducing number patterns, constructing mathematical arguments 4. Representations in Mathematical Thinking (Types of representation: visual (pictures, diagrams), symbolic (formulas), verbal (narratives), and numerical (numbers); The role of representations in supporting understanding and problem-solving; Linking representations to enhance students' critical and analytical thinking skills) 5. The Application of Mathematical Thinking in School Learning (Designing learning ' s' that foster students' critical, creative, and reasoning skills; Examples of activities: Open-ended questions, Pattern exploration, Argumentative discussions, Analysis of students' errors and thinking patterns, Development of mathematical thinking assessment instruments) 6. The Relationship Between Mathematical Thinking and 21st-Century Skills (Relationship with the 4C competencies (critical thinking, creativity, collaboration, communication); The role of mathematical thinking in strengthening numeracy literacy; Metacognitive skills: reflection on one's own thinking process; Implications for the national curriculum and assessment (AKM, PISA))		

Study Materials	Elements in BK	Formation of Course Modules	Course Name
2.12 Teaching Resources and Materials Development	1. Design of learning modules 2. Types of innovative worksheets (project-based, contextual, digital)		2.12 Teaching Resources and Materials Development
2.13 Computational Thinking	1. The Nature of Computational Thinking (CT) (Definition and scope of Computational Thinking; History and development of the CT concept in education; Differences and relationships between CT and critical, logical, and algorithmic thinking; The urgency of CT in 21st-century learning and Merdeka Belajar) 2. Core Components of Computational Thinking (Decomposition: Breaking down complex problems into smaller parts; Pattern Recognition: Analysing similarities or patterns in data and problems; Abstraction: Filtering out key information and eliminating irrelevant details; Algorithmic Thinking: Formulating logical steps to solve problems) 3. CT and Digital Literacy in Education (The relationship between CT and programming, coding, and technological literacy; CT as the foundation for developing ICT and STEM skills; Educational tools and platforms (Scratch, Blockly, Bebras, etc.) 4. CT in School Learning and Curricula (Integration of CT into the curriculum (primary, lower secondary, upper secondary schools); CT-based learning strategies: problem-based learning, project-based learning, inquiry-based learning; CT in the design of learning tasks and assessments) 5. Challenges and Opportunities for CT Implementation in Indonesian Education (Barriers to CT integration: teacher readiness, resources, and curriculum; Opportunities to strengthen CT through the Merdeka Belajar policy and digital literacy; The role of teachers as facilitators of higher-order thinking skills	2.13.1 2.13.2 2.13.3 2.13.4 2.13.5 3.12.1 3.12.2 5.11.1 5.11.2	2.13 Computational Thinking

Study Materials	Elements in BK	Formation of Course Modules	Course Name
2.14. Internship - Curriculum analysis	School Operational Curriculum		
2.15. Internship - Development of Lesson Plans	1. Learning approaches, 2. Learning models, 3. Teaching materials, 4. Assessment using ICT		
2.16. Internship - Development of Learning Media	Analysis of teaching materials and the application of ICT		
3.1 Planning Mathematics Lessons	1. Development of Lesson Plans (RPP) using the Problem-Based Learning (PBL) Model 2. Development of Lesson Plans (RPP) using the Project-Based Learning (PjBL) Model 3. Development of Lesson Plans (RPP) using the Discovery Learning Model 4. Development of Lesson Plans (RPP) using the Inquiry-Based Learning Model 5. Development of Lesson Plans (RPP) using Cooperative Learning Models (Jigsaw, STAD, Think Pair Share, etc.) 6. Development of Lesson Plans (RPP) using the Contextual Teaching and Learning (CTL) Model 7. Development of Differentiated Lesson Plans (RPP) 8. Development of Lesson Plans (RPP) based on TPACK (Technological Pedagogical Content Knowledge)	3.1.1 3.1.2 3.1.3 3.1.4 3.1.5 3.1.6 3.1.7 3.1.8	3.1 Mathematics Learning Planning
3.2 Joyful Learning in Mathematics Education	1. Designing Outdoor Mathematics Learning 2. Designing STEAM Integration in Enjoyable Mathematics Learning 3. Designing Project- and Experiment-Based Joyful Learning in Mathematics Education Activities 4. Designing enjoyable mathematics learning using an ethnomathematics approach through case studies: designing mathematics projects based on local culture and 5. Designing community-based learning: student–community collaboration)		3.2 Joyful Learning in Mathematics Education
3.3 Mathematical Thinking	1. The Application of Mathematical Thinking in School Learning		3.3. Mathematical Thinking

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	(Designing lessons that foster students' critical and creative thinking skills and reasoning; Examples of activities: Open-ended questions, Pattern exploration, Argumentative discussions, Analysis of errors s and students' thinking patterns, Development of mathematical thinking assessment tools) 2. Development of Mathematical Thinking-Based Questions and Activities (Characteristics of questions that stimulate higher-order thinking; Techniques for constructing HOTS-based questions that measure critical, creative, and reasoning skills; Practice in constructing and testing questions, as well as creating assessment rubrics; Lesson plans that focus on the thinking process, not just the final outcome)		
3.4 Educational Management	Case Analysis 1. Case Study 1: School financial management; 2. Case Study 2: Special needs management 3. Case Study 3: Constructivist educational supervision)	Section 2.1	3.4. Educational Management
3.5 Ethics and Educational Profession	1. Case Studies and Ethics and Educational Profession Practice (Discussion of real-life cases of ethical breaches or dilemmas faced by teachers; Simulation of ethical decision-making in classroom situations; Professional communication practice (e.g. providing feedback, managing conflict); Assessment of professionalism based on observation and reflection) 2. Case studies of ethical breaches in education and alternative resolutions	Entry 2.7	
3.6 Mathematics Learning Innovation	1. Designing Project-Based Learning models for school mathematics curriculum to enhance conceptual understanding through tangible products; 2. Designing a Problem-Based Learning (PBL) model for school mathematics curriculum to encourage students to solve open-		3.6 Mathematics Learning Innovation

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	ended problems to construct mathematical concepts; 3. Designing Discovery Learning & Inquiry-Based Learning models for school mathematics to support students in actively discovering concepts through exploration; 4. Designing a Realistic Mathematics Education (RME) learning model: linking mathematics to real-world contexts; 5. Designing STE(A)M learning models in mathematics education: integrating mathematics, science, technology and the arts into a single activity; 6. Designing the Scientific Approach (5M: Observing, Asking, Reasoning, Experimenting, Concluding) in school mathematics learning; 7. Designing an Expository Approach in school mathematics teaching 8. Designing a Contextual Approach (CTL); 9. Designing the Flipped Classroom: Students study the material at home and discuss/practise in class.		
3.7 Teaching Practice	1. Teaching Skills 2. Questioning Skills 3. Reinforcement Skills 4. Skills in Introducing Variation 5. Skills in Opening and Closing Lessons 6. Classroom Management Skills 7. Skills in Facilitating Group Discussions 8. Skills in Teaching Small Groups or Individuals	1.11.1 3.7.1 3.7.2 3.7.3 3.7.4 3.7.5 3.7.5 3.7.6 3.7.8 8.10.1	3.7 Teaching Practice
3.8 Mathematics Learning Assessment	1. Designing authentic assessments and digital portfolios for school mathematics learning; 2. Designing project-based assessments and performance assessments; 3. Designing problem-based assessments 4. Designing the use of technology for formative and summative assessment; 5. Designing peer assessment and self-assessment for innovation-based learning in school mathematics	2.5.1 2.5.2 2.5.3 2.5.4 2.5.5 2.5.6 2.5.7 2.5.8 2.5.9 3.8.1 3.8.2 3.8.3 3.8.4 3.8.5 3.8.6	3.8 Mathematics Learning Assessment

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	6. Formulating learning objectives (KKA, TP, ATP) for school mathematics content 7. Developing question frameworks and indicators 8. Developing multiple-choice, essay, fill-in-the-blank, Higher-Order Thinking Skills (HOTS) and contextual questions 9. Developing non-test instruments (observation, portfolios, rubrics, projects) 10. Testing test and non-test instruments in schools (validity, reliability, objectivity, practicability) 11. Analysing instruments (question quality analysis (discriminatory power, difficulty level, distractor effectiveness), 12. Conducting Criterion-Referenced Assessment (CRA) and Norm-Referenced Assessment (NRA) 13. Processing and interpreting results (scoring and processing of marks, interpretation of evaluation results, mapping of learning outcomes) 14. Follow-up & Feedback (Reflection on pupils' learning outcomes, Reinforcement of the learning process, Improvement of teaching strategies)	3.8.7 3.8.8 3.8.9 3.8.10 3.8.11 3.8.12 3.8.13 3.8.14	
3.9 Mathematics Learning Strategies	1. Designing Collaborative and Student-Centred Strategies (Cooperative Learning (STAD, Jigsaw, TAI, Numbered Heads Together); Integrative Thematic Learning; Think-Pair-Share and mathematical discussion strategies; Project-based Learning (Mathematics Projects)) 2. Designing Strategies to Integrate Literacy and Numeracy (Strengthening mathematical literacy through contextual problem-based ' '; Developing reasoning skills 3. Designing Differentiation Strategies in Mathematics Learning (Differentiation of content, process and products; Adapting strategies based on students' learning styles and readiness; Examples of applying differentiation to specific	2.4.1 2.4.2 2.4.3 2.4.4 2.4.6 3.9.1 3.9.2 3.9.3	3.9 Mathematics Learning Strategies

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	topics, communication and problem-solving; Integration of the Pancasila learner profile into learning)		
3.10 Mathematics Vocabulary	1. Mathematical vocabulary, 2. Reading and writing mathematical texts, 3. Speaking and listening in the academic presentation of mathematical concepts, 4. Translating and compiling mathematics teaching materials in English	3.10.1 3.10.2 3.10.3 3.10.4	3.10 English for Mathematics
3.11 Entrepreneurial Skills	Human Resource Management & Operations: Job Analysis and Supply Chain (Planning and Strategising)	2.12.1 2.12.2 3.11.1 3.11.2 10.4.1 10.4.2	3.11 Entrepreneurial Skills
3.12 Entrepreneurial Intention	Financial Management: Financial Projections & Working Capital Requirements (Unit Product Cost and Pricing Method)		3.12 Entrepreneurial Intention
3.13 Manipulative Teaching Aid Development	1. Needs Analysis 2. Analysis of Tools and Materials 3. Design of manipulative teaching aids tailored to the characteristics of the learners		3.13 Manipulative Teaching Aid Development
3.14 Development of Teaching Resources and Materials	1. Design of learning modules 2. Types of innovative worksheets (project-based, contextual, digital)		3.14 Development of Teaching Resources and Materials
3.15 Computational Thinking	1. Learning Design Based on Computational Thinking in Everyday Life and the World of Education (CT in non-computational contexts (social issues, logistics, management, etc.); CT in cross-curricular learning: mathematics, science, language, social studies; Case studies of CT use in real-world problem-solving) 2. Design of Computational Thinking Activities and Assessment (Designing CT activities according to learning levels and contexts; Examples of worksheets, educational games, and CT simulations; CT assessment rubrics and methods for measuring students' computational thinking skills)		3.15 Computational Thinking

Study Materials	Elements in BK	Formation of Course Modules	Course Name
3.16 Design and creation of manipulative teaching aids	1. Theoretical foundations of the design and creation of manipulative teaching aids 2. Basic concepts of manipulative teaching aids 3. Characteristics of effective manipulative teaching aids 4. Types of manipulative teaching aids		3.16 Manipulative Teaching Aid Development
3.17 Mathematics Education Curriculum Analysis	1. Designing and implementing contextual, innovative, and learner-centred mathematics learning that aligns with the development of the mathematics curriculum within the context of national and global education. 2. Evaluating the relationship between objectives, content, methods, assessment, and the suitability of textbooks, as well as the challenges of curriculum implementation, to design integrative and TPACK-based mathematics learning strategies.		3.17 Mathematics Education Curriculum Analysis
4.1 Calculus	1. The real number system, absolute value, and graphs of equations; 2. Functions and limits; 3. Derivatives; 4. Indefinite integrals 5. Definite integrals 6. Functions of two variables, partial derivatives and field equations 7. Chain rule, total and directed derivatives, Lagrange multipliers 8. Double integrals 9. Two-dimensional vector fields, line integrals and the curl 10. Green's theorem 11. Triple integrals 12. 3-dimensional vector fields 13. 3-dimensional flux 14. divergence theorem 15. 3-dimensional line integral 16. Stokes' theorem	4.1.1 4.1.2 4.1.3 4.1.4 4.1.5 5.1.1 5.1.2 4.1.6 4.1.7 4.1.8 4.1.9 4.1.10 4.1.11 4.1.12 4.1.13 4.1.14 4.1.15 4.1.16 5.1.3 5.1.4	4.1 Calculus
4.2 Algebra	1. Mathematical Logic 2. Number Systems: integers, rational numbers, real numbers, complex numbers 3. Basic algebraic operations on real and complex numbers: addition, subtraction, multiplication, division 4. Functions and Relations	4.2.1 4.2.2 4.2.3 4.2.4 4.2.5 4.2.6 4.2.7 4.2.8 4.2.9	4.2 Algebra

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	5. Equations and Inequalities: linear, quadratic, absolute value 6. Systems of Linear Equations 7. Sequences and Series 8. Exponents and Logarithms 9. Polynomial and Rational Functions 10. Systems of Linear Equations 11. Matrices 12. Determinants of matrices 13. Vectors in R^2 and R^3 14. Euclidean Vector Space 15. General Vector Spaces 16. Inner Product Space 17. Eigenvalue 18. Eigenvector 19. Linear Transformation 20. Ring Theory 21. Group Theory	5.2.1 5.2.2 5.2.3 5.2.4 5.2.5 5.2.6	
4.3 Geometry	1. Points and lines in a plane 2. Triangles, quadrilaterals, polygons, and circles 3. Points and lines in space 4. Relationships between lines and lines, lines and planes, planes and planes, 5. Relationships of parallelism and perpendicularity between lines and planes, and between planes and planes, 6. Angles between lines, Angles between a line and a plane, Angles between two planes, 7. Distance between a point and a plane, 8. Prisms and cubes, 9. Polyhedra 10. Pyramids 11. Rotational solids 12. Cones and truncated cones, 13. Spheres 14. Cartesian 15. Circle 16. Parabola 17. Ellipse 18. Hyperbola 19. Parametric Equations 20. Rotation 21. Reflection 22. Isometry 23. Product of Transformations 24. Inverse Transformation 25. Half-turn 26. Translation	4.3.1 4.3.2 4.3.3 4.3.4 4.3.5 4.3.6 4.3.7 4.3.8 4.3.9 4.3.10 4.3.11 4.3.12 4.3.13 4.3.14 4.3.15 4.3.16 4.3.17 4.3.18 4.3.19 4.3.20 4.3.21 4.3.22 4.3.23 4.3.24 4.3.25 4.3.26 4.3.27 4.3.28 4.3.29 5.3.1 5.3.3 5.3.2	4.3 Geometry

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	27. Rotation 28. Dilation 29. Geometry for the Olympiad		
4.4 Statistics	1. Measures of central tendency 2. Measures of dispersion 3. Data presentation 4. Discrete and Continuous Random Variables 5. Discrete andContinuous Distributions 6. Joint and Conditional Distributions 7. Expectation 8. Variance 9. Moment-generating functions 10. Hypothesis testing for means 11. Proportions hypothesis test 12. Variance hypothesis test 13. Analysis of Variance 14. Regression Analysis 15. Correlation Analysis 16. Forecasting methods: linear trend, non-linear, seasonal dummy, Naive, Simple Average, Moving Average 17. Exponential Smoothing Model 18. Decomposition Models 19. Box-Jenkins Model 20. Statistics for the Olympiad	4.4.1 4.4.2 4.4.3 4.4.4 4.4.5 4.4.6 4.4.7 4.4.8 4.4.9 4.4.10 4.4.11 4.4.12 4.4.13 4.4.14 4.4.15 5.4.1 5.4.2 5.4.3 5.4.4 5.4.5 5.4.6 5.4.7 5.4.8 5.4.9 5.4.10 9.2.12	4.4 Statistics
4.5 Probability Theory	1. Sets 2. Permutations 3. Combinations 4. Pigeonhole 5. Probability 6. Bayesian 7. Conditional 8. Function 9. Relation Generator 10. Recursive	4.5.1 4.5.2 4.5.3 4.5.4 4.5.5 4.5.6 4.5.7 5.5.1 5.5.2	4.5 Probability Theory
4.6 Numbers	1. Mathematical induction 2. Divisibility Relations 3. GCD 4. LCM 5. Number bases 6. Prime numbers 7. Simple factorisation 8. Congruence relations and their applications 9. Fermat and Wilson 10. Arithmetic functions 11. Euler 12. Primitive roots and indices 13. Number Theory for the Olympiad	4.6.1 4.6.2 4.6.3 4.6.4 4.6.5 4.6.6 4.6.7 4.6.8 4.6.9 4.6.10 4.6.11 4.6.12 5.6.1 5.6.2	4.6 Number Theory

