



CURRICULUM BOOK

2024-2028

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

**Bachelor in Informatics
Study Program**

**FACULTY OF MATHEMATICS
AND NATURAL SCIENCES
UNIVERSITAS SYIAH KUALA**

Curriculum Document
Study Program
Bachelor of Informatics

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	Informatics
3	Education Level	Bachelor's Degree
4	Address of the Study Program	Building of the Faculty of Mathematics and Natural Sciences, Building A, 3rd Floor
5	Accreditation Status and Accrediting Institution, e.g., BAN-PT, LAM	A (BAN-PT)
6	Degree/Title of Graduate	S.Kom
7	Duration of Study	4 Years (8 Semesters)

PROFILE OF THE INFORMATICS STUDY PROGRAM

The Informatics Study Program was established in 2010 under the Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala (USK). The permit to operate the study program was granted on June 9, 2010, through the Decree of the Minister of National Education of the Republic of Indonesia Number 70/D/O/2010. The establishment of this study program is not only seen as an effort to actualize the relevance of USK in preparing skilled personnel in the field of informatics and computing in the future, but also as an effort to realize a grand scenario in enhancing national competitiveness, as mandated in the Basic Framework for Higher Education Development KPPTJP IV 2003-2010 (HELTS 2003-2010), Directorate General of Higher Education, Ministry of National Education. The Informatics Study Program, as of 2024, has entered its 14th year as one of the study programs at USK.

The Informatics Study Program had produced nearly 472 graduates by the end of 2023. The number of active undergraduate students in the Informatics PS, Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala, is currently around 392 students. The number of teaching staff in the Informatics Study Program right now (June 2024) is 19, consisting of 13 permanent lecturers with ASN status, 6 permanent lecturers with CASN status, and 0 contract lecturers. The breakdown of functional academic positions as of the Even Semester of 2023/2024 includes 2 Associate Professors, 13 Assistant Professors, and 4 Lecturers.

The Informatics Study Program has achieved an “A” accreditation status from the National Accreditation Board for Higher Education (BAN-PT) with Decree Number 5658/SK/BAN-PT/Akred/S/IX/2020. This achievement reflects our dedication to maintaining high-quality standards in the implementation of education.

DECREE OF THE CURRICULUM DEVELOPMENT TEAM
(Decree on the Appointment of the Curriculum Development Team for the Study
Program)

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

The Informatics Study Program adopts the Outcome-Based Education (OBE) approach, and collaboration between internal university stakeholders and external stakeholders such as scientific associations, industry experts, and graduate users is key in designing its curriculum. This process begins with understanding the industry's needs regarding the required competencies of graduates, followed by an analysis of the gap between current graduate skills and those demands. Input from external stakeholders is essential to ensure that the designed curriculum remains relevant to the evolving needs of the job market and technology.

Later, well-defined and measurable learning objectives are established, and the curriculum is designed to support the achievement of these objectives through the selection of courses and effective teaching methodologies. Regular consultation and validation with external stakeholders are conducted to ensure the curriculum remains relevant. The implementation of the curriculum is followed by continuous evaluation, incorporating feedback from lecturers, students, and industry, enabling ongoing improvements and enhancement of educational quality.

1.1. Curriculum Document Development Process

The curriculum development process of the Informatics Study Program using the Outcome-Based Education (OBE) approach begins with the identification of market needs and current technologies through collaboration with scientific associations, industry experts, and graduate users. This curriculum development process ensures that the developed curriculum aligns with the continuously evolving needs of the industry.

After identifying industry needs, the curriculum development team conducts a gap analysis between the current competencies of graduates and those required by the industry. The results of this analysis form the basis for establishing measurable learning objectives. Input from scientific associations and industry experts is highly valuable during this formulation phase.

In the design phase, the curriculum is developed by selecting courses and evaluation methods to achieve the predetermined learning objectives. Regular consultation and feedback from graduate users ensure that the curriculum remains relevant and responsive. Meanwhile, the active role of lecturers and administrators in developing teaching strategies and evaluating learning outcomes enables continuous curriculum improvement, maintaining the quality and relevance of the OBE curriculum in the Informatics Study Program.

1.2. Curriculum Evaluation and Tracer Study

A. Results of Curriculum Implementation Evaluation

As of the end of 2023, the Informatics Study Program at the Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala, had graduated approximately 472 students, with around 394 active students enrolled in the undergraduate Informatics Study Program. The conducted Tracer Study report provides a comprehensive overview of alum transitions post-graduation, encompassing aspects of employment seeking, further education, and entrepreneurship, analyzed through online data and statistics.

The majority of alumni from the Informatics Study Program have entered the labor market, with many securing employment before or shortly after graduation, although several graduates are still seeking jobs after one year. The main challenge relates to employment status, as many alumni work under contract arrangements with unstable and sometimes below-minimum wages.

The report also emphasizes the importance of interpersonal and time management skills, as well as competencies such as fluency in English and information technology, although it indicates a lack of development in foreign language proficiency, as illustrated in Figure 1.1.

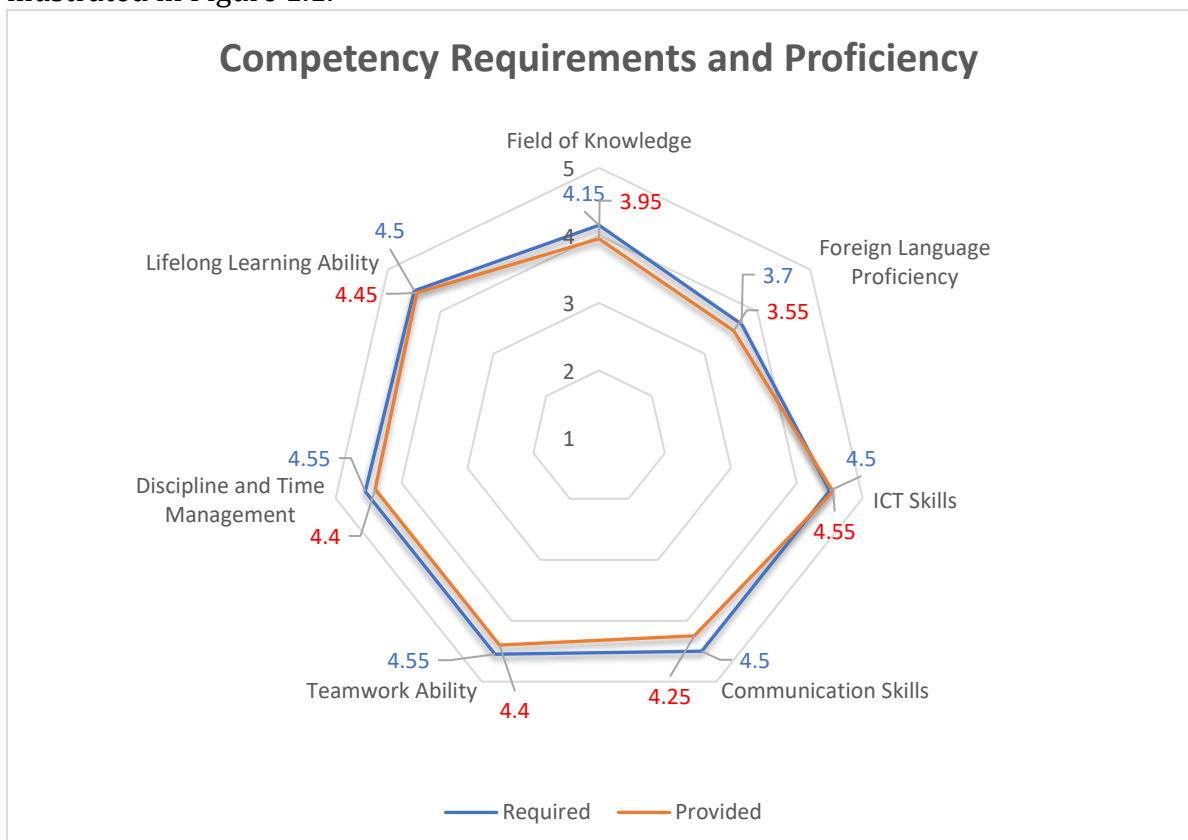


Figure 1.1. Fulfillment of Competency Requirements in Performing Current Activities.
1 = Very Low and 5 = Very High

B. Foundations of the Changes

The analysis of the need for curriculum changes in Informatics requires consideration of several key factors based on current data and prevailing trends. The results of the Tracer Study indicate that the majority of graduates are employed. However, a significant percentage are still seeking employment one year after graduation, with most securing jobs within six months. Primary sources of employment information come from online media and personal connections, rather than the university, and the majority of graduates earn salaries below 2.5 million Rupiah. Soft skills, including personality and ICT competencies, are prioritized in recruitment, but there are deficiencies in communication and foreign language skills. Regarding further studies, only a small portion of graduates choose to continue their education, generally at Indonesian public universities, indicating the need for improved competencies and more effective information dissemination.

On the policy side, there are both internal and external changes influencing the curriculum, including policies from the Ministry of Education, Culture, Research, and Technology through the Merdeka Campus Program, as well as the Strategic Plan of the Ministry of Communication and Information Technology which focuses on digital transformation, as well as the university's proactive approach toward the adoption of emerging industry trends. These efforts involve initiatives such as the Matching Fund scheme, the acceleration of high-speed internet provision, and curriculum adaptation to emerging technologies. Advances in science and technology also play a role, with developments in artificial intelligence, data analytics, and information security necessitating the integration of current topics into the curriculum. USK and its faculty are striving to synchronize their vision and mission with curriculum development that aligns with industry and societal needs, emphasizing project-based learning, research, and collaboration with various institutions to enhance graduate quality. Global missions such as the Sustainable Development Goals (SDGs) are also considered in designing a curriculum that supports sustainable development through information technology.

1.3. Foundations of Curriculum Design and Development

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. Curriculum Development Guidelines of Universitas Syiah Kuala, 2023
4. Strategic Plan of Universitas Syiah Kuala
5. Strategic Plan of the Faculty of Mathematics and Natural Sciences

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

Table 1. Scientific Vision of the Informatics Study Program, FMIPA, and University

Vision Bachelor's Informatics Study Program	Vision Faculty of Mathematics and Natural Sciences	Vision Universitas Syiah Kuala
To become an innovative, independent, and globally leading technopreneurship study programme.	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	
Technopreneur	Socio-sciencepreneur	Socio-technopreneur	✓
Innovative	Innovative	Innovative	✓
Independent	Independent	Independent	✓
Prominent	Prominent	Prominent	✓
Global	Global	Global	✓

2.1.2. Mission of the Study Program

1. Produce graduates who are moral, high-quality, independent, creative, entrepreneurial, and possess integrity in developing and applying informatics science and technology.
2. Implement the Tri Dharma of higher education in a quality, moral, conducive, and dynamic manner for the development of informatics science and technology for society and industry.
3. Establish cooperation with various parties in the field of informatics science and technology.

2.2. Objectives

The objectives and targets of the Informatics Study Program have been formulated, specifically and measurably, and will be evaluated every five years. The year 2015 marked the first milestone, and 2020 will serve as the second milestone before the vision of the Informatics Study Program is achieved no later than 2025. The objectives and targets of the Informatics Study Program are as follows:

1. To produce competent and high-quality graduates who are
 - a. Morally upright, faithful, and devoted to God Almighty;
 - b. Possess strong scientific knowledge, creativity, practical skills, and professionalism;
 - c. Capable of adapting to technological advancements;
 - d. Demonstrate innovation, independence, and an entrepreneurial mindset;
 - e. Uphold discipline and a strong work ethic.
2. To develop academic programmes in informatics and computer science that are responsive to societal needs and technological advancements.
3. To enhance the quality of education, research, and community service in the field of informatics and computer science.
4. To establish and strengthen sustainable collaborations in informatics and computer science with governmental and private institutions, as well as industries, both nationally and internationally, in support of the programme's development.

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 that are relevant to current issues, with the support of funding and research facilities.
 - c. Conducting evaluations of teaching, research, and community service.
4. Developing and Enhancing Collaborations
 - a. 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. By adhering to and implementing these values, Universitas Syiah Kuala aims to create an ethical, inclusive, and high-quality academic environment in order to realize 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

Table 3.1 Description of Graduate Profile

PL Code	Graduate Profile	Competency	Profession
PL-01	Graduates can become innovative, independent, and morally grounded technopreneurs. They demonstrate creativity, entrepreneurial mindset, lifelong learning capability, and critical thinking, while upholding noble character and the values of Pancasila in their professional conduct.	USK Vision + KU+S	• Entrepreneur • Startup Owner • Workshop Owner
PL-02	Graduates possess the skills to analyze and process data into meaningful information and knowledge to support organizational decision-making. They act with integrity and adhere to ethical standards and Pancasila values in their work.	KU+KK + P + S	• Data Scientist • Data Analyst • Machine Learning Scientist • Data Architect • Data Engineer • Business Intelligence Analyst • AI Engineer
PL-03	Graduates are capable of designing, managing, and analyzing geospatial data and information to solve problems and support decision-making. Their work is grounded in ethical behavior and the values of Pancasila.	KU+KK + P + S	• GIS Analyst • Remote Sensing Specialist • Cartographer • Image Processing Specialist • Geospatial Consultant
PL-04	Graduates are knowledgeable and skilled in managing, designing, improving, securing, and analyzing networks and device communications using scientific approaches. They uphold ethical values and national identity in their professional activities.	KU+KK + P + S	• IT Support • IT Maintenance Specialist • Network Administrator • Network Consultant • Information Security Specialist
PL-05	Graduates can conduct feasibility analysis, project evaluation, requirement analysis, design, development, quality assurance, and re-	KU+KK + P + S	• Programmer • Software Engineer • Front-End Engineer • Back-End Engineer • UI/UX Designer

	engineering of software systems. They maintain professionalism and integrity, grounded in the values of Pancasila.		● System Developer ● System Analyst ● Full Stack Developer ● Web Developer ● Mobile App Developer
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3.2. Elements of Intended Learning Outcomes (ILO)

The mechanism for determining the Intended Learning Outcomes (ILO) begins with identifying the primary objectives of the Informatics study program. This mechanism involves a thorough understanding of the needs of relevant industries or job markets, as well as the expectations of stakeholders such as companies, alumni, and the general public. Subsequently, an Outcome-Based Education (OBE) curriculum is used as the foundation.

In the context of Outcome-Based Education (OBE), the Intended Learning Outcomes (ILO) are directly related to the specific learning objectives of each course or learning unit. The ILO is then planned and formulated by referring to the Learning Outcomes of each course or unit that has been established. This process ensures that the ILO encompasses all the skills, knowledge, and attitudes expected of graduates upon completing the Informatics study program.

