USK
UNIVERSITAS
SYIAH KUALA

Kampus Merdeka
INDONESIA JAYA

CURRICULUM BOOK

2024-2028

Based on The Rector's Decree
No. : /UN11/KPT/2024

Master in Artificial Intelligence Study Program

FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS SYIAH KUALA

Curriculum Document
Study Program
Master of Artificial Intelligence

UNIVERSITAS SYIAH KUALA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
DARUSSALAM 2024

STUDY PROGRAM IDENTITY

Study Program Specification

1	Name of Institution	Universitas Syiah Kuala
2	Name of Study Program	Master of Artificial Intelligence
3	Education Level	Master's Degree
4	Address of the Study Program	No. 3 Tgk. Syech Abdurrauf Street Block A, 3rd Floor, Faculty of Mathematics and Natural Sciences Building Kopelma Darussalam, Syiah Kuala District, Banda Aceh City, Aceh 23111
5	Accreditation Status and Accrediting Institution, e.g., BAN-PT, LAM	Very Good, LAM Infokom
6	Degree/Title of Graduate	M.Kom
7	Duration of Study and Number of Credits Earned in ECTS	4 Semesters

PROFILE OF THE MASTER'S PROGRAM IN ARTIFICIAL INTELLIGENCE

The Master's Program in Artificial Intelligence at the Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala (USK), was established on June 25, 2021, based on the Decree of the Minister of Education, Culture, Research, and Technology Number 283/E/O/2021 concerning the authorization for the establishment of the Master's Program in Artificial Intelligence at Universitas Syiah Kuala in Banda Aceh. The establishment of this master's program is part of an international collaboration under the Erasmus+ Project Data Science and Artificial Intelligence 2019–2022. The collaboration in designing and developing the Data Science and Artificial Intelligence curriculum was carried out through a partnership between Universitas Syiah Kuala and the European Union under the Erasmus+ Capacity-Building Project in 2019. The curriculum development process for the Master's Program in Data Science & Artificial Intelligence (DS&AI) began with several meetings, including at the Athens University of Economics and Business (AUEB) in Athens, Greece, and Leiden University in the Netherlands. This activity engaged consortium partners from both Asia (Thailand, Indonesia, Sri Lanka) and Europe (the Netherlands, Greece, Portugal). The Erasmus DS/AI Project aims to facilitate universities involved in the Erasmus+ DS/AI Project in Asia (Indonesia, Thailand, Sri Lanka) in developing curricula and establishing Master's Programs in Data Science and Artificial Intelligence.

The establishment of this study program at USK has provided students with the opportunity to develop their potential in the field of artificial intelligence. Talent in the AI field is highly needed in the future and must be systematically prepared. Through the Master's Program in Artificial Intelligence under the Department of Informatics, Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala aims to prepared talent in this area at the graduate level. This program is expected to become one of USK's flagship program and be one of the most sought-after master's programs.

DECREE OF THE CURRICULUM DEVELOPMENT TEAM

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KEPUTUSAN REKTOR UNIVERSITAS SYIAH KUALA
NOMOR 80/UN11.1.8/KPT/2024
TENTANG
PENUNJUKAN TIM PENYUSUN KURIKULUM OUTCOME BASED EDUCATION (OBE) PADA PROGRAM STUDI MAGISTER KECERDASAN BUATAN DEPARTEMEN INFORMATIKA FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM UNIVERSITAS SYIAH KUALA

REKTOR UNIVERSITAS SYIAH KUALA,

Menimbang :

a. bahwa untuk kelancaran pelaksanaan kegiatan Penyusunan Kurikulum Outcome Based Education (OBE) pada Program Studi Magister Kecerdasan Buatan Departemen Informatika Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Syiah Kuala, maka perlu ditunjuk Tim Penyusun yang bertugas untuk itu;
b. bahwa untuk keperluan dimaksud, perlu ditetapkan dengan Keputusan Rektor;

Mengingat :

1. Undang-Undang Nomor 17 Tahun 2003 tentang Keuangan Negara;
2. Undang-Undang Nomor 1 Tahun 2004 tentang Perbendaharaan Negara;
3. Undang-Undang Nomor 12 Tahun 2012 tentang Pendidikan Tinggi;
4. Undang-Undang Nomor 19 Tahun 2023 tentang Anggaran Pendapatan dan Belanja Negara Tahun Anggaran 2024;
5. Peraturan Pemerintah Nomor 4 Tahun 2014 tentang Penyelenggaraan Pendidikan Tinggi dan Pengelolaan Perguruan Tinggi;
6. Peraturan Pemerintah Nomor 38 Tahun 2022 tentang Perguruan Tinggi Negeri Badan Hukum Universitas Syiah Kuala;
7. Peraturan Menteri Keuangan Nomor 49 Tahun 2023 tentang Standar Biaya Masukan Tahun Anggaran 2024;
8. Peraturan Rektor Nomor 5 Tahun 2024 tentang Organisasi dan Tata Kerja Unsur Rektor Universitas Syiah Kuala;
9. Keputusan Rektor Universitas Syiah Kuala Nomor 6002/UN11/KPT/2023 tentang Pemberhentian/Pengangkatan Dekan Fakultas MIPA Universitas Syiah Kuala periode 2023-2026;
10. Keputusan Rektor Universitas Syiah Kuala Nomor 1470/UN11/KPT/2024 tentang Pelimpahan Kewenangan Penandatanganan Keputusan Rektor Kepada Wakil Rektor, Ketua Lembaga, Dekan, dan Direktur Sekolah Pascasarjana Universitas Syiah Kuala;

MEMUTUSKAN:

Menetapkan	:	KEPUTUSAN REKTOR TENTANG PENUNJUKAN TIM PENYUSUN KURIKULUM OUTCOME BASED EDUCATION (OBE) PADA PROGRAM STUDI MAGISTER KECERDASAN BUATAN DEPARTEMEN INFORMATIKA FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM UNIVERSITAS SYIAH KUALA.
KESATU	:	Menunjuk Saudara-saudara yang namanya tercantum pada daftar lampiran keputusan ini sebagai Tim Penyusun kegiatan Penyusunan Kurikulum Outcome Based Education (OBE) pada Program Studi Magister Kecerdasan Buatan Departemen Informatika Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Syiah Kuala.
KEDUA	:	Kegiatan ini dilaksanakan pada bulan Januari 2024 sampai dengan bulan Juni 2024.
KETIGA	:	Segala biaya yang diakibatkan oleh keluarnya keputusan ini dibebankan pada Anggaran PTNBH Universitas Syiah Kuala Tahun Anggaran 2024 SUKPA Fakultas Matematika dan Ilmu Pengetahuan Alam yang sesuai dengan Peraturan Keuangan.
KEEMPAT	:	Keputusan ini mulai berlaku pada tanggal 2 Januari 2024 dan apabila dalam penetapan ini kemudian ternyata terdapat kekeliruan akan diperbaiki kembali sebagaimana mestinya.

Ditetapkan di Banda Aceh
pada tanggal 22 April 2024

a.n. REKTOR UNIVERSITAS SYIAH KUALA,
DEKAN FAKULTAS MATEMATIKA DAN ILMU
PENGETAHUAN ALAM

Prof. Dr. Taufik Fuadi Abidin, S.Si., M.Tech
NIP 197010081994031002

LAMPIRAN
KEPUTUSAN REKTOR UNIVERSITAS SYIAH KUALA
NOMOR 80/UN11.1.8/KPT/2024, TANGGAL 22 APRIL 2024
TENTANG
PENUNJUKAN TIM PENYUSUN KURIKULUM OUTCOME BASED EDUCATION (OBE) PADA PROGRAM STUDI MAGISTER KECERDASAN BUATAN DEPARTEMEN INFORMATIKA FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM UNIVERSITAS SYIAH KUALA

No	Nama/NIP/NIPK	Pangkat/Gol	Jabatan dalam Dinas	Jabatan dalam Panitia	Rincian Tugas	Tugas dan Fungsi
1	Dr. Nizamuddin, M.Info.Sc. 197108241996031001	Pembina (Gol. IV/a)	Ketua Departemen Informatika	Pengarah	Memberi arahan pada pelaksanaan kegiatan penyusunan kurikulum OBE Departemen Informatika	Ya
2	Dr. Muhammad Subianto, S.Si, M.Si 196812111994031005	Pembina (Gol. IV/a)	Wakil Dekan Sumber Daya dan Keuangan Fakultas Matematika dan Ilmu Pengetahuan Alam	Ketua	Mengkoordinir kegiatan review dan revisi kurikulum Outcome Based Education (OBE) Prodi Magister Kecerdsan Buatan	Tidak
3	Zahnur, S.Si, M.Info Tech. 196905291994031002	Penata Tk. I (Gol. III/d)	Lektor	Sekretaris	Merumuskan Capaian Pembelajaran Lulusan, profil dan kompetensi lulusan	Tidak
4	Prof. Dr. Taufik Fuadi Abidin, S.Si., M.Tech 197010081994031002	Pembina Utama Madya (Gol. IV/d)	Dekan Fakultas Matematika dan Ilmu Pengetahuan Alam	Anggota	Membantu merumuskan bahan kajian, dan kode mata kuliah	Tidak
5	Prof. Dr. Ir. Hammam Riza, M.Sc. IPU 196208081987111001	Pembina Utama (Gol. IV/e)	Guru Besar	Anggota	Merumuskan penentuan keluasan kedalaman materi pembelajaran	Tidak
6	Prof. Dr. Hizir 196805311993031003	Pembina Utama Madya (Gol. IV/d)	Direktur Sekolah Pascasarjana	Anggota	Memastikan Penentuan prasyarat dan daftar ekuivalensi mata kuliah	Tidak
7	Dr. Muzailin, S.Si, M.Sc. 197010191995121001	Penata Tk. I (Gol. III/d)	Kepala Kantor Urusan Internasional	Anggota	Membantu perumusan Capaian Pembelajaran Lulusan (CPL)	Tidak
8	Dr. Rumaisa Kruba, S.Si 199403222022072101	-	Tenaga Pengajar	Anggota	Mengkoordinir penyusunn deskripsi, prayarat dan ekivalensi mata kuliah prodi	Tidak
9	Intan Rahmatillah, S.Kom 199601232022052101	-	Pengadministrasi Akademik	Anggota	Membantu tugas ketua dan sekretaris dalam penyusunan dokumen-dokumen kurikulum	Tidak

Ditetapkan di Banda Aceh
pada tanggal 22 April 2024

a.n. REKTOR UNIVERSITAS SYIAH KUALA,
DEKAN FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

Prof. Dr. Taufik Fuadi Abidin, S.Si., M.Tech
NIP 197010081994031002

FOREWORD

The formulation and development of the curriculum are crucial steps in ensuring the academic quality of a Study Program. This formulation and development of the curriculum aims to prepare students so that competencies aligned with advancements in Science and Technology, as well as to enable them to respond to increasingly complex and competitive challenges in the era of globalization. In this context, it is important to adjust the Study Program curriculum with developments in Industry 4.0 technology, the policies of the Independent Learning Independent Campus (MBKM) program, the Minister of Education, Culture, Research, and Technology Regulation Number 53 of 2023 concerning Quality Assurance in Higher Education, and the status of Universitas Syiah Kuala (USK) as a State Higher Education Institution with Legal Entity status.

Curriculum changes across all study programs within the Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Syiah Kuala (USK), follow the Outcome-Based Education (OBE) approach. This approach ensures that the curriculum is designed to achieve concrete and measurable learning objectives. The teaching methods in the OBE curriculum ensure that every aspect of learning has clear, measurable goals that are relevant to the professional world. Accordingly, every element of the curriculum, assessment, and teaching process is oriented toward achieving the predetermined learning outcomes.

The current development of the OBE curriculum takes into account various aspects, including the Minister of Education, Culture, Research, and Technology Regulation Number 53 of 2023 on Quality Assurance in Higher Education, the Indonesian National Qualifications Framework, the MBKM policy, advancements in science and technology, as well as input from various stakeholders such as scientific associations, government, industry, and alumni. However, it is acknowledged that there are still shortcomings in the curriculum development process. Therefore, we sincerely welcome constructive feedback and suggestions to improve this curriculum in the future.

We extend our sincere gratitude to the department leaders, Study Program coordinators, curriculum development team, and all parties who have contributed and provided support throughout the curriculum revision process. We hope that the curriculum that has been developed will bring meaningful benefits to the students and graduates of FMIPA USK.

Darussalam, 6 Mei 2024
Dean,

Prof. Dr. Taufik Fuadi Abidin, S.Si., M. Tech.

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CHAPTER I
INTRODUCTION

1.1. Curriculum Document Development Process

The curriculum of the Master's Program in Artificial Intelligence is designed based on the vision, mission, and objectives of the study program, and aligned with the vision, mission, and objectives of the Faculty of Mathematics and Natural Sciences (FMIPA) and Universitas Syiah Kuala (USK). The education and research components designed into the curriculum are focused on the fields of artificial intelligence and data science.