Study Materials	Elements in BK	Formation of Course Modules	Course Name
4.7 Linear Programming	1. Definitions and principles of linear programming 2. Mathematical Models and Linear Inequalities 3. Solutions to Linear Programming 4. The Simplex Method 5. Primal-Dual Method	4.7.1 4.7.2 4.7.3 4.7.4 4.7.5 5.7.1	4.7 Linear Programming
4.8 Analysis	1. Mathematical Induction 2. Real Numbers 3. Sequences of Real Numbers 4. Limit Theorem for Functions 5. Theorem on Continuous Functions 6. Complex numbers: definition, algebraic properties, geometric meaning 7. Polar coordinates, Euler's formula 8. Roots of complex numbers 9. Analytic functions: functions of a complex variable, mappings, 10. Limits and continuity of complex numbers, 11. Derivatives: derivatives of polynomial functions, 12. Cauchy-Riemann equations (CRE), 13. Polar form of the CREs, 14. Analytic functions, harmonic functions,	4.8.2 4.8.3 4.8.4 4.8.5 4.8.5 4.8.6 4.8.7 4.8.8 4.8.9 4.8.10 4.8.11 4.8.12 4.8.13	4.8 Analysis
4.9 Graph	1. Graph Concepts 2. Graph Algorithms	4.9.1 4.9.2 4.5.8 4.5.9 5.8.1 5.14.1 5.14.2	4.9 Graph
4.10 Numerical Methods	1. Error; 2. Roots of Non-linear Equations; 3. Solutions to SPL via LU Decomposition, Jacobi Iteration, Gauss-Seidel Iteration; 4. Function Approximation; 5. Interpolation	4.10.1 4.10.2 4.10.3 4.10.4 4.10.5 5.9.1	4.10 Numerical Methods
4.11 Differential Equations	1. First-order differential equations, 2. Second-order differential equations, 3. nth-order differential equations, 4. D-Operator	4.11.1 4.11.2 4.11.3 4.11.4 5.10.1	4.11 Differential Equations
4.12 Elementary School Mathematics	1. Characteristics of Mathematics Learning in Primary School 2. Identifying and addressing pupils' misconceptions	3.15.1 4.12.1 4.12.2	4.12 Elementary School Mathematics

Study Materials	Elements in BK	Formation of Course Modules	Course Name
4.13 Junior High School Mathematics	1. Characteristics of Mathematics Learning in Secondary School 2. Common student misconceptions & how to address them	3.16.1 3.16.2 4.13.1 4.13.2 4.13.3 4.13.4	4.13 Junior High School Mathematics
4.15 Entrepreneurial Skills	1. Business Model Canvas Theory (Business Models) 2. Basic Concepts of Business Intelligence 3. Big Data in Education 4. Business Intelligence Tools 5. Data-Driven Decision Making 6. Business Models for Mathematics Education 7. Market Research & Competitive Analysis 8. Monetisation Strategies for Educational Products 9. The CRISP-DM and OSEMN Processes 10. Definition & Characteristics of Big Data 11. Hadoop, Spark and NoSQL Ecosystems 12. Distributed storage (HDFS), distributed computing (MapReduce) 13. Data lake architecture vs data warehouse 14. Streaming data vs batch data 15. Data pipelines & ingestion (Kafka, Flume) 16. Cloud platforms: AWS, GCP, Azure (overview) 17. Scalability, security, and privacy issues with big data 18. Tools: Apache Hadoop, Spark (introduction), MongoDB, Google BigQuery (overview)		4.15 Entrepreneurial Skills
4.16 Mathematical Economics	1. Classify, analyse and interpret financial data, including break-even point (BEP) calculations, break-even analysis ( ) preparation of financial statements (profit and loss, balance sheet), and simple tax calculations. 2. Supply and Demand 3. Annuities 4. Insurance 5. Savings and Loans (Credit and Savings) 6. Subsidies	4.16.1 4.16.2 4.16.3 4.16.4 4.16.5 4.16.6 7.2.1	4.16 Mathematical Economics

Study Materials	Elements in BK	Formation of Course Modules	Course Name
4.17 Research	1. Quantitative Research Design, 2. Qualitative Research Design, 3. Research and Development, 4. Design Research, 5. Realistic Mathematics Approach, 6. Quantitative Data Collection Techniques, 7. Qualitative Data Collection Techniques, 8. Quantitative Data Analysis Techniques, 9. Qualitative Data Analysis Techniques,		4.17 Research Methods
5.1 Calculus	1. Application of derivatives in solving mathematical and contextual problems 2. Application of integral concepts in solving mathematical and contextual problems 3. Application of higher-order derivative concepts in solving mathematical and contextual problems 4. Application of multiple integrals in solving mathematical and contextual problems		5.1 Calculus
5.2 Algebra	1. The application of linear equations and inequalities in determining speed, distance, time, profit in sales, and other fields. 2. Application of quadratic functions in physics and engineering problems 3. Application of rational and irrational functions in economics, engineering and other fields 4. The application of logarithms and exponentials in modelling phenomena across various fields 5. The application of sequences and series in the calculation of compound interest, economic growth, instalments, savings, population, bacteria, floor patterns, and so on. 6. The application of polynomials in modelling 7. The application of systems of linear equations in economics, physics and other fields 8. The application of matrices in presenting systems of linear equations with multiple variables,		5.2 Algebra

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	in data management and other fields 9. The application of elementary linear algebra in cryptography, Markov chains, and so on.		
5.3 Geometry	1. The application of geometry in architectural design and other contextual problems 2. The application of transformational geometry in architectural engineering and other contextual problems. 3. The application of Analytical Geometry in various fields		5.3 Geometry
5.4 Statistics	1. Application of measures of central tendency to contextual problems 2. Application of measures of data dispersion to contextual problems 3. Presenting data in contextual problems 4. Using hypothesis testing for means to make decisions 5. Using proportion hypothesis tests to make decisions 6. Using variance hypothesis tests to make decisions 7. Using analysis of variance to make decisions 8. Using regression analysis to make decisions 9. Using correlation analysis to make decisions 10. Using forecasting methods to solve contextual problems		5.4 Statistics
5.5 Probability Theory	1. Application of permutations, combinations and the pigeonhole principle to combinatorial problems 2. Application of probability in solving contextual probability problems		5.5 Probability Theory
5.6. Numbers	1. Applying GCD and LCM to various contextual problems 2. Applying congruence relations in various contextual problems		5.6 Numbers
5.7. Linear Programming	Applying linear programming methods to optimisation, transport and scheduling problems		5.7 Linear Programming
5.8. Graphs	Applications of graphs in mapping, navigation, networks, routing and other fields.		5.8 Graphs
5.9. Numerical Methods	Applying numerical methods to contextual problems		5.9 Numerical Methods

Study Materials	Elements in BK	Formation of Course Modules	Course Name
5.10. Differential Equations	Applying differential equations in engineering and other fields		5.10 Differential Equations
5.11. Computational Thinking	1. The Application of Computational Thinking in Learning Design in Everyday Life and the World of Education 2. The Application of Computational Thinking Activity and Assessment Design in Mathematics Teaching in Schools		5.11 Computational Thinking
5.12. Joyful Learning in Mathematics Education	1. Designing Outdoor Mathematics Learning 2. Designing the Integration of STEAM in Enjoyable Mathematics Learning 3. Designing Project-Based and Experimental Joyful Learning in Mathematics Education Activities 4. Designing enjoyable mathematics learning using an ethnomathematics approach through case studies: designing mathematics projects based on local culture and 5. Designing community-based learning: student–community collaboration)		5.12 Joyful Learning in Mathematics Education
5.13 Elementary School Mathematics	Strategies for teaching place value, arithmetic operations, basic geometry, mathematical patterns, simple data and measurement		5.13 Elementary School Mathematics
5.14 Junior High School Mathematics	Strategies for teaching algebra and functions, equations and inequalities; plane and solid geometry; geometric transformations, statistics and probability, and basic calculus		5.14 Junior High School Mathematics
5.15 Outdoor Mathematics	6. The Application of Geometry in Traditional Architecture (Building Structures, Traditional Houses) 7. The Application of Patterns and Numbers in Traditional Ceremonies (Calendar Systems, Ceremonial Cycles) 8. Application of Data and Statistics in Community Life (Craft Production, Cultural Tourism) 9. Application of Linear Programming in Entrepreneurship		5.15 Outdoor Mathematics

Study Materials	Elements in BK	Formation of Course Modules	Course Name
5.16 Discrete Mathematics	1. Application of Recursive Relations in Solving Contextual Problems 2. Application of Generating Functions to Solve Contextual Problems		5.16 Discrete Mathematics
6.1 Techniques for Drafting Research Proposals	1. Compiling a Literature Review, 2. Reference Search Techniques, 3. Citation Techniques, 4. Techniques for Presenting Simple Data 5. Writing Paragraphs in accordance with Indonesian language conventions, 6. Producing Academic Papers in accordance with Indonesian Spelling Rules 7. More complex data presentation techniques		6.1 Techniques for Drafting Research Proposals
6.2 Research Methods	1. Quantitative Research Design, 2. Qualitative Research Design, 3. Research and Development, 4. Design Research, 5. Realistic Mathematics Approach, 6. Quantitative Data Collection Techniques, 8. Qualitative Data Collection Techniques, 9. Quantitative Data Analysis Techniques, 10. Qualitative Data Analysis Techniques, 11. Application of data analytics software in a research-		6.2 Research Methods
6.3 Publication of Scientific Papers	1. Presentation of scientific work in Indonesian, 2. Presentation of academic work in English, 3. Presenting research findings or critical analysis of mathematics education in the form of a scientific article in Indonesian, 4. Presenting research findings or critical analysis of mathematics education in the form of a scientific article in English.		6.3 Publication of scientific works
6.4 Seminar in Mathematics Education	1. Examination of current issues in mathematics education 2. Trends and Mathematics Learning Innovation 3. Guidelines for writing scientific articles 4. Problems examined in depth; 5. Conceptual and theoretical frameworks forming the basis for		6.4 Seminar in Mathematics Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	theoretical problem-solving. 6. The methodology selected to address the research problem		
6.5 Final Project	Writing of scientific research results related to mathematics or mathematics education. 1. Writing the Introduction 2. Writing the Theoretical Review 3. Writing the Research Methodology 4. Writing of Results and Discussion 5. Writing the Conclusion		6.5 Final Project
7.1 Technology-Based Entrepreneurship	1. Market Analysis 2. Technology in the Education Business 3. Product and Service Design Digital Mathematics Business 4. Finance and Funding 5. Product Development 6. Digital Marketing Strategies for Educational Products		7.1 Technology-Based Entrepreneurship
7.2 Mathematical Economics	1. Application: a. Classify, analyse and interpret financial data, including break-even point calculations, the preparation of financial statements (profit and loss, balance sheet), and simple tax calculations. b. Supply and Demand c. Annuities d. Insurance e. Savings and Loans (Credit and Savings) f. Subsidies in business and banking		7.2 Mathematical Economics
8.1 Community Service - Digital Literacy	Digital Literacy		8.1 Community Service Program – Digital Literacy
8.2 Community Service Program – Problem Solving in the Community	Community Empowerment		8.2 Community Service Program – Problem Solving in the Community
8.3 Community Service Program – Inclusive and Exclusive Leadership	Inclusive and Exclusive Leadership		8.3 Community Service Program – Inclusive and Exclusive Leadership
8.4 Community Service Program – Non-Formal Education	Knowledge of POS PAUD, PAUD, Nursery Schools, Madin, Islamic Boarding Schools, Places of Worship		8.4 Community Service Program – Non-Formal Education

Study Materials	Elements in BK	Formation of Course Modules	Course Name
8.5 Teaching Practice	1. Curriculum analysis; 2. Teaching Resources and Materials Development (lesson plans, media, worksheets, teaching materials, assessment tools); 3. Conducting learning activities using a variety of teaching strategies and learning media; 4. Classroom management; 5. Use of information and communication technology in teaching; 7. Conducting assessment and evaluation of learning; 8. Management of co-curricular and extra-curricular activities; and 9. Teachers' administrative duties.		8.5 Teaching Practice
8.6 Entrepreneurial Skills	1. Presentation and Review of the Business Model Canvas (Business Idea Creation) 2. Creating a business analysis project using Data Analytics 3. Business analysis project using data visualisation 4. Business analysis project using big data 5. Business analysis project using forecasting methods 6. Business analysis project development using business intelligence 7. Development of business analysis projects using various data analytics software		8.6 Entrepreneurial Skills
8.7 Entrepreneurial Skills	Presentation and Review of the Business Model Canvas (Business Idea Creation)		8.7 Entrepreneurial Skills
8.8 Entrepreneurial Intention	Marketing Management: STP, Marketing Mix, and SWOT Analysis (Marketing Plan and Channels)		8.8 Entrepreneurial Intention
8.9 Entrepreneurial Intention	Marketing Management: Digital Marketing, Branding (Marketing Plan and Channels)		8.9 Entrepreneurial Intention
8.10 Evaluation of Learning Materials*	Ethics in learning evaluation		8.10 Learning Media Evaluation
8.11 Media Production Management*	Programme Planning & Media Programme Evaluation		8.11 Media Production Management*
8.12 Hypermedia*	Hypermedia Project Development		8.12 Hypermedia*
8.13 3D Animation*	3D Animation Project Development		8.13 3D Animation*

Study Materials	Elements in BK	Formation of Course Modules	Course Name
8.14 Outdoor Mathematics	Activity Reporting		8.14 Outdoor Mathematics
8.15 Microteaching	Teaching Resources and Materials Development , learning resources, and educational videos		8.15 Microteaching
8.16 Design and creation of manipulative teaching aids	1. Design and Development of Manipulative Teaching Aids 2. Stages of designing manipulative teaching aids 3. Tools and materials for making manipulative teaching aids 4. Production of a manual for the creation and use of manipulative teaching aids 5. Integration of teaching aids into lesson plans 6. Production of manipulative teaching aids		8.16 Manipulative Teaching Aid Development
8.17Algorithms and Programming	Creating programmes to solve mathematical problems using 1. the basics of programming logic, 2. the use of data types and variables, 3. control structures (branching and loops), 4. functions, 5. array processing and 6. simple data structures, 7. application of basic algorithms to solve mathematical problems		8.17Algorithms and Programming
8.18 Mathematical thinking	1. Case study analysing the implementation of learning designs that foster mathematical thinking skills in schools 2. Case study analysing the implementation of question development and activities based on mathematical thinking in schools		8.18 Mathematical thinking
8.19 Final Project	Making independent and responsible decisions in solving complex problems in the field of mathematics education		8.19 Final Project
9.1Algorithms and Programming	1. Data collection 2. Data Pre-processing (Data Cleaning & Preparation) 3. Data Exploration and Visualisation (EDA) 4. Statistical Analysis and Machine Learning		9.1Algorithms and Programming
9.2 Data Analytics	1. Identifying data analysis needs in business 2. Case studies based on types of data analytics 3. Data cleaning		9.2 Data Analytics

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	5. Data validation 6. Data collection 7. Data classification 8. Data clustering 9. Data exploration 10. Dataframe 11. Use of software in decision-making by applying: Forecasting methods including linear, non-linear, seasonal dummy, , Naive, Simple Average, and Moving Average models; Exponential Smoothing models; Decomposition models; Box-Jenkins models 12. Application of Big Data in determining business strategies or decisions 13. Ability to apply inferential statistics to make data-driven decisions in a business		
9.3 data analytics software	An introduction to data analytics software covers: installation, an overview of the software's features and menus, the software's strengths and weaknesses, and its uses. 1. Microsoft Excel 2. Tableau 3. Power BI 4. SPSS 5. Minitab 6. R 7. SAS		9.3 Data Analytics Tools and Software
9.4 Data Visualisation	1. Introduction to Data Visualisation 2. Basic Principles of Effective Visualisation 3. Representation Techniques Based on Data Types 4. Types of Charts (Bar, Line, Pie, Histogram, Scatter, Boxplot, etc.) 5. Mapping Data to Visuals (Encoding Position, Colour, Shape, Size) 6. Visualisation of Categorical, Numerical, and Time Data 7. Visualisation of Multivariate and Complex Data 8. Dashboards and Data Storytelling 9. Common Errors in Visualisation and Data Presentation Ethics 10. Use of Visualisation Software (Excel, Tableau, Power BI) 11. Visualisation with Programming Languages (Python – Matplotlib, Seaborn, Plotly)		9.4 Data Visualisation

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	12. Interactive Visualisation for the Web (D3.js, Dash) 13. Geospatial Data Visualisation (Maps, Heatmaps) 14. Data Visualisation Projects and Presentation of Analysis Results		
9.5 Business Intelligence	Application of business intelligence concepts and theories in business management and organisations.		9.5 Business Intelligence
10.1 Development of digital learning resources	1. Creation of proposals and storylines for learning media 2. Development of Interactive Learning Media (Adobe Animate) 3. Development of Augmented Reality (AR) and Virtual Reality (VR) Media		10.1 Digital Learning Media Development
10.2 Educational Technology Applications	1. Design of a Learning Management System (LMS): Google Classroom, Moodle, or Edmodo 2. Use of Spreadsheet Software: Microsoft Excel (Spreadsheet) or similar applications such as used for data calculation and analysis. 3. Use of presentation software: Microsoft PowerPoint, CANVA or similar applications used to create learning presentations. 4. Creating Educational Videos: CANVA, Capcut, Animaker. 5. Gamification in mathematics learning (Kahoot, Quizizz, Math Games)		10.2 Educational Technology Applications
10.3 Graphic design	1. 2D Asset Creation (using Adobe Animate) 2. 3D Asset Creation (using Blender) 3. Basic 2D animation creation 4. Basic 3D animation		10.3 Graphic design
10.4 Teaching Resources and Materials Development	1. Creation of mathematics teaching materials for various learning models based on TPACK and UDL (Universal Design for Learning) 2. Development of innovative worksheets (project-based, contextual, digital)		10.4 Teaching Resources and Materials Development
10.5 Learning Media Evaluation	1. Basic Concepts of Learning Media Evaluation 2. Types and Approaches to Evaluation 3. Criteria and Instruments for Evaluating Learning Media 4. Stages of Educational Media Evaluation 5. Techniques for Collecting and Analysing Evaluation Data		10.5 Learning Media Evaluation