Table 3.2 The Relationship between PL and ILO

PL Code	ILO Code	Description of ILO
PL-01, PL-02, PL-03, PL-04, PL-05	CPL-01	Demonstrates strong social character in professional and community environments. Description: This Intended Learning Outcome (ILO) broadly covers attributes of social character and effective communication. The ILO expects graduates to demonstrate religious attitudes, noble character, ethics, and responsibility in the workplace and society. The ILO also expects graduates to be able to communicate clearly and effectively, both orally and in writing, in the workplace and society. The ILO expects graduates to adopt the character of a technopreneur.
PL-01, PL-02, PL-03, PL-04, PL-05	CPL-02	Able to think logically, critically, creatively, and systematically in problem-solving, as well as in the implementation, evaluation, and advancement of science and technology. Description: This Intended Learning Outcome (ILO) broadly covers attributes of knowledge mastery, problem-solving ability, technological competence, and lifelong learning. The ILO

		expects graduates to be able to think logically and critically in analyzing problems and needs, to develop creative solutions, and to solve problems systematically. The ILO also expects graduates to be able to process and interpret data and information, learn independently, and apply information and communication technology.
PL-01, PL-02, PL-03, PL-04, PL-05	CPL-03	Capable of designing and implementing algorithms to identify and solve problems involving software and computational thinking. Description: This Intended Learning Outcome (ILO) broadly covers attributes of problem-solving ability, technological ability, and a spirit of lifelong learning. The ILO expects graduates to be able to analyze problems and then design appropriate algorithmic solutions using programming languages or specific software tools.
PL-02, PL-03, PL-04, PL-05	CPL-04	Proficient in utilizing appropriate software or hardware tools in the application of informatics. Description: This Intended Learning Outcome (ILO) broadly covers attributes of knowledge mastery and technological ability. The ILO expects graduates to be able to use appropriate methods and techniques in the field of informatics, as well as to test and analyze their performance. The ILO also expects graduates to be able to use relevant software, tools, or equipment in the field of informatics.
PL-01, PL-02, PL-03, PL-04, PL-05	CPL-05	Demonstrates mastery of informatics and the ability to apply it in conjunction with other multidisciplinary fields. Description: This Intended Learning Outcome (ILO) broadly covers attributes of knowledge mastery, problem-solving ability, technological ability, and a spirit of lifelong learning. The ILO expects graduates to master informatics and other multidisciplinary fields and be able to apply them in solving problems.

3.3. Determination of Study Materials

In the determination of the relationship between Intended Learning Outcomes and Study Materials based on the Association of Computing Machinery (ACM), reference to the ACM Body of Knowledge (BoK), which identifies core topics in computer science and informatics, and ensures that the established learning outcomes align with ACM standards, including the use of learning outcome statements developed by ACM.

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

CPL Code	Code	Study Materials
CPL-01	BK-CPL1	• Society, Ethics, dan Profession • Entrepreneurship • Personal Development
CPL-02	BK-CPL2	• Foundations of Mathematics and Statistics • Foundations of Algorithm • Foundations of Programming Languages • Graphics and Interactive Techniques • Fundamentals of Software Development • Fundamentals of Informatics
CPL-03	BK-CPL3	• Artificial Intelligence • Data Management • Operating Systems
CPL-04	BK-CPL4	• Networks and Communication • Software Engineering • Security • Specialized Platform Development
CPL-05	BK-CPL5	• Human Computer Interaction • Fundamentals of Science • Geospatial • Research Methodology

3.4. Formulation of Course Learning Outcomes (CLOs)

Course Learning Outcomes (CLOs) are further divided into several Sub-Course Learning Outcomes (Sub-CLOs), also commonly referred to as lesson learning outcomes (AUN-QA, 2015), which derive from the Intended Learning Outcomes (ILOs). CLOs 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 to allow for the analysis of its achievement through the evaluation of learning outcomes.

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

CLO Code	CLO Description	Course Code	Course Name
MKWKW01	Students are able to explain the state and system of government, national identity, and analyze issues of citizenship by demonstrating a humanistic attitude, integrity, and respect for diversity, as well as the ability to collaborate and communicate effectively	MKWU1002	Civic Education
MKWKW02	Students are able to analyze societal problems by implementing democratic and constitutional values in national and state life, while demonstrating the application of USK values		
MKWKW03	Students are able to explain politics and the system of citizenship. They are able to apply the concepts of human rights and anti-corruption in daily interactions by demonstrating the ability to collaborate and communicate effectively to realize peace, justice, and resilient institutions		
MKWKW04	Students are able to analyze the implementation of the Archipelagic Outlook (Wawasan Nusantara) and the concept of national resilience to realize peace, justice, and resilient institutions		
MKWUL01	Students demonstrate positive behavior related to disaster risk reduction and environmental preservation within the context of course learning.	MKWU1005	Disaster Management and Environment
MKWUL02	Students make appropriate decisions based on the analysis of information and data to solve problems in their field of expertise, integrated into course learning.		
MKWUL03	Students design a simple contingency plan as a crucial step in disaster preparedness, applied within the context of the course.		

CLO Code	CLO Description	Course Code	Course Name
MKWUL04	Students design a simple project that contributes to the prevention of environmental damage and the improvement of environmental sustainability, integrated into course learning materials.		
CPMKM01	Students are able to explain and determine fundamental concepts in Mathematics such as real numbers, exponents and roots, logarithms, algebraic and rational expressions, equations, inequalities, absolute values, Cartesian coordinates, equations of circles, linear equations, as well as graphing equations	SMPA1001	Introduction to Calculus
CPMKM02	Students are able to explain the basic concept of functions and determine matters related to functions, limits, and the continuity of functions.		
CPMKF01	Students are able to explain and solve problems of units, quantities, vectors and kinematics (one, two and three dimensional movements)	SMPA1003	Introduction to Physics
CPMKF02	Students are able to explain and solve Dynamics (Force, Pressure and Energy)		
CPMKF03	Students are able to explain and solve Dynamics (Momentum and Center of Mass)		
CPMKF04	Students are able to explain and solve Simple Harmonic Motion problems		
CPMKF05	Students are able to explain and solve rotational problems, rigid bodies, Elasticity, and gravity		
CPMKF06	Students are able to explain and solve Fluid problems.		
CMPKK01	Students are able to explain the concepts of atoms, molecules, molecular orbitals, chemical bonds, the periodic table, and the properties of elements.	SMPA1005	Introduction to Chemistry
CMPKK02	Students are able to explain concepts and perform calculations related to the fundamentals of chemistry.		

CLO Code	CLO Description	Course Code	Course Name
CPMKW71	Students are able to study and describe the structure, function, and metabolism of cells.	SMPA1007	Introduction to Biology
CPMKW72	Students are able to study and describe classical and modern genetics		
CPMKW73	Students are able to study and describe the structure and function of plant and animal organs		
CPMKW74	Students are able to describe and identify the basic principles of ecology and biosystematics of living things		
CPMKI01	Students are able to understand the core concepts and technologies underlying the Industry 4.0 revolution.	SMPA1009	Introduction to Industrial Revolution
CPMKI02	Students are able to analyze its impact on various economic, social, and environmental aspects.		
CPMKI03	Students are able to develop their digital skills and their ability to innovate within the context of the Industry 4.0 revolution.		
100101	Students are able to apply fundamental programming concepts using the C language.	SINF1001	Programming
100102	Students are able to manage and manipulate data using various techniques in the C language.		
100103	Students are able to combine various techniques to solve complex problems using the C language.		
100301	Students are able to implement basic programming concepts using the C language.	SINF1003	Practicum of Programming
100301	Students are able to implement data using various techniques in the C language.		
100301	Students are able to apply knowledge and solve complex problems using the C language.		
100501	Students are able to apply science and technology to solve problems in the field of science.	SINF1005	Practicum of Introduction to
100502	Students master the use of ICT in the academic field.		

CLO Code	CLO Description	Course Code	Course Name
100503	Students master information technology to access available sources of information on the Internet.		Industrial Revolution
MKWKP01	Students have a mindset, attitude, and behavior that reflect the implementation of Pancasila values in social, national, and national life.	MKWU1001	Pancasila
MKWKP02	Students are able to identify various problems and solve problems in social life based on the ethical and moral values of Pancasila.		
MKWKP03	Students exhibit attitudes and behaviors consistent with the values of Pancasila		
MKWKP04	Students are able to make appropriate decisions as alternative solutions to various issues in social, national, and state life in accordance with the principles and values of Pancasila		
MKWKI01	Students are able to explain the essence, position, function, and attitude of using the Indonesian language.	MKWU1003	Indonesian Language
MKWKI02	Students are able to use spelling, diction, affixation, reduplication, and composition in Indonesian writing.		
MKWKI03	Students are able to use sentence elements correctly and properly, and are able to write and develop paragraphs in Indonesian.		
MKWKI04	Students are able to write letters, scientific papers, technical reports, and various types of technical reports in proper and correct Indonesian.		
MKWUN01	Students are able to analyze TOEFL concepts related to listening skills.	MKWU1004	English
MKWUN02	Students are able to explain TOEFL concepts related to reading skills.		
MKWUN03	Students are able to explain TOEFL concepts related to language components (Structure and Written Expression).		

CLO Code	CLO Description	Course Code	Course Name
MKWUN04	Students are able to practice speaking skills (Communication Skills) integrated into TOEFL instruction.		
CPMKS01	Students are able to understand basic mathematical concepts in studying statistics	SMPA1011	Statistical Methods
CPMKS02	Students are able to explain the concepts, theoretical foundations, and discourse that form the basis for the use of data and statistics.		
100201	Students are able to take responsibility for work outcomes, both individually and in group settings.	SINF1002	Discrete Structures
100202	Students demonstrate a solid understanding of fundamental concepts in discrete structures, including combinatorics, mathematical logic, set theory, relations and functions, number theory, and graph theory.		
100203	Students are capable of implementing discrete structure concepts in the field of computer science and other relevant disciplines.		
100401	Students are able to understand the concepts, characteristics, and working principles of various data structures (arrays, linked lists, stacks, queues, trees, heaps, and hash tables) as well as fundamental algorithms (searching, sorting, and traversal) within the context of conceptual computational problem-solving.	SINF1004	Data Structures and Algorithms
100402	Students are able to design and explain theoretically efficient algorithmic solutions by selecting appropriate strategies and data structures, and to analyze the time and space complexity of algorithms analytically.		

CLO Code	CLO Description	Course Code	Course Name
100403	Students are able to evaluate and articulate, in written form, the process of implementing data structures and algorithms using algorithmic notation or pseudocode, in accordance with the principles of logic and software engineering.		
100601	Students are able to implement various data structures (such as arrays, linked lists, stacks, queues, trees, heaps, and hash tables) using programming languages to solve computational problems.	SINF1006	Practicum of Data Structures and Algorithms
100602	Students are able to design and test efficient algorithmic solutions by selecting the appropriate data structures and algorithms, and measure the time and space complexity of the developed programs.		
100603	Students are able to document and present the results of algorithm and data structure implementations in accordance with good programming principle and software engineering standards.		
100801	Students are able to identify and explain the architecture, models, protocols, and components of computer networks, including the Physical, Data Link, and Network layers.	SINF1008	Computer Networks
100802	Students are able to calculate IP addressing schemes.		
100803	Students are capable of performing basic configuration for end devices, switches, and routers, as well as verifying connectivity between devices.		
100804	Students are able to identify and explain the Transport and Application layers.		
100805	Students are capable of designing a local area network (LAN) based on specific conditions.		
101001	Students are able to identify and explain the architecture and elements of computer networks.	SINF1010	
101002	Students are able to calculate IP addressing schemes.		

CLO Code	CLO Description	Course Code	Course Name
101003	Students are able to perform basic configuration for end devices, switches, and routers, as well as verify connectivity between devices.		Practicum of Computer Networks
101004	Students are able to design a local area network (LAN) based on specific conditions.		
101201	Students are able to apply basic database concepts and system architecture.	SINF1012	Database I
101202	Students are able to design efficient databases.		
101203	Students are able to implement the designed database system.		
101401	Students are able to create tables, access, and manipulate data within the tables.	SINF1014	Practicum of Database I
101402	Students are proficient in using Data Definition Language (DDL) and Data Manipulation Language (DML).		
101403	Students are able to perform data operations using SQL queries.		
MKWKA01	Students are able to analyze the scope and identify the creation of humans and the universe based on Islamic and scientific perspectives through a correct problem-solving approach.	MKWU2001	Religion Education
MKWKA02	Students are able to explain the framework of Islamic teachings, creed (aqidah), ethics (akhlaq), sources of Islamic teachings (Qur'an, Hadith, Ijtihad), and the application of Islamic Sharia on campus, as well as its relation to Qanun legislation, family development in Islam, and resolve contextual issues accurately.		
MKWKA03	Students are able to analyze the concept of muamalah based on contemporary Islamic jurisprudence, understand Islamic principles as a scientific discipline, and apply proper social etiquette, dress code, and modesty (aurat covering) according to Islamic teachings.		

CLO Code	CLO Description	Course Code	Course Name
MKWKA04	Students are able to analyze Islamic inheritance law (fiqh mawaris), the urgency of addressing proxy wars, and strategies to confront them properly, as well as internalize the principle of istiqamah in applying mental revolution according to Islam comprehensively.		
200701	Students are able to take responsibility for work outcomes, both individually and collaboratively.	SINF2007	Logics
200702	Students demonstrate a solid understanding of fundamental concepts in mathematical logic, including reasoning and rules of inference using the natural deduction method, for both propositional and predicate logic.		
200703	Students are able to implement logical reasoning in the field of computer science and other disciplines.		
200901	Students are able to take responsibility for work outcomes, both individually and collaboratively.	SINF2009	Linear Algebra
200902	Students demonstrate a solid understanding of fundamental concepts in linear algebra, including systems of linear equations and matrices, determinants, vectors, vector spaces, inner product, linear transformations, eigenvalues, and eigenvectors.		
200903	Students are able to apply linear algebra concepts in the field of computer science and other disciplines.		
201101	Students are able to understand and explain the fundamental concepts of numerical methods and their applications.	SINF2011	Numerical Computation

CLO Code	CLO Description	Course Code	Course Name
201102	Students are able to apply numerical methods to solve problems related to binary, errors, nonlinear equations, linear systems, regression, interpolation, integration, differentiation, and ordinary differential equations in practical applications.		
201103	Students are able to design algorithms and write programs in Java or other programming languages to implement numerical methods for solving numerical problems in various scientific fields.		
201301	Students are able to apply algorithms in numerical methods to solve problems in various scientific fields using software applications.	SINF2013	Practicum of Numerical Computation
201302	Students are able to program using application development software to address numerical problem-solving tasks.		
201501	Students are able to apply object-oriented programming concepts to solve problems.	SINF2015	Object-Oriented Programming
201502	Students are able to use concepts such as data collection, exception handling, nested classes, annotations, generics, lambda expressions and method references, GUI, and event handling.		
201503	Students are able to use the Java programming language to solve problems using object-oriented approaches.		
201701	Students are able to explain Java program code and its corresponding output.	SINF2017	Practicum of Object-Oriented Programming
201702	Students are able to implement object-oriented solutions to solve problems using the Java programming language.		
201703	Students are able to use the Java programming language to solve problems using object-oriented approaches.		