The curriculum review of the Master's Program in Artificial Intelligence is conducted by Presidential Regulation of the Republic of Indonesia Number 8 of 2012 concerning the Indonesian National Qualifications Framework (KKNI); the National Standards for Higher Education as stipulated in the Ministry of Research, Technology, and Higher Education Regulation No. 44 of 2015, and the Ministry of Education and Culture Regulation No. 3 of 2020, regarding the National Standards for Higher Education. In addition, the curriculum review also considers a needs analysis based on input from stakeholders and the development of science and technology to implement the Industrial Revolution 4.0 and anticipate the emergence of Society 5.0.

The curriculum compilation mechanism in the Master's Program in Artificial Intelligence is carried out as follows:

1. The study program conducts a meeting to establish a curriculum development committee.
2. The compilation of the Master's Program in Artificial Intelligence curriculum, based on Outcome-Based Education (OBE), involves various parties in identifying the needs of industry and stakeholders, including the role of scientific associations, industry experts, and graduate users.
3. The committee studies regulations and legislation related to the curriculum, as well as curriculum guidelines from the Ministry of Education, Culture, Research, and Technology, and Universitas Syiah Kuala (USK).
4. The committee reviews survey results and feedback from scientific associations, industry experts, and graduate users as the basis for determining the graduate profile, and conducts a gap analysis between graduate competencies and industry needs.
5. The curriculum team and the head of each subject area identify subject matter, program learning outcomes (PLOs), course learning outcomes (CPMK), and sub-course learning outcomes (sub-CPMK).
6. The identified learning outcomes are then discussed in a study program meeting to finalize and determine which courses include.
7. The formulation of courses and their distribution across each semester, along with the development of the Semester Learning Plan, Lecture Contracts, and assessment rubrics.
8. The draft curriculum layout is submitted to LP3M USK for review.
9. Approval by the Rector of USK and publication on the official website of the Master's Program in Artificial Intelligence.

The development of the 2024 Curriculum is based on the principle that a good curriculum is not only excellent and theoretically accountable, but also practically implementable. Moreover, the curriculum must be sufficiently flexible to accommodate changes while maintaining the distinctive characteristics of the study program.

1.2. Curriculum Evaluation and Tracer Study

A. Results of Curriculum Implementation Evaluation

As of the end of 2023 (Odd Semester 2023/2024), the Master's Program in Artificial Intelligence, Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala (USK), has produced four graduates. Currently, the number of active students in the Master's program in Artificial Intelligence is 17. Among the four graduates, one has been employed, while the remaining three are still seeking employment.

The curriculum evaluation conducted by the Master's Program in Artificial Intelligence aims to assess all activities within the curriculum, improve curricula that are still under development, and the curriculum being implemented currently. The objective is to get a better curriculum that can be effectively adopted by stakeholders in alignment with the graduate competencies outlined in the Intended Learning Outcomes (CPL), which are integrated into an Outcome-Based Education (OBE) curriculum. This evaluation also refers to the Indonesian National Qualifications Framework (KKNI) and the National Standards for Higher Education (SN-DIKTI).

Curriculum evaluation and development refer to the Curriculum Evaluation and Development Manual of Universitas Syiah Kuala, which is based on the Higher Education Curriculum in the Era of Industry 4.0. Through curriculum revisions and the enhancement of learning quality, Universitas Syiah Kuala is well-prepared to face and has the opportunity to overcome the increasingly complex challenges of life in the 21st century, particularly the competition within the ASEAN Economic Community (AEC) era.

The curriculum development adopts advancements from the Fourth Industrial Revolution, with the development process initiated through a collaborative framework among consortium partners in Asia (Thailand, Indonesia, Sri Lanka) and Europe (the Netherlands, Greece, Portugal), sponsored by the Erasmus+ Capacity-Building. The goal of this collaborative initiative is to develop a Master's degree curriculum in Data Science & Artificial Intelligence (DS&AI) in the universities involved in the collaboration. Consortium member institutions include the Asian Institute of Technology (AIT), Leiden University (LEU), Skybridge, University of Minho (UMI), Athens University of Economics and Business (AUEB), University of Sri Jayewardenepura (USJP), University of Peradeniya (UoP), Universitas Syiah Kuala (USK), Universitas Sumatera Utara (USU), Institut Teknologi Bandung (ITB), Khon Kaen University (KKU), and Walailak University. USK's participation in this consortium demonstrates international recognition of Universitas Syiah Kuala.

The stages of curriculum evaluation in the Master's Program in Artificial Intelligence involve Focus Group Discussions (FGDs) that address the degree of application of the courses delivered to students in alignment with the needs of the workforce and the relevance to the curriculum required, concerning the National Standards for Higher Education (SN-DIKTI), the Indonesian National Qualifications

Framework (KKNI), and the National Higher Education Standards. One of the prioritized outcomes is that the graduate profile of the Master's Program in Artificial Intelligence must be based on the needs of all stakeholders, enabling graduates to contribute to the advancement of organizations or society by applying their values, knowledge, and skills to solve real-world problems.

The results of the curriculum implementation evaluation are obtained by gathering input from stakeholders regarding a curriculum that is more adaptive to the dynamic needs of the job market (through FGDs, surveys, tracer studies, associations, and other means), as well as the results of the evaluation of competency achievement.

B. Foundations of the Changes

The analysis of curriculum change needs in the Master's Program in Artificial Intelligence can be carried out by considering the following factors:

1. **Stakeholder Needs Based on Tracer Study Results:**
   - Analyze the results of tracer studies to determine the extent to which graduates of the Master's Program in Artificial Intelligence meet the needs of the industry and labor market.
   - Identify the most in-demand competencies required by stakeholders, such as IT companies, industries, or research institutions.
2. **Changes in Internal and External Policies:**
   - Assess changes in national and regional policies related to education, technology, and workforce.
   - Identify regulatory changes that affect the field of information and communication technology.
   - Ensure that the curriculum reflects current trends and the latest developments in the technology sector.
3. **Advancements in Science, Technology, and the Arts (IPTEKS):**
   - Analyze of recent developments in science and technology related to artificial intelligence and data science.
   - Align the curriculum with the latest advancements in artificial intelligence, data analytics, information security, and other emerging technologies.
4. **Analysis of the Latest SDGs (Sustainable Development Goals) Mission:**
   - Align the curriculum with the principles of sustainable development carried by the SDGs.
   - Integrate elements of sustainable development within the context of information and communication technology.
5. **Analysis of USK's Vision and Mission and Curriculum Development Priorities:**
   - Evaluate the extent to which the Master's Program in Artificial Intelligence curriculum supports the university's vision and mission.
   - Identify curriculum development priorities based on the university's strategic direction and focus.
6. **Analysis of the Faculty's Vision and Mission:**
   - Assess the correspondence of the Master's Program in Artificial Intelligence curriculum with the faculty's vision and mission.

- Identify the contributions of the Master's Program in Artificial Intelligence to the achievement of the faculty's vision and mission.

C. Formulation of Curriculum Changes

The changes from the previous curriculum of the Master's Program in Artificial Intelligence to the Outcome-Based Education (OBE) approach involve several key changes. First, specific learning objectives are emphasized, with the curriculum detailing the skills, knowledge, and attitudes that students are expected to acquire upon completing the program. Second, evaluation is carried out using more specific methods, including written tests, practical projects, and formative assessments, to measure the achievement of the defined learning objectives and to provide students with feedback for continuous improvement. Through the OBE approach, the Master's Program in Artificial Intelligence can produce graduates who are better prepared and more adaptable in facing the continuously evolving challenges of the information technology industry.

1.3. Foundations of Curriculum Design and Development

The following are the foundations for the design and development of the curriculum of the Master's Program in Artificial Intelligence in its formulation and implementation:

1. Regulation of the Minister of Education, Culture, Research, and Technology Number 53 of 2023 concerning Quality Assurance in Higher Education
2. Regulation of the Minister of Education and Culture Number 3 of 2020 concerning National Standards for Higher Education, as well as partial excerpts from the Curriculum Development Guidelines for Higher Education in the Era of the Industrial Revolution 4.0, published by the Directorate General of Learning and Student Affairs, Ministry of Education and Culture, Research, and Technology in 2020
3. Presidential Regulation of the Republic of Indonesia Number 8 of 2012 concerning the Indonesian National Qualifications Framework (KKNI).
4. Curriculum Development Guidelines of Universitas Syiah Kuala, 2023.

CHAPTER II
SCIENTIFIC VISION, OBJECTIVES, AND STRATEGIES OF THE STUDY PROGRAM

2.1. Scientific Vision and Mission of the Study Program

2.1.1. Scientific Vision

The vision of the Master's Program in Artificial Intelligence is "to become one of the innovative, independent, and leading master's study programs in producing graduates in the fields of artificial intelligence and data science by 2030". This vision represents the aspiration to be achieved within a specific timeframe and serves as the focus for developing the study program. Within a maximum period of 10 years since the establishment of the Master's Program in Artificial Intelligence at Universitas Syiah Kuala (USK), the study program aspires to become an innovative, independent, and leading program in producing graduates in artificial intelligence and data science by 2030.

The vision of the Master's Program in Artificial Intelligence aligns closely with the vision aspired to by the Faculty of Mathematics and Natural Sciences (FMIPA) and Universitas Syiah Kuala, as outlined in Table 2.1.

Table 1. Comparison of the Vision of the Study Program, Faculty, and Universitas Syiah Kuala

Vision Master's Artificial Intelligence Study Program	**Vision Faculty of Mathematics and Natural Sciences**	**Vision Universitas Syiah Kuala**
To become one of the innovative, independent, and leading master's study programs in producing graduates in the fields of artificial intelligence and data science at the global level by 2030.	To become an innovative, independent, and globally leading socio-sciencepreneur faculty by the year 2035.	To become an innovative, independent, and prominent socio-technopreneur university at the global level.

Table 2. Checklist of the Alignment Between the Vision of USK/Faculty and the Vision of the Study Program

Keywords of the Study Program Vision	**Alignment of the Study Program Vision with (mark with ✔)**		**Description of Alignment**
	Keywords of the Faculty Vision	**Keywords of the University Vision**	
Sciencepreneur	✔	✔	In alignment with the characteristics of the scientific discipline
Innovative	✔	✔	Aligned
Independent	✔	✔	Aligned

Prominent	✔	✔	Aligned
Global	✔	✔	

2.1.2. Mission of the Study Program

To achieve its vision, the Master's Program in Artificial Intelligence has established four main missions. A mission represents the concrete steps that the Master's Program in Artificial Intelligence must undertake to realize its vision. Strong determination and sincere commitment to carrying out these missions are believed to lead the Master's Program in Artificial Intelligence toward its aspirations by no later than 2030. The four missions of the Master's Program in Artificial Intelligence are:

1. Produce graduates who are competent, independent, and creative, and who are capable of analyzing and solving problems systematically with the support of artificial intelligence and data science technologies.
2. Implement the Tri Dharma of higher education with high quality and to foster an academic environment that is moral, healthy, conducive, and dynamic.
3. Develop research in the fields of artificial intelligence and data science and utilize the outcomes of such research for development and the benefit of humanity.
4. Establish mutually beneficial collaborations with various stakeholders.

2.2. Objectives

The objectives of the Master's Program in Artificial Intelligence have been formulated clearly, specifically, and measurably, and will be evaluated every five years. The objectives of the Master's Program in Artificial Intelligence are as follows:

1. To produce high-quality graduates who:
   a. Possess moral integrity, noble character, faith, and devotion to Allah SWT.
   b. Knowledgeable, skilled, professional, and capable of contributing to development.
   c. Able to adapt to the advancement of science and technology.
   d. Demonstrating independence and entrepreneurial insight
   e. Disciplined and have a strong work ethic.
2. Develop academic programs in artificial intelligence and data science that are aligned with current needs and developments.
3. Improve the quality of education and research in the fields of artificial intelligence and data science.
4. Develop and enhance symmetrical and synergistic collaborations in artificial intelligence and data science that are mutually beneficial with government or private institutions, both domestically and internationally, in order to support the advancement of the study program.

2.3. Strategies

1. Producing High-Quality Graduates
   a) Developing a responsive and adaptive curriculum in line with current developments without neglecting character and religious education.

b) Implementing self-development and professionalism programs for students through lectures, extracurricular activities, workshops, and training designed to enhance professional skills, creativity, innovation, and student entrepreneurship.

2. Developing Relevant Academic Programs
   a) Collaborating with stakeholders (government/private institutions and industry) in the development of learning materials, practicum, research, and entrepreneurship.
   b) Improving learning, practicum, and research facilities.

3. Enhancing the Quality of Education, Research, and Community Service
   a) Conducting training programs and continuous development for lecturers and staff, including further studies, workshops, and conferences.
   b) Encouraging lecturers and students to engage in research and community service activities relevant to current issues, with support for funding and research facilities.
   c) Conducting evaluations of teaching, research, and community service.
4. Developing and Enhancing Collaborations

Establishing and expanding cooperation networks with government agencies, private institutions, and industries both domestically and internationally in the fields of research, curriculum development, academic exchange, and internship opportunities for students.