Study Materials	Elements in BK	Formation of Course Modules	Course Name
	6. Validation and Reliability of Evaluation Instruments 7. Reporting the Results of Learning Media Evaluation		
10.6 Media Production Management*	1. Basic concepts of media production management 2. Planning and organising media production 3. Management of production resources 4. Creativity and content management 5. Media distribution and utilisation 6. Ethics, law and regulation 7. Trends and innovation in media production		10.6 Media Production Management*
10.7 Hypermedia*	1. Basic Concepts of Hypermedia 2. Hypermedia Structure and Architecture 3. Hypermedia Technologies and Platforms (Hypermedia development software (e.g. Adobe Director, H5P, Unity), Web and markup technologies (HTML, CSS, XML) 4. Interactive Design and User Experience (UX) 5. Multimedia Integration in Hypermedia 6. Hypermedia in an Educational Context		10.7 Hypermedia*
10.8 3D Animation*	1. Introduction to 3D Animation 2. Fundamentals of 3D Modelling 3. Texturing and Material Techniques 4. Lighting in 3D Animation 5. Camera and Perspective 6. 6. Fundamentals of Rigging and Skinning 7. 7. Basic Animation Techniques		10.8 3D Animation*

Table 6.3 PLO - MK Mapping Matrix

No	Course	PLO										
		1	2	3	4	5	6	7	8	9	10	11
Semester 1												
1	Pancasila Education	✓										✓
2	Indonesian Language	✓										✓
3	Mathematics Educational Psychology		✓									
4	Algebra and				✓	✓						

No	Course	PLO										
		1	2	3	4	5	6	7	8	9	10	11
	Trigonometry											
5	Geometry				✓	✓						
6	English	✓										✓
7	Foundations of Education		✓									
8	Calculus				✓	✓						
Semester 2												
1	Islamic Religious Education	✓										✓
2	Christian Religious Education	✓										✓
3	-Catholic Religious Education	✓										✓
4	Hindu Religious Education	✓										✓
5	Buddhist Religious Education	✓										✓
6	Confucian Religious Education	✓										✓
7	Educational Management		✓	✓								
8	PGRI Studies	✓										✓
9	Civics	✓										✓
10	Elementary Linear Algebra				✓	✓						
11	Analytical Geometry				✓	✓						
12	Advanced Calculus				✓	✓						
13	Mathematics Learning Innovation		✓	✓								
Semester 3												
1	Ethics and Educational Profession	✓	✓	✓								
2	Mathematics Education Curriculum Analysis	✓	✓	✓					✓			
3	Mathematics Learning Strategies		✓	✓								
4	Statistics				✓	✓						
5	Transformational Geometry				✓	✓						

No	Course	PLO										
		1	2	3	4	5	6	7	8	9	10	11
6	Probability Theory				✓	✓						
7	Graphic Design							✓			✓	
8	Educational Technology Applications										✓	
9	Elementary School Mathematics			✓	✓							
Semester 4												
1	Linear Programming				✓	✓						
2	Number Theory				✓	✓						
3	Olympic Mathematics				✓							
4	n Mathematics Learning Assessment		✓	✓								
5	Junior High School Mathematics			✓	✓							
6	Economics Mathematics				✓			✓				
7	Digital Learning Media Development							✓			✓	
8	Development of Manipulative Teaching Aids			✓					✓			
9	Philosophy of Mathematics Education Education		✓									
Semester 5												
1	Mathematics Learning Planning			✓								
2	Research Methods				✓		✓					
3	Data Analysis								✓			
4	Programming Algorithms									✓		
5	Development of Teaching Resources and Materials		✓	✓							✓	
6	Introduction to Real Analysis		✓		✓	✓						
7	English for		✓									

No	Course	PLO										
		1	2	3	4	5	6	7	8	9	10	11
	Mathematics											
8	Junior High School Mathematics			✓	✓							
9	Complex Analysis				✓	✓						
Semester 6												
1	Business Intelligence				✓					✓		
2	Microteaching	✓		✓					✓			
3	Mathematical Thinking		✓	✓					✓			
4	Algebraic Structures				✓	✓						
5	Discrete Mathematics				✓	✓						
6	Seminar in Mathematics Education	✓					✓					
7	Technology-based entrepreneurship	✓						✓	✓			✓
8	Real Analysis				✓	✓						
Semester 7												
1	Internship - Teaching Practice			✓					✓			
2	Internship - Curriculum Analysis			✓					✓			
3	Internship – Lesson Plan Development			✓					✓			
4	Internship – Teaching Media Development			✓					✓			
1	Data Visualisation						✓		✓	✓		
2	Big Data				✓				✓	✓		
3	Forecasting Methods				✓	✓			✓	✓		
4	Analytics Software		✓				✓		✓	✓		
1	Hypermedia								✓		✓	
2	3D Animation								✓		✓	
3	Evaluation of Learning Materials								✓		✓	
4	Media Production Management								✓		✓	

No	Course	PLO										
		1	2	3	4	5	6	7	8	9	10	11
1	Numerical Methods				✓	✓						
2	Computational Thinking		✓	✓		✓						
3	Joyful Learning in Mathematics Education		✓	✓		✓						
4	Differential Equations				✓	✓						
5	Mathematical Statistics				✓	✓						
Semester 8												
1	Community Service	✓							✓			✓
5	Final Project						✓		✓			

**) Able to use MS Excel

7. Organisation of courses in the Mathematics Education programme

The organisation of courses in the Mathematics Education programme is presented in Table 7.1 below.

Table 7.1. Course Organisation

No	Course Code	Course Name	Course Group				Course Group					
			Compulsory Course	Elective Course	Compulsory Courses in the Curriculum	UPGRIS Distinctive MK	MPK	MPKK	MKB	MPB	MBB	MKDK
1	312512161	Islamic Religious Education			✓		✓					
2	312512162	Christian Religious Education			✓		✓					
3	312512163	Catholic Religious Education			✓		✓					
4	312512164	Hindu Religious Education			✓		✓					
5	312512165	Buddhist Religious Education			✓		✓					
6	312512166	Confucian Religious Education			✓		✓					
7	312522167	PGRI Studies			✓	✓	✓					
8	312512168	Pancasila Education			✓		✓					
9	312512169	Civics Education			✓		✓					
10	3125121610	Indonesian Language			✓							✓
11	3125221611	English				✓						✓
12	3125224612	Community Service Program - Problem Solving in the Community				✓					✓	
13	3125321613	Educational Management	✓					✓				
14	3125321614	Ethics and Educational Profession	✓							✓		
15	3125321615	Foundations of Education	✓					✓				

No	Course Code	Course Name	Course Group				Course Group					
			Compulsory Course	Elective Course	Compulsory Courses in the Curriculum	UPGRIS Distinctive MK	MPK	MPKK	MKB	MPB	MBB	MKDK
16	3125332616	Mathematics Learning Planning	✓					✓				
17	3125321617	Mathematics Education Curriculum Analysis	✓					✓				
18	3125331618	Innovations in Mathematics Education	✓					✓				
19	3125322619	Microteaching	✓							✓		
20	3125331620	Mathematics Learning Assessment	✓					✓				
21	3125321621	Mathematics Learning Strategies	✓					✓				
22	3125321622	English for Mathematics	✓					✓				
23	3125344623	Internship - Teaching Practice	✓								✓	
24	3125324624	Internship - Curriculum Analysis	✓								✓	
25	3125324625	Internship – Lesson Plan Development	✓								✓	
26	3125324626	Internship – Teaching Media Development	✓								✓	
27	3125322627	Development of Manipulative Teaching Aids	✓					✓				
28	3125321628	Mathematics Educational Psychology	✓					✓				
29	3125324629	Mathematics Olympiad	✓					✓				
30	3125321630	Elementary School Mathematics	✓					✓				

No	Course Code	Course Name	Course Group				Course Group					
			Compulsory Course	Elective Course	Compulsory Courses in the Curriculum	UPGRIS Distinctive MK	MPK	MPKK	MKB	MPB	MBB	MKDK
31	3125321631	Lower Junior High School Mathematics	✓					✓				
32	3125331632	Calculus	✓									✓
33	3125321633	Elementary Linear Algebra	✓					✓				
34	3125321634	Algebra and Trigonometry	✓									✓
35	3125321635	Geometry	✓									✓
36	3125321636	Analytical Geometry	✓					✓				
37	3125321637	Probability Theory	✓									✓
38	3125321638	Number Theory	✓									✓
39	3125321639	Real Analysis	✓					✓				
40	3125331640	Statistics	✓									✓
41	3125331641	Research Method	✓					✓				
42	3125323642	Mathematics Seminar	✓						✓			
43	3125765643	Final Project				✓			✓			
44	3125242644	Technology-Based Entrepreneurship				✓			✓			
45	3125321645	Mathematical Economics	✓					✓				✓
46	3125322646	Data Analytics	✓						✓			
47	3125322647	Programming Algorithms	✓						✓			
48	3125321648	Business Intelligence	✓						✓			
49	3125322649	Digital Learning Media Development	✓						✓			

No	Course Code	Course Name	Course Group				Course Group					
			Compulsory Course	Elective Course	Compulsory Courses in the Curriculum	UPGRIS Distinctive MK	MPK	MPKK	MKB	MPB	MBB	MKDK
50	3125321650	Development of Teaching Resources and Materials	✓					✓				
51	3125332651	Application of Learning Technologies	✓						✓			
52	3125322652	Graphic design	✓						✓			
53	3125431653	Algebraic Structures		✓				✓				
54	3125421654	Mathematical Statistics		✓				✓				
55	3125421655	Linear Programming		✓				✓				
56	3125421656	Numerical Methods		✓				✓				
57	3125431657	Advanced Calculus		✓				✓				
58	3125421658	Transformation Geometry		✓				✓				
59	3125421659	Differential Equations		✓				✓				
60	3125421660	Discrete Mathematics		✓				✓				
61	3125421661	Joyful Learning in Mathematics Education		✓				✓				
62	3125421662	Computational Thinking		✓				✓				
63	3125421663	Mathematical Thinking		✓				✓				
64	3125421664	Philosophy of Mathematics Education Education		✓				✓				
65	3125432665	Data Visualisation		✓					✓			
66	3125432666	Big Data		✓					✓			
67	3125422667	Forecasting Methods		✓					✓			
68	3125422668	Data Analytics Software		✓					✓			

No	Course Code	Course Name	Course Group				Course Group					
			Compulsory Course	Elective Course	Compulsory Courses in the Curriculum	UPGRIS Distinctive MK	MPK	MPKK	MKB	MPB	MBB	MKDK
69	3125432669	Hypermedia		✓					✓			
70	3125432670	3D Animation		✓					✓			
71	3125421671	Evaluation of Learning Materials		✓					✓			
72	3125421672	Media Production Management		✓					✓			
73	3125321673	Introduction to Real Analysis	✓					✓				
74	3125421674	Complex Analysis		✓				✓				
75	3125321675	Mathematics for Senior High School	✓					✓				
76	3125224676	Digital Literacy Community Service				✓					✓	
77	3125224677	Community Service Program - Inclusive and Exclusive Leadership				✓					✓	
78	3125224678	Community Service Program - Non-Formal Education				✓					✓	

Table 7.2. Course Organisation Matrix

Semester	Credit	No. of Courses	Course Group																														
			Compulsory Courses								Elective Courses														Compulsory Courses		UPGRIS Distinctive Courses						
VIII	10	2																									Final Project (6 credits: PLO 6 + PLO 8)		Community Service (4 credits PLO 1+PLO 8+PLO 11)		
VII	20	9	Internship - Teaching Practice (4 credits PLO 1 + PLO 2 + PLO 3 + PLO 8)	Internship - Curriculum Analysis (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)	Internship - Lesson Plan Development (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)	Internship - Development of Learning Media (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)					**Numerical Methods (2 credits PLO 4+PLO 5)**	**Computational Thinking (2 credits PLO 2+PLO 3+PLO 5)**	**Joyful Learning in Mathematics Education (2 credits PLO 2+PLO 3+PLO 5)**	**Differential Equations (2 credits PLO 4+PLO 5)**	**Mathematical Statistics (2 credits PLO 4 + PLO 5)**	Forecasting Methods* (2 credits PLO 4+PLO 5+PLO 8+PLO 9)	Data Analytics Software * (2 credits PLO 6+PLO 8+PLO 9)	Data Visualisation* (3 credits PLO 6+PLO 8+PLO 9)	Big Data * (3 credits PLO 4 + PLO 8 + PLO 9)	Learning Media Evaluation (2 credits PLO 8+PLO 10)	Media Production Management* (2 credits PLO 8+PLO 10)	Hypermedia* (3 credits PLO 8+PLO 10)	3D Animation* (3 credits PLO 8+PLO 10)									
VI	20	7	Business Intelligence (2 credits PLO 4+ PLO 9)	Microteaching (2 credits PLO 1+ PLO 3+ PLO 8)	Seminar in Mathematics Education (2 credits PLO 1+PLO 6)	Technology-based Entrepreneurship (4 credits PLO 1+ PLO 7+ PLO 8 + PLO 11)					Mathematical Thinking (3 credits PLO 2+ PLO 3+	Algebraic Structures (3 credits PLO 4)	Discrete Mathematics (2 credits PLO 4+PLO 5)	Real Analysis (2 credits PLO 4)																				

Semester	Credit	No. of Courses	Course Group																																
			Compulsory Courses								Elective Courses														Compulsory Courses		UPGRIS Distinctive Courses									
											PLO 8)																									
V	16	7	Mathematics Curriculum Planning (3 credits PLO 3)	Research Methods (3 credits PLO 4 + PLO 6)	Data Analytics (2 credits PLO 9)	Programming Algorithms (2 credits PLO 9)	Development of Teaching Resources and Materials (3 credits PLO 2 + PLO 3 + PLO 10)	English for Mathematics (2 credits PLO 2)	Junior High School Mathematics (2 credits PLO 3 + PLO 4)		Introduction to Real Analysis (2 credits PLO 4)	Complex Analysis (2 credits, PLO 4)																								
IV	20	9	Olympic Mathematics (2 credits PLO 4)	Mathematics Learning Assessment (2 credits PLO 2 + PLO 3)	Junior High School Mathematics (2 credits PLO 3 + PLO 4)	Mathematics for Economics (2 credits PLO 4 + PLO 7)	Digital Learning Media Development (2 credits) PLO 7 + PLO 10)	Development of Manipulative Teaching Aids (2 credits PLO 3 +	Number Theory (2 credits PLO 4 + PLO 5)	Linear Programming (2 credits PLO 4 + PLO 5)	Philosophy of Mathematics Education Education (2 credits																								

Semester	Credit	No. of Courses	Course Group																																
			Compulsory Courses								Elective Courses														Compulsory Courses		UPGRIS Distinctive Courses									
								PLO 8)			PLO 2)																										
III	20	9	Curriculum Analysis (2 credits) PLO 2	Mathematics Learning Strategies (2 credits PLO 2 + PLO 3)	Statistics (3 credits PLO 4 + PLO 5 + PLO 9)	Probability Theory (2 credits PLO 4 + PLO 5)	Graphic Design (2 credits PLO 7 + PLO 10)	Educational Technology Application (3 credits PLO 10)	Elementary School Mathematics (2 credits PLO 3 + PLO 4)	Ethics and Educational Profession (2 credits PLO 1 + PLO 2 + PLO 3)	Transformational Geometry (2 credits PLO 4 + PLO 5)																									
II	18	8	Educational Management (2 credits PLO 2 + PLO 3)	Elementary Linear Algebra (2 credits PLO 4 + PLO 5)	Analytical Geometry (2 credits PLO 4 + PLO 5)	Advanced Calculus (3 credits) PLO 4 + PLO 5	Mathematics Learning Innovation (3 credits PLO 2 + PLO 3)																			Religious Education (2 credits PLO 1 + PLO 11)	PGRI Studies (2 credits PLO 1 + PLO 11)	Civic Education (2 credits PLO 1 + PLO 11)									

Semester	Credit	No. of Courses	Course Group																												
			Compulsory Courses								Elective Courses														Compulsory Courses		UPGRIS Distinctive Courses				
I	17	8	Mathematics Educational Psychology (2 credits PLO 2)	Algebra and Trigonometry (2 credits PLO 4 + PLO 5)	Geometry (2 credits PLO 4 + PLO 5)	Foundations of Education (2 credits PLO 2)	Calculus (3 credits PLO 4 + PLO 5)																		Pancasila Education (2 credits PLO 1 + PLO 11)	Indonesian Language Language (2 credits PLO 1 + PLO 11)	English (2 credits PLO 1 + PLO 11)				
	144																														

8. PLO Fulfilment Chart for Courses

The PLO fulfilment map for courses is presented in Table 8.1 below.