CLO Code	CLO Description	Course Code	Course Name
201901	Students are able to use PL/SQL to analyze and solve problems.	SINF2019	Database II
201902	Students are able to design the flow of data storage, indexing processes, query processing and optimization, as well as develop various transaction mechanisms, concurrency control, and database backup and recovery procedures.		
201903	Students are able to use Oracle DBMS tools to create databases.		
202101	Students are able to use PL/SQL to analyze and solve problems.	SINF2021	Practicum of Database II
202102	Students are able to design the flow of data storage, indexing processes, query processing and optimization, and implement various types of transactions, concurrency control, backup, and recovery mechanisms in database systems.		
202103	Students are able to use Oracle DBMS tools to create databases.		
202301	Students demonstrate responsibility for their work or output, including awareness of risks involved in professional practice.	SINF2023	Operation Systems
202302	Students demonstrate theoretical and practical knowledge involving foundational theories, problems, methods, and problem-solving in the field of inter-device communication.		
202303	Students demonstrate general skills and soft skills, including independent performance, effective teamwork in a structured and measurable manner, as well as the ability to present, promote, and socialize scientific products in the field of inter-device communication, by economically and intellectually productive business processes.		
202304	Students demonstrate specialized skills to explain, illustrate, design, develop, apply, evaluate, document, and solve problems through learning specific knowledge areas in inter-device communication.		

CLO Code	CLO Description	Course Code	Course Name
202501	Students demonstrate responsibility for their work or output, including awareness of risks involved in professional practice.	SINF2025	Practicum of Operation Systems
202502	Students demonstrate theoretical and practical knowledge involving foundational theories, problems, methods, and problem-solving in the field of inter-device communication.		
202503	Students demonstrate general skills and soft skills, including independent performance, effective teamwork in a structured and measurable manner, as well as the ability to present, promote, and socialize scientific products in the field of inter-device communication, by economically and intellectually productive business processes.		
202504	Students demonstrate specialized skills to explain, illustrate, design, develop, apply, evaluate, document, and solve problems through learning specific knowledge areas in inter-device communication.		
202701	Students are able to take responsibility for their actions and decisions, and Students can operate independently in both personal and professional contexts.	SINF2027	Human Computer Interaction
202702	Students are able to think logically and critically when analyzing problems, comparing possible solutions, and making decisions based on data and information.		
202703	Students are able to communicate clearly and effectively, both orally and in writing, using exact and appropriate language tailored to different audiences.		
202704	Students are able to process and interpret data and information through the application of information and communication technology.		
202705	Students are able to use relevant software, tools, and equipment in the field of informatics.		

CLO Code	CLO Description	Course Code	Course Name
202901	Students are able to analyze problems and design appropriate and efficient algorithmic solutions.	SINF2029	Practicum of Human Computer Interaction
202902	Students are able to use relevant software, tools, and equipment in the field of informatics.		
202903	Students are able to perform analysis, design, implementation, testing, and maintenance of high-quality software.		
201601	Students understand the fundamental concepts of ethics and morality and their relevance in the context of information technology.	SINF2016	Ethics for Information Technology
201602	Students understand various ethical and moral theories relevant to the development of information technology.		
201603	Students are able to apply ethical and moral theories in practical contexts within the field of information and communication technology (ICT).		
201801	Students are able to understand the fundamental concepts of graph theory.	SINF2018	Graph Theory
201802	Students are able to identify the characteristics of graphs and apply shortest path algorithms to problem-solving.		
201803	Students are able to analyze and apply various types of graphs in addressing problem-solving tasks.		
202001	Students are able to identify problems and analyze requirements to address them systematically.	SINF2020	Software Engineering
202002	Students are able to work effectively in a team to complete informatics projects.		
202003	Students are able to communicate clearly and effectively, both orally and in writing, using exact and appropriate language tailored to different audiences.		

CLO Code	CLO Description	Course Code	Course Name
202004	Students are able to analyze problems and design appropriate and efficient algorithmic solutions.		
202005	Students are able to perform analysis, design, implementation, testing, and maintenance of high-quality software.		
202201	Students are able to analyze problems and design appropriate and efficient algorithmic solutions.	SINF2022	Practicum of Software Engineering
202202	Students are able to use relevant software, tools, and equipment in the field of informatics.		
202203	Students are able to perform analysis, design, implementation, testing, and maintenance of high-quality software.		
202401	Students are able to explain the fundamental concepts of Geographic Information Systems (GIS).	SINF2024	Geographical Information System
202402	Students are able to create geospatial data.		
202403	Students are able to perform fundamental GIS analysis.		
202404	Students are able to solve problems using GIS applications.		
202601	Students are able to create geospatial data.	SINF2026	Practicum of Geographical Information System
202602	Students are able to perform fundamental GIS analysis.		
202603	Students are able to solve problems using GIS applications.		
202801	Students demonstrate responsibility for their work or output, including the associated risks in professional practice.	SINF2028	Data Communications
202802	Students demonstrate theoretical and practical knowledge involving fundamental theories, problems, methods, and solutions in the field of inter-device communication.		

CLO Code	CLO Description	Course Code	Course Name
202803	Students demonstrate general skills and soft skills, such as independent performance, effective teamwork in a structured and measurable manner, presentation, promotion, and socialization of scientific products in the field of inter-device communication aligned with economically and intellectually productive business processes.		
202804	Students demonstrate specific skills to explain, present, design, create, implement, evaluate, document, and solve problems through the study of specific knowledge in inter-device communication.		
203001	Students demonstrate responsibility for their work or output, including the associated risks in professional practice.	SINF2030	Practicum of Data Communications
203002	Students demonstrate theoretical and practical knowledge involving fundamental theories, problems, methods, and solutions in the field of inter-device communication.		
203003	Students demonstrate general skills and soft skills, such as independent performance, effective teamwork in a structured and measurable manner, presentation, promotion, and socialization of scientific products in the field of inter-device communication aligned with economically and intellectually productive business processes.		
203004	Students demonstrate specific skills to explain, present, design, create, implement, evaluate, document, and solve problems through the study of specific knowledge in inter-device communication.		
203201	Students understand web application development technologies.	SINF2032	Web Programming
203202	Students are able to determine and use appropriate algorithms in web applications based on the specified requirement analysis.		

CLO Code	CLO Description	Course Code	Course Name
203203	Students are able to develop innovative, interactive, and professional web-based applications that are deployed and publicly accessible.		
203401	Students master key concepts in web development and web programming languages, such as HTML, CSS, and JavaScript, to create interactive web pages.	SINF2034	Practicum of Web Programming
203402	Students are able to design responsive layouts, manage resources, and apply web security principles.		
203403	Students are able to perform a live demonstration of the developed project.		
203601	Students are able to analyze concepts, techniques, idioms, and implementation examples in data visualization.	SINF2036	Data Visualization
203602	Students are able to analyze data and tasks based on the dataset used in the project.		
203603	Students are able to implement effective data visualization.		
203801	Students are able to explain the D3.js program code and its output.	SINF2036	Practicum of Data Visualization
203802	Students are able to write program code to read and manipulate external data in visualizations using D3.js.		
203803	Students are able to write program code to create charts and add interactivity using D3.js.		
CPPS04	Students are able to analyze the fundamental principles of entrepreneurship.	SMPA3013	Entrepreneurship
CPPS05	Students are able to apply the fundamental concepts of science and applied knowledge in entrepreneurship.	SMPA3015	Practicum of Entrepreneurship
303101	Students are able to understand and explain the fundamental concepts of artificial intelligence.	SINF3031	Artificial Intelligence
303102	Students are able to understand the concepts of intelligent agents, knowledge representation, and knowledge interface representation in artificial intelligence.		

CLO Code	CLO Description	Course Code	Course Name
303103	Students are able to understand and implement search concepts and expert systems.		
303301	Students are able to implement artificial intelligence concepts such as neural networks to solve real-world problems.		
303302	Students are able to operate the Prolog programming language for artificial intelligence.	SINF3033	Practicum of Artificial Intelligence
303303	Students are able to use libraries in the Python programming language for artificial intelligence cases.		
303501	Students are able to implement frameworks in the Python programming language for artificial intelligence cases.		
303502	Students are able to understand the basics of data mining and data preprocessing.	SINF3035	Data Mining
303503	Students are able to understand the methods of Classification, Clustering, and Association Rule Mining (ARM).		
303701	Students are able to utilize Data Mining to solve real-world problems.		
303702	Students are able to understand the basics of data mining and data preprocessing.	SINF3037	Practicum of Data Mining
303703	Students are able to understand the methods of Classification, Clustering, and Association Rule Mining (ARM).		
303901	Students are able to utilize Data Mining to solve real-world problems.		
303901	Students are able to explain the concept of language definition and its supporting mathematical operations.	SINF3039	Automata and Language Theory
303901	Students are able to demonstrate regular language modeling using Finite Automata.		
303901	Students are able to prove whether a language is regular or not.		

CLO Code	CLO Description	Course Code	Course Name
304101	Students are able to solve problems related to context-free grammar and pushdown automata.		
304001	Students are able to demonstrate regular language modeling using Finite Automata.	SINF3041	Practicum of Automata and Language Theory
304002	Students understand and can create an organized system plan using various diagrams such as Data Flow Diagrams, Entity Relationship Diagrams, and Process Descriptions.	SINF3040	Information System
304201	Students understand and can distinguish types of information systems such as Decision Support Systems, Expert Systems, Knowledge Management Systems, and Enterprise Resource Planning.		
304202	Students understand the basic concepts of research methodology, including the formulation of research problems, selection of appropriate research methods, and development of a theoretical framework to support research.	SINF3042	Research Methodologies
304203	Students possess skills in data collection and analysis techniques, both quantitative and qualitative, such as surveys, interviews, observations, as well as statistical analysis and interpretation of research results.		
304401	Students can design and conduct research systematically and ethically, taking into account relevant methodological aspects such as validity, reliability, and generalizability of research findings.		
304402	Students understand the basic concepts of mobile programming, including application structure, framework usage, and user interface (UI) interaction.	SINF3044	Mobile Programming

CLO Code	CLO Description	Course Code	Course Name
304403	Students possess proficiency in programming languages commonly used in mobile application development, such as Java or Kotlin for the Android platform, or Swift for the iOS platform.		
304601	Students are able to design, develop, and deploy responsive and high-performance mobile applications, taking into account sound design principles and user experience (UX).		
304602	Students understand the basic concepts of mobile programming, including application structure, framework usage, and user interface (UI) interaction.	SINF3046	Practicum of Mobile Programming
304603	Students possess proficiency in programming languages commonly used in mobile application development, such as Java or Kotlin for the Android platform, or Swift for the iOS platform.		
MKWKN01	Students are able to design, develop, and deploy responsive and high-performance mobile applications, taking into account sound design principles and user experience (UX).		
MKWKN02	Community Service Program (KKN) students are expected to be able to identify problems, design, and develop village community empowerment programs based on their academic discipline, skills, and general knowledge (Proposal).	MKWUP001	Community Services Program
CPMKU05	Community Service Program (KKN) students are expected to be able to implement and report on village community empowerment programs based on their knowledge, general skills, and specific expertise in their field of study (Project Implementation and KKN Report).		
404301	Students are able to design, report, and explain a research plan in accordance with scientific principles.	SMPAP002	Research Proposal
404302	Students write a scientific paper in the form of a proposal draft or research article in the field of informatics.	SINF4043	Seminar
CPMKU03	Students present a scientific paper in class.		

CLO Code	CLO Description	Course Code	Course Name
CPMKU04	Students are able to explain the management of industries, companies, or public/private institutions.	SMPAP001	Internship
CPMKU06	Students are able to undertake a practical in industries, companies, or public/private institutions relevant to their field of study.		
201801	Students are able to conduct, report, and disseminate research findings in an undergraduate thesis defense.	SMPAPA01	Final Project
604501	Students understand the basic concepts of information retrieval, including types of information retrieval, index construction, scoring, weighting, vector space models, and how to calculate retrieval result rankings.	SINF6045	Information Retrieval
604502	Students apply practical implementations of information retrieval concepts.		
604503	Students implement a simple information retrieval system prototype by integrating learned concepts into the development of software that can retrieve relevant documents based on a given query.		
604701	Students implement fundamental information retrieval concepts using open source software.	SINF6047	Practicum of Information Retrieval
604702	Students build a simple information retrieval system prototype capable of indexing documents, calculating relevance scores, and delivering accurate search results based on the given query.		
604901	Students understand the Fundamental Concepts and Techniques of Computer Vision.	SINF6047	Computer Vision
604902	Students analyze and Design Solutions Using Computer Vision Techniques.		
604903	Students develop Computer Vision Applications for Various Domains.		
605101	Students actively participate in Computer Vision laboratory sessions.	SINF6051	

CLO Code	CLO Description	Course Code	Course Name
605102	Students are able to utilize OpenCV functions in the Python programming language to process images or videos.		Practicum of Computer Vision
605103	Students are able to implement algorithms available in OpenCV to complete various computer vision tasks.		
605301	Students are able to explain fundamental concepts in bioinformatics.	SINF6053	Bioinformatics
605302	Students are able to use R/Python software to solve bioinformatics problems.		
605501	Students are able to use R/Python software to solve bioinformatics problems.	SINF6055	Practicum of Bioinformatics
605701	Students understand the fundamental concepts of image processing, including image formation, digital representation, intensity transformation, and spatial filtering techniques.	SINF6057	Image Processing
605702	Students apply image processing techniques such as image detection, image segmentation, image morphology, geometric transformations, image restoration, and image shape analysis.		
605703	Students apply knowledge and skills to solve practical problems in various fields using image processing technologies.		
605901	Students actively participate in Image Processing practicum sessions.	SINF6059	Practicum of Image Processing
605902	Students are able to understand the OpenCV library for image processing.		
605903	Students are able to utilize the OpenCV library for image processing.		
606101	Students are able to analyze spatial data comprehensively.	SINF6061	Advanced Geographical Information System
606102	Students are able to model and integrate spatial data.		
606103	Students are able to apply spatial data estimation methods.		
606104	Students are able to apply Geographic Information System (GIS) methods to solve location search problems based on specific criteria.		