2.4. University Value

The values upheld by Universitas Syiah Kuala (USK) refer to the core values stated in Article 7 of Government Regulation Number 38 of 2022, namely Pancasila, sincerity, honesty, and togetherness. These values serve as the fundamental foundation in every aspect of university life, including academics, research, and community service. Pancasila serves as the foundation for development diversity and pluralism, while sincerity is a principle in the development of both individual and collective character. Honesty is upheld as a crucial aspect in maintaining integrity and morality, whereas togetherness is emphasized as the key to building solidarity and harmonious collaboration within the campus environment. By adhering to and implementing these values, Universitas Syiah Kuala strives to create an ethical, inclusive, and high-quality academic environment, thereby realizing the university's vision and mission of producing graduates with integrity who contribute positively to society and the nation.

CHAPTER III
PROFILE AND FORMULATION OF GRADUATE COMPETENCY STANDARDS

3.1. Graduate Profile and Profile Description

Indonesia is one of the middle-income countries in Southeast Asia with an established and continuously developing education system that is increasingly focused on quality improvement. However, in terms of the number of master's graduates in the fields of artificial intelligence and data science, Indonesia still lags significantly behind its two closest neighboring countries, Singapore and Malaysia. One of the main reasons for the shortage of master's graduates in artificial intelligence and data science in Indonesia is that such study programs did not exist until recently. Despite that, talent in the fields of artificial intelligence and data science is in high demand.

In addition to the high demand for talent, the proposal to establish the Master's Program in Artificial Intelligence was also driven by Universitas Syiah Kuala's participation in the Erasmus+ Project under the theme of Capacity Building in Higher Education, which involved ten (10) universities across Asia and Europe (www.dsai-project.eu). From Indonesia, the participating universities include Universitas Syiah Kuala, Universitas Sumatera Utara, and Institut Teknologi Bandung. From Thailand, the participating universities are the Asian Institute of Technology, Walailak University, and Khon Kaen University. From Sri Lanka, the University of Peradeniya and the University of Sri Jayewardenepura are involved. European partners include the Athens University of Economics and Business, the University of Minho, and Leiden University (https://www.dsai-project.eu/site/en/project/partners).

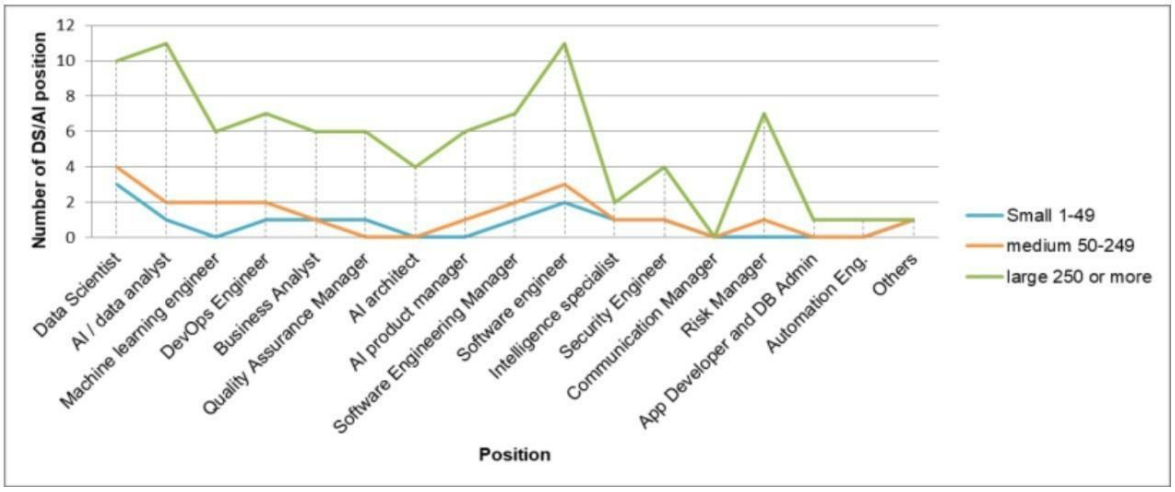

Figure 3.1 Talent needs (skill on the specific position) in Indonesia

A survey conducted through the Erasmus+ Data Science and Artificial Intelligence activity involving 26 companies of various sizes including 5 small-scale companies (up to 50 employees), 5 medium-scale companies (50–250 employees), and 16 large-scale companies (more than 250 employees) revealed that the demand for talent in the fields of data science (data scientists) and artificial intelligence (AI engineers) in Indonesia is very high, matching the demand for software engineers, as illustrated in Figure 3.1. A similar pattern is also observed in Thailand and Sri Lanka.

One of the steps in formulating graduate profiles is conducting a tracer study, which aims to identify the fields of work and performance of graduates in the job market. Graduates of the Master's Program in Artificial Intelligence are expected to pursue careers or continue their studies abroad. This aligns with the objective of producing high-quality graduates who are capable of applying scientific and technological knowledge to solve current societal problems, while upholding the values of humanity, faith, and piety. The graduate profiles and corresponding competencies are presented in Table 3.1.

Table 3.1 Description of Graduate Profile

PL Code	Graduate Profile	Competency	Profession
PL-01	Demonstrate good social character in a professional and community environment.	USK Vision+ S	1. Data and Business Analyst 2. Software Engineer 3. Data Engineer 4. Spatial Data Analyst 5. Lecturer / Researcher / Consultant and Professional
PL-02	Able to think logically, critically, systematically, and innovatively in solving problems, as well as to review data scientifically and disseminate the findings both orally and in writing.	USK Vision + KU	
PL-03	Able to utilize algorithms, methods, skills, and advancements in information technology in the fields of artificial intelligence and data science to solve problems across various domains.	KK	
PL-04	Master and able to apply knowledge of artificial intelligence, data science, and other multidisciplinary fields.	KK + P	
PL-05	Possesses the insight to analyze problems in the fields of artificial intelligence and data science, and to address them through research using interdisciplinary and multidisciplinary approaches.	KU + P	

3.2. Elements of Intended Learning Outcomes (CPL)

Table 3.2 The Relationship between PL and CPL

PL Code	CPL Code	Description of CPL
PL-01, PL-02, PL-03,	CPL-01	Possessing Good Social Character in the Workplace and Society.

PL Code	CPL Code	Description of CPL
PL-04, PL-05		General Attributes: 1. Social character (Social skills) 2. Effective communication (Effective communication skills) Description: This Intended Learning Outcome (CPL) in general encompasses attributes of social character and effective communication. The CPL expects graduates to demonstrate religious attitudes, noble character, ethical behavior, and responsibility in both the workplace and society. The CPL also expected to communicate clearly and effectively, both orally and in writing, within the workplace and society. The CPL expected graduates to adopt the character of a technopreneur.
PL-01, PL-02, PL-03, PL-04, PL-05	CPL-02	Be Able to Think Logically, Critically, Creatively, and Systematically in Problem Solving, and to Implement, Evaluate, and Develop Scientific and Technological Knowledge. General Attributes: 1. Scientific mastery (Scientific skills) 2. Problem-solving ability (Problem-solving skills) 3. Technological capability (Technology skills) 4. Lifelong learning spirit Description: This Intended Learning Outcome (CPL) in general encompasses attributes of scientific mastery, problem-solving ability, technological capability, and a lifelong learning spirit. The CPL expects graduates to think logically and critically in analyzing problems and needs, develop creative solutions, and solve problems systematically. This CPL also expected to process and interpret data scientifically, and to disseminate findings both orally and in writing.
PL-01, PL-02, PL-03, PL-04, PL-05	CPL-03	Be Able to Design and Implement Algorithms to Identify and Solve Problems Involving Software and Computational Thinking. General Attributes: 1. Scientific mastery (Scientific skills) 2. Problem-solving ability (Problem-solving skills)

PL Code	CPL Code	Description of CPL
		3. Technological capability (Technology skills) Description: This Intended Learning Outcome (CPL) in general encompasses attributes such as problem-solving ability, technological capability, and a spirit of lifelong learning. The CPL expects graduates to be able to analyze problems and design algorithmic solutions that, according to the development of information technology in the fields of artificial intelligence and data science, are necessary to address issues across various domains.
PL-01, PL-02, PL-03, PL-04, PL-05	CPL-04	Be Able to Use Appropriate Methods, Techniques, or Tools by the Application of Artificial Intelligence and Data Science. General Attributes: 1. Problem-solving ability (Problem-solving skills) 2. Technological capability (Technology skills) Description: This Intended Learning Outcome (CPL) generally encompasses the attributes of scientific mastery and technological capability. The CPL expects graduates to be able to use appropriate methods and techniques in the fields of artificial intelligence and data science, as well as to test and analyze their performance. This CPL also expects graduates to be capable of applying knowledge of artificial intelligence, data science, and other multidisciplinary fields.
PL-01, PL-02, PL-03, PL-04, PL-05	CPL-05	Mastering and Able to apply knowledge of Informatics and Other Multidisciplinary Fields. General Attributes: 1. Scientific mastery (Scientific skills) 2. Problem-solving ability (Problem-solving skills) 3. Technological capability (Technology skills) 4. Lifelong learning spirit Description: This Intended Learning Outcome (CPL) in general encompasses the attributes of scientific mastery, problem-solving ability, technological capability, and a lifelong learning spirit. The CPL expects graduates to be able to master knowledge in artificial intelligence and

PL Code	CPL Code	Description of CPL
		data science, as well as other related disciplines, and to apply this knowledge to solve problems through interdisciplinary and multidisciplinary approaches.

3.3. Determination of Study Materials

Tabel 3.3 The Relationship between Intended Learning Outcomes (CPL) and Study Materials

CPL Code	Code	Study Material
CPL-01	BK1	Ethics and Character → (Scientific Seminar, Thesis, Research Methodology, Article Review)
CPL-02	BK2	Scientific Writing → (Research Methodology, Scientific Seminar, Thesis Proposal, Scientific Publication, Thesis)
CPL-03	BK3	Data Science → (Programming for Data Science and Artificial Intelligence, Data Management and Modeling, Machine Learning, Computational Linguistics, Social Network Analysis, Spatio-Temporal Data Analysis, Human-Computer Interaction and Data Visualization, Software Development and Project Management, Distributed Systems, Computer Vision)
CPL-04	BK4	Artificial Intelligence → (Artificial Intelligence, Data Management and Modeling, Machine Learning, Business Intelligence and Analytics, Software Development and Project Management, Computer Vision)
CPL-05	BK5	System Development → (Human-Computer Interaction and Data Visualization, Software Development and Project Management, Distributed Systems)

3.4. Formulation of Course Learning Outcomes (CPMK)

The Course Learning Outcomes (CPMK) of the Master's Program in Artificial Intelligence are formulated based on the defined study materials. CPMK are further divided into several Sub-Course Learning Outcomes (Sub-CPMK), also commonly referred to as lesson learning outcomes (AUN-QA, 2015), which derive from the Intended Learning Outcomes (CPL). CPMK are the learning objectives that are expected to be achieved after the completion of a course. Each course is assigned a regular and consistent code, allowing for the analysis of its achievement through the evaluation of learning outcomes.

Table 3.4 The Relationship between Course Learning Outcomes (CPMK) and Courses

CPMK Code	CPMK Description	Course Code	Course Name
CPMK-1	Students are able to formulate problems related to their area of expertise and to develop appropriate answers or solutions to problems under study by applying the steps of the scientific method.	FPPS 1001	Research Methodology
CPMK-1	Students are able to understand the theories and concepts of artificial intelligence and their applications in daily life, as well as their use in planning and decision-making, ranging from precise to uncertain situations and in temporal reasoning through the utilization of intelligent agent–based applications.	MMAI 1001	Artificial Intelligence
CPMK-1	Students are able to solve problems that require programming approaches, such as using Python, which is used in quantitative and analytical computing.	MMAI 1003	Programming for Data Science and Artificial Intelligence
		MMAI 1005	Practicum of Programming for Data Science and Artificial Intelligence
CPMK-1	Students are able to determine appropriate data models and technologies for managing various types and characteristics of data.	MMAI 1007	Data Management and Modelling
CPMK-2	Students are able to analyze, evaluate, model, and develop data modeling and management by considering both technical and business aspects.		

CPMK Code	CPMK Description	Course Code	Course Name
CPMK-1	Students are able to conduct research and development involving machine learning techniques and applications, including dimensionality reduction, training and testing of linear and regression models, supervised learning methods, unsupervised learning methods, deep learning methods and applications, and reinforcement learning methods.	MMAI 1002 MMAI 1004	Machine Learning Practicum of Machine Learning
CPMK-2	Students are able to design, implement, and evaluate intelligent systems that integrate learned models to solve real-world problems based on data.		
CPMK-1	Students are able to explain human and computer capabilities, as well as the theoretical foundations of human-computer interaction (HCI).	MMAI 1006 MMAI 1008	HCI and Information Visualization Practikum of HCI and Information Visualization
CPMK-2	Students are able to adopt design thinking processes for developing interactive systems.		
CPMK-3	Students are able to utilize HCI tools to implement systems with maximum usability and enhanced user experience.		
CPMK-4	Students are able to explain the fundamentals of information visualization and to summarize dynamic, real-time, and spatial datasets across categories, space, and time using visualization tools.		
CPMK-1	Students are able to extract discriminative features from image/video data and use them for pattern classification.	MMAI 1010	Computer Vision
CPMK-2	Students are able to analyze, inspect, and evaluate existing practical computer vision systems.		