Table 8.1. PLO Fulfilment Map in Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 1	Bahasa Indonesia	Pendidikan Agama	Etika Profesi Kependidikan			Microteaching	PLP - Praktik Mengajar	KKN
	Pendidikan Pancasila	Pendidikan Kewarganegaraan				Seminar Matematika	PLP - Analisis Kurikulum	
	Bahasa Inggris	Ke-PGRI-an				Kewirausahaan berbasis teknologi	PLP - Pengembangan Rencana Pembelajaran	
							PLP - Pengembangan Media Pembelajaran	

Table 8.2. PLO Fulfilment Map in Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 2	Landasan Kependidikan	Manejemen Pendidikan	Analisis Kurikulum	Asesmen Pembelajaran Matematika	Pengembangan Sumber dan Bahan Ajar	Berpikir Matematis	Computational Thinking	
	Etika Profesi Kependidikan	Inovasi Pembelajaran Matematika	Strategi Pembelajaran Matematika	Filsafat Pendidikan Matematika	Bahasa Inggris Matematika		Joyful Learning	
	Psikologi Pendidikan Matematika							

Table 8.3. PLO Fulfilment Map in Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 3	Etika dan Profesi Kependidikan	Manajemen Pendidikan	Matematika Sekolah Dasar	Matematika Sekolah Menengah Pertama	Matematika Sekolah Menengah Atas	Berpikir Matematis	Computational Thinking	
		Inovasi Pembelajaran Matematika	Strategi Pembelajaran Matematika	Pengembangan Alat Peraga Manupulatif	Pengembangan Sumber dan Bahan Ajar	Microteaching	Joyful Learning	
			Analisis Kurikulum Pendidikan Matematika	Assesmen Pembelajaran Matematika	Perencanaan Pembelajaran Matematika		PLP - Praktik Mengajar	
							PLP - Analisis Kurikulum	
							PLP - Pengembangan Rencana Pembelajaran	
							PLP - Pengembangan Media Pembelajaran	

Table 8.4. PLO Fulfilment Map for Courses

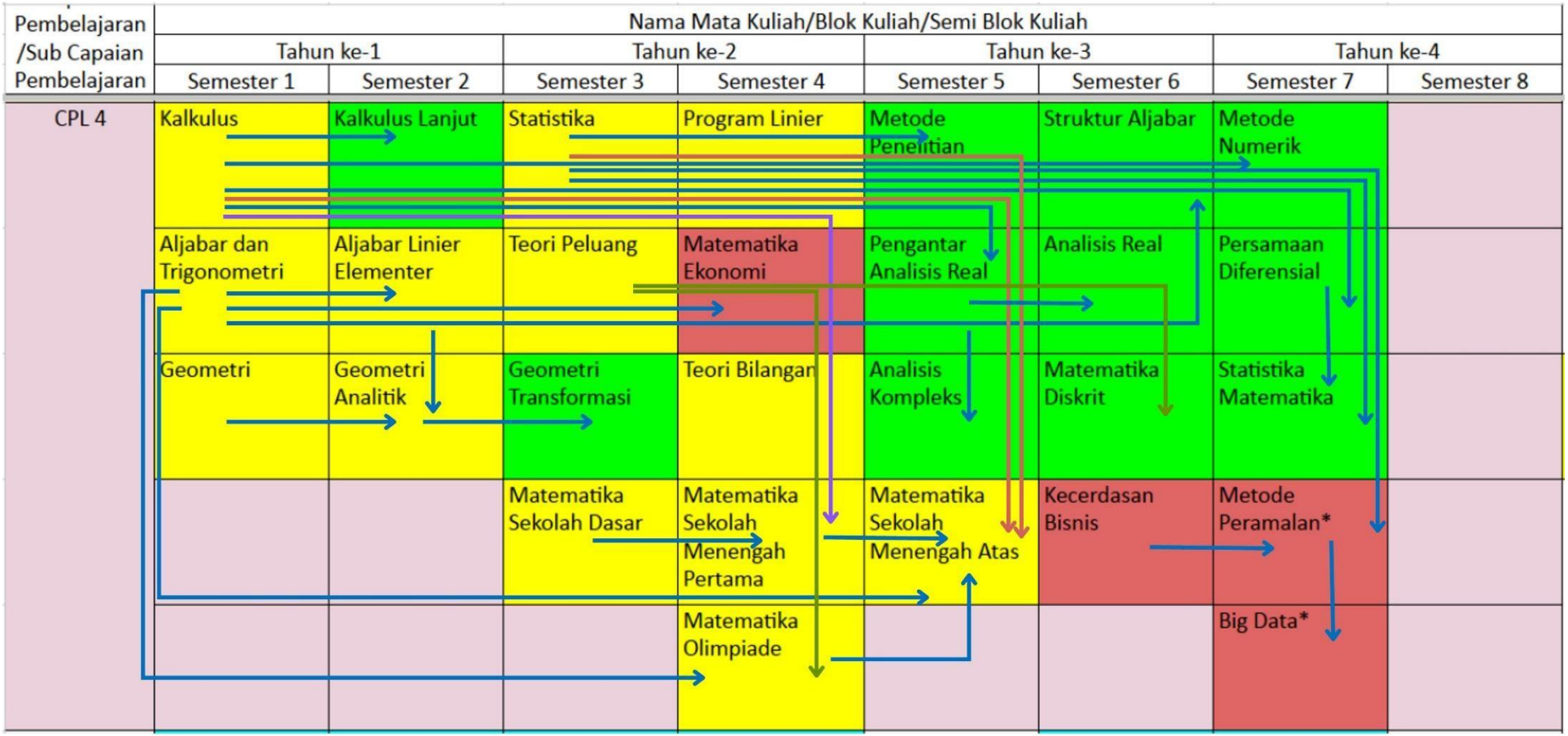

Table 8.5. PLO Fulfilment Map for Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 5	Kalkulus	Aljabar Linier Elementer	Teori Peluang	Teori Bilangan		Matematika Diskrit	Persamaan Diferensial	
	Aljabar dan Trigonometri	Kalkulus Lanjut	Statistika	Program Linier			Metode Numerik	
	Geometri	Geometri Analitik	Geometri Transformasi				Computational Thinking	
							Metode Peramalan*	
							Joyful Learning	

Table 8.6. PLO Fulfilment Map for Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 6			Statistika		Metode Penelitian	Seminar Matematika	Software Data Analitik*	Tugas Akhir
							Visualisasi Data*	

Table 8.7. PLO Fulfilment Map for Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 7			Desain Grafis	Matematika Ekonomi		Kewirausahaan berbasis teknologi		
				Pengembangan Media Pembelajaran Digital				

Table 8.8. PLO Fulfilment Map for Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 8				Pengembangan Alat Peraga Manipulatif		Microteaching	PLP - Praktik Mengajar	KKN
							PLP - Analisis Kurikulum	
							PLP - Pengembangan Rencana Pembelajaran	
							PLP - Pengembangan Media Pembelajaran	
						Kewirausahaan Berbasis Teknologi	Metode Peramalan*	Tugas Akhir
						Berpikir Matematis	Software Data Analitik*	
							Visualisasi Data*	
							Big Data*	
							Evaluasi Media Pembelajaran*	
							Manajemen Produksi Media*	
							Hypermedia*	
							Animasi 3D*	

Table 8.9. PLO Fulfilment Map for Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 9			Statistika		Algoritma Pemrograman	Kecerdasan Bisnis	Metode Peramalan*	
					Data Analitik		Software Data Analitik*	
							Visualisasi Data	
							Big Data*	

Table 8.10. PLO Fulfilment Map for Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 10			Desain Grafis	Pengembangan Media Pembelajaran Digital	Pengembangan Sumber dan Bahan Ajar		Evaluasi Media Pembelajaran*	
			Aplikasi Teknologi Pembelajaran	Pengembangan Alat Peraga Manipulatif			Manajemen Produksi Media*	
							Hypermedia*	
							Animasi 3D*	

Table 8.11. PLO Fulfilment Map for Courses

Pembelajaran /Sub Capaian Pembelajaran	Nama Mata Kuliah/Blok Kuliah/Semi Blok Kuliah							
	Tahun ke-1		Tahun ke-2		Tahun ke-3		Tahun ke-4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
CPL 11	Bahasa Indonesia	Pendidikan Agama				Kewirausahaan Berbasis Teknologi		KKN - Literasi Digital
	Pendidikan Pancasila	Pendidikan Kewarganegaraan						
	Bahasa Inggris	Ke-PGRI-an						

9. Distribution of courses per semester and PLO assessment scheduling

9.1 Distribution of Courses

The distribution of courses per semester is presented in Table 9.1 below

Table 9.1. List of Semester Courses

Semester I

No	Course Code	Course	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	312512168	Pancasila Education	1	1			2	
2	3125121610	Indonesian Language	1	1			2	
3	3125321628	Mathematics Educational Psychology	2				2	
4	3125321634	Algebra and Trigonometry	2				2	
5	3125321635	Geometry	2				2	
6	3125221611	English	2				2	
7	3125321615	Foundations of Education	2				2	
8	3125331632	Calculus	3				3	
Total Course Load for Semester I			17				**17**	

Semester II

No	Course Code	Course	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	312512161	Islamic Religious Education	1	1			2	
2	312512162	Christian Religious Education						
3	312512163	Catholic Religious Education						
4	312512164	Hindu Religious Education						
5	312512165	Buddhist Religious Education						
6	312512166	Confucian Religious Education						
7	3125321613	Educational Management	2				2	
8	312522167	PGRI Studies	2				2	
9	312512169	Civics Education	2				2	
10	3125321633	Elementary Linear Algebra	2				2	Algebra
11	3125321636	Analytical Geometry	2				2	Geometry
12	3125431657	Advanced Calculus	3				3	Calculus
13	3125331618	Innovations in Mathematics Education	2	1			3	
Total Course Load for Semester II				2			**18**	

Semester III

No	Course Code	Course	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	3125321614	Ethics and Educational Profession	2				2	
2	3125321617	Mathematics Education Curriculum Analysis	2				2	
3	3125321621	Mathematics Learning Strategies	2				2	
4	3125331640	Statistics	2	1			3	
5	3125421658	Geometric Transformations	2				2	Algebra, Geometry, Analytical Geometry
6	3125321637	Probability Theory	2				2	
7	3125322652	Graphic Design		2			2	
8	3125332651	Educational Technology Applications	1		2		3	
9	3125321630	Elementary School Mathematics	2				2	Algebra, geometry, calculus
Total Credit Points for Semester III			14	3			**20**	

Semester IV

No	Course Code	Course	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	3125421655	Linear Programming	1	1			2	
2	3125321638	Number Theory	1	1			2	
3	3125324629	Olympic Mathematics				2	2	
4	3125331620	Mathematics Learning Assessment	2	1			3	
5	3125321631	Junior High School Mathematics	2				2	Algebra, geometry, calculus
6	3125321645	Mathematics for Economics	2				2	
7	3125322649	Digital Learning Media Development		2			2	
8	3125322627	Development of Manipulative Teaching Aids		2			2	
9	3125421664	Philosophy of Mathematics Education Education	2				2	
Total Course Load for Semester IV			13	7		2	**19**	

Semester V

No	Course Code	Course	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	3125332616	Mathematics Learning Planning		3			3	Mathematics Learning Innovation, Mathematics Learning Strategies , Mathematics Learning Assessment, Digital Learning Media Development , Development of Manipulative Teaching Aids
2	3125331641	Research Method	3				3	Statistics
3	3125322646	Data Analytics		2			2	Statistics, Programming Algorithms
4	3125322647	Programming Algorithms		2			2	Algebra
5	3125321650	Development of Teaching Resources and Materials		2			2	
6	3125321673	Introduction to Real Analysis	2				2	Calculus Advanced Calculus
7	3125321622	English for Mathematics	2				2	
8	3125321675	Mathematics for Senior High School	2				2	Algebra, geometry, calculus
9	3125421674	Complex Analysis	2				2	
Total Course Load for Semester V			11	9			**20**	

Semester VI

No	Course Code	Course	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	3125321648	Business Intelligence	2				2	
2	3125322619	Microteaching		2			2	Mathematics Learning Planning
3	3125421663	Mathematical Thinking	3				3	
4	3125431653	Algebraic Structures	3				3	Algebra Elementary Linear Algebra
5	3125421660	Discrete Mathematics	2				2	Probability Theory
6	3125323642	Seminar in Mathematics Education		1	1		2	
7	3125242644	Technology-based entrepreneurship	1	2		1	4	Mathematical Economics

No	Course Code	Course	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8	3125321639	Real Analysis	2				2	Introduction to Real- e Analysis
Total Course Load for Semester VI			13	5	1		**20**	

Semester VII

No	Course Code	Course (MK)	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Teaching Placement							
1	3125344623	Internship - Teaching Practice				4	4	
2	3125324624	Internship - Curriculum Analysis				2	2	
3	3125324625	Internship – Lesson Plan Development				2	2	
4	3125324626	Internship – Teaching Media Development				2	2	
		Total					**10**	
	Industry Placement at the Centre of Excellence for Data Analytics							
1	3125432665	Data Visualisation		3			3	Programming Algorithms, Data Analytics
2	3125432666	Big Data	2	1			3	Programming Algorithms, Data Analytics
3	3125422667	Forecasting Methods	1	1			2	Programming Algorithms, Statistics
4	3125422668	Data Analytics Software		2			2	Programming Algorithms, Data Analytics
		Total		**7**			**10**	
	CoE PMPM Industry Placement							
1	3125432669	Hypermedia		3			3	
2	3125432670	3D Animation		3			3	
3	3125421671	Learning Media Evaluation	2				2	
4	3125421672	Media Production Management	2				2	
		Total		**6**			**10**	
	Elective Courses (Non-Internship)							

No	Course Code	Course (MK)	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	3125421656	Numerical Methods	1	1			2	
2	3125421662	Computational Thinking	1	1			2	
3	3125421661	Joyful Learning in Mathematics Education	1	1			2	
4	3125421659	Differential Equations	2				2	Calculus, Advanced Calculus
5	3125421654	Mathematical Statistics	2				2	Statistics
		Total		**3**			10	
Total Course Load for Semester VII				16			**20**	

Semester VIII

No	Course Code	Course	T	P	S	L	Number of credits	Course Name Prerequisites
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	3125224612	Community Service Program				4	4	
2	3125765643	Final Project			6		6	
Total Course Load for Semester VIII							10	

9.2 PLO Assessment Schedule

The PLO assessment schedule for the Mathematics Education programme is presented in Table 9.2 below.

Table 9.2 PLO Assessment Schedule Table for Programmes Outside the Engineering Field

NO	COURSE CODE	COURSE NAME	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)	(14)	(15)
1	312512161	Islamic Religious Education	Semester 2										Semester 2
2	312512162	Christian Religious Education	Semester 2										Semester 2
3	312512163	Catholic Religious Education	Semester 2										Semester 2
4	312512164	Hindu Religious Education	Semester 2										Semester 2
5	312512165	Buddhist Religious Education	Semester 2										Semester 2
6	312512166	Confucian Religious Education	Semester 2										Semester 2
7	312522167	PGRI Studies	Semester 2										Semester 2
8	312512168	Pancasila Education	Semester 1										Semester 1
9	312512169	Civics Education	Semester 2										Semester 2
10	3125121610	Indonesian Language	Semester 1										Semester 1
11	3125221611	English	Semester 1										Semester 1
12	3125224612	Community Service	Semester 8							Semester 8			Semester 8

NO	COURSE CODE	COURSE NAME	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)	(14)	(15)
16	3125321613	educational management		Semester 2	Semester 2								
17	3125321614	Ethics and Educational Profession	Semester 1	Semester 1	Semester 1								
18	3125321615	Foundations of Education		Semester 1									
19	3125332616	Mathematics Curriculum Planning			Semester 5								
20	3125321617	Mathematics Education Curriculum Analysis		Semester 3	Semester 3								
21	3125331618	Innovations in Mathematics Education		Semester 2	Semester 2								
22	3125322619	Microteaching	Semester 6		Semester 6					Semester 6			
23	3125331620	Mathematics Learning Assessment		Term 4	Semester 5								
24	3125321621	Mathematics Learning Strategies		Semester 3	Semester 3								
25	3125321622	English for Mathematics		Semester 5									
26	3125344623	Internship - Teaching Practice	Semester 7	Semester 7	Semester 7					Semester 7			
27	3125324624	Internship - Curriculum Analysis	Semester 7	Semester 7	Semester 7					Semester 7			
28	3125324625	Internship - Development of the Learning Plan	Semester 7	Semester 7	Semester 7					Semester 7			
29	3125324626	Internship - Development of Learning Media	Semester 7	Semester 7	Semester 7					Semester 7			
30	3122222638	Development of Manipulative Teaching Aids			Semester 4					Semester 4			

NO	COURSE CODE	COURSE NAME	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)	(14)	(15)
31	3125321628	Mathematics Educational Psychology		Semester 1									
32	3125324629	Olympic Mathematics				Semester 4							
33	3125321630	Elementary School Mathematics			Term 3	Term 3							
34	3125321631	Lower Junior High School Mathematics			Term 4	Term 4							
35	3125331632	Calculus				Semester 1	Semester 1						
36	3125321633	Elementary Linear Algebra				Semester 2	Semester 2						
37	3125321634	Algebra and Trigonometry				Semester 1	Semester 1						
38	3125321635	Geometry				Semester 1	Semester 1						
39	3125321636	Analytical Geometry				Semester 2	Semester 2						
40	3125321637	Probability Theory				Semester 3	Semester 3						
41	3125321638	Number Theory				Semester 4	Semester 4						
42	3125321639	Real Analysis				Semester 5							
43	3125331640	Statistics				Semester 3	Semester 3	Semester 3			Semester 3		
44	3125331641	Research Methods				Semester 5		Semester 5					
45	3125323642	Seminar in Mathematics Education	Semester 6					Semester 6					

NO	COURSE CODE	COURSE NAME	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)	(14)	(15)
46	3125765643	Final Project						Semester 8		Semester 8			
47	3125242644	Technology-Based Entrepreneurship	Semester 6						Semester 6	Semester 6			Semester 6
48	3125321645	Mathematical Economics				Semester 4			Semester 4				
49	3125322646	Data Analytics									Semester 5		
50	3125322647	Programming Algorithms									Semester 5		
51	3125321648	Business Intelligence				Semester 6					Semester 6		
52	3125322649	Digital Learning Media Development							Semester 4			Semester 4	
53	3125321650	Development of Teaching Resources and Materials		Semester 5	Semester 5							Semester 5	
54	3125332651	Educational Technology Applications										Semester 3	
55	3125322652	Graphic Design							Semester 3			Semester 3	
56	3125431653	Algebraic Structures				Semester 6							
57	3125421654	Mathematical Statistics				Semester 7	Semester 7						
58	3125421655	Linear Programming				Semester 4	Semester 4						
59	3125421656	Numerical Methods				Semester 7	Semester 7						
60	3125431657	Advanced Calculus				Semester 2	Semester 2						

NO	COURSE CODE	COURSE NAME	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)	(14)	(15)
61	3125421658	Transformational Geometry				Semester 3	Semester 3						
62	3125421659	Differential Equations				Semester 7	Semester 7						
63	3125421660	Discrete Mathematics				Semester 6	Semester 6						
64	3125421661	Joyful Learning in Mathematics Education		Term 7	Term 7		Semester 7						
65	3125421662	Computational Thinking		Semester 7	Semester 7		Semester 7						
66	3125421663	Mathematical Thinking		Semester 6	Semester 6					Semester 6			
67	3125421664	Philosophy of Mathematics Education Education		Semester 4									
68	3125432665	Data Visualisation						Semester 7		Semester 7	Semester 7		
69	3125432666	Big Data				Semester 7				Semester 7	Semester 7		
70	3125422667	Forecasting Methods				Semester 7	Semester 7			Semester 7	Semester 7		
71	3125422668	Data Analytics Tools and Software						Semester 7		Semester 7	Semester 7		
72	3125432669	Hypermedia								Semester 7		Semester 7	
73	3125432670	3D Animation								Semester 7		Semester 7	
74	3125421671	Learning Media Evaluation								Semester 7		Semester 7	
75	3125421672	Media Production Management								Semester 7		Semester 7	

NO	COURSE CODE	COURSE NAME	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)	(14)	(15)
76	3125321675	Mathematics for Senior High School			Term 5	Term 5							
77	3125321673	Introduction to Real Analysis				Semester 5							
78	3125421674	Complex Analysis				Semester 5							

10.Learning Assessment

Learning assessment standards are the minimum criteria for assessing students' learning processes and outcomes in order to meet graduate learning outcomes. The assessment of students' learning processes and outcomes covers:

1. Assessment mechanisms and procedures;

   The assessment mechanisms are carried out as follows.

   a. developing, communicating, and agreeing upon the stages, techniques, instruments, criteria, indicators, and weightings of assessment between assessors and those being assessed in accordance with the learning plan;

   b. carrying out the assessment process in accordance with the stages, techniques, instruments, criteria, indicators, and weightings that incorporate the assessment principles referred to in point a;

   c. providing feedback and an opportunity for students to question the assessment results; and

   d. documenting the assessment of students' learning processes and outcomes in a systematic and transparent manner.