CLO Code	CLO Description	Course Code	Course Name
606301	Students are able to apply vector and raster data analysis methods in problem-solving.	SINF6063	Practicum of Advanced Geographical Information System
606501	Students are able to prepare and design a survey mapping system.	SINF6065	Survey and Mapping Management
606502	Students are able to use geospatial technologies in processing survey data.		
606503	Students are able to develop skills in solving problems related to geographic data analysis.		
606701	Students are able to prepare and design tools and materials for a survey mapping system.	SINF6067	Practicum of Survey and Mapping Management
606702	Students are able to analyze survey data using the latest geospatial technologies.		
606703	Students are able to prepare a report on the results of the survey and mapping.		
606901	Students are able to use features and commands in Windows and Linux operating systems.	SINF6069	Cyber Security
606902	Students are able to mention and explain protocols, services, and network infrastructure.		
606903	Students are able to mention and explain security principles and types of attacks.		
606904	Students are able to mention and explain network protection, endpoint security, and data intrusion monitoring.		
606905	Students are able to mention and explain data intrusion analysis and steps for responding to network security incidents.		
607101	Students are able to use features to identify running processes and explore processes, threads, handles, Windows registry, configuration, and monitoring in Windows OS.	SINF6071	Practicum of Cyber Security
607102	Students are able to use the Linux shell, perform basic server administration, and manage the file system in Linux OS.		

CLO Code	CLO Description	Course Code	Course Name
607103	Students are able to use Wireshark to examine frames, TCP 3-Way Handshake processes, UDP DNS, and HTTP and HTTPS traffic.		
607104	Students are able to use Network Security Monitoring (NSM) tools, such as Security Onion, including Sguil, Kibana, and Wireshark, to investigate alerts that occur.		
607105	Students are able to use Security Onion to investigate network data (alerts) and perform incident response.		
607301	Students demonstrate a responsible attitude toward their work or creations, including the associated risks involved in producing such work.	SINF6073	Advanced Network Protocol
607302	Students demonstrate general theoretical and practical knowledge involving foundational theories, issues, methods, and problem-solving within the field of inter-device communication.		
607303	Students demonstrate general skills and soft skills, including the ability to work independently, collaborate in well-directed and measurable teams, and deliver presentations, promotions, and dissemination of inter-device communication products in alignment with business processes that yield economic and intellectual outcomes.		
607304	Students demonstrate specific skills in explaining, demonstrating, designing, creating, implementing, evaluating, documenting, and solving problems through learning in specialized domains of inter-device communication.		
607501	Students demonstrate a responsible attitude toward their work or creations, including the associated risks involved in producing such work.	SINF6075	Practicum of Advanced Network Protocol
607502	Students demonstrate general theoretical and practical knowledge involving foundational theories, issues, methods, and problem-solving within the field of inter-device communication.		

CLO Code	CLO Description	Course Code	Course Name
607503	Students demonstrate general skills and soft skills such as the ability to work independently, collaborate in well-directed and measurable teams, and deliver presentations, promotions, and dissemination of inter-device communication products in alignment with business processes that yield economic and intellectual outcomes.		
607504	Students demonstrate specific skills in explaining, demonstrating, designing, creating, implementing, evaluating, documenting, and solving problems through learning in specialized domains of inter-device communication.		
607701	Students are able to analyze problems and design appropriate and efficient algorithmic solutions for problem-solving.	SINF6077	Software Development and Operations
607702	Students are able to test the implemented algorithms, analyze their performance, and make necessary improvements.		
607703	Students are able to use software, tools, and equipment relevant to the field of informatics.		
607901	Students are able to analyze problems and design appropriate and efficient algorithmic solutions for problem-solving.	SINF6079	Practicum of Software Development and Operations
607902	Students are able to test the implemented algorithms, analyze their performance, and make necessary improvements.		
607903	Students are able to use software, tools, and equipment relevant to the field of informatics.		
608101	Students are able to analyze problems and design appropriate and efficient algorithmic solutions for problem-solving.	SINF6081	Software Architecture
608102	Students are able to use software, tools, and equipment relevant to the field of informatics.		

CLO Code	CLO Description	Course Code	Course Name
608103	Students are able to perform analysis, design, implementation, testing, and maintenance of high-quality software.		
608301	Students are able to analyze problems and design appropriate and efficient algorithmic solutions for problem-solving.	SINF6083	Practicum of Software Architecture
608302	Students are able to use software, tools, and equipment relevant to the field of informatics.		
608303	Students are able to perform analysis, design, implementation, testing, and maintenance of high-quality software.		
608501	Students are able to understand the basic concepts of big data.	SINF6085	Big Data and Data Analytics
608502	Students are able to understand and explain the processes of crawling, cleaning, modeling, and visualization using text data.		
608503	Students are able to understand the use of the Hadoop ecosystem in big data applications.		
608701	Students are able to understand and explain the basic concepts of big data.	SINF6087	Practicum of Big Data and Data Analytics
608702	Students are able to perform crawling, cleaning, modeling, and visualization processes using the Python programming language.		
608703	Students are able to operate the Hadoop ecosystem for big data applications.		
608901	Students are able to understand and explain cloud computing.	SINF6089	Cloud Computing
608902	Students are able to understand and explain SaaS, PaaS, and IaaS.		
608903	Students are able to understand and explain Docker and containers.		
609101	Students are able to understand the use of SaaS, PaaS, and IaaS as cloud computing services.	SINF6091	Practicum of Cloud Computing
609102	Students are able to perform deployment on cloud computing services.		
609103	Students are able to use Docker and containers.		

CLO Code	CLO Description	Course Code	Course Name
304801	Students understand the fundamental principles of business communication, including effective message delivery, audience understanding, and communication needs in a business context.	SINF3048	Business Communication and Interpersonal Skill
304802	Students possess proficiency in written and oral communication techniques relevant to business settings, such as writing professional emails, delivering persuasive presentations, and communicating effectively in business meetings.		
304803	Students develop strong interpersonal skills, including active listening, building good working relationships, and managing conflicts constructively to achieve desired business outcomes.		
609301	Students are capable of designing and implementing algorithms to identify and solve problems involving software and computational thinking.	SINF6093	Informatics Research
605001	Students are able to explain the fundamental concepts of machine learning, distinguish between different types of learning (supervised and unsupervised), and understand the stages of data processing and the selection of appropriate algorithms.	SINF6050	Machine Learning
605002	Students are able to implement various machine learning algorithms, both supervised and unsupervised (regression, classification, and clustering), and quantitatively evaluate model performance.		
605003	Students are able to develop and train deep learning models, including neural networks, CNN, RNN, and LSTM, and apply them to natural language processing tasks.		
605201	Students are able to perform data processing, including cleaning, transformation, normalization, and dataset splitting for machine learning model training and testing.	SINF6052	Practicum of Machine Learning

CLO Code	CLO Description	Course Code	Course Name
605202	Students are able to implement various machine learning algorithms, such as regression, classification, and clustering, and evaluate model performance using appropriate metrics.		
605203	Students are able to develop deep learning models, including neural networks, CNN, RNN, and LSTM, using libraries such as TensorFlow or PyTorch, and implement basic NLP models.		
605401	Students are able to explain the basic concepts of natural language processing, including syntax, semantics, and pragmatics.	SINF6054	Natural Language Processing
605402	Students are able to use natural language processing algorithms and techniques, such as tokenization, parsing, and language modeling.		
605403	Students are able to design and develop applications that utilize natural language processing, such as chatbots, translation systems, or sentiment analysis.		
605601	Students are able to explain the basic concepts of natural language processing, including syntax, semantics, and pragmatics.	SINF6056	Natural Language Processing Practicum
605602	Students are able to apply essential natural language processing algorithms and techniques, such as tokenization, parsing, and language modeling, to effectively understand text.		
605603	Students are able to design and develop applications leveraging natural language processing, such as interactive chatbots, automatic translation systems, or text-based sentiment analysis.		
605801	Students are able to explain the concepts of cartography.	SINF6058	Cartography
605802	Students demonstrate mastery of map design techniques.		
605803	Students possess geovisualization skills.		
605804	Students are able to use modern technologies for map creation.		

CLO Code	CLO Description	Course Code	Course Name
606001	Students are able to apply cartographic concepts.	SINF6060	Practicum of Cartography
606002	Students demonstrate proficiency in formal transformation techniques.		
606003	Students possess geovisualization skills.		
606004	Students are able to implement modern technologies for map creation.		
606201	Students are able to explain the fundamental concepts of remote sensing.	SINF6062	Remote Sensing
606202	Students are able to visualize satellite imagery.		
606203	Students are able to perform fundamental analysis of satellite imagery.		
606204	Students are able to solve problems using remote sensing applications.		
606401	Students are able to operate applications for inputting and processing digital image data.	SINF6064	Practicum of Remote Sensing
606402	Students are able to operate applications used in remote sensing, including satellite-based developments for land utilization in agriculture and other related fields.		
606601	Students can identify and explain the concepts of network security.	SINF6066	Network Reliability
606602	Students can identify and explain threats and vulnerabilities in computer networks.		
606603	Students can identify and explain network penetration testing and advanced network attacks.		
606801	Students can identify and explain the concepts of network security.	SINF6068	Practicum of Network Reliability
606802	Students can identify and explain threats and vulnerabilities in computer networks.		
606803	Students can identify and explain network penetration testing and advanced network attacks.		
607001	Students demonstrate a responsible attitude toward their work or creations, including the associated risks involved in producing such work.	SINF6070	Wireless Networks
607002	Students demonstrate general theoretical and practical knowledge involving foundational theories, issues, methods, and problem-solving within the field of inter-device communication.		

CLO Code	CLO Description	Course Code	Course Name
607003	Students demonstrate general skills and soft skills, including the ability to work independently, collaborate in well-directed and measurable teams, and deliver presentations, promotions, and dissemination of inter-device communication products in alignment with business processes that yield economic and intellectual outcomes.		
607004	Students demonstrate specific skills in explaining, demonstrating, designing, creating, implementing, evaluating, documenting, and solving problems through learning in specialized domains of inter-device communication.		
607201	Students demonstrate general theoretical and practical knowledge involving foundational theories, issues, methods, and problem-solving within the field of inter-device communication.	SINF6072	Practicum of Wireless Networks
607202	Students demonstrate general skills and soft skills, including the ability to work independently, collaborate in well-directed and measurable teams, and deliver presentations, promotions, and dissemination of inter-device communication products in alignment with business processes that yield economic and intellectual outcomes.		
607203	Students demonstrate specific skills in explaining, demonstrating, designing, creating, implementing, evaluating, documenting, and solving problems through learning in specialized domains of inter-device communication.		
607401	Students demonstrate general theoretical and practical knowledge involving foundational theories, issues, methods, and problem-solving within the field of inter-device communication.	SINF6074	Optical Network Communication System
607402	Students demonstrate general skills and soft skills, including the ability to work independently, collaborate in well-directed and measurable teams, and deliver presentations,		

CLO Code	CLO Description	Course Code	Course Name
	promotions, and dissemination of inter-device communication products in alignment with business processes that yield economic and intellectual outcomes.		
607403	Students demonstrate specific skills in explaining, demonstrating, designing, creating, implementing, evaluating, documenting, and solving problems through learning in specialized domains of inter-device communication.		
607601	Students demonstrate general theoretical and practical knowledge involving foundational theories, issues, methods, and problem-solving within the field of inter-device communication.	SINF6076	Practicum of Optical Network Communication System
607602	Students demonstrate general skills and soft skills, including the ability to work independently, collaborate in well-directed and measurable teams, and deliver presentations, promotions, and dissemination of inter-device communication products in alignment with business processes that yield economic and intellectual outcomes.		
607603	Students demonstrate specific skills in explaining, demonstrating, designing, creating, implementing, evaluating, documenting, and solving problems through learning in specialized domains of inter-device communication.		
607801	Students understand the stages of software development, including requirements analysis, design, implementation, testing, and maintenance, and they are capable of applying them practically within a software project.	SINF6078	Software Project
607802	Students develop skills in effective teamwork within a software development environment, including clear communication, project management, and efficient task delegation to successfully achieve project goals.		

CLO Code	CLO Description	Course Code	Course Name
607803	Students are capable of producing high-quality software products, including user-centered design, appropriate functionality, well-written code, and the ability to manage necessary changes and improvements throughout the software product lifecycle.		
608001	Students gain hands-on experience in software development through a project-based practicum, involving practical processes of requirements analysis, system design, implementation, and testing.	SINF6080	Practicum of Software Project
608002	Students develop technical skills in utilizing various current tools and technologies relevant to software development, and understand best practices in code management, version control, and continuous integration.		
608003	Students master effective team collaboration skills, including efficient communication, shared responsibilities, and the ability to address challenges and conflicts that may arise during the software development process.		
608201	Students understand the fundamental concepts of component-based software, including the separation of functionality into reusable units, as well as the benefits and challenges in component development and integration.	SINF6082	Component Based-Software Engineering
608202	Students can design, implement, and integrate software components using appropriate standards and design patterns, such as service-oriented architecture (SOA) design or microservices-based design.		
608203	Students develop skills in utilizing and managing component repositories and understand best practices in documentation, testing, and maintenance of software components to ensure overall system interoperability and quality.		

CLO Code	CLO Description	Course Code	Course Name
608401	Students gain practical experience in designing, implementing, and integrating software components within a project, involving appropriate component selection, feature development, and functionality and integration testing.	SINF6084	Practicum of Component-Based Software Engineering
608402	Students develop technical skills in using frameworks and tools that support component-based software development, and understand sound design principles for creating reusable and maintainable components.		
608403	Students master efficient team collaboration practices in the context of component-based software development, including effective communication, code sharing, and resolving integration and interdependency issues among team members.		
608601	Students can identify, analyze, and measure software quality using appropriate methods and tools.	SINF6086	Software Quality
608602	Students understand the key principles that underlie software quality, including reliability, security, performance, and code readability.		
608603	Students can design and implement effective software testing strategies, including functional, non-functional, and automated testing, to ensure the desired level of quality.		
608801	Students can practically apply software testing techniques, including unit, integration, system, and acceptance testing, and be capable of analyzing test results to detect and fix software defects.	SINF6088	Practicum of Software Quality
608802	Students can create test scenarios and execute automation scripts for testing software on web and mobile applications.		

CLO Code	CLO Description	Course Code	Course Name
609001	Students are able to understand the fundamental concepts of cryptography and the application of mathematical principles in cryptography.	SINF6090	Data Security and Cryptography
609002	Students are able to understand the concepts of classical and modern cryptography.		
609003	Students are able to understand the concepts of symmetric-key and asymmetric-key cryptography.		
609201	Students are able to implement the fundamental concepts of cryptography and apply mathematical principles in cryptography.	SINF6092	Practicum of Data Security and Cryptography
609202	Students are able to implement classical and modern cryptographic methods.		
609203	Students are able to understand the concepts of symmetric-key and asymmetric-key cryptography.		
609421	Students are able to generate ideas and topics for a game concept.	SINF6094	Game Development
609422	Students are able to explain game design, including game design principles and theories, play mechanics, gameplay, visual design, and user interface.		
609443	Students are able to use the Unity Game Engine and the C# programming language.		
609444	Students are able to identify and explain the use of Unity 2D and 3D in the development of 2D and 3D games.		
609621	Students are able to explain game design, including game design principles and theories, play mechanics, gameplay, visual design, and user interface.	SINF6096	Practicum of Game Development
609642	Students are able to use the Unity Game Engine and the C# programming language.		
609653	Students are able to identify and explain the use of Unity 2D and 3D in the development of 2D and 3D games.		