CPMK Code	CPMK Description	Course Code	Course Name
CPMK-3	Students are able to apply computer vision algorithms from standard libraries and tools to build prototype computer vision systems for real-world scenarios.		
CPMK-1	Students are able to search for scholarly journals or proceedings, identify journals or proceedings that match their article, and identify the status of those journals or proceedings.	MMAI 1012	Article Review
CPMK-2	Students are able to create a summary of scholarly journals or proceedings, identify the issues presented in scholarly journals or proceedings, and draw a conclusion.		
CPMK-1	Students are able to understand the scope of research titles and the background of research.	MMPA P001	Thesis Proposal
CPMK-2	Students are able to comprehend research problems and the theoretical foundations of a study.		
CPMK-1	Students are able to explain the importance of software development and project management.	MMAI 6002 MMAI 6004	Software Development and Project Management Practicum of Software Development and Project Management
CPMK-2	Students are able to explain the workflow of model-based development in DevOps and agile environments.		
CPMK-3	Students are able to create data models and versions, and apply project management principles to artificial intelligence and data science projects.		
CPMK-1	Students are able to understand single and multiple CPU/Core/Processor models, as well as single and parallel computing.	MMAI 6006 MMAI 6008	Distributed Systems Practicum of Distributed Systems

CPMK Code	CPMK Description	Course Code	Course Name
CPMK-2	Students are able to create and understand threads and their methods.		
CPMK-3	Students are able to implement parallel computing knowledge to develop multiple tasks, priorities, and pools.		
CPMK-1	Students are able to understand and review current topics in the fields of artificial intelligence and data science, and to present the selected topic.	MMAI 2009	Scientific Seminar
CPMK-1	Students are able to understand the principles of business intelligence and data analytics to support organizations in carrying out activities competitively.	MMAI 2011	Business Intelligence and Analysis
CPMK-1	Students are able to understand computational linguistics, including text processing, language fundamentals, text mining, natural language processing, and their applications.	MMAI 2013	Computational Linguistics
CPMK-1	Students are able to search for scholarly journals or proceedings, identify scholarly journals or proceedings that are compatible with their articles, and identify the status of those scholarly journals or proceedings.	MMAI P001	Scientific Publication
CPMK-2	Students are able to select article titles, write abstracts, determine keywords, write the introduction section, and write the methodology section.		
CPMK-3	Students are able to analyze data, formulate research findings, and discuss the results of their studies.		
CPMK-1	Students are able to explain problems and methods (at minimum, clustering and predictive learning methods) in spatio-temporal data mining.	MMAI 6001 MMAI 6003	Spatio-Temporal Data Analysis Practicum of Spatio-Temporal Data Analysis

CPMK Code	CPMK Description	Course Code	Course Name
CPMK-2	Students are able to apply modeling skills to realize spatio-temporal data projects.		
CPMK-3	Students are able to apply integration skills to realize spatio-temporal data projects.		
CPMK-4	Students are able to apply visualization skills to realize spatio-temporal data projects.		
CPMK-1	Students are able to explain various algorithms and methods of Social Network Analysis.	MMAI 6005 MMAI 6007	Social Network Analysis Practicum of Social Network Analysis
CPMK-2	Students are able to understand the evolution of social networks.		
CPMK-3	Students are able to utilize Social Network Analysis to study social behavior or social structures for informed decision-making.		
CPMK-4	Students are able to develop Social Network Analysis applications.		
CPMK-1	Students are able to apply scientific thinking to solve problems related to their field of expertise.	MMPA PA01	Thesis
CPMK-2	Students are able to manage research programs, as well as research and development activities, in the area of management in thesis writing.		
CPMK-3	Students are able to advance knowledge in management or professional practices through scientific research, resulting in innovative and proven works for publication.		

3.5. Course Development

The curriculum development of the Master's Program in Artificial Intelligence began to be discussed during the meeting of 15 European and Asian partners under the Erasmus+ Capacity Building in Higher Education grant, Curriculum Development of Master's in Data Science and Artificial Intelligence (http://dsai-project.eu), a three-year

project that ran from November 2018 to 2021. The curriculum development project had a consortium coordinator based in Southeast Asia, that is the Asian Institute of Technology (AIT) in Bangkok. Under this project, eight universities in Asia, as members of the consortium, were required to establish a Master's Program in Artificial Intelligence. From Indonesia, the participating institutions included Universitas Syiah Kuala, Universitas Sumatera Utara, and Institut Teknologi Bandung. From Thailand, the partners were the Asian Institute of Technology, Walailak University, and Khon Kaen University. From Sri Lanka, the participating universities were the University of Peradeniya and the University of Sri Jayewardenepura. The European partners in this project were Athens University of Economics and Business, University of Minho, and Leiden University (https://www.dsai-project.eu/site/en/project/partners).

Code	Course Name	Number of CPMK	Estimated Student Workload Time		SKS
			Theory	Practical	
FPPS 1001	Research Methodology		5,6 hours/week for 16 weeks = 87,36 hours	0	2
MMAI 1001	Artificial Intelligence		8,5 hours/week for 16 weeks = 134,4 hours	0	3
MMAI 1003	Programming for Data Science and Artificial Intelligence		8,5 hours/week for 16 weeks = 134,4 hours	0	3
MMAI 1005	Practicum of Programming for Data Science and Artificial Intelligence		0	2,73 hours/week for 16 weeks = 43,68 hours	1
MMAI 1007	Data Management and Modelling		8,5 hours/week for 16 weeks = 134,4 hours	0	3
MMPA P001	Thesis Proposal		0	5,6 hours/week for 16 weeks = 87,36 hours	2
MMAI 1002	Machine Learning		5,6 hours/week for 16 weeks = 87,36 hours	0	2
MMAI 1004	Practicum of Machine Learning		0	2,73 hours/week for 16 weeks = 43,68 hours	1
MMAI 1006	HCI and Information Visualization		5,6 hours/week for 16 weeks = 87,36 hours	0	2
MMAI 1008	Practikum of HCI and Information Visualization		0	2,73 hours/week for 16 weeks = 43,68 hours	1

Code	Course Name	Number of CPMK	Estimated Student Workload Time		SKS
			Theory	Practical	
MMAI 1010	Computer Vision		8,5 hours/week for 16 weeks = 134,4 hours	0	3
MMAI 1012	Article Review		0	8,5 hours/week for 16 weeks = 134,4 hours	3
MMAI 6002	Software Development and Project Management		5,6 hours/week for 16 weeks = 87,36 hours	0	2
MMAI 6004	Practicum of Software Development and Project Management		0	2,73 hours/week for 16 weeks = 43,68 hours	1
MMAI 6006	Distributed Systems		5,6 hours/week for 16 weeks = 87,36 hours	0	2
MMAI 6008	Practicum of Distributed Systems		0	2,73 hours/week for 16 weeks = 43,68 hours	1
MMAI 2009	Scientific Seminar		0	5,6 hours/week for 16 weeks = 87,36 hours	2
MMAI 2011	Business Intelligence and Analysis		8,5 hours/week for 16 weeks = 134,4 hours	0	3
MMAI 2013	Computational Linguistics		8,5 hours/week for 16 weeks = 134,4 hours	0	3
MMAI P001	Scientific Publication		0	8,5 hours/week for 16 weeks = 134,4 hours	3
MMAI 6001	Spatio-Temporal Data Analysis		5,6 hours/week for 16 weeks = 87,36 hours	0	2
MMAI 6003	Practicum of Spatio-Temporal Data Analysis		0	2,73 hours/week for 16 weeks = 43,68 hours	1
MMAI 6005	Social Network Analysis		5,6 hours/week for 16 weeks = 87,36 hours	0	2
MMAI 6007	Practicum of Social Network Analysis		0	2,73 hours/week for 16 weeks = 43,68 hours	1
MMPA PA01	Thesis		0	22,5 hours/week for 16 weeks = 360 hours	8

* The credit point (SKS) weight for each course is calculated as follows: Credit Point (Total Estimated Time) × 1 credit / (2.83 hours/week × 16 weeks) = 45.28 hours; therefore, 134.4 hours / 45.28 hours = 2.97, which is then rounded to 3 SKS.

The formulation of intended learning outcomes, in addition to referring to the graduate profile, according to Ministry of Education and Culture Regulation No. 3 of 2020, must refer to the description of intended learning outcomes in the Indonesian National Qualifications Framework (KKNI), and have equivalence with the qualification level defined in the KKNI.

Table 3.5 Course Titles and Their Relation to Course Learning Outcomes (CPMK)

Code	Course Name	CPMK Code (marked with a √ in the relevant CPMK components)				
		CPL1	CPL2	CPL3	CPL4	CPL5
FPPS1001	Research Methodology	√				√
MMAI1001	Artificial Intelligence		√	√	√	√
MMAI1003	Programming for Data Science and Artificial Intelligence		√	√	√	√
MMAI1005	Practicum of Programming for Data Science and Artificial Intelligence		√	√	√	√
MMAI1007	Data Management and Modelling		√	√	√	√
MMPAP001	Thesis Proposal		√		√	√
MMAI1002	Machine Learning		√	√	√	√
MMAI1004	Practicum of Machine Learning		√	√	√	√
MMAI1006	HCI and Information Visualization		√	√	√	√
MMAI1008	Practikum of HCI and Information Visualization		√	√	√	√
MMAI1010	Computer Vision		√	√	√	√
MMAI1012	Article Review	√	√	√	√	√
MMAI6002	Software Development and Project Management		√	√	√	√
MMAI6004	Practicum of Software Development and Project Management		√	√	√	√
MMAI6006	Distributed Systems		√	√	√	√

Code	Course Name	CPMK Code (marked with a √ in the relevant CPMK components)				
		CPL1	CPL2	CPL3	CPL4	CPL5
MMAI6008	Practicum of Distributed Systems		√	√	√	√
MMAI2009	Scientific Seminar	√	√	-	-	√
MMAI2011	Business Intelligence and Analysis		√	√	√	√
MMAI2013	Computational Linguistics		√	√	√	√
MMAIP001	Scientific Publication	√	√	√	√	√
MMAI6001	Spatio-Temporal Data Analysis		√	√	√	√
MMAI6003	Practicum of Spatio-Temporal Data Analysis		√	√	√	√
MMAI6005	Social Network Analysis		√	√	√	√
MMAI6007	Practicum of Social Network Analysis		√	√	√	√
MMPAPA01	Thesis	√	√	√	√	√

Table 3.6 Description of Study Material

Code	Study Material (Course Name)	Description
FPPS1001	Research Methodology	This course covers topics including types of research, research paradigms, the research process, literature reviews, formulating research problems, identifying research variables, building hypotheses, designing research, data collection, data processing and presentation, drawing conclusions, formulating research proposals, and creating research reports.
MMAI1001	Artificial Intelligence	This course discusses the fundamental concepts of artificial intelligence, including intelligent agents, knowledge representation, knowledge reasoning and interface, search techniques, and expert systems. It also covers the history and development of artificial intelligence therefore its can implement in real life to facilitate human work. Additionally, the course introduces the concept of artificial neural networks.
MMAI1003	Programming for Data Science and Artificial Intelligence	This course introduces Python programming and relevant libraries, including Scikit-learn, NumPy, Pandas, TensorFlow, PyTorch, and Matplotlib,

Code	Study Material (Course Name)	Description
MMAI1005	Practicum of Programming for Data Science and Artificial Intelligence	designed to solve problems that require a programming approach.
MMAI1007	Data Management and Modelling	This course covers skills in analyzing, evaluating, modeling, and developing data modeling and management, with a focus on both technical and business aspects.
MMPAP001	Thesis Proposal	The thesis proposal course is a compulsory course for students in the Master's Program in Artificial Intelligence. In this course, students are required to prepare a research proposal that includes the research title, introduction, background of the problem, objectives, significance, literature review, scope limitation, hypothesis formulation, and research benefits. It also covers research methodology, research methods, and citation writing. The proposal must be presented orally in a seminar before thesis examiners and fellow students.
MMAI1002	Machine Learning	This course explores various machine learning algorithms, including both supervised and unsupervised learning techniques.
MMAI1004	Practicum of Machine Learning	
MMAI1006	HCI and Information Visualization	Students must understand the principles, processes, and techniques for designing, implementing, and evaluating interactive systems to maximize usability and enhance the user experience in data-based systems. Students will learn methods and techniques for presenting information to improve data comprehension.
MMAI1008	Practicum of HCI and Information Visualization	
MMAI1010	Computer Vision	This course aims to introduce the concepts of computer vision with an emphasis on state-of-the-art methods used in modern vision applications.
MMAI1012	Article Review	Students are requested to review, understand, and summarize at least 10 articles from journals or conference proceedings in the field of computing, which will be relevant to their thesis writing. The summaries will be presented both orally and in written form before course instructors and fellow students.