   Meanwhile, the assessment procedure covers the planning stage, the assignment of tasks or questions, the observation of performance/active participation/projects/quizzes/mid-term exams/final exams, the return of observation results, and the awarding of final marks.

2. Assessment techniques and instruments;

   Assessment is carried out by developing indicators derived from the sub-CLO. Assessment instruments are created by the team of lecturers in charge and approved by the course cluster coordinator and the head of the study programme. Assessment may use rubrics and portfolios. The assessment techniques in this curriculum comprise the following 6 components.

   a. Active Participation
   b. Project
   c. Assignments
   d. Quizzes
   e. Mid-term
   f. Final Exam

Assessment instruments are physical tools or formats used to record and organise data collected through assessment techniques. Assessment instruments used include Test/Quiz Questions, Checklists, Rating Scales, Rubrics, Notes, Interview Sheets/Question Guides, and Portfolios

a. Rubric

A rubric is an assessment guide or framework that outlines the criteria required for assessing or grading students' learning outcomes. A rubric consists of the dimensions or aspects being assessed, as well as the criteria for students' learning outcomes or indicators of learning achievement.

The purpose of assessment using a rubric:

- To clarify the dimensions or aspects and levels of assessment of students' learning outcomes;
- To serve as a motivator for students to achieve their learning outcomes.

A rubric may be comprehensive or general in nature, or it may be specific, applying only to a particular topic or a specific learning outcome. An example of a question sheet as part of an assessment instrument, where each question item is preceded by the relevant Sub-CLO corresponding to that item.

Table 10.1 Assessment of EAS using a rubric

Accuracy of answering questions	Incorrect 2 points	Partially correct 6 points	Correct 8 points	Very accurate 10 points
Systematic approach to answering questions	Not systematic 2 points	Lacks structure 6 points	Systematic 8 points	Very systematic 10 points
Ability to describe results	Inaccurate 2 points	Somewhat inaccurate 6 points	Accurate 8 points	Very accurate 10 points
Neatness of answers	Not neat 2 points	Somewhat neat 6 points	Neat 8 points	Very neat 10 points
Timeliness of submitting results	Did not submit 0 points	Inaccurate 6 points	Correct 8 points	Very correct 10 points

b. Portfolio of Learning Outcomes

A portfolio is an assessment instrument/document of learning outcomes based on a collection of information demonstrating the development of students' PLO achievements over a specific period. This information may consist of students'

work from the learning process deemed to be their best, or work demonstrating the development of their ability to achieve learning outcomes.

3. Nature/Principles of Assessment

Assessment principles encompass educational, authentic, validity, reliability, objectivity, accountability, and transparency, applied in an integrated manner.

a. The educational principle involves assessment that motivates students to be able to:
    1. improve their planning and learning methods; and
    2. achieve graduate learning outcomes.
b. The principle of authenticity refers to assessment that is oriented towards a continuous learning process and learning outcomes that reflect students' abilities during the learning process.
c. The principle of validity means that assessment must accurately measure what it is intended to measure.
d. The principle of reliability means that assessment must yield **consistent** results when repeated under the same conditions.
e. The principle of objectivity refers to assessment based on standards agreed between lecturers and students, free from the influence of the assessor's and the assessed student's subjectivity.
f. The principle of accountability refers to assessment carried out in accordance with clear procedures and criteria, agreed upon at the start of the course, and understood by students.
g. The principle of transparency means that the assessment is a procedural process whose results are accessible to all stakeholders.

11.Implementation of Students' Right to Education (Maximum 3 Semesters)

Activities to Fulfil the Study Load Outside the Study Programme are learning processes carried out outside the Study Programme, whether within UPGRIS or outside UPGRIS, comprising:

1. learning within other study programmes within UPGRIS;
2. learning within the same study programme at higher education institutions outside UPGRIS;
3. learning within other study programmes at higher education institutions outside UPGRIS; and
4. learning at non-higher education institutions

The scope of activities for fulfilling the study load outside the study programme comprises 8 (eight) learning activities, including:

1. Educational Internship
2. Work/Industry Placement at the CoE PMPM
3. Work/Industry Placement at the CoE for Data Analytics
4. Academic Future Teacher (AFT)
5. SEA TEACHER
6. International PPL Community Service Program
7. Merdeka Student Exchange (PMM)
8. PURWAKA
9. Student exchange between study programmes within UPGRIS
10. Credit Transfer
11. Certified Internship
12. Fulfilment of Study Load Outside the BRIN Study Programme
13. MAHARDEKA
14. Independent Entrepreneurship
15. P2MW (Student Entrepreneurship Development Programme)
16. BERDIKARI
17. Certified Independent Study (MSIB)
18. KABARI
19. UPGRIS Thematic Community Service Program
20. MANGUNSARI

21. MAHESA
22. International Community Service
23. Lecturer Community Service
24. Student Organisation PPK
25. BKP HUMANITARIAN PROJECT
26. KENARI
27. Lecturer Research
28. Research-based PKM (PKM RSH and PKM RE)

11.1 Implementation Model for Learning Activities Outside the Degree Programme

The implementation model for learning activities outside the study programme is presented in Table 11.1 below.

Table 11.1. Implementation Model for Learning Activities Outside the Study Programme

Semester	Credit	Study Programme								Programme for Meeting Study Load Outside the Study Programme													
										Within the University	OTHER HIGHER EDUCATION INSTITUTIONS					Non-Higher Education Institutions							
																Thematic Community Service							
VIII	16	Final Project (6 credits PLO 6 + PLO 8)	Community Service (4 credits)													Community Service Program (CSP) – Digital Literacy (2 credits PLO 1+PLO 8+PLO 11)	Community Service Program (4 credits PLO 1+PLO 8+PLO 11)	Community Service Program (CSP) – Inclusive and Exclusive Leadership (2 credits PLO 1+PLO 8+PLO 11)	Community Service Program (CSP) – Non-Formal Education (2 credits PLO 1+PLO 8+PLO 11)				
VII	20	Internship - Teaching Practice (4 credits PLO 1+PLO 2 + PLO 3 + PLO 8)	Internship - Curriculum Analysis (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)	Internship – Lesson Plan Development (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)	Internship - Development of Learning Media (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)						**Numerical Methods (2 credits PLO 4+PLO 5)**	**Computational Thinking (2 credits PLO 2+PLO 3+PLO 5)**	**Joyful Learning in Mathematics Education (2 credits PLO 2 + PLO 3 + PLO 5)**	**Differential Equations (2 credits PLO 4+PLO 5)**	**Mathematical Statistics (2 credits PLO 4)**	Forecasting Methods* (2 credits PLO 4+PLO 6+PLO 8+PLO 9)	Data Analytics Software* (2 credits PLO 6+PLO 8+PLO 9)	Data Visualisation* (3 credits PLO 6+PLO 8+PLO 9)	Big Data* (3 credits PLO 4+ PLO 8+ PLO 9)	Learning Media Evaluation (2 credits PLO 8+PLO 10)	Media Production Management* (2 credits PLO 8+PLO 10)	Hypermedia* (3 credits PLO 8+PLO 10)	3D Animation* (3 credits PLO 8+PLO 10)

Semester	Credit	Study Programme								Programme for Meeting Study Load Outside the Study Programme													
										Within the University	OTHER HIGHER EDUCATION INSTITUTIONS					Non-Higher Education Institutions							
VI	17	Business Intelligence (2 credits PLO 4+ PLO 9)	Microteaching (2 credits PLO 1+ PLO 3+ PLO 8)	Seminar in Mathematics Education (2 credits PLO 1+PLO 6)	Technology-based Entrepreneurship (4 credits PLO 1+ PLO 7+ PLO 8 + PLO 11)						Mathematical Thinking (2 credits PLO 2+ PLO 3+ PLO 8)	Algebraic Structures (3 credits PLO 4)	Discrete Mathematics (2 credits PLO 4+PLO 5)										
V	18	Mathematics Curriculum Planning (3 credits) PLO 3	Research Methods (3 credits PLO 4 + PLO 6)	Data Analytics (2 credits PLO 9)	Programming Algorithms (2 credits PLO 9)	Development of Teaching Resources and Materials (2 credits PLO 2 + PLO 3 + PLO 10)	English for Mathematics (2 credits PLO 2)	Junior High School Mathematics (2 credits PLO 3 + PLO 4)			Introduction to Real Analysis (2 credits PLO 4)												
IV	19	Olympic Mathematics (2 credits PLO 4)	Mathematics Learning Assessment (2 credits PLO 2 + PLO 3)	Junior High School Mathematics (2 credits PLO 3 + PLO 4)	Mathematics for Economics (2 credits PLO 4 + PLO 7)	Digital Learning Media Development (2 credits PLO 10)	Development of Manipulative Teaching Aids (2 credits PLO 3 + PLO 8)	Number Theory (2 credits PLO 4 + PLO 5)	Linear Programming (2 credits) PLO 4 + PLO 5		Philosophy of Mathematics Education Education (2 credits PLO 2)												
III	20	Curriculum Analysis (2 credits PLO 2 + PLO 3)	Mathematics Learning Strategies (2 credits PLO 2 + PLO 3)	Statistics (3 credits PLO 4 + PLO 5 + PLO 9)	Probability Theory (2 credits PLO 4 + PLO 5)	Graphic Design (2 credits PLO 7 + PLO 10)	Educational Technology Application (3 credits PLO 10)	Elementary School Mathematics (2 credits PLO 3 + PLO 4)	Ethics and Educational Profession (2		Transformational Geometry (2 credits) PLO 4 + PLO 5												

Semester	Credit	Study Programme								Programme for Meeting Study Load Outside the Study Programme											
										Within the University	OTHER HIGHER EDUCATION INSTITUTIONS					Non-Higher Education Institutions							
									credits PLO 2 + PLO 3)														
II	18	Educational Management (2 credits PLO 2 + PLO 3)	PGRI Studies (2 credits, PLO 1 + PLO 11)	Civic Education (2 credits PLO 1+PLO 11)	Elementary Linear Algebra (2 credits PLO 4 + PLO 5)	Analytical Geometry (2 credits PLO 4 + PLO 5)	Advanced Calculus (3 credits PLO 4 + PLO 5)	Mathematics Learning Innovation (3 credits PLO 2 + PLO 3)	Religious Education (2 credits PLO 1 + PLO 11)													
I	17	Mathematics Educational Psychology (2 credits PLO 2	Algebra and Trigonometry (2 credits PLO 4 + PLO 5)	Geometry (2 credits PLO 4 + PLO 5)	English (2 credits PLO 1 + PLO 11)	Foundations of Education (2 credits PLO 2)	Calculus (3 credits PLO 4 + PLO 5)	Pancasila Education (2 credits PLO 1 + PLO 11)	Indonesian Language (2 credits PLO 1 + PLO 11)													

11.2 Compulsory Courses within the Programme

The courses that must be taken by every student in the mathematics education programme are presented in Table 11.2 as follows.

Table 11.2. Compulsory Courses

No	Course Code	Course Name	Credit Points	Description
1	3125321613	Educational Management	2	
2	3125321614	Ethics and Educational Profession	2	
3	3125321615	Foundations of Education	2	
4	3125332616	Mathematics Learning Planning	3	
5	3125321617	Mathematics Education Curriculum Analysis	2	
6	3125331618	Innovations in Mathematics Education	3	
7	3125322619	Microteaching	2	
8	3125331620	Mathematics Learning Assessment	3	
9	3125321621	Mathematics Learning Strategies	2	
10	3125321622	English for Mathematics	2	
11	3125344623	Internship - Teaching Practice	4	
12	3125324624	Internship - Curriculum Analysis	2	
13	3125324625	Internship – Lesson Plan Development	2	
14	3125324626	Internship – Teaching Media Development	2	
15	3125322627	Development of Manipulative Teaching Aids	2	
16	3125321628	Mathematics Educational Psychology	2	
17	3125324629	Olympic Mathematics	2	
18	3125321630	Elementary School Mathematics	2	
19	3125321631	Lower Junior High School Mathematics	2	
20	3125331632	Calculus	3	
21	3125321633	Elementary Linear Algebra	2	
22	3125321634	Algebra and Trigonometry	2	
23	3125321635	Geometry	2	
24	3125321636	Analytical Geometry	2	
25	3125321637	Probability Theory	2	
26	3125321638	Number Theory	2	
27	3125321639	Real Analysis	2	
28	3125331640	Statistics	3	
29	3125331641	Research Methods	3	
30	3125323642	Mathematics Seminar	2	
31	3125765643	Final Project	6	
32	3125242644	Technology-Based Entrepreneurship	4	
33	3125321645	Mathematical Economics	2	
34	3125322646	Data Analytics	2	
35	3125322647	Programming Algorithms	2	

No	Course Code	Course Name	Credit Points	Description
36	3125321648	Business Intelligence	2	
37	3125322649	Digital Learning Media Development	2	
38	3125321650	Development of Teaching Resources and Materials	2	
39	3125332651	Application of Learning Technologies	3	
40	3125322652	Graphic design	2	
41	3125321673	Introduction to Real Analysis	2	
42	3125321675	Mathematics for Senior High School	2	
Total Credit Points			99	

11.3 Course learning outside the degree programme

Course learning outside the mathematics education study programme is presented in Table 11.3 below.

Table 11.3. Coursework Outside the Degree Programme

No	Course Taken	Maximum credit weight	Remarks
1	Outside the programme, on/off campus	6	The courses taken have the same total credit weight, and have corresponding PLOs and additional competencies.
2	In the same programme outside the campus	20	Courses taken must have the same total credit weight; it is recommended that these be selected from courses agreed upon by the association/society of similar study programmes.
3	Off-campus (DUDI, etc.)	20	Courses taken must have the same total credit weight and must align with the PLO and relevant additional competencies.
	Maximum total credit weight	46	

11.4 Forms of Learning Activities Outside Higher Education Institutions

The forms of learning activities outside the university are presented in Table 11.4 as follows.

Table 11.4. Forms of Learning Activities Outside the Study Programme

No	Form of Learningctivity	Can be carried out with credit weight		Notes
		Regular	Fulfilment of Study Load Outside the Study Programme	
1	Internship/Work Placement	0	10	Internship activities fulfilling the study load outside the degree programme may be converted into several modules where the PLOs align and the duration of the learning activities corresponds to the credit weight of the respective modules.
2	Community Service Program /KKNT	4	6	KKNT activities fulfilling the study load outside the study programme, which are an extension of the regular Community Service Program , can be converted into several courses that have PLO alignment and a duration of study activities corresponding to the credit weight of those courses.
3	Entrepreneurship	6	≤14	Entrepreneurship Activities to Fulfil the Study Load Outside the Study Programme may be converted into several courses that have compatible PLOs and learning activity times corresponding to the credit weight of those courses, including the Entrepreneurship course if available.
4	Teaching Assistant at an Educational Institution (AMSP)	8	2	AMSP activities fulfilling the study load outside the study programme may be converted into several courses that have compatible PLOs and learning time commensurate with the course's credit weight.
5	Lecturer research	6	0	Can be converted into several courses that have PLO alignment and learning activity time commensurate with the course's credit weight.
6	Lecturer Community Service	6	0	Can be converted into several courses that have PLO alignment and learning activity time commensurate with the course's credit weight.
6	Independent Study/Project	13	≤7	Can be converted into several courses that have PLO equivalence and learning activity time commensurate with the course's credit weight.
7	Humanitarian project	8	≤12	Can be converted into several courses that have PLO alignment and learning

No	Form of Learningctivity	Can be carried out with credit weight		Notes
		Regular	Fulfilment of Study Load Outside the Study Programme	
				activity time commensurate with the course's credit weight.
8	PKM	10	0	If a student qualifies funding, they receive 7 credits, and if they qualify for PIMNAS, they receive an additional 3 credits.