CLO Code	CLO Description	Course Code	Course Name
609801	Students understand the basic concepts and principles of digital marketing, including online branding strategies, the use of social media, and search engine optimization (SEO). They can apply them in designing effective digital marketing campaigns.	SINF6098	Digital Marketing and Product Visualization
609802	Students develop skills in using various tools and techniques for product visualization, such as graphic design, photography, and multimedia content creation, to enhance the appeal and marketability of products in the digital marketplace.		
609803	Students can apply data analysis and consumer behavior insights in marketing decision-making and to optimize digital marketing strategies and product visualization based on the insights gained from such data.		
610001	Students understand the basic concepts of entrepreneurial financial management, including financial planning, cash flow management, budgeting, and monitoring business financial performance.	SINF6100	Entrepreneur Finance Management
610002	Students can develop accurate financial projections and sustainable business plans, as well as evaluate business financial performance to identify opportunities and risks.		
610003	Students develop skills in managing financial resources efficiently, including an understanding of business financing, financial risk management, and sound investment decision-making.		

3.5. Course Development

The formulation of courses and course weights, based on the ILO (with their derivatives at the course level) and the subject matter, as well as the determination of credit points (SKS), is presented in the following table.

Table 3.5 Course Formulation and Course Weights

Code	Course Name	Number of CLOs	Estimated Student Workload Time		SKS
			Theory	Practical	
MKWU1002	Civic Education	4	5,6 hours/ week for 16 weeks = 87,36	0	2
MKWU1005	Disaster Management and Environment	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SMPA1001	Introduction to Calculus	2	8,5 hours/ week for 16 weeks =134,4 jam	0	3
SMPA1003	Introduction to Physics	6	5,6 hours/ week for 16 weeks = 87,36	0	2
SMPA1005	Introduction to Chemistry	2	5,6 hours/ week for 16 weeks = 87,36	0	2
SMPA1007	Introduction to Biology	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SMPA1009	Introduction to Industrial Revolution	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF1001	Programming	3	8,5 hours/ week for 16 weeks =134,4 jam	0	3
SINF1003	Practicum of Programming	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF1005	Practicum of Introduction to Industrial Revolution	3	0	2,73 hours/ week for 16 weeks = 43,68	1
MKWU1001	Pancasila	4	5,6 hours/ week for 16 weeks = 87,36	0	2
MKWU1003	Indonesian Language	4	5,6 hours/ week for 16 weeks = 87,36	0	2

MKWU1004	English	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SMPA1011	Statistical Methods	2	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF1002	Discrete Structures	3	8,5 hours/ week for 16 weeks = 134,4 jam	0	3
SINF1004	Data Structures and Algorithms	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF1006	Practicum of Data Structures and Algorithms	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF1008	Computer Networks	5	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF1010	Practicum of Computer Networks	4	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF1012	Database I	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF1014	Practicum of Database I	3	0	2,73 hours/ week for 16 weeks = 43,68	1
MKWU2001	Religion Education	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2007	Logics	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2009	Linear Algebra	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2011	Numerical Computation	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2013	Practicum of Numerical Computation	2	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF2015	Object-Oriented Programming	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2017	Practicum of Object- Oriented Programming	3	0	2,73 hours/ week for 16 weeks = 43,68	1

SINF2019	Database II	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2021	Practicum of Database II	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF2023	Operation Systems	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2025	Practicum of Operation Systems	4	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF2027	Human Computer Interaction	5	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2029	Practicum of Human Computer Interaction	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF2016	Ethics For Information Technology	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2018	Graph Theory	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2020	Software Engineering	5	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2022	Practicum of Software Engineering	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF2024	Geographical Information System	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2026	Practicum of Geographical Information System	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF2028	Data Communications	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2030	Practicum of Data Communications	4	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF2032	Web Programming	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2034	Practicum of Web Programming	3	0	2,73 hours/ week for 16 weeks = 43,68	1

SINF2036	Data Visualization	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF2038	Practicum of Data Visualization	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SMPA3013	Entreneurship	1	5,6 hours/ week for 16 weeks = 87,36	0	2
SMPA3015	Practicum of Entrepreneurship	1	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF3031	Artificial Intelligence	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF3033	Practicum of Artificial Intelligence	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF3035	Data Mining	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF3037	Practicum of Data Mining	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF3039	Automata and Language Theory	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF3041	Practicum of Automate and Language Theory	1	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF3040	Information System	2	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF3042	Research Methodologies	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF3044	Mobile Programming	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF3046	Practicum of Mobile Programming	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF3048	Business Communication and Interpersonal Skill	3	5,6 hours/ week for 16 weeks = 87,36	0	2
MKWUP001	Community Services Program	2	5,6 hours/ week for 16 weeks = 87,36	0	2

SMPAP002	Research Proposal	1	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF4043	Seminar	2	5,6 hours/ week for 16 weeks = 87,36	0	2
SMPAP001	Internship	2	8,5 hours/ week for 16 weeks =134,4 jam	0	3
SMPAPA01	Final Project	1		0	4
SINF6045	Information Retrieval	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6047	Practicum of Information Retrieval	2	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6049	Computer Vision	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6051	Practicum of Computer Vision	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6053	Bioinformatics	2	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6055	Practicum of Bioinformatics	1	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6057	Image Processing	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6059	Practicum of Image Processing	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6061	Advanced Geographical Information System	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6063	Practicum of Advanced Geographical Information System	1	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6065	Survey and Mapping Management	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6067	Practicum of Survey and Mapping Management	3	0	2,73 hours/ week for 16 weeks = 43,68	1

SINF6069	Cyber Security	5	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6071	Practicum of Cyber Security	5	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6073	Advanced Network Protocol	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6075	Practicum of Advanced Network Protocol	4	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6077	Software Development and Operations	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6079	Practicum of Software Development and Operations	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6081	Software Architecture	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6083	Practicum of Software Architecture	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6085	Big Data and Data Analytics	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6087	Practicum of Big Data and Data Analytics	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6089	Cloud Computing	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6091	Practicum of Cloud Computing	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6093	Informatics Research	1		0	11
SINF6050	Machine Learning	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6052	Practicum of Machine Learning	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6054	Natural Language Processing	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6056	Natural Language Processing Practicum	3	0	2,73 hours/ week for 16 weeks = 43,68	1

SINF6058	Cartography	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6060	Practicum of Cartography	4	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6062	Remote Sensing	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6064	Practicum of Remote Sensing	2	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6066	Network Reliability	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6068	Practicum of Network Reliability	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6070	Wireless Networks	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6072	Practicum of Wireless Networks	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6074	Optical Network Communication System	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6076	Practicum of Optical Network Communication System	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6078	Software Project	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6080	Practicum of Software Project	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6082	Component Based- Software Engineering	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6084	Practicum of Component-Based Software Engineering	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6086	Software Quality	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6088	Practicum of Software Quality	2	0	2,73 hours/ week for 16 weeks = 43,68	1

SINF6090	Data Security and Cryptography	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6092	Practicum of Data Security and Cryptography	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6094	Game Development	4	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6096	Practicum of Game Development	3	0	2,73 hours/ week for 16 weeks = 43,68	1
SINF6098	Digital Marketing and Product Visualization	3	5,6 hours/ week for 16 weeks = 87,36	0	2
SINF6100	Entrepreneur Finance Management	3	5,6 hours/ week for 16 weeks = 87,36	0	2

Table 3.6 Course Titles and Their Relation to Course Learning Outcomes (CLOs)

Course Code	Courses	CPL-01	CPL-02	CPL-03	CPL-04	CPL-05
MKWU1002	Civic Education	✓				
MKWU1005	Disaster Management and Environment					✓
MKWU1006	Character Building I	✓				
SMPA1001	Introduction to Calculus					✓
SMPA1003	Introduction to Physics					✓
SMPA1005	Introduction to Chemistry					✓
SMPA1007	Introduction to Biology					✓
SMPA1009	Introduction to Industrial Revolution					✓
SINF1001	Programming		✓	✓	✓	
SINF1003	Practicum of Programming		✓	✓	✓	
SINF1005	Practicum of Introduction to Industrial Revolution		✓		✓	
MKWU1001	Pancasila	✓				✓

MKWU1003	Indonesian Language	✓				✓
MKWU1004	English	✓				✓
MKWU1007	Character Building II	✓				
SMPA1011	Statistical Methods				✓	✓
SINF1002	Discrete Structures	✓	✓	✓	✓	✓
SINF1004	Data Structures and Algorithms		✓	✓	✓	
SINF1006	Practicum of Data Structures and Algorithms		✓	✓	✓	
SINF1008	Computer Networks		✓		✓	✓
SINF1010	Practicum of Computer Networks		✓		✓	
SINF1012	Database I		✓		✓	✓
SINF1014	Practicum of Database I				✓	✓
MKWU2001	Religion Education	✓				
SINF2007	Logics	✓	✓	✓	✓	✓
SINF2009	Linear Algebra	✓	✓	✓	✓	✓
SINF2011	Numerical Computation		✓	✓	✓	✓
SINF2013	Practicum of Numerical Computation		✓	✓	✓	✓
SINF2015	Object-Oriented Programming		✓	✓	✓	✓
SINF2017	Practicum of Object-Oriented Programming		✓	✓	✓	
SINF2019	Database II		✓		✓	✓
SINF2021	Practicum of Database II		✓	✓		✓
SINF2023	Operation Systems	✓	✓	✓	✓	
SINF2025	Practicum of Operation Systems	✓	✓	✓	✓	
SINF2027	Human Computer Interaction	✓	✓	✓	✓	✓

SINF2029	Practicum of Human Computer Interaction	✓	✓	✓		
SINF2016	Practicum of Human Computer Interaction	✓				
SINF2018	Graph Theory		✓	✓		✓
SINF2020	Software Engineering	✓	✓	✓	✓	✓
SINF2022	Practicum of Software Engineering	✓	✓	✓		
SINF2024	Geographical Information System		✓		✓	✓
SINF2026	Practicum of Geographical Information System		✓		✓	✓
SINF2028	Data Communications	✓	✓	✓	✓	
SINF2030	Practicum of Data Communications	✓	✓	✓	✓	
SINF2032	Web Programming		✓	✓	✓	✓
SINF2034	Practicum of Web Programming		✓	✓	✓	✓
SINF2036	Data Visualization	✓	✓	✓	✓	✓
SINF2038	Practicum of Data Visualization	✓	✓		✓	
SMPA3013	Entreneurship	✓				
SMPA3015	Practicum of Entrepreneurship	✓				
SINF3031	Artificial Intelligence		✓	✓		✓
SINF3033	Practicum of Artificial Intelligence			✓		✓
SINF3035	Data Mining		✓	✓	✓	✓
SINF3037	Practicum of Data Mining	✓	✓	✓	✓	
SINF3039	Automata and Language Theory		✓			✓
SINF3041	Practicum of Automate and Language Theory	✓	✓			✓

SINF3040	Information System		✓			✓
SINF3042	Research Methodologies	✓	✓			
SINF3044	Mobile Programming		✓	✓	✓	✓
SINF3046	Practicum of Mobile Programming		✓	✓	✓	✓
SINF3048	Business Communication and Interpersonal Skill	✓				
MKWUP001	Community Services Program	✓	✓			
SMPAP002	Research Proposal	✓	✓	✓	✓	✓
SINF4043	Seminar	✓	✓			✓
SMPAP001	Internship	✓	✓	✓	✓	✓
SMPAPA01	Final Project	✓	✓	✓	✓	✓
SINF6045	Information Retrieval		✓	✓	✓	✓
SINF6047	Practicum of Information Retrieval		✓	✓	✓	✓
SINF6049	Computer Vision	✓	✓	✓	✓	✓
SINF6051	Practicum of Computer Vision	✓	✓	✓	✓	
SINF6053	Bioinformatics		✓		✓	✓
SINF6055	Practicum of Bioinformatics	✓	✓		✓	
SINF6057	Image Processing		✓	✓	✓	✓
SINF6059	Practicum of Image Processing	✓	✓	✓	✓	
SINF6061	Advanced Geographical Information System		✓		✓	✓
SINF6063	Practicum of Advanced Geographical Information System		✓		✓	✓
SINF6065	Survey and Mapping Management	✓			✓	✓

SINF6067	Practicum of Survey and Mapping Management	✓			✓	✓
SINF6069	Cyber Security		✓		✓	✓
SINF6071	Practicum of Cyber Security		✓		✓	
SINF6073	Advanced Network Protocol	✓	✓	✓	✓	
SINF6075	Practicum of Advanced Network Protocol	✓	✓	✓	✓	
SINF6077	Software Development and Operations	✓	✓	✓	✓	✓
SINF6079	Practicum of Software Development and Operations	✓	✓	✓		
SINF6081	Software Architecture		✓	✓	✓	✓
SINF6083	Practicum of Software Architecture		✓	✓	✓	✓
SINF6085	Big Data and Data Analytics		✓	✓	✓	
SINF6087	Practicum of Big Data and Data Analytics	✓	✓	✓	✓	
SINF6089	Cloud Computing		✓	✓	✓	
SINF6091	Practicum of Cloud Computing	✓	✓	✓	✓	
SINF6093	Informatics Research	✓	✓	✓	✓	✓
SINF6050	Machine Learning		✓	✓	✓	✓
SINF6052	Practicum of Machine Learning	✓		✓	✓	✓
SINF6054	Natural Language Processing		✓	✓	✓	✓
SINF6056	Natural Language Processing Practicum	✓		✓	✓	✓
SINF6058	Cartography		✓		✓	✓
SINF6060	Practicum of Cartography		✓		✓	

SINF6062	Remote Sensing		✓		✓	✓
SINF6064	Practicum of Remote Sensing		✓		✓	✓
SINF6066	Network Reliability		✓		✓	✓
SINF6068	Practicum of Network Reliability		✓		✓	
SINF6070	Wireless Networks	✓	✓	✓	✓	
SINF6072	Practicum of Wireless Networks	✓	✓	✓	✓	
SINF6074	Optical Network Communication System	✓	✓	✓	✓	
SINF6076	Practicum of Optical Network Communication System	✓	✓	✓	✓	
SINF6078	Software Project	✓	✓	✓	✓	✓
SINF6080	Practicum of Software Project	✓	✓	✓		
SINF6082	Component Based-Software Engineering		✓	✓	✓	
SINF6084	Practicum of Component-Based Software Engineering	✓	✓	✓		
SINF6086	Software Quality		✓	✓	✓	
SINF6088	Practicum of Software Quality			✓	✓	
SINF6090	Data Security and Cryptography		✓		✓	✓
SINF6092	Practicum of Data Security and Cryptography		✓		✓	✓
SINF6094	Game Development		✓		✓	✓
SINF6096	Practicum of Game Development		✓		✓	✓
SINF6098	Digital Marketing and Product Visualization	✓	✓			
SINF6100	Entrepreneur Finance Management	✓	✓			

Table 3.7 Description of Study Material

Code	Study Material	Description
BK 01	Artificial Intelligence	Artificial Intelligence (AI) addresses complex problems using non-algorithmic approaches. AI is widely applied in everyday computing and the development of autonomous agents. Traditional AI encompasses both symbolic and sub-symbolic methods with machine learning approaches. There has been a shift toward automated learning from large datasets. The use of AI has expanded across business and various other disciplines, including controversial applications such as job evaluations and recidivism prediction. Given its significant impact, a deep understanding and ethical considerations are essential in its development and implementation.
BK 02	Fundamentals of Algorithms	Algorithms and data structure is the fundamental foundation in computer science, influencing every aspect of theoretical computation and applied programming. Selecting appropriate computational solutions for real-world problems requires a deep understanding of various algorithms, computational paradigms, and their societal impacts. This knowledge not only offers insight into the nature of computation but also transcends programming languages and hardware. Emphasis is placed on developing the skills to design and analyze algorithms for real-world challenges, supporting the core of software development. Mastery of these foundational concepts is expected of all computer science graduates, providing the basis for further exploration of advanced algorithmic topics across disciplines.
BK 03	Data Management	Data Management involves the processes of collecting, storing, managing, and analyzing data to support effective decision-making. It encompasses organized data, security policies, system integration, and development strategies. Efficient management ensures that data is available, accurate, and reliable, enabling organizations to utilize it optimally. It includes concepts such as data mining, transaction processing, and cloud storage. Current practices also consider data regulatory compliance and the adoption of technologies such as Big Data and predictive analytics to gain valuable insights.