Code	Study Material (Course Name)	Description
MMAI6002	Software Development and Project Management	This course emphasizes the development of modern and essential software, software engineering processes, and project management. Students will tailor software development and project management processes for Data Science and Artificial Intelligence (DS&AI) projects, including planning, iterative development, test-driven development, continuous integration/delivery, versioning, and outcomes. Students will learn process to apply this knowledge to solve problems in AI and data science domains.
MMAI6004	Practicum of Software Development and Project Management	
MMAI6006	Distributed Systems	This course is an advanced course in parallel computing. Topics covered focus on the parallel computation aspect involving multiprocessor systems to solve a problem. Topics covered include: parallel computing architectures, parallel algorithm design, shared memory programming, message passing programming, MPI, Floyd's algorithm, performance analysis, and large-scale matrix multiplication.
MMAI6008	Practicum of Distributed Systems	
MMAI2009	Scientific Seminar	Understand, review, and present current topics in artificial intelligence and data science based on journals or conference proceedings in the field of computing. Each student is required to select one topic, study and present it in a seminar attended by course instructor and fellow students. The selected seminar topic is expected to serve as a foundation for the student's future research.
MMAI2011	Business Intelligence and Analysis	Business Intelligence and Analytics is a course focused on business data analysis to generate insights, intelligence, and actionable knowledge that support better decision-making and enable the identification of new opportunities.
MMAI2013	Computational Linguistics	This course introduces the fundamental concepts of computational linguistics, including language fundamentals, text mining, natural language processing (NLP), and text processing.
MMAIP001	Scientific Publication	This course offers an in-depth examination of the procedures for writing scientific publications that accurately reflect current research findings. It emphasizes theoretical aspects, philosophical explanations of methodological steps or forms of study within specific journal formats, and the coherent, interconnected structure of sections or chapters. The course also addresses current literacy techniques. The expected outcome of this course is

Code	Study Material (Course Name)	Description
		the submission of a manuscript to a journal or conference proceedings.
MMAI6001	Spatio-Temporal Data Analysis	Students are required to understand problems, methods, algorithms, and emerging computational techniques for analyzing spatio-temporal databases. Students will apply this understanding in the spatio-temporal data projects.
MMAI6003	Practicum of Spatio-Temporal Data Analysis	
MMAI6005	Social Network Analysis	With the rapid growth and popularity of social networks, analyzing large-scale network datasets has become increasingly important. This course provides students with an understanding of social network analysis methods and their applications.
MMAI6007	Practicum of Social Network Analysis	
MMPAPA01	Thesis	In this course, students are expected to: 1. Understand the core problem of their thesis topic. 2. Be able to build a basic configuration of the methods/techniques used to solve problems related to the topic. 3. Produce data and analyze it to answer the problem related to their thesis topic. 4. Compile the results obtained into a written document according to academic guidelines. 5. Defend their work in a thesis defense before the thesis examiners.

3.6. Curriculum Structure

Each student enrolled in the Master's Program in Artificial Intelligence, Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Syiah Kuala (USK), is required to complete a total of 54 SKS. These include 45 SKS of compulsory courses and 9 SKS of elective courses. The distribution of courses across the semesters is as follows:

- Semester 1 consists of 12 SKS (12 SKS compulsory courses).
- Semester 2 consists of 20 SKS (14 SKS compulsory courses and 6 SKS elective courses).
- Semester 3 consists of 14 SKS (11 SKS compulsory courses and 3 SKS elective courses).
- Semester 4 consists of 8 SKS compulsory course allocated for the thesis.

The detailed curriculum structure for each semester throughout the duration of study in the Master's Program in Artificial Intelligence, FMIPA USK, is presented in Table 3.7.

Table 3.7 List of Courses

First Semester / Odd Semester									
No	Course Code	Course	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	FPPS1001	Research Methodology	2	2	0	0	0	W	
2	MMAI1001	Artificial Intelligence	3	3	0	0	0	W	
3	MMAI1003	Programming for Data Science and Artificial Intelligence	3	3	0	0	0	W	
4	MMAI1005	Practicum of Programming for Data Science and Artificial Intelligence	1	0	1	0	0	W	
5	MMAI1007	Data Management and Modelling	3	3	0	0	0	W	
TOTAL			**12**	**11**	**1**	**0**	**0**		

Second Semester / Even Semester									
No	Course Code	Course	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	MMPAP001	Thesis Proposal	2	0	2	0	0	W	
2	MMAI1002	Machine Learning	2	2	0	0	0	W	

Second Semester / Even Semester									
No	Course Code	Course	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
3	MMAI1004	Practicum of Machine Learning	1	0	1	0	0	W	
4	MMAI1006	HCI and Information Visualization	2	2	0	0	0	W	
5	MMAI1008	Practicum of HCI and Information Visualization	1	0	1	0	0	W	
6	MMAI1010	Computer Vision	3	3	0	0	0	W	
7	MMAI1012	Article Review	3	0	3	0	0	W	
8	MMAI6002	Software Development and Project Management	2	2	0	0	0	P	
9	MMAI6004	Practicum of Software Development and Project Management	1	0	1	0	0	P	
10	MMAI6006	Distributed Systems	2	2	0	0	0	P	
11	MMAI6008	Practicum of Distributed Systems	1	0	1	0	0	P	
TOTAL			**20**	**11**	**9**	**0**			

Third Semester / Odd Semester									
No	Course Code	Course	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	MMAI2009	Scientific Seminar	2	0	2	0	0	W	
2	MMAI2011	Business Intelligence and Analysis	3	3	0	0	0	W	
3	MMAI2013	Computational Linguistics	3	3	0	0	0	W	

Third Semester / Odd Semester									
No	Course Code	Course	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
4	MMAIP001	Scientific Publication	3	0	3	0	0	W	
5	MMAI6001	Spatio-Temporal Data Analysis	2	2	0	0	0	P	
6	MMAI6003	Practicum of Spatio-Temporal Data Analysis	1	0	1	0	0	P	
7	MMAI6005	Social Network Analysis	2	2	0	0	0	P	
8	MMAI6007	Practicum of Social Network Analysis	1	0	1	0	0	P	
TOTAL			**17**	**10**	**7**	**0**	**0**		

Fourth Semester / Even Semester									
No	Course Code	Course	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	MMPAPA01	Thesis	8	0	8	0	0	W	
TOTAL			**8**	**0**	**8**	**0**	**0**		
TOTAL SKS			**57**	**32**	**25**	**0**	**0**		

3.7. Summary of Curriculum Structure

Summary of the curriculum, including the study load, the number of compulsory and elective courses, as well as other components of the courses, as recorded in the general information on the study material, is presented in Table 3.8.

Table 3.8 General Information

General Information	Total SKS
Minimum number of credits required for graduation	54
Number of elective courses required to be taken	9
Total number of elective courses offered	12
Number of General Compulsory Course (MKWU) Components	-

General Information	Total SKS
Number of Skill Based Course Components	8
Number of Foundational Scientific Course Components	37
Number of Foundational Scientific / Specialized Expertise Course Components	12
Number of curricular/extracurricular activities promoting innovation, entrepreneurship, and IT skills	-
Course components aligned with the SDGs vision	-

Table 3.9 Characteristics of Elective Courses

No	Course Code	Course Name	SKS	Characteristic (√)								
				A	B	C	D	E	F	G	T	P
1	FPPS1001	Research Methodology	2	√								
2	MMAI1001	Artificial Intelligence	3	√		√						
3	MMAI1003	Programming for Data Science and Artificial Intelligence	3	√		√						
4	MMAI1005	Practicum of Programming for Data Science and Artificial Intelligence	1	√								√
5	MMAI1007	Data Management and Modelling	3	√	√	√						
6	MMPAP001	Thesis Proposal	2	√								
7	MMAI1002	Machine Learning	2	√		√		√				
8	MMAI1004	Practicum of Machine Learning	1	√		√		√				√
9	MMAI1006	HCI and Information Visualization	2	√		√		√				
10	MMAI1008	Practikum of HCI and Information Visualization	1	√		√		√				√
11	MMAI1010	Computer Vision	3	√								
12	MMAI1012	Article Review	3	√	√							

No	Course Code	Course Name	SKS	Characteristic (√)								
				A	B	C	D	E	F	G	T	P
13	MMAI6002	Software Development and Project Management	2		√	√		√				
14	MMAI6004	Practicum of Software Development and Project Management	1		√	√		√				√
15	MMAI6006	Distributed Systems	2		√	√		√				
16	MMAI6008	Practicum of Distributed Systems	1		√	√		√				√
17	MMAI2009	Scientific Seminar	2	√								
18	MMAI2011	Business Intelligence and Analysis	3	√	√	√						
19	MMAI2013	Computational Linguistics	3	√	√	√						
20	MMAIP001	Scientific Publication	3	√								
21	MMAI6001	Spatio-Temporal Data Analysis	2		√	√	√		√			
22	MMAI6003	Practicum of Spatio-Temporal Data Analysis	1		√	√	√		√			√
23	MMAI6005	Social Network Analysis	2		√	√	√		√			
24	MMAI6007	Practicum of Social Network Analysis	1		√	√	√		√			√
25	MMPAPA01	Thesis	8	√								

A = Deepening field of study,
B = Enhancing professional skills for the workplace,
C = Improving IT skills,
D = Promoting entrepreneurship,
E = Enhancing soft skills,
F = Can Equivalent to activities under the MBKM program,
G = Others
T = Tutorial
P = Practice

Table 3.10 List of Courses Implemented in Relation to SDGs, PBR, PjBL, Case-M, and/or MBKM

No	Code	Course	SKS	Category	Targeted SDGs	Label			
						PBR	PjBL	Case-M	MBKM
1	FPPS1001	Research Methodology	2	W	-	-	-	-	-
2	MMAI1001	Artificial Intelligence	3	W	4,9	-	-	-	-
3	MMAI1003	Programming for Data Science and Artificial Intelligence	3	W	4,9	-	√	-	-
4	MMAI1005	Practicum of Programming for Data Science and Artificial Intelligence	1	W	4,9	-	-	-	-
5	MMAI1007	Data Management and Modelling	3	W	4,9	-	-	-	-
6	MMPAP001	Thesis Proposal	2	W		-	-	-	-
7	MMAI1002	Machine Learning	2	W	4,9	-	-	-	-
8	MMAI1004	Practicum of Machine Learning	1	W	4,9	-	-	-	-
9	MMAI1006	HCI and Information Visualization	2	W	4,9	-	-	-	-
10	MMAI1008	Practikum of HCI and Information Visualization	1	W	4,9	-	-	-	-
11	MMAI1010	Computer Vision	3	W	4,9	-	-	√	
12	MMAI1012	Article Review	3	W	-	√	-	-	-
13	MMAI6002	Software Development and Project Management	2	P	4,9	-	-	√	-
14	MMAI6004	Practicum of Software Development and Project Management	1	P	4,9	-	-	√	-
15	MMAI6006	Distributed Systems	2	P	4,9	-	-	-	-
16	MMAI6008	Practicum of Distributed Systems	1	P	4,9	-	-	-	-
17	MMAI2009	Scientific Seminar	2	W	-	√	-	-	-

No	Code	Course	SKS	Category	Targeted SDGs	Label			
						PBR	PjBL	Case-M	MBKM
18	MMAI2011	Business Intelligence and Analysis	3	W	4,9	-	-	-	-
19	MMAI2013	Computational Linguistics	3	W	4,9	-	-	-	-
20	MMAIP001	Scientific Publication	3	W	-	√	-	-	-
21	MMAI6001	Spatio-Temporal Data Analysis	2	P	4,9	-	-	-	-
22	MMAI6003	Practicum of Spatio-Temporal Data Analysis	1	P	4,9	-	-	-	-
23	MMAI6005	Social Network Analysis	2	P	4,9	-	-	-	-
24	MMAI6007	Practicum of Social Network Analysis	1	P	4,9	-	-	-	-
25	MMPAPA01	Thesis	8	W	-	√	-	-	-

SDGs = Sustainable Development Goals (SDGs) are a universal agenda agreed upon through 2030, aimed at achieving sustainable development based on human rights and equality. The SDGs consist of 17 goals and 169 targets. (1) No Poverty; (2) Zero Hunger; (3) Good Health and Well-being; (4) Quality Education; (5)Gender Equality; (6)Clean Water and Sanitation; (7)Affordable and Clean Energy; (8) Decent Work and Economic Growth; (9) Industry, Innovation, and Infrastructure; (10) Reduced Inequalities; (11) Sustainable Cities and Communities; (12) Responsible Consumption and Production; (13) Climate Action; (14) Life Below Water; (15) Life on Land; (16) Peace, Justice, and Strong Institutions; (17) Partnerships for the Goals (Source: Bappenas, 2017).