11.5 Curriculum Structure for Learning Activities Outside the Mathematics Education Programme

The curriculum structure for learning activities outside the mathematics education programme is presented in Table 11.5 as follows.

Table 11.5 Curriculum Structure for Learning Activities Outside the Degree Programme

Semester	Credits	Programme of Study Within the Programme								Programmes for Meeting Study Load Requirements Outside the Programme											
										Within the University	Other Higher Education Institutions					Non-Higher Education Institutions					
																Thematic Community Service					
VIII	16	Final Project (6 credits PLO 6 + PLO 8)	Community Service (4 credits)													Community Service Program (CSP) – Digital Literacy (2 credits PLO 1+PLO 8+PLO 11)	Community Service Program (4 credits PLO 1+PLO 8+PLO 11)	Community Service Program (CSP) – Inclusive and Exclusive Leadership (2 credits PLO 1+PLO 8+PLO 11)	Community Service Program (CSP) – Non-Formal Education (2 credits PLO 1+PLO 8+PLO 11)				

Semester	Credits	Programme of Study Within the Programme								Programmes for Meeting Study Load Requirements Outside the Programme												
										Within the University	Other Higher Education Institutions					Non-Higher Education Institutions						
VII	20	Internship - Teaching Practice (4 credits: PLO 1 + PLO 2 + PLO 3 + PLO 8)	Internship - Curriculum Analysis (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)	Internship – Lesson Plan Development (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)	Internship - Development of Learning Media (2 credits PLO 1+PLO 2 + PLO 3 + PLO 8)						**Numerical Methods (2 credits PLO 4+PLO 5)**	**Computational Thinking (2 credits PLO 2+PLO 3+PLO 5)**	**Joyful Learning in Mathematics Education (2 credits PLO 2 + PLO 3 + PLO 5)**	**Differential Equations (2 credits PLO 4+PLO 5)**	**Mathematical Statistics (2 credits PLO 4)**	Forecasting Methods* (2 credits PLO 4+PLO 6+PLO 8+PLO 9)	Data Analytics Software* (2 credits PLO 6+PLO 8+PLO 9)	Data Visualisation* (3 credits PLO 6+PLO 8+PLO 9)	Big Data* (3 credits PLO 4+ PLO 8+ PLO 9)	Learning Media Evaluation (2 credits PLO 8+PLO 10)	Media Production Management* (2 credits PLO 8+PLO 10)	Hyper media* (3 credits PLO 8+PLO 10)	3D Animation* (3 credits PLO 8+PLO 10)
VI	17	Business Intelligence (2 credits PLO 4+ PLO 9)	Microteaching (2 credits PLO 1+ PLO 3+ PLO 8)	Seminar in Mathematics Education (2 credits PLO 1+PLO 6)	Technology-based Entrepreneurship (4 credits PLO 1+ PLO 7+ PLO 8 + PLO 11)						Mathematical Thinking (2 credits PLO 2+ PLO 3+ PLO 8)	Algebraic Structures (3 credits PLO 4)	Discrete Mathematics (2 credits PLO 4+PLO 5)										
V	18	Mathematics Curriculum Planning (3 credits) PLO 3	Research Methods (3 credits PLO 4 + PLO 6)	Data Analytics (2 credits PLO 9)	Programming Algorithms (2 credits PLO 9)	Development of Teaching Resources and Materials (2 credits PLO 2 + PLO 3 + PLO 10)	English for Mathematics (2 credits PLO 2)	Junior High School Mathematics (2 credits PLO 3 + PLO 4)			Introduction to Real Analysis (2 credits PLO 4)												

Semester	Credits	Programme of Study Within the Programme								Programmes for Meeting Study Load Requirements Outside the Programme											
										Within the University	Other Higher Education Institutions					Non-Higher Education Institutions					
IV	19	Olympic Mathematics (2 credits PLO 4)	Mathematics Learning Assessment (2 credits PLO 2 + PLO 3)	Junior High School Mathematics (2 credits PLO 3 + PLO 4)	Mathematics for Economics (2 credits PLO 4 + PLO 7)	Digital Learning Media Development (2 credits PLO 10)	Development of Manipulative Teaching Aids (2 credits PLO 3 + PLO 8)	Number Theory (2 credits PLO 4 + PLO 5)	Linear Programming (2 credits) PLO 4 + PLO 5		Philosophy of Mathematics Education Education (2 credits PLO 2)										
III	20	Curriculum Analysis (2 credits PLO 2 + PLO 3)	Mathematics Learning Strategies (2 credits PLO 2 + PLO 3)	Statistics (3 credits PLO 4 + PLO 5 + PLO 9)	Probability Theory (2 credits PLO 4 + PLO 5)	Graphic Design (2 credits PLO 7 + PLO 10)	Educational Technology Application (3 credits PLO 10)	Elementary School Mathematics (2 credits PLO 3 + PLO 4)	Ethics and Educational Profession (2 credits PLO 2 + PLO 3)		Transformational Geometry (2 credits) PLO 4 + PLO 5										
II	18	Educational Management (2 credits PLO 2 + PLO 3)	PGRI Studies (2 credits PLO 1 + PLO 11)	Civic Education (2 credits PLO 1 + PLO 11)	Elementary Linear Algebra (2 credits PLO 4 + PLO 5)	Analytical Geometry (2 credits PLO 4 + PLO 5)	Advanced Calculus (3 credits PLO 4 + PLO 5)	Mathematics Learning Innovation (3 credits PLO 2 + PLO 3)	Religious Education (2 credits PLO 1 + PLO 11)												

Semester	Credits	Programme of Study Within the Programme								Programmes for Meeting Study Load Requirements Outside the Programme													
										Within the University	Other Higher Education Institutions					Non-Higher Education Institutions							
I	17	Mathematics Educational Psychology (2 credits PLO 2	Algebra and Trigonometry (2 credits PLO 4 + PLO 5)	Geometry (2 credits PLO 4 + PLO 5)	English (2 credits PLO 1 + PLO 11)	Foundations of Education (2 credits PLO 2)	Calculus (3 credits PLO 4 + PLO 5)	Pancasila Education (2 credits PLO 1 + PLO 11)	Indonesian Language (2 credits PLO 1 + PLO 11)														

11.6 PLO FORMS OF LEARNING OUTSIDE THE STUDY PROGRAMME

PLO / Additional competencies that can be achieved through activities fulfilling the study load outside the study programme, as shown in Table 11.6 below.

Table 11.6 PLOs achieved through forms of learning outside the study programme

No	Sem	Course Code	Course Title	Credit Points	PLO assigned to the course											Form of Fulfilment of Study Load Outside the Study Programme, as Specified	Notes
(1)	(2)	(3)	(4)	(5)	(6)											(7)	(8)
					PLO (1)	PLO (2)	PLO (3)	PLO (4)	PLO (5)	PLO (6)	PLO (7)	PLO (8)	PLO (9)	PLO (10)	PLO (11)		
1	7	3125421656	Numerical Methods	2				✓	✓								
2	7	3125421662	Computational Thinking	2		✓	✓		✓								
3	7	3125421661	Joyful Learning in Mathematics Education	2		✓	✓		✓								
4	7	3125421659	Differential Equations	2				✓	✓								
5	7	3125421654	Mathematical Statistics	2				✓	✓							Certified Internship, MAHARDEKA, Certified Independent	

No	Sem	Course Code	Course Title	Credit Points	PLO assigned to the course											Form of Fulfilment of Study Load Outside the Study Programme, as Specified	Notes
(1)	(2)	(3)	(4)	(5)	(6)											(7)	(8)
					PLO (1)	PLO (2)	PLO (3)	PLO (4)	PLO (5)	PLO (6)	PLO (7)	PLO (8)	PLO (9)	PLO (10)	PLO (11)		
																Study (MSIB), KABARI, KENARI	
6	6	3125421663	Mathematical Thinking	2		✓	✓					✓					
7	6	3125431653	Algebraic Structures	3				✓									
8	6	3125421660	Discrete Mathematics	2				✓	✓								
9	5	3125321673	Introduction to Real Analysis	2				✓									
10	4	3125421664	Philosophy of Mathematics Education	2		✓											
11	3	3125421658	Geometric Transformations	2				✓	✓								

No	Sem	Course Code	Course Title	Credit Points	PLO assigned to the course											Form of Fulfilment of Study Load Outside the Study Programme, as Specified	Notes
(1)	(2)	(3)	(4)	(5)	(6)											(7)	(8)
					PLO (1)	PLO (2)	PLO (3)	PLO (4)	PLO (5)	PLO (6)	PLO (7)	PLO (8)	PLO (9)	PLO (10)	PLO (11)		
12	8	3125224676	Community Service Program - Digital Literacy	2	✓							✓			✓	UPGRIS Thematic Community Service Program, MANGUNSARI, MAHESA, International Community Service Program, Staff Community Service, BKP Humanitarian Project	
13	8	3125224612	Community Service Program – Problem Solving in the Community	2	✓							✓			✓	UPGRIS Thematic Community Service Program, MANGUNSARI, MAHESA,	

No	Sem	Course Code	Course Title	Credit Points	PLO assigned to the course											Form of Fulfilment of Study Load Outside the Study Programme, as Specified	Notes
(1)	(2)	(3)	(4)	(5)	(6)											(7)	(8)
					PLO (1)	PLO (2)	PLO (3)	PLO (4)	PLO (5)	PLO (6)	PLO (7)	PLO (8)	PLO (9)	PLO (10)	PLO (11)		
																International Community Service Program, Lecturer Outreach, BKP HUMANITARIAN PROJECT	
14	8	3125224677	Community Service Program (KKN) – Inclusive and Exclusive Leadership	3	✓							✓			✓	UPGRIS Thematic Community Service Program, MANGUNSARI, MAHESA, International Community Service Program, Staff Community Service, BKP	

No	Sem	Course Code	Course Title	Credit Points	PLO assigned to the course											Form of Fulfilment of Study Load Outside the Study Programme, as Specified	Notes
(1)	(2)	(3)	(4)	(5)	(6)											(7)	(8)
					PLO (1)	PLO (2)	PLO (3)	PLO (4)	PLO (5)	PLO (6)	PLO (7)	PLO (8)	PLO (9)	PLO (10)	PLO (11)		
																HUMANITARIAN PROJECT	
15	8	3125224678	Community Service Program - Non-Formal Education	3	✓							✓			✓	UPGRIS Thematic Community Service Program, MANGUNSARI, MAHESA, International Community Service Program, Staff Community Service, BKP HUMANITARIAN PROJECT	

No	Sem	Course Code	Course Title	Credit Points	PLO assigned to the course											Form of Fulfilment of Study Load Outside the Study Programme, as Specified	Notes
(1)	(2)	(3)	(4)	(5)	(6)											(7)	(8)
					PLO (1)	PLO (2)	PLO (3)	PLO (4)	PLO (5)	PLO (6)	PLO (7)	PLO (8)	PLO (9)	PLO (10)	PLO (11)		
16	7	3125422667	Forecasting Methods*	2				✓	✓			✓	✓			Work/Industry Placement	
17	7	3125422668	Data Analytics Software*	2						✓		✓	✓			Work Placement/Industry	
18	7	3125432665	Data Visualisation*	3						✓		✓	✓			Work Placement/Industry	
19	7	3125432666	Big Data*	3				✓				✓	✓			Work Placement/Industry	
20	7	3125421671	Evaluation of Learning Materials*	2								✓		✓		Work/Industry Placement	
21	7	3125421672	Media Production Management*	2								✓		✓		Work Placement/Industry	
22	7	3125432669	Hypermedia*	3								✓		✓		Work/Industry Placement	
23	7	3125432670	3D Animation*	3	✓							✓				Work/Industry Placement	

No	Sem	Course Code	Course Title	Credit Points	PLO assigned to the course											Form of Fulfilment of Study Load Outside the Study Programme, as Specified	Notes
(1)	(2)	(3)	(4)	(5)	(6)											(7)	(8)
					PLO (1)	PLO (2)	PLO (3)	PLO (4)	PLO (5)	PLO (6)	PLO (7)	PLO (8)	PLO (9)	PLO (10)	PLO (11)		
24	3	3125322652	Graphic Design	2							✓			✓			
25	4	3125322649	Development of Digital Learning Materials	2							✓			✓		Work Placement/Industry Placement	
26	6	3125321639	Real Analysis	2				✓									

11.7 Quality Assurance for Activities Outside the Degree Programme

To ensure that the implementation of the policy on fulfilling the study load outside the study programme, specifically the "right to study for three semesters outside the study programme", proceeds with guaranteed quality, the following quality standards must be established:

1. Quality of participants' competencies.
2. Quality of implementation.
3. Quality of internal and external supervision processes.
4. Quality of facilities and infrastructure for implementation.
5. Quality of reporting and presentation of results.
6. Quality of assessment

To ensure quality assurance is carried out effectively, the details of activities regarding the Fulfilment of Study Load Outside the Study Programme are presented in Table 11.7 below.

Table 11.7 Quality Assurance of Learning Activities Outside the Study Programme

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
1	Teaching Placement	taken in semester 7 Students must pass the following modules: 1. Microteaching (grade B) 2. Have completed a minimum of 100 credits	carried out over 3 months Converted to 10 credits 1. Students must register with the programme to participate in the educational placement (P) 2. Students must complete the Course Registration Form for Study Load Fulfilment Outside the Programme of Study in SIMEKAR, selecting the Educational Internship (P) activity 3. Students carry out activities in accordance with the instructions of the Educational Internship committee (D) 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) 6. The Internship Supervisor monitors the outcomes of the student interns (C) 7. The Assessor for Fulfilment of Study Load Outside the Study Programme conducts an overall evaluation of student outcomes (C)
2	Work/Industry Placement CoE PMPM	conducted in semester 7 Minimum grade of B in the course 1. Graphic Design 2. Educational Technology Applications 3. Development of teaching resources and materials	Conducted over 3 months converted to 10 credits 1. Students must register with the programme to participate in the CoE PMPM (P) work placement/industrial placement 2. Students complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Study Programme via SIMEKAR, including the CoE PMPM (P) work placement/industrial placement 3. Students carry out activities in accordance with the instructions of the CoE PMPM (D) work placement/industrial placement committee 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for the Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) 6. The Internship Supervisor monitors the outcomes of the student interns (C) 7. The assessor for the fulfilment of study load outside the study programme conducts an

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			overall evaluation of student outcomes (C)
3	Work/Industry Placement CoE Data Analytics	conducted in semester 7 Minimum grade of B in the following course 1. Statistics 2. Data Analytics 3. Programming Algorithms 4. Business Intelligence	carried out over a period of 3 months converted to 10 credits 1. Students must register with their department to participate in the CoE Data Analytics (P) work placement/industrial placement 2. Students complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Study Programme via SIMEKAR, including the CoE Data Analytics (P) work placement/industrial placement 3. Students carry out activities in accordance with the instructions of the CoE Data Analytics work placement/industrial placement committee (D) 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for fulfilment of study load outside the study programme, and the course logbook (C) 6. The Internship Supervisor monitors the outcomes of the student interns (C) 7. The assessor for the fulfilment of study load outside the study programme conducts an overall evaluation of student outcomes (C)
4	Academic Future Teacher (AFT)	This activity is intended for final-year students (from semester 7 onwards)	Conducted over 1 semester Converted to 20 credits 1. Students must register with their department to participate in the Academic Future Teacher (AFT)(P) programme 2. Students must complete the Course Registration Form for Study Load Outside the Programme of Study in SIMEKAR, selecting the Academic Future Teacher (AFT)(P) activity 3. Students carry out the activities in accordance with the instructions of the Academic Future Teacher (AFT)(D) committee 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for fulfilment of study load outside the study programme, and the course logbook (C) 6. The Academic Supervisor monitors student outcomes (C) 7. The assessor for the fulfilment of study load outside the study programme conducts an overall

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			evaluation of student outcomes (C)
5	SEA TEACHER	Students may participate in this activity from Semester 7	organised by SEAMEO under the coordination of UPT KUI lasts approximately 1 month converted to 10 credits. 1. Students must register with their department to participate in the SEA TEACHER(P) programme 2. Students must complete the Course Registration Form for Study Load Fulfilment Outside the Degree Programme in SIMEKAR, selecting the SEA TEACHER(P) activity 3. Students carry out the activities in accordance with the instructions of the SEA TEACHER(D) committee 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for fulfilment of study load outside the study programme, and the course logbook (C) 6. The academic supervisor monitors student outcomes (C) 7. The assessor for the fulfilment of study load outside the study programme conducts an overall evaluation of student outcomes (C)
6	International Community Service Placement	Students may participate in this activity from Semester 5	organised by the UPT KUI UPGRIS lasts approximately 1 month Converted to 10 credits 1. Students must register with their department to participate in the International Community Service Program (P) 2. Students must complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Programme of Study via SIMEKAR, selecting the International PPL Community Service Program (P) activity 3. Students carry out the activities in accordance with the instructions of the International PPL Community Service Program committee (D) 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for the Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C)

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			6. The supervising lecturer monitors student outcomes (C) 7. Assessor for the Fulfilment of Study Load Outside the Degree Programme, conducting an overall evaluation of student outcomes (C)
7	Student Exchange Programme (PMM)	Requirements in accordance with the updated programme from the Ministry of Education, Culture, Research and Technology courses must have the same CLO as the degree programme minimum of 6th-semester students	Kemdikbudristek programme Conducted over a full semester The host institution must be an inter-island higher education institution The number of credits converted corresponds to the courses taken by the student at the host university 1. Students must register with their department to participate in the PMM(P) programme 2. Students complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Programme of Study in SIMEKAR, including the PMM(P) activity 3. Students carry out activities in accordance with the instructions of the PMM(D) committee 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for the Fulfilment of Study Load Outside the Study Programme and the Course Logbook 6. The Academic Supervisor monitors student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Programme conduct an overall evaluation of student outcomes (C)
8	PURWAKA	student exchange activities organised independently by the programme, faculty, or the University.	These activities must be recorded in http://bursakmm.lldikti6.id carried out over a full semester converted according to the courses taken by the student 1. Students must register with their study programme to participate in the PURWAKA(P) programme 2. Students must complete the Course Registration Form (KRS) for Academic Load Fulfilment Outside the Study Programme in SIMEKAR, specifying the PURWAKA(P) activity 3. Students carry out the activity in accordance with the instructions of the PURWAKA(D) committee 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity records, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for the Fulfilment of Study Load Outside the