BK 04	Foundations of Programming Language	The fundamentals of programming languages are rooted in discrete mathematics, logic, and formal languages, providing a foundation for understanding the complexities of modern programming languages. Despite the diversity in language paradigms and problem domains, programming languages share abstract models of computation and program development. Knowledge of common abstractions and programming paradigms accelerates the learning of programming languages. The Knowledge Area of Programming Language Fundamentals addresses core concepts and principles, formal language specifications, implementation, and interactions with operating systems and hardware. Understanding these principles supports programmers in selecting appropriate programming languages and making informed design decisions.
BK 05	Graphics and Interactive Techniques	Computer graphics refers to the generation and manipulation of images through computation, representing a branch of visual communication science. Its application domains include animation, CGI, visual effects, engineering, machine learning, medical imaging, scientific visualization, simulation, special effects, user interfaces, and video games. The course of computer graphics has evolved beyond image-based graphics, involving data science, physical computing, animation, and haptics. Learning in this area is integrated with other disciplines such as artificial intelligence, human-computer interaction, and distributed computing. Students are expected to consider ethical issues in graphics applications, such as autonomous navigation, deepfakes, computational photography, and facial recognition. The broad impact of graphics technologies across various fields should also be emphasized.
BK 06	Human Computer Interaction	Computing systems not only enable users to solve problems but also strengthen social connections and support a wide range of human endeavors. Therefore, these systems must interact with users well and solve problems in ways that respect human dignity, social justice, and values of humanity and creativity. Human-Computer Interaction (HCI) considers these concerns from an interdisciplinary perspective that encompasses computer science, psychology, business strategy, and design principles. The design of effective computing systems

		must foster trust while respecting user privacy, provide security, and adhere to ethical principles. Technology design should be iterative and attentive to the diversity of users.
BK 07	Mathematical and Statistical Foundations	A strong foundation in mathematics remains the basis of computer science education and incorporates computational practices in algorithm development, system design, modeling real-world phenomena, and data processing. The Mathematical and Statistical Foundations (MSF) Knowledge Area—successor to the "Discrete Structures" area in the ACM CS2013 curriculum—aims to identify the mathematical and statistical content that underpins modern computer science. The name change reflects a recognition that a broader name more accurately explains the combination of topics from the 2013 report, as well as those needed for emerging areas in computer science, such as artificial intelligence, machine learning, data science, and quantum computing.
BK 08	Networking and Communication	Networks and communication play a central role in interconnected computer systems that are transforming the daily lives of billions of people. The public Internet provides connectivity for networked applications serving an ever-growing number of individuals and organizations worldwide. In addition to the public sector, private networks of large enterprises leverage their global network to support distributed computing, storage, and efficient content delivery. Advances in satellite networking are expanding connectivity to rural areas. Device-to-device communication underpins the emerging Internet of Things (IoT). This field of knowledge addresses key concepts in networking and communication, as well as their implementation in the Internet and other computer networks.
BK 09	Operating System	An operating system is a collection of services necessary to interface hardware with applications securely. Its core focuses on the mechanisms and policies required to virtualize computation, memory, and input/output (I/O). Key themes commonly applied across various levels of computer systems are effectively illustrated through operating systems (such as polling vs. interrupts, caching, flexibility vs. cost, process scheduling approaches, and page

		replacement, etc.). The Operating Systems Knowledge Area encompasses fundamental concepts that serve as the foundation for other knowledge areas, including trust boundaries, concurrency, persistence, and secure extensibility.
BK 10	Software Development Fundamentals	Expertise in the software development process is fundamental to the study of computer science. To effectively use computers to solve problems, students must be competent in reading and writing programs. In addition to programming skills, they must also be able to select and apply appropriate data structures and algorithms, as well as utilize modern development and testing tools. The Software Development Fundamentals (SDF) Knowledge Area integrates basic concepts and skills related to software development, with a focus on the concepts and skills that should be taught in the early stages of a computer science program, typically during the first year.
BK 11	Software Engineering	Software engineering involves the collaborative construction of multi-version programs. In addition to programming proficiency, software engineers must be skilled in communication, teamwork, and adaptability to change. The curriculum should emphasize testing, collaboration, communication, design, maintenance, and the use of software tools. Real-world projects and hands-on experience provide a better understanding than theoretical learning. Communication, teamwork, planning, testing, and tool usage become increasingly important as students transition into the real world, surpassing the relevance of classroom-only learning. Although most computer science graduates will work in industry, core computer science topics are equally valuable for both industry professionals and academic researchers.
BK 12	Security	Computing underpins nearly every aspect of modern critical infrastructure, including transportation, communication, healthcare, education, energy, and more. With the increasing frequency of attacks and breaches on such infrastructure, computer science graduates play a vital role in designing, implementing, and operating robust, secure, and dependable software systems. The Security (SEC) Knowledge Area focuses on embedding security-minded thinking into the ethos of computer science graduates, so that security is an

		integral part of all their professional work. It encompasses system vulnerabilities, threats, privacy, cryptography, secure systems, secure data, and secure code, as well as concepts of assurance and insurance.
BK 13	Society, Ethics, and Professionalism	The ACM Code of Ethics and Professional Conduct states: "Computing professionals' actions change the world. To act responsibly, they must consider the broader impacts of their work, consistently supporting the public welfare." The IEEE Code of Ethics acknowledges "the importance of our technologies in affecting the quality of life throughout the world." The AAAI Code of Professional Ethics and Conduct begins with: "Computing professionals' actions, especially those of artificial intelligence professionals, change the world. To act responsibly, they must consider the broader impacts of their work, consistently supporting the public welfare."
BK 14	Specialized Platform Development	The Specialized Platform Development (SPD) Knowledge Area refers to the creation of software for non-traditional hardware platforms such as robotics systems, mobile devices, web platforms, and embedded systems. Industry demand continues to grow for developers skilled in specialized platforms like mobile applications, web development, robotics, and embedded systems. Key professional competencies include creating consistent user experiences across devices, developing application programming interfaces (APIs), managing resource constraints, and implementing cross-cutting concerns such as optimization and security. A strong understanding of specialized platforms enables developers to create effective solutions tailored to societal and industry needs.
BK 15	Foundations of Science	Foundations of Science refer to the fundamental principles that form the basis for scientific research. These include the scientific method, observation, measurement, experimentation, and data analysis. Science aims to understand the universe through the understanding of natural phenomena and the laws that govern them. Fundamental concepts such as theories, laws, hypotheses, and variables are essential to comprehending science. Learning about atomic structure, energy flow in ecosystems, forces and motion, and the principles of genetics are all part of the foundations of science,

		enabling a deeper understanding of the universe and the world around us.
BK 16	Self Development	Self-development is the process of enhancing an individual's potential through learning and personal growth. It involves improving skills and awareness of one's strengths and weaknesses. Self-development materials cover topics such as time management, effective communication, motivation, stress management, and leadership skills. Through this learning, individuals can increase productivity, achieve goals, build better relationships, and attain personal fulfillment. Self-development plays a vital role in creating balance and success in both personal and professional life.
BK 17	Geospatial	Geospatial material involves the study of data and information related to geographic locations on Earth. It includes mapping, geographic information systems (GIS), satellite image processing, and spatial analysis. Geospatial technologies are applied in various applications such as regional mapping, environmental monitoring, natural resource management, navigation, and urban planning. Through these technologies, we can understand and analyze patterns and trends on the Earth's surface, enabling more appropriate decision-making based on spatial information.
BK 18	Research Methodology	Research methodology is the study of the methods for designing, conducting, and analyzing scientific research. It includes understanding research planning, selecting research methods, data collection, data analysis, and interpreting results. This subject is essential for researchers across various disciplines to ensure the reliability and validity of their studies. Research methodology helps determine the appropriate approach to address research questions, gather relevant data, and accurately interpret findings. It also encompasses research ethics and considerations related to the protection of research subjects.
BK 19	Entrepreneurship	Entrepreneurship is the study of creating, managing, and growing new businesses or initiatives. This subject includes concepts such as business planning, market analysis, marketing strategies, financial management, and product development. Entrepreneurship also involves leadership skills, innovation, and intelligent risk-taking. It is

		essential for individuals who aim to start their businesses or take active roles within existing business environments. Understanding entrepreneurship helps generate new ideas, identify market opportunities, and effectively manage businesses in dynamic and evolving contexts.
BK 20	Fundamentals of Informatics	Fundamentals of Informatics encompass an understanding of core computer science concepts such as data structures, algorithms, and programming. This subject also includes the study of computer architecture, operating systems, computer networks, and databases. It is essential to grasp the foundational principles underlying information technology, as well as the ability to apply these concepts in developing technological solutions. By understanding the fundamentals of informatics, individuals can develop skills in problem-solving, software development, and data management, and gain a deeper insight into how information technology impacts everyday life and various industries.

3.6. Curriculum Structure

Table 3.8 List of Courses

First Semester / Odd Semester									
No	Course Code	Course Name	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	MKWU1002	Civic Education	2	2	0	0	0	W	
2	MKWU1005	Disaster Management and Environment	2	2	0	0	0	W	
3	MKWU1006	Character Building I	0	0	0	0	0	W	
4	SMPA1001	Introduction to Calculus	3	3	0	0	0	W	
5	SMPA1003	Introduction to Physics	2	2	0	0	0	W	
6	SMPA1005	Introduction to Chemistry	2	2	0	0	0	W	
7	SMPA1007	Introduction to Biology	2	2	0	0	0	W	
8	SMPA1009	Introduction to Industrial Revolution	2	2	0	0	0	W	

9	SINF1001	Programming	3	3	0	0	0	W	
10	SINF1003	Practicum of Programming	1	0	1	0	0	W	
11	SINF1005	Practicum of Introduction to Industrial Revolution	1	0	1	0	0	W	
TOTAL			20						

Second Semester / Even Semester									
No	Course Code	Course Name	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	MKWU1001	Pancasila	2	2	0	0	0	W	
2	MKWU1003	Indonesian Language	2	2	0	0	0	W	
3	MKWU1004	English	2	2	0	0	0	W	
4	MKWU1007	Character Building II	0	0	0	0	0	W	
5	SMPA1011	Statistical Methods	2	2	0	0	0	W	
6	SINF1002	Discrete Structures	3	2	0	0	0	W	
7	SINF1004	Data Structures and Algorithms	2	2	0	0	0	W	
8	SINF1006	Practicum of Data Structures and Algorithms	1	0	1	0	0	W	
9	SINF1008	Computer Networks	2	2		0	0	W	
10	SINF1010	Practicum of Computer Networks	1	0	1	0	0	W	
11	SINF1012	Database I	2	2		0	0	W	
12	SINF1014	Practicum of Database I	1	0	1	0	0	W	
TOTAL			20						

Third Semester / Odd Semester									
No	Course Code	Course Name	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	MKWU2001	Religion Education	2	2	0	0	0	W	
2	SINF2007	Logics	2	2	0	0	0	W	
3	SINF2009	Linear Algebra	2	2	0	0	0	W	
4	SINF2011	Numerical Computation	2	2	0	0	0	W	
5	SINF2013	Practicum of Numerical Computation	1	0	1	0	0	W	
6	SINF2015	Object-Oriented Programming	2	2	0	0	0	W	
7	SINF2017	Practicum of Object-Oriented Programming	1	0	1	0	0	W	
8	SINF2019	Database II	2	2	0	0	0	W	SINF1012
9	SINF2021	Practicum of Database II	1	0	1	0	0	W	
10	SINF2023	Operation Systems	2	2	0	0	0	W	
11	SINF2025	Practicum of Operation Systems	1	0	1	0	0	W	
12	SINF2027	Human Computer Interaction	2	2		0	0	W	
13	SINF2029	Practicum of Human Computer Interaction	1	0	1	0	0	W	
TOTAL			21						

Fourth Semester / Even Semester									
No	Course Code	Course Name	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	SINF2016	Ethics for Information Technology	2	2	0	0	0	W	
2	SINF2018	Graph Theory	2	2	0	0	0	W	
3	SINF2020	Software Engineering	2	2	0	0	0	W	

4	SINF2022	Practicum of Software Engineering	1	0	1	0	0	W	
5	SINF2024	Geographical Information System	2	2	0	0	0	W	
6	SINF2026	Practicum of Geographical Information System	1	0	1	0	0	W	
7	SINF2028	Data Communications	2	2	0	0	0	W	
8	SINF2030	Practicum of Data Communications	1	0	1	0	0	W	
9	SINF2032	Web Programming	2	2	0	0	0	W	
10	SINF2034	Practicum of Web Programming	1	0	1	0	0	W	
11	SINF2036	Data Visualization	2	2	0	0	0	W	
12	SINF2038	Practicum of Data Visualization	1	0	1	0	0	W	
TOTAL			19						