PBR = Research-Based Learning
PjBL = Project-Based Learning
Case-M = Case Method
MBKM = Independent Learning Independent Campus

3.8. List of Course Equivalencies and Recognition of (Independent Learning Independent Campus) MBKM Activities for Credit Transfer

3.8.1. Course Equivalencies

Old Courses					New Courses			
No	**Course Code**	**Course Name**	**SKS**		**No**	**Course Code**	**Course Name**	**SKS**
1	PPS 601	Research Methodology	2		1	FPPS 1001	Research Methodology	2
2	MAI 611	Artificial Intelligence	3		2	MMAI 1001	Artificial Intelligence	3
3	MAI 612	Computer Programming for Data Science and Artificial Intelligence	4		3	MMAI 1003	Programming for Data Science and Artificial Intelligence	3
					4	MMAI 1005	Practicum of Programming for Data Science and Artificial Intelligence	1
					5	MMAI 6006	Distributed Systems	2
					6	MMAI 6008	Praktikum Sistem Terdistribusi	1
4	MAI 613	Data Management and Modelling	3		7	MMAI 1007	Data Management and Modelling	3
5	MAI 621	Machine Learning	3		8	MMAI 1002	Machine Learning	2
					9	MMAI 1004	Practicum of Machine Learning	1
6	MAI 622	Computer Vision	3		10	MMAI 1010	Computer Vision	3
					11	MMAI 6002	Software Development and Project Management	2

Old Courses					New Courses			
No	**Course Code**	**Course Name**	**SKS**		**No**	**Course Code**	**Course Name**	**SKS**
					12	MMAI 6004	Practicum of Software Development and Project Management	1
7	MAI 623	HCI and Information Visualization	3		13	MMAI 1006	HCI and Information Visualization	2
					14	MMAI 1008	Practikum of HCI and Information Visualization	1
					15	MMAI 6001	Spatio-Temporal Data Analysis	2
					16	MMAI 6003	Practicum of Spatio-Temporal Data Analysis	1
8	PPS 603	Statistics	2		17	MMAI 1012	Article Review	3
9	MAI 711	Seminar	3		18	MMAI 2009	Scientific Seminar	2
					19	MMAI P001	Scientific Publication	3
10	MAI 712	Business Intelligence and Analysis	3		20	MMAI 2011	Business Intelligence and Analysis	3
11	MAI 714	Computational Linguistics	3		21	MMAI 2013	Computational Linguistics	3
12	MAI 715	Social Network Analysis	3		22	MMAI 6005	Social Network Analysis	2
					23	MMAI 6007	Practicum of Social Network Analysis	1
13	MPA PT1	Thesis	6		24	MMPA PA01	Thesis	8

Old Courses					New Courses			
No	**Course Code**	**Course Name**	**SKS**		**No**	**Course Code**	**Course Name**	**SKS**
					25	MMPA P001	Thesis Proposal	2

3.8.2. List of Recognized Courses under the MBKM Program

*Study programs must prepare several regular courses or MKRU courses (University Recognition Courses provided by USK) to anticipate cases where there are no suitable regular courses for the recognition of Independent Learning Independent Campus (MBKM) activities undertaken by students. The academic division will prepare the code and title of the MKRU, and the course code will be assigned uniformly across all study programs by the ICT Center. These MKRU courses will be registered in the PDDikti, but will not be offered in the same manner as regular courses within the study program. The equivalency and recognition model follows the example shown in Table 10.

3.9. Example of Semester Learning Plan (RPS) Using Case Method and Team-Based Project/PjBL in the Study Program

	UNIVERSITAS SYIAH KUALA FAKULTAS MATEMTIKA DAN ILMU PENGETAHUAN ALAM PROGRAM STUDI MAGISTER KECERDASAN BUATAN	Kode Dokumen 49302-003-01-04

RENCANA PEMBELAJARAN SEMESTER

MATA KULIAH (MK)	Kode MK	Kategori	MK Prasyarat	Rumpun MK	Bobot (sks)		Semester	Tgl Penyusunan
Pemrograman Komputer untuk Data Sains dan Kecerdasan Artifisial	MMAI7003	Wajib			T= 3	P= 0	1	22-Mar-24

OTORISASI	Pengembang RPS	Koordinator MK	Koordinator Program Studi
	Prof. Dr. Taufik Fuadi Abidin, S.Si., M.Tech (Nama Dosen Pengembang RPS)	*Prof. Dr. Taufik Fuadi Abidin, S.Si., M.Tech* (Nama Koordinator MK)	*Dr. Nizamuddin, M.Info.Sc.* (Nama Koordinator Prodi)

Dosen Pengampu: Prof. Dr. Taufik Fuadi Abidin, S.Si., M.Tech;

Deskripsi Singkat MK: *Tuliskan deskripsi singkat MK yang berisi materi / bahan kajian MK, dan relevansi nya kegunaan / manfaat MK dengan Kondisi Riil*
Mata kuliah ini membahas tentang pemrograman Python dan modul-modul terkait seperti Scikit Learn, Numpy, Panda, TensorFlow, Pytorch, dan Matplotlib untuk memecahkan permasalahan yang membutuhkan pendekatan pemrograman.

Capaian Pembelajaran

CPL-Prodi (Capaian Pembelajaran Lulusan Program Studi) yang di bebankan pada MK	
CPL 3	Mampu merancang dan mengimplementasikan algoritma dalam mengidentifikasi dan memecahkan masalah yang melibatkan perangkat lunak dan pemikiran komputasi.
CPL 4	Mampu menggunakan metode, teknik atau peralatan yang sesuai dalam penerapan ilmu kecerdasan buatan dan sains data.
CPL 5	Menguasai dan mampu mengaplikasikan ilmu informatika dan multi disiplin ilmu lainnya.
Capaian Pembelajaran Mata Kuliah (CPMK)	
CPMK3	Mampu memecahkan permasalahan yang membutuhkan pendekatan pemrograman, misal dengan Python, yaitu dalam komputasi kuantitatif dan analitik.

Matriks Korelasi CPL dan CPMK

Korelasi CPL terhadap CPMK

Tuliskan korelasi CPL terhadap CPMK dengan menuliskan bobot CPMK untuk setiap CPL

	CPL(%)					Bobot CPMK (%)
	CPL1	CPL2	CPL3	CPL4	CPL5	
CPMK1						0
CPMK2						0
CPMK3			40	40	20	100
CPMK.... dst						0
Bobot CPL (%)	0	0	40	40	20	100

Matriks Kesesuaian CPMK terhadap Visi Universitas, SDGs, dan Research Based Learning (RBE)

Korelasi CPMK terhadap Visi Universitas, SDGs, dan RBL

**contoh*

Aspek	CPMK				
	CPMK1	CPMK2	CPMK3	CPMK4	CPMK5
Sosio-Teknopreneur			√		
SDGs ke-			4		
RBL					

Bahan Kajian / Materi Pembelajaran

Tuliskan materi / bahan kajian MK, secara rinci, dengan penulisan secara

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Pustaka Pembelajaran

Utama :

Tuliskan referensi utama dalam susunan berurut (untuk gaya penulisannya bebas)

- Geron, A. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 2019 (2nd edition)
- VanderPlas, J. Python Data Science Handbook: Essential Tools for Working with Data, 2016 (1st edition)
- Hastie, T., Tibshirani, R., and Friedman, J. The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2016 (2nd edition)
- Weidman, S. Deep Learning from Scratch: Building with Python from First Principles, 2019 (1st edition)
- Charu, C. Neural Networks and Deep Learning: A Textbook, 2018 (1st edition)
- Deisenroth, M.P., Faisal A.A., Ong, C.S., Mathematics for Machine Learning, 2020 (1st edition)

Pendukung :

Tuliskan referensi pendukung dalam susunan berurut (penomoran merupakan dari referensi utama)

- Python tutorials available online: https://docs.python.org/3/tutorial/
- Jupyter notebook tutorials available online: https://ipython.org/documentation.html
- Numpy tutorials available online:https://numpy.org/doc/stable/
- Pandas tutorials available online: https://pandas.pydata.org/docs/
- Nltk tutorials available online: https://www.nltk.org
- Matplotlib tutorials available online: https://matplotlib.org/contents.html
- Scikit-learn tutorials available online: https://scikit-learn.org/stable/user_guide.html
- Pytorch tutorials available online: https://pytorch.org/tutorials/
- Nice visuals on CNN - https://github.com/vdumoulin/conv_arithmetic

Kriteria Penilaian

Kriteria dan Item Penilaian

Rentang Skor	Huruf Mutu	Kategori	Status Kelulusan
≥87	A	Sangat Baik	LULUS
78 - <87	AB	Baik	
69 - <78	B	Kurang Baik	
60 - <69	BC	Sedang	
51 - <60	C	Cukup	
41 - <51	D	Kurang Baik	TIDAK LULUS
<41	E	Gagal	

Komponen Penilaian

Komponen Penilaian

Bentuk Evaluasi		CPMK1 (%)	CPMK2 (%)	CPMK3 (%)	CPMK4 (%)
		0	0	0	0
Tugas	25%			25	
Praktikum	15%			15	
UTS	25%			25	
Final Projek	35%			35	
				100	
Total					

Rumus perhitungan %Bobot CPMK per Asesmen*:

$$\%Bobot\ CPMK\ per\ Asesmen\ = \frac{Bobot\ Asesmen}{Bobot\ CPMK} \times 100\%$$

*berlaku untuk CPMK dengan satu item asesmen selebihnya dapat diperoleh dari hasil pengurangan item tersebut dengan bobot 100%

Mg ke-	Kemampuan Akhir Tiap Tahapan Belajar (Sub-CPMK)	Penilaian: Indikator	Penilaian: Kriteria & Teknik	Bentuk Pembelajaran, Metode Pembelajaran, dan Penugasan Mahasiswa [Estimati Waktu]: Luring (*offline*)	Bentuk Pembelajaran, Metode Pembelajaran, dan Penugasan Mahasiswa [Estimati Waktu]: Daring (*online*)	Materi Pembelajaran [Pustaka]	Bobot Nilai (%)
1	Mahasiswa mampu memahami tentang Python dan toolset	**Ketrampilan:** Keberhasilan dalam menyiapkan Python programming IDE **Afektif:** tepat waktu, tanggung jawab, dan	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar Python • Python toolset & Jupiter	-
2	Mahasiswa memahami objek dan struktur data dalam Python dan library numpy	**Keterampilan Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Objek dan struktur data • List, Tuple, String, Dictionary • Library Numpy	-
3	Mahasiswa mampu memahami Panda dan visualisasi data dengan Matplotlib	**Keterampilan Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Library Pandas • Library Matplotlib untuk visualisasi data	-
4	Mahasiswa mampu memahami regresi, kodingnya, dan scikit-learn	**Keterampilan Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar regresi • Penyelesaian regresi dan penggunaan scikit-learn	5%
5	Mahasiswa mampu memahami metode logistik regresi dan kodingnya	**Keterampilan Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar logistik regresi • Pemrograman logit dan penggunaan scikit-learn	5%
6	Mahasiswa mampu memahami metode Naive Bayesian dan kodingnya	**Keterampilan Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar Naive Bayesian • Pemrograman NB dan penggunaan scikit-learn	5%
7	Mahasiswa mampu memahami metode K-Nearest Neighbors (K-NN) dan kodingnya	**Keterampilan Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar K-NN • Pemrograman K-NN dan penggunaan scikit-learn	5%

8	**UJIAN TENGAH SEMESTER**						**25%**
9	Mahasiswa mampu memahami metode Support Vector Machine (SVM) dan kodingnya	**Keterampilan** **Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar SVM • Pemrograman SVM dan penggunaan scikit-learn	-
10	Mahasiswa mampu memahami metode Support Vector Machine (SVM) dan kodingnya	**Keterampilan** **Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Lanjutan Kernel SVM • Pemrograman SVM berbagai kernel dan penggunaan scikit-learn	5%
11	Mahasiswa mampu memahami metode Decision Tree dan kodingnya	**Keterampilan** **Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar Decision Tree • Pemrograman Decision Tree dan penggunaan scikit-learn	-
12	Mahasiswa mampu memahami ensemble learning Random Forrest dan kodingnya	**Keterampilan** **Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar ensemble learning • Pemrograman Random Forrest dan penggunaan scikit-learn	5%
13	Mahasiswa mampu memahami metode neural network, PyTorch, dan kodingnya	**Keterampilan** **Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar neural network • Pemrograman neural network dan PyTorch	-
14	Mahasiswa mampu memahami metode convolutional neural (CNN) network dan PyTorch	**Keterampilan** **Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar CNN • Pemrograman CNN dan PyTorch	5%
15	Mahasiswa mampu memahami metode clustering K-Means	**Keterampilan** **Sikap:** kerjasama dan partisipasi	**Pendekatan:** Ketrampilan proses **Metode:** Diskusi dan presentasi **Model:** PBL	3 x 50		• Pengantar K-Means • Pemrograman K-Means dan penggunaan scikit-learn	5%
16	**FINAL PROJEK**						**35%**

Catatan:

1	**Capaian Pembelajaran Lulusan Program Studi (CPL-Prodi)** adalah kemampuan yang dimiliki oleh setiap lulusan PRODI yang merupakan internalisasi dari sikap, penguasaan pengetahuan dan ketrampilan sesuai dengan jenjang prodinya yang diperoleh melalui proses pembelajaran.
2	**CPL yang dibebankan pada mata kuliah** adalah beberapa capaian pembelajaran lulusan program studi (CPL-PRODI) yang digunakan untuk pembentukan/pengembangan sebuah mata kuliah yang terdiri dari aspek sikap, ketrampulan umum, ketrampilan khusus dan pengetahuan.
3	**CP Mata kuliah (CPMK)** adalah kemampuan yang dijabarkan secara spesifik dari CPL yang dibebankan pada mata kuliah, dan bersifat spesifik terhadap bahan kajian atau materi pembelajaran mata kuliah tersebut.
4	**Sub-CP Mata Kuliah (Sub-CPMK)** adalah kemampuan yang dijabarkan secara spesifik dari CPMK yang dapat diukur atau diamati dan merupakan kemampuan akhir yang direncanakan tiap tahap pembelajaran, dan bersifat spesifik terhadap materi pembelajaran mata kuliah tersebut
5	**Indikator Penilaian** kemampuan dalam proses maupun hasil belajar mahasiswa adalah pernyataan spesifik dan terukur yang mengidentifikasi kemampuan atau kinerja hasil belajar mahasiswa yang disertai bukti-bukti.
6	**Kriteria Penilaian** adalah patokan yang digunakan sebagai ukuran atau tolak ukur ketercapaian pembelajaran dalam penilaian berdasarkan indikator-indikatoe yang telah ditetapkan. Kriteria penilaian merupakan pedoman bagi penilai agar penilaian konsisten dan tidak bias. Kriteria dapat berupa kuantitatif maupun kualitatif.
7	**Teknik Penilaian:** tes dan non-tes
8	**Bentuk Pembelajaran**: Kuliah, Responsi, Tutorial, Seminar atau yang setara, Praktikum, Praktik Studio, Praktik Bengkel, Praktik Lapangan, Penelitian, Pengabdian kepada Masyarakat, dan/atau bentuk pembelajaran lainnya
9	**Metode Pembelajaran:** Small Grup Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, dan metode lain yang setara.
10	**Materi Pembelajaran** adalah rincian atau uraian dari bahan kajian yang dapat disajikan dalam bentuk beberapa pokok dan sub-pokok bahasan.
11	**Bobot Penilaian** adalah persentasi pernilaian terhadap setiap pencapaian sub-CPMK yang besarnya proposional dengan tingkat kesulitan pencapaian sub-CPMK tersebut dan totalnya 100%.
12	**PB**=Proses Belajar, **PT**=Penugasan Terstruktur, **KM**=Kegiatan Mandiri.
13	**Sustainable Development Goals (SDGs):** 17 Tujuan Pembangunan Berkelanjutan yaitu (1) Tanpa Kemiskinan; (2) Tanpa Kelaparan; (3) Kehidupan Sehat dan Sejahtera; (4) Pendidikan Berkualitas;
14	**Socio-Technopreneurship** merupakan kemampuan menyelesaikan masalah yang ada di dalam lingkungan masyarakat dengan memanfaatkan sumber daya yang ada di sekitarnya.
15	**Research-Based Learning (RBL)** adalah suatu metode pembelajaran dengan konsep multi-segi yang mengacu pada berbagai strategi pembelajaran dan pengajaran yang menghubungkan penelitian dan pengajaran.

3.10. Example of Lecture Contract for the Study Program

UNIVERSITAS SYIAH KUALA
Darussalam, Banda Aceh

DOKUMEN: FORMAT KONTRAK KULIAH			
Kode : /H11/PP-POB/2016		**Tanggal dikeluarkan**	: 26/09/2023
Area : **Fakultas&BJM UniversitasSyiah Kuala**		**No. Revisi**	:0

Nama Mata Kuliah	: MANAJEMEN DAN PEMODELAN DATA
Kode Mata Kuliah	: MAI613
Bobot SKS	: 3 (3 - 0)
Semester	: 1
Hari Pertemuan	: Jum at jam 16:30 – 19:00
Tempat Pertemuan	: A.01.01
Koordinator MK	: Dr. Nizamuddin, M.Info.Sc.
Dosen Pengampu	: Dr. Nizamuddin, M.Info.Sc

1. Manfaat Mata Kuliah (isi sesuai mata kuliah diampu)

Mata kuliah Manajemen dan Pemodelan Data pada Magister Kecerdasan Buatan memberikan pemahaman mendalam tentang konsep-konsep kunci seperti basis data relasional, NoSQL, dan Big Data.

2. Deskripsi Mata Kuliah (isi sesuai mata kuliah diampu)

Pemahaman mendalam tentang topik seperti basis data relasional, database NoSQL, big data, teorema CAP, serta model ACID dan model berbasis transaksi. Mahasiswa akan mempelajari prinsip-prinsip dasar manajemen data, analisis kebutuhan data, dan penerapan konsep-konsep canggih seperti distribusi data, manajemen transaksi, dan pemrosesan big data untuk mendukung pengambilan keputusan di era kecerdasan buatan

3. Standar Kompetensi dan Kompetensi Dasar

Mata kuliah Manajemen dan Pemodelan Data pada program Magister Kecerdasan Buatan mencakup standar kompetensi dan kompetensi dasar yang memfokuskan pada pemahaman tentang Relational Database, NoSQL, Big Data, Cap Theorem, serta Model Acid dan Model Based. Mahasiswa diharapkan dapat menguasai konsep dan penerapan prinsip-prinsip ini untuk mendukung kecerdasan buatan dalam mengelola dan menganalisis data. Materi mencakup aspek-aspek kunci dalam manajemen data, dari basis data tradisional hingga konsep-konsep terkini dalam pengelolaan data

4. Strategi Pembelajaran (metode cara proses pembelajaran)

Ceramah/lecture/presentasi, demonstrasi, diskusi, dan latihan

5. Materi Pokok

Pengantar Pemodelan dan Manajemen Data
Relational Model Concept
Mini Project #1: RDB Design and Implementation
(ideation/discussion/consultation / final presentation)
Mini Project #1: RDB Design and Implementation
(ideation/discussion/consultation / final presentation)
NoSQL Data Modeling and Management
CAP Theorem
Konsep Pemrosesan Transaksi
Model ACID & Model BASE
Karakteristik Big Data
Pemodelan dan Manajemen Big Data
Keamanan Data
Privasi Data dan Masalah Hukum,
Tata Kelola Data: Masalah Sosial dan Etika, Bias

6. Bahan Bacaan

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts 13th Edition, McGraw-Hill Press, 2019
2. NoSQL:
3. Martin Fowler, Pramod J. Sadalage, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence 1st Edition, Addison-Wesley Press, 2012
4. Viktor Mayer-Schönberger, Kenneth Cukier, Big Data: A Revolution That Will Transform How We Live, Work, and Think, Reprint Edition, Eamon Dolan/Mariner Books, 2014
5. Eric Brewer (Konsep CAP Theorem oleh Eric Brewer, Consistency, Availability, and Partition Tolerance in Distributed Systems, ACM Digital Library, 2000
6. Jim Gray, Andreas Reuter, Transaction Processing: Concepts and Techniques 1st Edition, Morgan Kaufmann PRESS, 1993

7. Tugas

Tugas 1: Relational database
Tugas 2: NOSQL
Tugas 3: Big DATA

8. Kriteria dan Standar Penilaian

Kriteria penilaian:
- Praktikum = 15%
- Kuis = 10%
- Tugas = 25%
- UTS = 25%
- UAS = 25%

Standar penilaian:
A ≥ 87
78 ≤ AB < 87
69 ≤ B < 78
60 ≤ BC < 69
51 ≤ C < 60
41 ≤ D < 51
E < 41

9. Tata Tertib Siswa dan Dosen

Dosen:
1. Kuliah berlangsung selama 16 minggu (termasuk jadwal ujian).
2. Kuliah dilaksanakan tepat waktu dengan kompensasi keterlambatan 20 menit.
3. Pada hari pertama, dosen memberitahukan:
   - Kontrak perkuliahan
   - Rencana Pembelajaran Semester (RPS)
   - Buku teks
   - Kriteria dan standard penilaian
4. Kehadiran dosen minimal 12 kali tatap muka (tidak termasuk ujian). Apabila kurang dari jumlah tersebut, dosen wajib menambah tatap muka.
5. Jika dosen berhalangan sehingga kehadirannya tidak sesuai dengan jadwal perkuliahan, maka dosen wajib:
   - Memberitahukan ketidakhadirannya kepada Komting sebelum perkuliahan berlangsung
   - Mengganti perkuliahan pada jadwal lain sesuai kesepakatan dengan mahasiswa
6. Mahasiswa wajib menunggu kehadiran dosen di kelas dalam waktu maksimal 30 menit. Apabila sesudah 30 menit ternyata dosen belum hadir, Komting dapat menghubungi dosen bersangkutan dan bertanya kepada staf admin jurusan.

Mahasiswa:
1. Selama mengikuti aktivitas perkuliahan harus berpakaian rapi dan sopan bagi wanita dan kemeja atau kaos berkerah bagi laki-laki.
2. Menggunakan sepatu (tidak menggunakan sandal).

3. Telefon genggam hanya digunakan untuk absensi perkuliahan, mengakses e-learning bila diperlukan.
4. Tidak merokok di dalam kelas.
5. Keterlambatan maksimal adalah 30 menit sesudah dosen masuk ke kelas, kecuali ada alasan penting dan diijinkan oleh dosen.
6. Selama perkuliahan mahasiswa diharapkan datang tepat waktu dan berpartisipasi aktif, serta tidak meninggalkan kelas sebelum perkuliahan berakhir.
7. Bagi mahasiswa yang kehadirannya kurang dari 80% dari kehadiran dosen, tidak dibenarkan mengikuti ujian akhir.
8. Surat izin dan surat sakit harus disampaikan kepada dosen.

1. Jadwal Kuliah (Course Outline)

No.	Pokok Bahasan	Minggu Ke	Dosen Pengajar
1	Pengantar Pemodelan dan Manajemen Data	1	Nizamuddin
2	Relational Model Concept	2	Nizamuddin
3	Entity Relationship Model (ER Model)	3	Nizamuddin
4	Relational Database Design and Normalization	4	Nizamuddin
5	Mini Project #1: RDB Design and Implementation (ideation/discussion/consultation / final presentation)	5	Nizamuddin
6	Mini Project #1: RDB Design and Implementation (ideation/discussion/consultation / final presentation)	6	Nizamuddin
7	NoSQL Data Modeling and Management NoSQL Concepts and Characteristics	7	Nizamuddin
8	UTS	8	Nizamuddin
9	NoSQL Data Modeling and Management Major Categories of NoSQL Data Models	9	Nizamuddin
10	NoSQL Data Modeling and Management NoSQL Database Design	10	Nizamuddin

UNIVERSITAS SYIAH KUALA
Darussalam, Banda Aceh

DOKUMEN: FORMAT KONTRAK KULIAH			
Kode : /H11/PP-POB/2016		**Tanggal dikeluarkan**	: 26/09/2023
Area : **Fakultas&BJM UniversitasSyiah Kuala**		**No. Revisi**	:0

No.	Pokok Bahasan	Minggu Ke	Dosen Pengajar
11	NoSQL Features and Operations	11	Nizamuddin
12	CAP Theorem	12	Nizamuddin
13	Konsep Pemrosesan Transaksi Model ACID Model BASE	13	Nizamuddin
14	Karakteristik Big Data Pemodelan dan Manajemen Big Data	14	Nizamuddin
15	Keamanan Data Privasi Data dan Masalah Hukum, Tata Kelola Data: Masalah Sosial dan Etika, Bias	15	Nizamuddin
16	UAS	16	Nizamuddin

2. Lain-lain

Apabila ada hal-hal yang diluar kesepakatan ini untuk perlu disepakati, dapat dibicarakan secara teknis pada saat setiap acara perkuliahan. Apabila ada perubahan isi kontrak perkuliahan, akan ada pemberitahuan terlebih dahulu.

Kontrak perkuliahan ini dapat dilaksanakan, mulai dari disampaikan kesepakatan ini.

Banda Aceh, 25 Agustus 2023

Pihak I
Dosen Pengampu,

(Dr.Nizamuddin,M.Info.Sc)

Pihak II
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CHAPTER IV
PROGRAM LEARNING EVALUATION DESIGN

4.1. The Relationship Between Graduate Profile and Intended Learning Outcomes (CPL)

This matrix aims to ensure that each item of the graduate profile achievements of the Master's Program in Artificial Intelligence is aligned with the formulated graduate profiles, namely: Data and Business Analyst, Software Engineer, Data Engineer, Spatial Data Analyst, Lecturer/Researcher/Consultant, and Professional. The relationship between the graduate profiles and the Intended Learning Outcomes (CPL) of the Master's Program in Artificial Intelligence is presented in Tables 4.1 and 4.2.