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			Study Programme and the Course Logbook (C) 6. The academic supervisor monitors student outcomes (C) 7. The assessor for the fulfilment of learning load outside the study programme conducts an overall evaluation of student outcomes (C)
9	Student exchange between study programmes within UPGRIS	Conducted for fifth-semester students	courses taken in other programmes within UPGRIS 1. Students must register with their programme to participate in the Inter-programme Student Exchange within UPGRIS (P) 2. Students must complete the Course Registration Form (KRS) for Course Load Fulfilment Outside the Programme of Study via SIMEKAR, selecting the Inter-Departmental Student Exchange Programme within UPGRIS (P) 3. Students carry out activities in accordance with the instructions of the Inter-departmental Student Exchange within UPGRIS committee (D) 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. Lecturers monitor the SPADA for Course Load Fulfilment Outside the Study Programme and the Course Logbook ( ) (C) 6. The academic supervisor monitors student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
10	Credit Transfer	carried out from at least the 6th semester	organised by the UPT KUI carried out over one semester Credit conversion follows the courses taken by the student at the host institution. 1. Students must register with their programme to participate in the Credit Transfer (P) scheme 2. Students complete the Course Registration Form (KRS) for Course Load Fulfilment Outside the Study Programme in SIMEKAR, including the Credit Transfer (P) activity 3. Students carry out activities in accordance with the Credit Transfer Committee's instructions (D) 4. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The course lecturer monitors the SPADA system for the fulfilment of study load

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			requirements outside the degree programme, and the course logbook (C) 6. The Academic Supervisor monitors student outcomes (C) 7. The assessor for the fulfilment of study load requirements outside the degree programme conducts an overall evaluation of student outcomes (C)
11	Certified Internship	The activity is undertaken by students from Semester 5 onwards.	Organised by the Ministry of Education, Culture, Research and Technology carried out over a full semester Conversion of 20 credits ii. Students must register with their department to participate in the certified internship programme (P) iii. Students must complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Study Programme in SIMEKAR, including the certified internship (P) iv. Students carry out activities in accordance with the instructions of the certified internship committee (D) v. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) vi. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) vii. The Internship Supervisor monitors the outcomes of the student interns (C) viii. The Assessor for Fulfilment of Study Load Outside the Study Programme conducts an overall evaluation of the student's outcomes (C)
12	Fulfilment of Study Load Outside the BRIN Programme	This activity is only open to students in at least their 6th semester.	Conducted over a full semester equivalent to 20 credits. i. Students must register with their department to participate in the BRIN(P) Programme of Study External Academic Load Fulfilment activity ii. Students must register for the Course Registration Form (KRS) for the Course Load Fulfilment Outside the BRIN Study Programme in SIMEKAR, selecting the 'Course Load Fulfilment Outside the BRIN Study Programme (P)' activity iii. Students carry out the activity in accordance with the instructions of the BRIN(D) Programme-External Study Load Fulfilment committee iv. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D)

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			v. The supervising lecturer monitors the SPADA for the Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) vi. The Academic Supervisor monitors student outcomes (C) vii. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
13	MAHARDEKA	The activity is attended by students from Semester 6 onwards.	organised by LLDIKTI VI Conducted over a full semester equivalent to 20 credits. i. Students must register with their department to participate in the MAHARDEKA(P) programme ii. Students must register for the Course Registration Form (KRS) for Coursework Outside the Programme of Study in SIMEKAR, selecting the MAHARDEKA(P) activity iii. Students carry out the activities in accordance with the instructions of the MAHARDEKA(D) committee iv. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) v. The supervising lecturer monitors the SPADA for fulfilment of study load outside the study programme and the course logbook (C) vi. The academic supervisor monitors student outcomes (C) vii. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
14	Independent Entrepreneurship	Students may participate in this activity from the third semester of the ‘ ’ programme.	Conducted over 1 semester Conversion: 20 credits 4. Students must register with their department to participate in the Independent Entrepreneurship (P) programme 5. Students must complete the Course Registration Form for Academic Load Fulfilment Outside the Degree Programme in SIMEKAR, selecting the Independent Entrepreneurship (P) activity 6. Students carry out the activities in accordance with the instructions of the Wirausaha Merdeka committee (D) 7. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log,

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			critical analysis, etc. (D) 8. The course lecturer monitors SPADA compliance with the study load requirements outside the degree programme and the course logbook (C) 9. The Academic Supervisor monitors student outcomes (C) 10. The assessor for the fulfilment of study load outside the degree programme conducts an overall evaluation of student outcomes (C)
15	P2MW (Student Entrepreneurship Development Programme)	Conducted in semester 6; if undertaken before semester 6, it will be converted to freefoam in accordance with BELMAWA's schedule	Conversion if 7 credits are passed; if reaching the EXPO, 3 credits will be added 1. Students must register with their department to participate in the P2MW(P) programme 2. Students must complete the Course Registration Form (KRS) for Academic Load Fulfilment Outside the Study Programme in SIMEKAR, including the P2MW(P) activity 3. Students carry out activities in accordance with the instructions of the P2MW(D) committee 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) 6. The academic supervisor monitors student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
16	INDEPENDENT	Students may enrol from the 6	organised by LLDIKTI VI conducted over 1 semester equivalent to 20 ECTS credits. 1. Students must register with their department to participate in the BERDIKARI(P) programme 2. Students must complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Programme of Study in SIMEKAR, selecting the BERDIKARI(P) activity 2. Students carry out the activities in accordance with the instructions of the BERDIKARI(D) committee 3. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 4. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C)

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			5. The academic supervisor monitors student outcomes (C) 6. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
17	Certified Independent Study (MSIB)	The programme is open to students from Semester 6	conducted over a full semester equivalent to 20 credits 1. Students must register with their department to participate in the Certified Independent Study (MSIB)(P) programme 2. Students must complete the Course Registration Form for Study Load Fulfilment Outside the Degree Programme in SIMEKAR, selecting the Certified Independent Study (MSIB)(P) activity 3. Students carry out activities in accordance with the instructions of the Certified Independent Study (MSIB)(D) committee 4. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) 6. The supervising lecturer monitors student outcomes (C) 7. The Assessor for Fulfilment of Study Load Outside the Study Programme conducts an overall evaluation of student outcomes (C)
18	KABARI	The activity is open to students from Semester 6 onwards	conducted over a full semester converted to 20 credits 1. Students must register with their department to participate in the KABARI(P) programme 2. Students must select the 'Course Load Fulfilment Outside the Study Programme' module in SIMEKAR, specifying the KABARI(P) activity 3. Students carry out the activity in accordance with the instructions of the KABARI(D) committee 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) 6. The academic supervisor monitors student outcomes (C)

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			7. The Assessor for the Fulfilment of Study Load Outside the Degree Programme conducts a comprehensive evaluation of student learning outcomes (C)
19	UPGRIS Thematic Community Service Program	The activity is open to students from Semester 6 onwards	Organised by the UPGRIS Community Service Centre carried out over approximately 3 months Equivalent to 10 credit points 1. Students must register with their department to participate in the UPGRIS Thematic Community Service Program (P) 2. Students must register for the 'Course Load Fulfilment Outside the Study Programme' module in SIMEKAR, selecting the UPGRIS Thematic Community Service Program (P) 3. Students carry out activities in accordance with the instructions of the UPGRIS Thematic Community Service Program committee (D) 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for fulfilment of study load outside the study programme and the course logbook (C) 6. Supervising lecturers monitor student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
20	MANGUNSARI	The activity is open to students from Semester 6 onwards	organised by LLDIKTI VI Conducted over a full semester equivalent to 20 credits 1. Students must register with their department to participate in the MANGUNSARI(P) programme 2. Students must register for the Course Registration Form (KRS) for Study Load Fulfilment Outside the Degree Programme in SIMEKAR, selecting the MANGUNSARI(P) activity 3. Students carry out the activities in accordance with the instructions of the MANGUNSARI(D) committee 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for the Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C)

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			6. The academic supervisor monitors student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
21	MAHESA	Activities are open to students from Semester 6	programme under the Vice-Chancellor 3 held over 3 weeks equivalent to 7 ECTS credits 9. Students must register with their department to participate in the MAHESA(P) programme 9. Students must complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Programme of Study in SIMEKAR, including the MAHESA(P) activity 10. Students carry out the activities in accordance with the instructions of the MAHESA(D) committee 11. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 12. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) 13. The academic supervisor monitors student outcomes (C) 14. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
22	International Community Service	The activity is open to students from Semester 6 onwards	organised by the UPT KUI the programme runs for a full week at the location Equivalent to 4 credits. 1. Students must register with their department to participate in the International Community Service Program (P) 2. Students must complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Study Programme in SIMEKAR, selecting the International Community Service Program (P) 3. Students carry out the activities in accordance with the instructions of the International Community Service Program committee (D) 4. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			Study Programme and the Course Logbook (C) 6. Supervising lecturers monitor student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
23	Lecturer Community Service	attended by active students in semester 7; those below semester 7 receive freefoam	Community service funded by DTRM and LPPM Conversion of 6 credits. 1. Students must register with their department to participate in the lecturer's community service activities (P) 2. Students must complete the Course Registration Form (KRS) for Academic Load Fulfilment Outside the Study Programme in SIMEKAR, selecting the lecturer community service activity (P) 3. Students carry out the activities in accordance with the instructions of the faculty community service committee (D) 4. Students complete the forms appearing in SIMEKAR: course logbook, daily activity log , critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for fulfilling the study load outside the study programme and the course logbook (C) 6. The supervising lecturer monitors student outcomes (C) 7. The assessor for the fulfilment of study load outside the study programme conducts an overall evaluation of student outcomes (C)
24	Student Organisation Activities	Students may participate in the activity from Semester 7 onwards; those in earlier semesters receive free credits	if students secure funding, they receive a conversion of 7 credits if they pass the ABDIDAYA ORMAWA assessment, they receive an additional 3 credits 1. Students must register with their department to participate in the PPK Ormawa(P) activity 2. Students must complete the Course Registration Form (KRS) for Study Load Fulfilment Outside the Study Programme in SIMEKAR, specifying the PPK Ormawa(P) activity 3. Students carry out activities in accordance with the instructions of the PPK Ormawa committee (D) 4. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for fulfilment of study load outside the study

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			programme and the course logbook (C) 6. The academic supervisor monitors student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
25	BKP HUMANITARIAN PROJECT	The activity is open to students from Semester 6	Duration: one full semester Conversion: 20 credits 1. Students must register with their department to participate in the BKP HUMANITARIAN PROJECT (P) 2. Students must complete the Course Registration Form for Study Load Fulfilment Outside the Programme of Study in SIMEKAR, selecting the BKP HUMANITARIAN PROJECT (D) activity 3. Students complete the forms appearing in SIMEKAR: course logbook, daily activity records, critical analysis, etc. (D) 4. The supervising lecturer monitors the SPADA for Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) 5. The Academic Supervisor monitors student outcomes (C) 6. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of the student's outcomes (C)
26	KENARI	The activity is attended by final-year students (from semester 7 onwards)	Research is conducted over a full semester conversion of 20 credits. 1. Students must register with their department to participate in the KENARI(P) programme 2. Students must register for the 'Course Load Fulfilment Outside the Study Programme' module in SIMEKAR, selecting the KENARI(P) activity 3. Students carry out the activity in accordance with the instructions of the KENARI(D) committee 4. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. The supervising lecturer monitors the SPADA for the Fulfilment of Study Load Outside the Study Programme and the Course Logbook (C) 6. The academic supervisor monitors student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall

No	Form of Fulfilment of Study Load Outside the Study Programme	Requirements	Description
(1)	(2)	(3)	(4)
			evaluation of student outcomes (C)
27	Lecturer Research	attended by active 7th-semester students; those below the 7th semester receive freefoam	students become members of the lecturer's research conversion of 6 credits 1. Students must register with the department to participate in the Faculty Research (P) activity 2. Students must complete the Course Registration Form (KRS) for Coursework Outside the Programme of Study in SIMEKAR, selecting Faculty Research (P) 3. Students carry out activities in accordance with the instructions of the Faculty Research Committee (D) 4. Students complete the forms that appear in SIMEKAR: course logbooks, daily activity logs, critical analyses, etc. (D) 5. Lecturers monitor SPADA for the fulfilment of study load requirements outside the degree programme and the course logbook (C) 6. The Internship Supervisor monitors student outcomes (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)
28	Research PKM (PKM RSH and PKM RE)	Activities undertaken by students in semester 7 are converted into course credits; however, if undertaken before semester 7, they are treated as free-form credits	if students secure funding, they receive 7 credits if they qualify for PIMNAS, they receive an additional 3 credits 1. Students must register with their department to participate in PKM Research activities (PKM RSH and PKM RE)(P) 2. Students must complete the Course Registration Form for Academic Load Fulfilment Outside the Study Programme on SIMEKAR , specifying the PKM Research (PKM RSH and PKM RE) activity (P) 3. Students carry out activities in accordance with the instructions of the PKM Research committee (PKM RSH and PKM RE)(D) 4. Students complete the forms that appear in SIMEKAR: course logbook, daily activity log, critical analysis, etc. (D) 5. Lecturers monitor SPADA for the fulfilment of study load outside the study programme and course logbooks (C) 6. The PKM Supervisor monitors the students' PKM outputs (C) 7. Assessors for the Fulfilment of Study Load Outside the Study Programme conduct an overall evaluation of student outcomes (C)

12. Quality Assurance

12.1 Quality Control Courses

The quality of both the learning process and its outcomes must be ensured through control over various aspects of implementation, including specific stages or steps within the learning process. Consequently, minimum activity outcomes are established for the delivery of lectures through courses within the group known as Quality Control Courses for each Study Programme. The minimum results that students must achieve for their participation in the aforementioned courses must be equal to or higher than a B grade. Study Programmes may list Quality Control Courses in Table 12.1.

Table 12.1. Quality Control Courses

Quality Control Courses for All Students in the Mathematics Education Study Programme

No	Course Code	Course	Credit
1	3125322619	Microteaching	2
2	3125344623	Internship - Teaching Practice	4
3	3125324624	Internship - Curriculum Analysis	2
4	3125324625	Internship – Lesson Plan Development	2
5	3125324626	Internship – Teaching Media Development	2
6	3125765643	Final Project	6
7	3125321631	Junior High School Mathematics	2
8	3125321675	Mathematics for Senior High School	2
9	3125322646	Data Analytics	2
10	3125322649	Digital Learning Media Development	2
11	3125321634	Algebra and Trigonometry	2
12	3125331632	Calculus	3
13	3125321621	Mathematics Learning Strategies	2
14	3125331620	Mathematics Learning Assessment	3
15	3125332616	Mathematics Learning Planning	3
		Total credits	**39**

Quality Control Course for the General Course Field of Study/Competency/Cluster

No	Course Code	Course	Credit
1	312512161	Islamic Religious Education	2
2	312512162	Christian Religious Education	2
3	312512163	Catholic Religious Education	2
4	312512164	Hindu Religious Education	2
5	312512165	Buddhist Religious Education	2
6	312512166	Confucian Religious Education	2
7	312522167	PGRI Studies	2
8	312512168	Pancasila Education	2
9	312512169	Civics Education	2
10	3125121610	Indonesian Language	2
11	3125221611	English	2
		Total credits	**22**

Quality Control Course for the Field of Study/Competency/Core Educational Competency Cluster

No	Course Code	Course	Credit
1	3125321613	Educational Management	2
2	3125321628	Mathematics Educational Psychology	2
3	3125321615	Foundations of Education	2
		Total credits	**6**

Quality Control Course for the Field of Study/Competency/Mathematics Academic Cluster

No	Course Code	Course	Credit
1	3125331632	Calculus	3
2	3125321634	Algebra and Trigonometry	2
3	3125321635	Geometry	2
4	3125331640	Statistics	3
		Total credits	**10**

Quality Control Course for the Field of Study/Competency/Mathematics Learning Cluster

No	Course Code	Course	Credit Points
1	3125321621	Mathematics Learning Strategies	2
2	3125331620	Mathematics Learning Assessment	3
3	3125331618	Innovations in Mathematics Education	3
4	3125321650	Development of Teaching Resources and Materials	2
		Total credits	**10**

Quality Control Course for Field of Study/Competency/Cluster of Advanced Competency Enhancement

No	Course Code	Course	Credit
1	3125421661	Joyful Learning in Mathematics Education	2
2	3125431657	Advanced Calculus	3
		Total credits	**5**

Quality Control Course for Field of Study/Competency/Research and Publication Cluster

No	Course Code	Course	Credit
1	3125331641	Research Methods	3
2	3125765643	Final Project	6
		Total credits	**9**

Quality Control Course for the Field of Study/Competency/Cluster of Entrepreneurial Spirit Development (including CoE)

No	Course Code	Course	Credit
1	3125242644	Technology-Based Entrepreneurship	4
2	3125322649	Digital Learning Media Development	2
3	3125322646	Data Analytics	2
		Total Credits	**8**

12.2 Course Prerequisites

The programme must map courses based on their interrelationships so that students can more easily plan their studies. By viewing this course structure, students are encouraged to take each course seriously as they are linked to subsequent courses. The programme may enter Prerequisite Courses in Table 12.2.