Fifth Semester / Odd Semester									
No	Course Code	Course Name	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	SMPA3013	Entrepreneurship	2	2	0	0	0	W	
2	SMPA3015	Practicum of Entrepreneurship	1	0	1	0	0	W	
3	SINF3031	Artificial Intelligence	2	2	0	0	0	W	
4	SINF3033	Practicum of Artificial Intelligence	1	0	1	0	0	W	
5	SINF3035	Data Mining	2	2	0	0	0	W	
6	SINF3037	Practicum of Data Mining	1	0	1	0	0	W	
7	SINF3039	Automata and Language Theory	2	2	0	0	0	W	
8	SINF3041	Practicum of Automate and Language Theory	1	0	1	0	0	W	

9		Elective Courses	9					P	
TOTAL			21						

Sixth Semester / Even Semester									
No	Course Code	Course Name	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	SINF3040	Information System	2	2	0	0	0	W	
2	SINF3042	Research Methodologies	2	2	0	0	0	W	
3	SINF3044	Mobile Programming	2	2	0	0	0	W	
4	SINF3046	Practicum of Mobile Programming	1	0	1	0	0	W	
5	SINF3048	Business Communication and Interpersonal Skill	2	2	0	0		W	
6		Elective Courses	9					P	
TOTAL			18						

Seventh Semester / Odd Semester									
No	Course Code	Course Name	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	MKWUP001	Community Services Program	2	0	0	2	0	W	
2	SMPAP001	Internship	3	0	0	3	0	W	
4	SINF4043	Seminar	2	2	0	0	0	W	
5		Elective Courses	12					P	
TOTAL			19						

Eighth Semester / Even Semester									
No	Course Code	Course Name	SKS	Substance				Course Category	Prerequisite
				K	P	PL	S		
1	SMPAP002	Research Proposal	2	0	0	2	0	W	
2	SMPAPA01	Final Project	4	0	0	4	0	W	
TOTAL			6						
TOTAL SKS			144						

List of Elective Courses										
No	Course Code	Course Name	SKS	Substance				Course Category	Expertise / Area of Interest	
				K	P	PL	S			
Odd Semester										
1	SINF6045	Information Retrieval	2	2	0	0	0		Database and Data Mining	
2	SINF6047	Practicum of Information Retrieval	1	0	1	0	0		Database and Data Mining	
3	SINF6049	Computer Vision	2	2	0	0	0		Database and Data Mining	
4	SINF6051	Practicum of Computer Vision	1	0	1	0	0		Database and Data Mining	
5	SINF6053	Bioinformatics	2	2	0	0	0		Database and Data Mining	
6	SINF6055	Practicum of Bioinformatics	1	0	1	0	0		Database and Data Mining	
7	SINF6057	Image Processing	2	2	0	0	0		Geospatial	
8	SINF6059	Practicum of Image Processing	1	0	1	0	0		Geospatial	
9	SINF6061	Advanced Geographical Information System	2	2	0	0	0	SINF2024	Geospatial	

10	SINF6063	Practicum of Advanced Geographical Information System	1	0	1	0	0		Geospatial
11	SINF6065	Survey and Mapping Management	2			0	0		Geospatial
12	SINF6067	Practicum of Survey and Mapping Management	1	0	1	0	0		Geospatial
13	SINF6069	Cyber Security	2	2	0	0	0		Computer Networks and Cybersecurity
14	SINF6071	Practicum of Cyber Security	1	0	1	0	0		Computer Networks and Cybersecurity
15	SINF6073	Advanced Network Protocol	2	2	0	0	0	SINF1008	Computer Networks and Cybersecurity
16	SINF6075	Practicum of Advanced Network Protocol	1	0	1	0	0		Computer Networks and Cybersecurity
17	SINF6077	Software Development and Operations	2	2	0	0	0		Software
18	SINF6079	Practicum of Software Development and Operations	1	0	1	0	0		Software
19	SINF6081	Software Architecture	2	2	0	0	0		Software
20	SINF6083	Practicum of Software Architecture	1	0	1	0	0		Software
21	SINF6085	Big Data and Data Analytics	2	2	0	0	0		
22	SINF6087	Practicum of Big Data and Data Analytics	1	0	1	0	0		
23	SINF6089	Cloud Computing	2	2	0	0	0		
24	SINF6091	Practicum of Cloud Computing	1	0	1	0	0		
25	SINF6093	Informatics Research	11	0	0	11	0		
26	SMPA6001	Entrepreneurial Practice	17	0	0	17	0		
27	SMPA6003	Industrial Internship A	17	0	0	17	0		

28	SMPA6005	Village Project A	18	0	0	18	0		
29	SMPA6007	Science Teaching Practice A	18	0	0	18	0		
Even Semester									
1	SINF6050	Machine Learning	2	2	0	0	0		Database and Data Mining
2	SINF6052	Practicum of Machine Learning	1	0	1	0	0		Database and Data Mining
3	SINF6054	Natural Language Processing	2	2	0	0	0		Database and Data Mining
4	SINF6056	Natural Language Processing Practicum	1	0	1	0	0		Database and Data Mining
5	SINF6058	Cartography	2	2	0	0	0		Geospatial
6	SINF6060	Practicum of Cartography	1	0	1	0	0		Geospatial
7	SINF6062	Remote Sensing	2	2	0	0	0		Geospatial
8	SINF6064	Practicum of Remote Sensing	1	0	1	0	0		Geospatial
9	SINF6066	Network Reliability	2	2	0	0	0		Computer Networks and Cybersecurity
10	SINF6068	Network Reliability	1	0	1	0	0		Computer Networks and Cybersecurity
11	SINF6070	Wireless Networks	2	2	0	0	0		Computer Networks and Cybersecurity
12	SINF6072	Practicum of Wireless Networks	1	0	1	0	0		Computer Networks and Cybersecurity
13	SINF6074	Optical Network Communication System	2	2	0	0	0		Computer Networks and Cybersecurity
14	SINF6076	Practicum of Optical Network Communication System	1	0	1	0	0		Computer Networks and Cybersecurity
15	SINF6078	Software Project	2	2	0	0	0		Software

16	SINF6080	Practicum of Software Project	1	0	1	0	0		Software
17	SINF6082	Component Based-Software Engineering	2	2	0	0	0		Software
18	SINF6084	Practicum of Component-Based Software Engineering	1	0	1	0	0		Software
19	SINF6086	Software Quality	2	2	0	0	0		Software
20	SINF6088	Practicum of Software Quality	1	0	1	0	0		Software
21	SINF6090	Data Security and Cryptography	2	2	0	0	0		
22	SINF6092	Practicum of Data Security and Cryptography	1	0	1	0	0		
23	SINF6094	Game Development	2	2	0	0	0		
24	SINF6096	Practicum of Game Development	1	0	1	0	0		
25	SINF6098	Digital Marketing and Product Visualization	2	2	0	0	0		
26	SINF6100	Entrepreneur Finance Management	2	2	0	0	0		
27	SMPA6004	Internship B	11	0	0	11	0		
28	SMPA6006	Village Project B	12	0	0	12	0		
29	SMPA6008	Science Teaching Practice B	12	0	0	12	0		

Substance Categories :

K = Lecture

P = Practicum

PL = Field Practice

S = Simulation

Course Categories :

W = Compulsory Course

P = Elective Course

3.7. Summary of Curriculum Structure

Table 3.9 General Information

General Information	Total SKS
Minimum number of credits required for graduation	144
Number of elective courses required to be taken	15
Total number of elective courses offered	89
Number of General Compulsory Course (MKWU) Components	14
Number of Skill Based Course Components	30
Number of Foundational Scientific Course Components	32
Number of Foundational Scientific / Specialized Expertise Course Components	51
Number of curricular/extracurricular activities promoting innovation, entrepreneurship, and IT skills	0
Course components aligned with the SDGs vision	29

Table 3.10 Characteristics of Elective Courses

No	Code	Course Name	SKS	Characteristic								
				A	B	C	D	E	F	G	T	P
1	SINF6045	Information Retrieval	2	✓				✓	✓			
2	SINF6047	Practicum of Information Retrieval	1		✓	✓			✓			✓
3	SINF6049	Computer Vision	2	✓				✓	✓			
4	SINF6051	Practicum of Computer Vision	1		✓	✓			✓			✓
5	SINF6053	Bioinformatics	2	✓				✓	✓			
6	SINF6055	Practicum of Bioinformatics	1		✓	✓			✓			✓
7	SINF6057	Image Processing	2	✓				✓	✓			
8	SINF6059	Practicum of Image Processing	1		✓	✓			✓			✓
9	SINF6061	Advanced Geographical Information System	2	✓				✓	✓			
10	SINF6063	Practicum of Advanced Geographical Information System	1		✓	✓			✓			✓
11	SINF6065	Survey and Mapping Management	2	✓	✓	✓		✓	✓			

12	SINF6067	Practicum of Survey and Mapping Management	1		✓	✓			✓			✓
13	SINF6069	Cyber Security	2	✓	✓	✓		✓	✓			
14	SINF6071	Practicum of Cyber Security	1		✓	✓			✓			✓
15	SINF6073	Advanced Network Protocol	2	✓	✓	✓			✓			
16	SINF6075	Practicum of Advanced Network Protocol	1		✓	✓			✓			✓
17	SINF6077	Software Development and Operations	2	✓		✓			✓		✓	
18	SINF6079	Practicum of Software Development and Operations	1	✓		✓			✓			✓
19	SINF6081	Software Architecture	2	✓		✓			✓		✓	
20	SINF6083	Practicum of Software Architecture	1	✓		✓			✓			✓
21	SINF6085	Big Data and Data Analytics	2	✓				✓	✓			
22	SINF6087	Practicum of Big Data and Data Analytics	1		✓	✓			✓			✓
23	SINF6089	Cloud Computing	2	✓				✓	✓			
24	SINF6091	Practicum of Cloud Computing	1		✓	✓			✓			✓
25	SINF6093	Informatics Research	11	✓	✓	✓			✓			
26	SINF6050	Machine Learning	2	✓	✓	✓			✓			
27	SINF6052	Practicum of Machine Learning	1		✓	✓			✓			✓
28	SINF6054	Natural Language Processing	2	✓	✓	✓			✓			
29	SINF6056	Natural Language Processing Practicum	1		✓	✓			✓			✓
30	SINF6058	Cartography	2	✓				✓	✓			
31	SINF6060	Practicum of Cartography	1		✓	✓			✓			✓
32	SINF6062	Remote Sensing	2	✓				✓	✓			
33	SINF6064	Practicum of Remote Sensing	1		✓	✓			✓			✓
34	SINF6066	Network Reliability	2	✓	✓	✓		✓	✓			
35	SINF6068	Network Reliability	1		✓	✓			✓			✓
36	SINF6070	Wireless Networks	2	✓	✓	✓		✓	✓			

37	SINF6072	Practicum of Wireless Networks	1		✓	✓			✓			✓
38	SINF6074	Optical Network Communication System	2	✓	✓	✓		✓	✓			
39	SINF6076	Practicum of Optical Network Communication System	1		✓	✓			✓			✓
40	SINF6078	Software Project	2	✓	✓	✓			✓			
41	SINF6080	Practicum of Software Project	1		✓	✓			✓			✓
42	SINF6082	Component Based-Software Engineering	2	✓	✓	✓			✓			
43	SINF6084	Practicum of Component-Based Software Engineering	1		✓	✓			✓			✓
44	SINF6086	Software Quality	2	✓	✓	✓			✓			
45	SINF6088	Practicum of Software Quality	1		✓	✓			✓			✓
46	SINF6090	Data Security and Cryptography	2	✓	✓	✓		✓	✓			
47	SINF6092	Practicum of Data Security and Cryptography	1		✓	✓			✓			✓
48	SINF6094	Game Development	2	✓	✓	✓		✓	✓			
49	SINF6096	Practicum of Game Development	1		✓	✓			✓			✓
50	SINF6098	Digital Marketing and Product Visualization	2	✓	✓	✓	✓	✓	✓			✓
51	SINF6100	Entrepreneur Finance Management	2	✓	✓	✓	✓	✓	✓			✓

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

Course Code	Course	SKS	Category (Elective / Cumpolsory) Course	SDG	Label			
					RBL	PjBL	Case Method	MBKM
MKWU1002	Civic Education	2	Cumpolsory Course	4				
MKWU1005	Disaster Management and Environment	2	Cumpolsory Course	4				
MKWU1006	Character Building I	0	Cumpolsory Course	4				
SMPA1001	Introduction to Calculus	3	Cumpolsory Course	4				
SMPA1003	Introduction to Physics	2	Cumpolsory Course	4				
SMPA1005	Introduction to Chemistry	2	Cumpolsory Course	4				
SMPA1007	Introduction to Biology	2	Cumpolsory Course	4				
SMPA1009	Introduction to Industrial Revolution	2	Cumpolsory Course	4				
SINF1001	Programming	3	Cumpolsory Course	4				
SINF1003	Practicum of Programming	1	Cumpolsory Course	4				
SINF1005	Practicum of Introduction to Industrial Revolution	1	Cumpolsory Course	4				
MKWU1001	Pancasila	2	Cumpolsory Course	4				
MKWU1003	Indonesian Language	2	Cumpolsory Course	4				
MKWU1004	English	2	Cumpolsory Course	4				
MKWU1007	Character Building II	0	Cumpolsory Course	4				
SMPA1011	Statistical Methods	2	Cumpolsory Course	4				
SINF1002	Discrete Structures	3	Cumpolsory Course	4				
SINF1004	Data Structures and Algorithms	2	Cumpolsory Course	4				

SINF1006	Practicum of Data Structures and Algorithms	1	Cumpolsory Course	4				
SINF1008	Computer Networks	2	Cumpolsory Course	4				
SINF1010	Practicum of Computer Networks	1	Cumpolsory Course	4				
SINF1012	Database I	2	Cumpolsory Course	4				
SINF1014	Practicum of Database I	1	Cumpolsory Course	4				
MKWU2001	Religion Education	2	Cumpolsory Course	4				
SINF2007	Logics	2	Cumpolsory Course	4				
SINF2009	Linear Algebra	2	Cumpolsory Course	4				
SINF2011	Numerical Computation	2	Cumpolsory Course	4				
SINF2013	Practicum of Numerical Computation	1	Cumpolsory Course	4				
SINF2015	Object-Oriented Programming	2	Cumpolsory Course	4		√		
SINF2017	Practicum of Object-Oriented Programming	1	Cumpolsory Course	4			√	
SINF2019	Database II	2	Cumpolsory Course	4				
SINF2021	Practicum of Database II	1	Cumpolsory Course	4				
SINF2023	Operation Systems	2	Cumpolsory Course	4				
SINF2025	Practicum of Operation Systems	1	Cumpolsory Course	4				
SINF2027	Human Computer Interaction	2	Cumpolsory Course	4				
SINF2029	Practicum of Human Computer Interaction	1	Cumpolsory Course	4				
SINF2016	Practicum of Human Computer Interaction	2	Cumpolsory Course	4				
SINF2018	Graph Theory	2	Cumpolsory Course	4				