Table 4.1. Matrix of the Relationship Between Graduate Profile and Intended Learning Outcomes (CPL)

Graduate Profile	PL-01	PL-02	PL-03	PL-04	PL-05
CPL-01	H	M	H	H	M
CPL-02	M	H	M	M	H
CPL-03	M	H	H	H	H
CPL-04	M	H	H	H	H
CPL-05	L	M	M	M	H

*The coding of CPL and PL is determined by each respective study program.
Explanation: L = Low (0–40); M = Medium (41–70); H = High (71–100)

Table 4.2. Matrix of the Relationship Between CPL (Based on SNDikti/KKNI) and SKL Components (attitudes, knowledge, general skills, and specific skills). SKL (Graduate Competency Standards) is the term used in SNDikti and is equivalent to CPL.

Competencies (SKL)*	CPL-01	CPL-02	CPL-03	CPL-04	CPL-05
Attitude (S)	√				
Knowledge (P)			√	√	
General Skills (KU)		√			√
Specific Skills (KK)			√	√	

*According to the Regulation of the Minister of Education, Culture, Research, and Technology Number 53 of 2023, it is not mandatory to detail them in the Course Learning Outcomes (CPL).

4.2. The Relationship Between Courses and Intended Learning Outcomes (CPL)

Table 4.3. Weight Calculation Matrix of Intended Learning Outcomes (CPL) in the Master's Program in Artificial Intelligence

No	SMT	Course Code	Course Title	CPL						
				SKS	1	2	3	4	5	Total
1	1	FPPS1001	Research Methodology	2	2					2
2		MMAI1001	Artificial Intelligence	3		0,75	0,75	0,75	0,75	3
3		MMAI1003	Programming for Data Science and Artificial Intelligence	3		0,75	0,75	0,75	0,75	3
4		MMAI1005	Practicum of Programming for Data Science and Artificial Intelligence	1		0,25	0,25	0,25	0,25	1
5		MMAI1007	Data Management and Modelling	3		0,75	0,75	0,75	0,75	3
6	2	MMPAP001	Thesis Proposal	2		0,5	0,5	0,5	0,5	2
7		MMAI1002	Machine Learning	2		0,5	0,5	0,5	0,5	2
8		MMAI1004	Practicum of Machine Learning	1		0,25	0,25	0,25	0,25	1
9		MMAI1006	HCI and Information Visualization	2		0,5	0,5	0,5	0,5	2
10		MMAI1008	Practikum of HCI and Information Visualization	1		0,25	0,25	0,25	0,25	1
11		MMAI1010	Computer Vision	3		0,75	0,75	0,75	0,75	3
12		MMAI1012	Article Review	3	0,5	0,5	0,5	0,75	0,75	3
13		MMAI6002	Software Development and Project Management	2		0,5	0,5	0,5	0,5	2
14		MMAI6004	Practicum of Software Development and Project Management	1		0,25	0,25	0,25	0,25	1
15		MMAI6006	Distributed Systems	2		0,5	0,5	0,5	0,5	2
16		MMAI6008	Practicum of Distributed Systems	1		0,25	0,25	0,25	0,25	1
17	3	MMAI2009	Scientific Seminar	2	0,5	0,5	0,5	0,25	0,25	2
18		MMAI2011	Business Intelligence and Analysis	3		0,75	0,75	0,75	0,75	3
19		MMAI2013	Computational Linguistics	3		0,75	0,75	0,75	0,75	3
20		MMAIP001	Scientific Publication	3	0,5	0,5	0,5	0,75	0,75	3

No	SMT	Course Code	Course Title	CPL						
				SKS	1	2	3	4	5	Total
21		MMAI6001	Spatio-Temporal Data Analysis	2		0,5	0,5	0,5	0,5	2
22		MMAI6003	Practicum of Spatio-Temporal Data Analysis	1		0,25	0,25	0,25	0,25	1
23		MMAI6005	Social Network Analysis	2		0,5	0,5	0,5	0,5	2
24		MMAI6007	Practicum of Social Network Analysis	1		0,25	0,25	0,25	0,25	1
25	4	MMPAPA01	Thesis	8	1,6	1,6	1,6	1,6	1,6	8
Total Weight of CPL Assessment Samples				57	5	13	13	13	13	57
Percentage of CPL Assessment Sample Weights					9%	23%	23%	23%	23%	100%

Aspects Focused on in Measuring the Attainment of Intended Learning Outcomes (CPL):

1. An CPL can be achieved through several Course Learning Outcomes (CPMK) distributed across more than one course.
2. The CPMK should remain consistent even if the course names change.
3. Each CPL should ideally be linked to no more than four courses to facilitate easier calculation.
4. The number of CPMK per course should not exceed five, although it may be expanded with sub-CPMK.
5. The achievement of CPMK within a course must be fully distributed (100%) across all types of assessments in that course.
6. A student's score above 50 may be considered passing for a specific CPMK.

4.3. Monitoring of Learning Implementation and Evaluation of the Achievement of Course Learning Outcomes (CPMK)

Monitoring of learning implementation and evaluation of Course Learning Outcome (CPMK) attainment is conducted as part of the PDCA (Plan, Do, Check, Act) cycle to ensure continuous improvement. Monitoring of learning implementation focuses on the learning content, the learning process, the assessment process, and the lecturer's attendance. Evaluation of CPMK attainment emphasizes the pass rate for each CPMK, as well as the highest, lowest, and average scores of students.

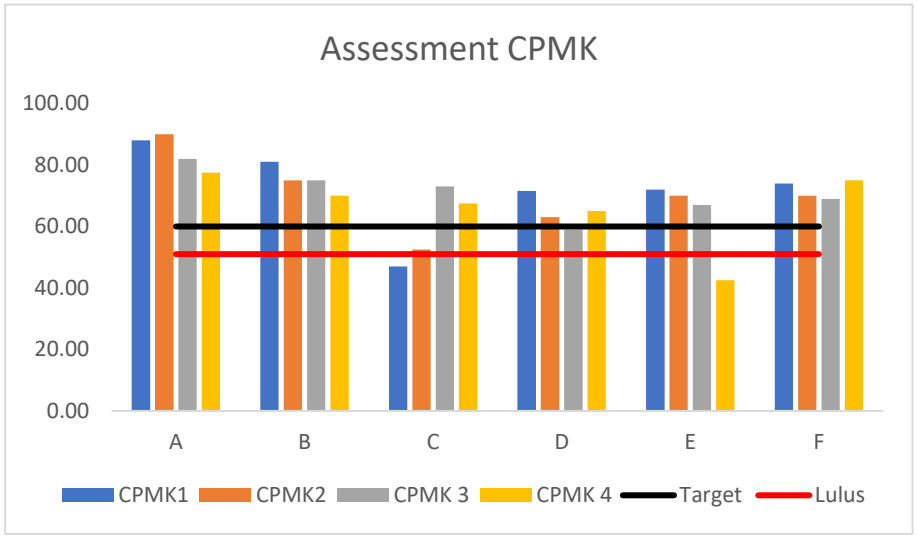
Monitoring of learning implementation and evaluation of Course Learning Outcome (CPMK) attainment are conducted through the following procedures:

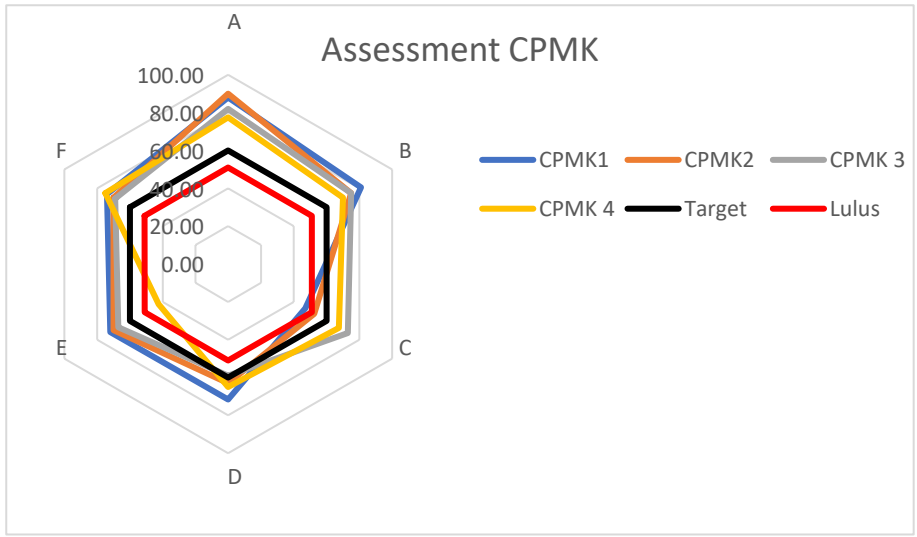
1. Each lecturer is required to prepare a course control document at the beginning of the semester.
2. Each lecturer must take attendance during every class session and complete a weekly Learning Implementation Monitoring form.
3. In one semester, the lecturer conducts 16 class meetings, including the mid-semester and final examinations.
4. At the end of each semester, students evaluate the lecturer's performance by completing an online questionnaire.
5. At the end of each semester, lecturers must evaluate the implementation of learning and the attainment of learning outcomes by filling out a portfolio provided by the study program. The results are reported to the study program for further evaluation.
6. The Head of Study Program evaluates lecturer attendance, the alignment of the RPS with its implementation, and the timeliness of final grade submission.

The following is an example of the evaluation and analysis of Course Learning Outcome (CPMK) attainment that can serve as a reference for the Master's Program in Artificial Intelligence.

Evaluation of Course Learning Outcome (CPMK) Attainment

Student Name	Assessment Items								CPMK Score				CPL Score			Final Grade	
	Assignment 1	Assignment 2	Quiz 1	Quiz 2	Midterm Exam		Final Exam		CPL-A	CPL-D		CPL-F	CPL-A	CPL-D	CPL-F	Numeric Grade	Letter Grade
	CPMK1	CPMK2	CPMK3	CMPK4	CPMK1	CPMK2	CPMK3	CPMK4	CPMK1	CPMK2	CPMK3	CPMK4					
	10%	10%	15%	15%	15%	10%	10%	15%	25.0%	20.0%	25.0%	30.0%	25%	45%	30%	100%	
A	100	90	80	70	80	90	85	85	88.00	90	82	77.5	88.00	85.56	77.5	84	AB
B	90	80	75	80	75	70	75	60	81.00	75	75	70	81.00	75.00	70	75	B
C	50	60	75	80	45	45	70	55	47.00	52.5	73	67.5	47.00	63.89	67.5	61	BC
D	89	56	45	60	60	70	80	70	71.60	63	59	65	71.60	60.78	65	65	BC
E	75	60	75	45	70	80	55	40	72.00	70	67	42.5	72.00	68.33	42.5	62	BC
F	80	60	75	90	70	80	60	60	74.00	70	69	75	74.00	69.44	75	72	B
Avarage Score	80.7	67.7	70.8	70.8	66.7	72.5	70.8	61.7	72.3	70.1	70.8	66.3	72.3	70.5	66.3	69.7	





Analysis of Course Learning Outcome (CPMK) Attainment:

- The passing score for CPMK in course X is set at 51 out of a scale of 100, which means that the minimum targeted level of student understanding is 51% of the understanding of the overall learning outcomes. The course instructor set a target that the average class score for each CPMK is 60 out of 100, or 60% for each CPMK.
- The average CPMK score across all students exceeds 60, or is above the target. However, there are 2 students (approximately 33.33% of the total of 6 students) who have not met the minimum specified score for the Course Learning Outcome (CPMK) that is for CPMK 1 and CPMK 4, as shown in the CPMK score column.
- The average CPL score for all students is above 60. However, 2 students have CPL scores below the minimum passing threshold in CPL A and CPL F, as shown in the CPL score column.
- The final average score of the students is 69.7.

Control Measures Taken

Based on the results of the learning outcomes achieved, a further evaluation was conducted for the extent of student learning outcomes attainment. A focused observation was carried out on two students whose CPMK scores were still below the minimum target. The observation revealed that both students had low scores on the midterm and final examinations. The course coordinator also conducted a confirmation regarding the attendance level of those two students in participating in the lectures. To achieve the intended learning outcomes, the main obstacle faced by both students was their unpreparedness in taking exams that involved limited understanding of theory, as well as poor skills in calculation and programming. As a result, they were unable to complete the exam questions properly when the examination was held.

Future Control Plan

To maximize the attainment of the learning outcomes specified, the following strategies will be implemented:

- Monitoring each student's online learning conditions. Lecturers are advised to provide alternative learning methods as solutions for students having problems with online learning.
- Providing students with the opportunity to take remedial examinations if their initial exam results fall below the targeted learning outcome thresholds.

Assessment and evaluation of Intended Learning Outcomes (CPL) are conducted by the Study Program at the end of each academic year to monitor and evaluate the attainment of CPL by each student's cohort, as well as to inform the consideration and continuous improvement of the learning process in the Master's Program in Artificial Intelligence at FMIPA USK.