Table 12.2. Prerequisite Courses

No	Code	Course Name	Prerequisite for			
			Prerequisites	Semester	Code	Course Title
1	3125332616	Mathematics Learning Planning	L(B)	6	3125322619	Microteaching
			L(B)	7	3125324625	School Internship - Lesson Plan Development
2	3125321617	Mathematics Education Curriculum Analysis	L(B)	6	3125322619	Microteaching
			L(B)	7	3125324624	School Internship - Curriculum Analysis
3	3125331618	Innovations in Mathematics Education	L(B)	5	3125332616	Mathematics Learning Planning
			L(B)	6	3125322619	Microteaching
4	3125322619	Microteaching	L(B)	7	3125344623	School Internship - Teaching Practice
5	3125331620	Mathematics Learning Assessment	L(B)	5	3125332616	Mathematics Learning Planning
			L(B)	6	3125322619	Microteaching
6	3125321621	Mathematics Learning Strategies	L(B)	5	3125332616	Mathematics Learning Planning
			L(B)	6	3125322619	Microteaching
7	3125322627	Manipulative Teaching Aids Development	L(B)	7	3125324626	School Internship - Learning Media Development
			L(B)	6	3125322619	Microteaching
8	3125321630	Elementary School Mathematics	L	4	3125321631	Junior High School Mathematics
9	3125321631	Junior High School Mathematics	L	6	3125322619	Microteaching
10	3125331632	Calculus	L	2	3125431657	Advanced Calculus
			L	6	3125321639	Real Analysis
			L	7	3125421659	Differential Equations
			L	7	3125421656	Numerical Methods
			L	3	3125321630	Elementary School Mathematics
11	3125321634	Algebra and Trigonometry	L	2	3125321633	Elementary Linear Algebra
			L	3	3125321630	Elementary School Mathematics
12	3125321635	Geometry	L	3	3125321630	Elementary School Mathematics
			L	3	3125421658	Transformational Geometry
			L	2	3125321636	Analytical Geometry

No	Code	Course Name	Prerequisite for			
			Prerequisites	Semester	Code	Course Title
13	3125321636	Analytical Geometry	L	3	3125421658	Transformational Geometry
14	3125321637	Probability Theory	L	6	3125421660	Discrete Mathematics
			L	4	3125321631	Junior High School Mathematics
15	3125331640	Statistics	L	5	3125331641	Research Methods
			L	7	3125422667	Forecasting Methods
16	3125331641	Research Methods	L(B)	8	3125765643	Final Project
			L(B)	6	3125323642	Seminar in Mathematics Education
17	3125323642	Seminar in Mathematics Education	L(B)	8	3125765643	Final Project
19	3125321645	Mathematical Economics	L	6	3125242644	Technology Based Entrepreneurship
20	3125322647	Algorithms and Programming	L	5	3125322646	Data Analytics
			L	6	3125321648	Business Intelligence
			L	7	3125432665	Data Visualisation
			L	7	3125422667	Forecasting Methods
			L	7	3125432666	Big Data
			L	7	3125422668	Data Analytics Software
21	3125322649	Digital Learning Media Development	L(B)	7	3125324626	School Internship - Learning Media Development
			L(B)	6	3125322619	Microteaching
22	3125321650	Teaching Resources and Materials Development	L(B)	7	3125324626	School Internship - Learning Media Development
			L(B)	6	3125322619	Microteaching
23	3125322652	Graphic Design	L	4	3125322649	Digital Learning Media Development
24	3125321673	Introduction to Real Analysis	L	6	3125321639	Real Analysis

Notes: L = Passed, PT = Previously Taken, B = Concurrent, meaning taken concurrently with a prerequisite course, L(B) = Passed with a minimum grade of B with a specified field of study.

13. Learning Management

Table 13.1 Learning management in the study programme

No	Activity	Officer
1	Person responsible for curriculum development	Chairperson / Head of Department
2	Person in Charge of Learning Materials (RPS, RAE and RT) for Subjects in the Curriculum	
3	Person in Charge of monitoring and evaluating curriculum implementation (referring to learning materials) ● Checking the alignment of questions with CLO and/or PLO ● Checking the duration of assessments against the course credit weight	
4	PIC for monitoring and evaluation of the implementation of the Fulfilment of Study Load Outside the Study Programme ● Verification of the duration of activities for the Fulfilment of Study Load Outside the Study Programme ● Verification of the alignment of acquired competencies with the PLO ● Review of the alignment of assessment formats and techniques with PLO ● Review of guidelines for students, field supervisors, and programme supervisors	
5	PIC for monitoring and evaluating PLO achievement, as well as reporting on PLO achievement	

14.Procedures for Student Admission at Various Stages of the Curriculum

The selection process for new student admissions at UPGRIS can be conducted through the following pathways.

1. Achievement Pathway

   The Merit Pathway is open to high school students or equivalent who have graduated or are due to graduate in the current year, or who were declared to have graduated no more than two years previously, with specific achievements in accordance with applicable regulations.

2. Regular Pathway

   The Regular Pathway is open to high school graduates or equivalent who have graduated or are due to graduate in the current year, or who were declared to have graduated no more than two years previously, through a selection process based on a computer-based test (CBT) and a personality test

3. Kartu Indonesia Pintar (KIP) Pathway

   The Regular Pathway is open to high school graduates or equivalent who have graduated or are due to graduate in the current academic year; it is intended for prospective students from low-income families, as verified by a means test and in accordance with applicable regulations. This pathway is adopted from the government's 100% tuition fee assistance programme for students meeting specific criteria.

4. Employee Pathway

   The Employee Pathway is specifically open to employees who wish to continue their studies whilst working. This pathway offers flexibility in the lecture timetable.

5. RPL Pathway

   The RPL Pathway is open to prospective students who already have a track record of prior learning, whether formal or non-formal. This prior learning record may consist of: 1) Formal education (from Diploma 1 to Bachelor's degree) evidenced by a diploma; 2) Non-formal education (training/courses) meeting specific criteria evidenced by a certificate; 3) Work experience as a practitioner meeting specific criteria evidenced by a recognised certificate of employment, which is converted into a specific number of credit points.

Enrolment Options

Registration options for new student admissions at UPGRIS consist of offline registration and online registration.

1. Offline Registration

   Offline registration is the registration and selection of new students conducted in person on campus. A one-day service is available, meaning registration, testing, and results are completed in a single day by registering directly at the UPGRIS Admissions Office, 2nd Floor, Central Building, Jalan Sidodadi Timur No. 24, Semarang.

2. Online Registration

   Online registration is the process of registering and selecting new students conducted online via the website pmb.upgris.ac.id.

PROCEDURES FOR THE ADMISSION OF NEW STUDENTS

1. Merit and Regular Streams
   a. Complete the registration form on the UPGRIS PMB website.
   b. Print the registration form.
   c. Make a payment of Rp 250,000.00 at Bank BRI, Bank Mandiri, or Bank Jateng by presenting your Registration PIN.
   d. Print the registration card from the UPGRIS PMB website.
   e. Take the UPGRIS entrance test/exam according to the designated track.
   f. Check the announcement on the UPGRIS PMB website (within a maximum of 3 days after making the payment).
2. KIP Kuliah Pathway
   a. Register on the website pmb.upgris.ac.id by selecting the regular pathway under the KIP group, and complete the required data fields.
   b. Pay the registration fee of Rp. 250,000 (if accepted through the KIP selection process, the registration fee will be refunded).
   c. Synchronise your data by bringing the relevant documents (KIP registration forms and cards, UPGRIS registration forms and cards, KIP, KKS, PKH, SKTM, or other supporting cards from government programmes in your possession).

d. Take the CBT test and attend an interview at the UPGRIS main campus, 2nd Floor, Central Building, Jalan Sidodadi Timur No. 24, Semarang. Services are available every Monday to Saturday from 07:30 to 12:00 WIB.
e. Wait for the home visit schedule to be arranged by the UPGRIS team, which will be confirmed via WhatsApp.
f. Once the selection stages have been completed, check the announcements on the website pmb.upgris.ac.id under the 'Announcements' menu by entering your registration number and date of birth.

3. Employee and RPL Classes
   a. Come in person to register at the UPGRIS Admissions Office, 2nd Floor, Central Building, Jalan Sidodadi Timur No. 24, Semarang.
   b. If the quota has not been met, prospective students will be placed on a waiting list to join the employee class programme.

15. Conclusion

The UPGRIS Mathematics Education Curriculum for 2025, which has been developed, is primarily aimed at realising a specific graduate profile: Novice Mathematics Educators proficient in TPACK, Novice Researchers in Mathematics Education, and Novice Entrepreneurs grounded in mathematical knowledge. This curriculum serves as the primary instrument for aligning the Programme's Graduate Learning Outcomes (PLO) with the University's PLO, which aim to foster outstanding and self-reliant intellectuals. Graduates are expected not only to master in-depth teaching content and methodology (content and pedagogy), but also to be proficient in integrating the latest technology (Technological al Knowledge), in line with the university's vision of being adaptable to developments in science. This expectation will be achieved through core courses focused on learning innovation and mastery of basic research in the field of mathematics education.

The implementation of the 2025 Curriculum will centre on the full integration of the 'Fulfilment of Learning Load Outside the Study Programme' scheme, which plays a vital role in achieving the graduate profile of an entrepreneur. Through the Certified Internship or Entrepreneurship scheme, students are provided with real-world experience to apply mathematical knowledge in creating innovative products or services (for example, edutech development). The implementation of the curriculum is also supported by the programme's focus on developing Centres of Excellence (CoE) related to Mathematics Education, such as a focus on Technology-Based Learning Innovation or Applied Research. These CoEs serve as platforms for producing high-quality research and providing intensive training, ensuring that students' TPACK knowledge and early-stage research competencies are well-honed. Off-campus experience through the Fulfilment of Study Load Outside the Programme will directly strengthen soft skills and leadership qualities, which are an integral part of the University's PLO.

Efforts to improve the quality of Mathematics Education at UPGRIS following the implementation of the 2025 Curriculum will be carried out on an ongoing basis. Quality enhancement will focus on refining graduate profiles. For Emerging Mathematics Educators, the curriculum will ensure the integration of technology (T) across all modules, not just those specifically focused on technology, so that TPACK becomes an inherent competence. Quality enhancement for Emerging Researchers will be realised through a final-year project scheme based on published research outputs and student involvement in lecturers' research projects at the Centre of Excellence (CoE). Meanwhile, for Emerging Entrepreneurs, the programme will

collaborate with the UPGRIS Career Centre and Business Incubator to facilitate and monitor start-ups initiated by students during the 'Fulfilment of Study Load Outside the Entrepreneurship Programme' scheme. Thus, the 2025 Curriculum serves as a strategic foundation for producing graduates who are not only ready to teach but also capable of creating jobs and driving innovation based on mathematical knowledge.

16. Overview Curriculum

Course Type	Credit Points	Semester								TOTAL	
		1	2	3	4	5	6	7	8		
University Compulsory Course	30	9	9	0	0	0	6	0	6	**30**	
Compulsory Course	162	16,5	18	30	28,5	30	24	15	0	**162**	
Elective Course	15	0	0	0	0	0	0	15	0	**15**	
Final Project, Intership, Thesis	9	0	0	0	0	0	0	0	9	**9**	
Total ECTS Credit Points	**216,00**	**25,50**	**27,00**	**30,00**	**28,50**	**30,00**	**30,00**	**30,00**	**15,00**	**0**	
Total SKS Credit Points	**144,00**										

Legends		**Type**	**Semester**	**Credit Points**	**Academic Hours**	**Learning Activities**				**Weight for GPA**
Type	C = Compulsory;									
	E = Elective									
Credit Points	ECTS Credit Points									
Academic Hours	Academic Hours per Semester									
Learning Activities	L = Lecture (Discussion, Presentation, Quiz, Case Method, Project Base Learning, Exam)									
	A = Assignment									
	E = Exercise									
	FP= Final Project									
	La= Laboratory Activity									
	In=Internship									
University Compulsory Course				**30**	**900**					
312512168	Pancasila Education	C	1	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125121610	Indonesian Language	C	1	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**

3125221611	English	C	1	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
312512161	Religious Education	C	2	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
312522167	PGRI Studies	C	2	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
312512169	Civics Education	C	2	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125242644	Technology Based Entrepreneurship	C	6	6	180	L = 13	A = 16	E = 16	La = 90	Fw = 45	**0,02777778**
3125224612	Community Service Program (KKN)	C	8	6	180			L = 45		FW = 135	**0,02777778**
Compulsory Course				**162**	**4860**						
3125321628	Mathematics Educational Psychology	C	1	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125321634	Algebra and Trigonometry	C	1	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125321635	Geometry	C	1	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125321615	Foundations of Education	C	1	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125331632	Calculus	C	1	4,5	135	L = 40	A = 47,5	E = 47,5			**0,02083333**
3125321613	Educational Management	C	2	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125321633	Elementary Linear Algebra	C	2	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125321636	Analytic Geometry	C	2	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125431657	Advanced Calculus	C	2	4,5	135	L = 40	A = 47,5	E = 47,5			**0,02083333**
3125331618	Innovations in Mathematics Education	C	2	4,5	135	L = 40	A = 47,5	E = 47,5			**0,02083333**
3125321614	Ethics and Educational Profession	C	3	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125321617	Mathematics Education Curriculum Analysis	C	3	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125321621	Mathematics Learning Strategies	C	3	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125421658	Geometric Transformations	C	3	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**
3125321637	Probability Theory	C	3	3	90	L = 27	A = 31,5	E = 31,5			**0,01388889**

3125322652	Graphic Design	C	3	3	90	La = 90				**0,01388889**
3125332651	Educational Technology Applications	C	3	4,5	135	La = 135				**0,02083333**
3125331640	Statistics	C	3	4,5	135	L = 27	A = 31,5	E = 31,5	La = 45	**0,02083333**
3125321630	Elementary School Mathematics	C	3	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125421655	Linear Programming	C	4	3	90	L = 13	A = 16	E = 16	La = 45	**0,01388889**
3125321638	Number Theory	C	4	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125324629	Olympic Mathematics	C	4	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125331620	Mathematics Learning Assessment	C	4	4,5	135	L = 27	A = 31,5	E = 31,5	La = 45	**0,02083333**
3125321631	Junior High School Mathematics	C	4	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125321645	Mathematics for Economics	C	4	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125322649	Digital Learning Media Development	C	4	3	90	La = 90				**0,01388889**
3125322627	Development of Manipulative Teaching Aids	C	4	3	90	La = 90				**0,01388889**
3125421664	Philosophy of Mathematics Education	C	4	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125332616	Mathematics Learning Planning	C	5	4,5	135	L = 40	A = 47,5	E = 47,5		**0,02083333**
3125331641	Research Methods	C	5	4,5	135	L = 40	A = 47,5	E = 47,5		**0,02083333**
3125322646	Data Analytics	C	5	3	90	La = 90				**0,01388889**
3125322647	Programming Algorithms	C	5	3	90	La = 90				**0,01388889**
3125321650	Development of Teaching Resources and Materials	C	5	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125321673	Introduction to Real Analysis	C	5	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125321622	English for Mathematics	C	5	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125321675	Mathematics for Senior High School	C	5	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125421674	Complex Analysis	C	5	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**

3125321648	Business Intelligence	C	6	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125322619	Microteaching	C	6	3	90	La = 90				**0,01388889**
3125421663	Mathematical Thinking	C	6	4,5	135	L = 40	A = 47,5	E = 47,5		**0,02083333**
3125431653	Algebraic Structures	C	6	4,5	135	L = 40	A = 47,5	E = 47,5		**0,02083333**
3125421660	Discrete Mathematics	C	6	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125323642	Seminar in Mathematics Education	C	6	3	90	La = 45		FP = 45		**0,01388889**
3125321639	Real Analysis	C	6	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125344623	School Internship - Teaching Practice	C	7	6	180	In = 181				**0,02777778**
3125324624	School Internship - Curriculum Analysis	C	7	3	90	L = 13	A = 16	E = 16	In = 45	**0,01388889**
3125324625	School Internship - Lesson Plan Development	C	7	3	90	L = 13	A = 16	E = 16	In = 45	**0,01388889**
3125324626	School Internship - Learning Media Development	C	7	3	90	L = 13	A = 16	E = 16	In = 45	**0,01388889**
Elective Course *only 15 ECTS elective courses are taken				**15**	**450**					
3125432665	Data Visualisation	E	7	4,5	135	In = 135				**0,02083333**
3125422667	Forecasting Methods	E	7	3	90	In = 90				**0,01388889**
3125432666	Big Data	E	7	4,5	135	In = 135				**0,02083333**
3125422668	Data Analytics Software	E	7	3	90	In = 90				**0,01388889**
3125421661	Joyful Learning in Mathematics Education	E	7	3	90	L = 13	A = 16	E = 16	In = 45	**0,01388889**
3125432669	Hypermedia	E	7	4,5	135	In = 135				**0,02083333**
3125432670	3D Animation	E	7	4,5	135	In = 135				**0,02083333**
3125421671	Learning Media Evaluation	E	7	3	90	In = 90				**0,01388889**
3125421672	Media Production Management	E	7	3	90	In = 90				**0,01388889**
3125421656	Numerical Methods	E	7	3	90	L = 14	A=15.5	E = 15.5	La = 45	**0,01388889**
3125421662	Computational Thinking	E	7	3	90	L = 14	A=15.5	E = 15.5	La = 45	**0,01388889**

3125421659	Differential Equations	E	7	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
3125421654	Mathematical Statistics	E	7	3	90	L = 27	A = 31,5	E = 31,5		**0,01388889**
Final Project Course				**9**	**270**					
3125765643	Final Project	C	8	9	270	FP = 272				**0,04166667**
TOTAL WEGHT GPA										**1,00000000**