SINF2020	Software Engineering	2	Cumpolsory Course	4		√		
SINF2022	Practicum of Software Engineering	1	Cumpolsory Course	4		√		
SINF2024	Geographical Information System	2	Cumpolsory Course	4				
SINF2026	Practicum of Geographical Information System	1	Cumpolsory Course	4				
SINF2028	Data Communications	2	Cumpolsory Course	4				
SINF2030	Practicum of Data Communications	1	Cumpolsory Course	4				
SINF2032	Web Programming	2	Cumpolsory Course	4		√		
SINF2034	Practicum of Web Programming	1	Cumpolsory Course	4		√		
SINF2036	Data Visualization	2	Cumpolsory Course	4		√		
SINF2038	Practicum of Data Visualization	1	Cumpolsory Course	4			√	
SMPA3013	Entreneurship	2	Cumpolsory Course	4		√		
SMPA3015	Practicum of Entrepreneurship	1	Cumpolsory Course	4		√		
SINF3031	Artificial Intelligence	2	Cumpolsory Course	4		√		
SINF3033	Practicum of Artificial Intelligence	1	Cumpolsory Course	4		√		
SINF3035	Data Mining	2	Cumpolsory Course	4				
SINF3037	Practicum of Data Mining	1	Cumpolsory Course	4				
SINF3039	Automata and Language Theory	1	Cumpolsory Course	4				
SINF3041	Practicum of Automate and Language Theory	1	Cumpolsory Course	4				
SINF3040	Information System	2	Cumpolsory Course	4		√		
SINF3042	Research Methodologies	2	Cumpolsory Course	4	√		√	

SINF3044	Mobile Programming	2	Cumpolsory Course	4		√		
SINF3046	Practicum of Mobile Programming	1	Cumpolsory Course	4		√		
SINF3048	Business Communication and Interpersonal Skill	2	Cumpolsory Course	4			√	
MKWUP001	Community Services Program	2	Cumpolsory Course	4		√		
SMPAP002	Research Proposal	2	Cumpolsory Course	4	√	√		
SINF4043	Seminar	2	Cumpolsory Course	4	√			
SMPAP001	Internship	3	Cumpolsory Course	4		√		
SMPAPA01	Final Project	4	Cumpolsory Course	4		√		
SINF6045	Information Retrieval	2	Elective Course	4				
SINF6047	Practicum of Information Retrieval	1	Elective Course	4				
SINF6049	Computer Vision	2	Elective Course	4		√		
SINF6051	Practicum of Computer Vision	1	Elective Course	4			√	
SINF6053	Bioinformatics	2	Elective Course	4				
SINF6055	Practicum of Bioinformatics	1	Elective Course	4				
SINF6057	Image Processing	2	Elective Course	4		√		
SINF6059	Practicum of Image Processing	1	Elective Course	4		√		
SINF6061	Advanced Geographical Information System	2	Elective Course	4		√		
SINF6063	Practicum of Advanced Geographical Information System	1	Elective Course	4		√		
SINF6065	Survey and Mapping Management	2	Elective Course	4				
SINF6067	Practicum of Survey and Mapping Management	1	Elective Course	4				

SINF6069	Cyber Security	2	Elective Course	4				
SINF6071	Practicum of Cyber Security	1	Elective Course	4				
SINF6073	Advanced Network Protocol	2	Elective Course	4				
SINF6075	Practicum of Advanced Network Protocol	1	Elective Course	4				
SINF6077	Software Development and Operations	2	Elective Course	4				
SINF6079	Practicum of Software Development and Operations	1	Elective Course	4		√		
SINF6081	Software Architecture	2	Elective Course	4		√		
SINF6083	Practicum of Software Architecture	1	Elective Course	4		√		
SINF6085	Big Data and Data Analytics	2	Elective Course	4		√		
SINF6087	Practicum of Big Data and Data Analytics	1	Elective Course	4			√	
SINF6089	Cloud Computing	2	Elective Course	4			√	
SINF6091	Practicum of Cloud Computing	1	Elective Course	4			√	
SINF6093	Informatics Research	11	Elective Course	4	√			
SINF6050	Machine Learning	2	Elective Course	4		√		
SINF6052	Practicum of Machine Learning	1	Elective Course	4		√		
SINF6054	Natural Language Processing	2	Elective Course	4		√		
SINF6056	Natural Language Processing Practicum	1	Elective Course	4		√		
SINF6058	Cartography	2	Elective Course	4		√		
SINF6060	Practicum of Cartography	1	Elective Course	4		√		
SINF6062	Remote Sensing	2	Elective Course	4				

SINF6064	Practicum of Remote Sensing	1	Elective Course	4				
SINF6066	Network Reliability	2	Elective Course	4				
SINF6068	Practicum of Network Reliability	1	Elective Course	4				
SINF6070	Wireless Networks	2	Elective Course	4				
SINF6072	Practicum of Wireless Networks	1	Elective Course	4				
SINF6074	Optical Network Communication System	2	Elective Course	4				
SINF6076	Practicum of Optical Network Communication System	1	Elective Course	4				
SINF6078	Software Project	2	Elective Course	4		√		
SINF6080	Practicum of Software Project	1	Elective Course	4		√		
SINF6082	Component Based-Software Engineering	2	Elective Course	4				
SINF6084	Practicum of Component-Based Software Engineering	1	Elective Course	4				
SINF6086	Software Quality	2	Elective Course	4			√	
SINF6088	Practicum of Software Quality	1	Elective Course	4			√	
SINF6090	Data Security and Cryptography	2	Elective Course	4				
SINF6092	Practicum of Data Security and Cryptography	1	Elective Course	4				
SINF6094	Game Development	2	Elective Course	4		√		
SINF6096	Practicum of Game Development	1	Elective Course	4		√		
SINF6098	Digital Marketing and Product Visualization	2	Elective Course	4				
SINF6100	Entrepreneur Finance Management	2	Elective Course	4				

SDGs = Sustainable Development Goals (SDGs) are a universal agenda agreed upon by 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

CM = 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

Table 3.12 List of Course Equivalencies

2021 Curriculum					2024 Curriculum			
No	Code	Course Name	SKS	Semester	Code	Course Name	SKS	Semester
1	MKS 101	Indonesian Language	2	2	MKWU1003	Indonesian Language	2	2
2	MKS104	ISBD	2	2	MKWU1001	Pancasila	2	2
3	MKS103	PPKn	2	1	MKWU1002	Civic Education	2	1
4	MKS 106	PKL	2	1	MKWU1005	Disaster Management and Environment	2	1
5	MKS105	Religion Education	2	3	MKWU2001	Religion Education	2	3
6	MKS107	Character Building I	0	1	MKWU1006	Character Building I	0	1
7	MKS202	Character Building II	0	2	MKWU1007	Character Building II	0	2
8	MKS201	English	2	2	MKWU1004	English	2	2
9	MPA101	Introduction to Calculus	3	1	SMPA1001	Introduction to Calculus	3	1
10	MPA103	Introduction to Physics	3	1	SMPA1003	Introduction to Physics	2	1
					SINF6095	Practicum of Introduction to Physics ***	1	1
11	MPA105	Introduction to Chemistry	3	1	SMPA1005	Introduction to Chemistry	2	1

					SINF6097	Practicum of Introduction to Chemistry ***	1	1
12	MPA107	Introduction to Biology	3	1	SMPA1007	Introduction to Biology	2	1
					SINF6099	Practicum of Introduction to Biology ***	2	1
13	MPAP01	Introduction to ICT	2	1	SMPA1009	Introduction to Industrial Revolution	2	1
14	MPAP02	Introduction to Statistics	3	2	SMPA1011	Statistical Methods	2	2
					SINF6101	Practicum of Statistical Methods ***	1	2
15	MPAP03	Entrepreneurship	2	3	SMPA3013	Entrepreneurship	2	5
					SMPA3015	Practicum of Entrepreneurship	1	5
16	MPA01	Introduction to ICT	2	1	SINF1005	Practicum of Introduction to Industrial Revolution	1	1
17	INF108	Programming	4	2	SINF1001	Programming	3	1
					SINF1003	Practicum of Programming	1	1
18	INF110	Discrete Structures	3	2	SINF1002	Discrete Structures	3	2
19	INF218	Data Structures and Algorithms	3	4	SINF1004	Data Structures and Algorithms	2	2
					SINF1006	Practicum of Data Structures and Algorithms	1	2
20	INF112	Computer Networks	3	2	SINF1008	Computer Networks	2	2
					SINF1010	Practicum of Computer Networks	1	2
21	INF114	Database	3	2	SINF1012	Database I	2	2
					SINF1014	Practicum of Database I	1	2
22	INF215	Logics	2	3	SINF2007	Logics	2	3
23	INF223	Linear Algebra	2	3	SINF2009	Linear Algebra	2	3
24	INF227	Numerical Computation	3	3	SINF2011	Numerical Computation	2	3
					SINF2013	Practicum of Numerical Computation	1	3

25	INF213	Object-Oriented Programming	3	3	SINF2015	Object-Oriented Programming	2	3
					SINF2017	Practicum of Object-Oriented Programming	1	3
26	INF219	Advanced Database	3	3	SINF2019	Database II	2	3
					SINF2021	Practicum of Database II	1	3
27	INF221	Operation Systems	3	3	SINF2023	Operation Systems	2	3
					SINF2025	Practicum of Operation Systems	1	3
28	INF312	Human Computer Interaction	3	6	SINF2027	Human Computer Interaction	2	3
					SINF2029	Practicum of Human Computer Interaction	1	3
29	INF228	Ethics for Information Technology	2	4	SINF2016	Ethics for Information Technology	2	4
30	INF216	Graph Theory	2	4	SINF2018	Graph Theory	2	4
31	INF206	Software Engineering	3	4	SINF2020	Software Engineering	2	4
					SINF2022	Practicum of Software Engineering	1	4
32	INF210	Geographical Information System	3	4	SINF2024	Geographical Information System	2	4
					SINF2026	Practicum of Geographical Information System	1	4
33	INF220	Data Communications	3	4	SINF2028	Data Communications	2	4
					SINF2030	Practicum of Data Communications	1	4
34	INF224	Web Programming	3	4	SINF2032	Web Programming	2	4
					SINF2034	Practicum of Web Programming	1	4
35	INF314	Data Visualization	3	6	SINF2036	Data Visualization	2	4
					SINF2038	Practicum of Data Visualization	1	4
36	INF311	Artificial Intelligence	3	5	SINF3031	Artificial Intelligence	2	5
					SINF3033	Practicum of Artificial Intelligence	1	5
37	INF305	Data Mining	3	5	SINF3035	Data Mining	2	5

					SINF3037	Practicum of Data Mining	1	5
38	INF307	Teori Bahasa dan Automata	3	5	SINF3039	Automata and Language Theory	2	5
					SINF3041	Practicum of Automate and Language Theory	1	5
39	INF309	Information System	2	5	SINF3040	Information System	2	6
40	INF310	Research Methodologies	2	6	SINF3042	Research Methodologies	2	6
41	INF308	Mobile Programming	3	6	SINF3044	Mobile Programming	2	6
					SINF3046	Practicum of Mobile Programming	1	6
42	INF310	Research Methodologies	2	6	SINF3048	Business Communication and Interpersonal Skill	2	6
43	MKSP02	Community Services Program	2	7	MKWUP001	Community Services Program	2	7
44	MPAPA1	Research Proposal	2	7	SMPAP002	Research Proposal	2	7
45	INF403	Seminar	2	7	SINF4043	Seminar	2	7
46	MPAP04	Internship	3	8	SMPAP001	Internship	3	8
47	MPAPA2	Final Project	4	8	SMPAPA01	Final Project	4	8
48	INF501	Information Retrieval	3	Elective Course (Odd Semester)	SINF6045	Information Retrieval	2	Elective Course (Odd Semester)
					SINF6047	Practicum of Information Retrieval	1	Elective Course (Odd Semester)
49	INF535	Computer Vision	3	Elective Course (Odd Semester)	SINF6049	Computer Vision	2	Elective Course (Odd Semester)
					SINF6051	Practicum of Computer Vision	1	Elective Course (Odd Semester)
50	INF505	Bioinformatics	3	Elective Course (Odd Semester)	SINF6053	Bioinformatics	2	Elective Course (Odd Semester)

					SINF6055	Practicum of Bioinformatics	1	Elective Course (Odd Semester)
51	INF509	Image Processing	3	Elective Course (Odd Semester)	SINF6057	Image Processing	2	Elective Course (Odd Semester)
					SINF6059	Practicum of Image Processing	1	Elective Course (Odd Semester)
52	INF521	Advanced Geographical Information System	3	Elective Course (Odd Semester)	SINF6061	Advanced Geographical Information System	2	Elective Course (Odd Semester)
					SINF6063	Practicum of Advanced Geographical Information System	1	Elective Course (Odd Semester)
53	INF523	Survey and Mapping Management	3	Elective Course (Odd Semester)	SINF6065	Survey and Mapping Management	2	Elective Course (Odd Semester)
					SINF6067	Practicum of Survey and Mapping Management	1	Elective Course (Odd Semester)
54	INF511	Network Security	3	Elective Course (Odd Semester)	SINF6069	Cyber Security	2	Elective Course (Odd Semester)
					SINF6071	Practicum of Cyber Security	1	Elective Course (Odd Semester)
55	INF537	Distributed Systems	3	Elective Course (Odd Semester)	SINF6073	Advanced Network Protocol	2	Elective Course (Odd Semester)
					SINF6075	Practicum of Advanced Network Protocol	1	Elective Course (Odd Semester)
56	INF525	Software Requirements Engineering	3	Elective Course (Odd Semester)	SINF6077	Software Development and Operations	2	Elective Course (Odd Semester)
					SINF6079	Practicum of Software	1	Elective Course

						Development and Operations		(Odd Semester)
57	INF527	Software Architecture	3	Elective Course (Odd Semester)	SINF6081	Software Architecture	2	Elective Course (Odd Semester)
					SINF6083	Practicum of Software Architecture	1	Elective Course (Odd Semester)
58	INF529	Big Data	3	Elective Course (Odd Semester)	SINF6085	Big Data and Data Analytics	2	Elective Course (Odd Semester)
					SINF6087	Practicum of Big Data and Data Analytics	1	Elective Course (Odd Semester)
59	INF531	Cloud Computing	3	Elective Course (Odd Semester)	SINF6089	Cloud Computing	2	Elective Course (Odd Semester)
					SINF6091	Practicum of Cloud Computing	1	Elective Course (Odd Semester)
60	MPAP06	Scientific Publication	11		SINF6093	Informatics Research	11	
61	INF540	Machine Learning	3	Elective Course (Even Semester)	SINF6050	Machine Learning	2	Elective Course (Even Semester)
					SINF6052	Practicum of Machine Learning	1	Elective Course (Even Semester)
62	INF504	Text and Web Mining	3	Elective Course (Even Semester)	SINF6054	Natural Language Processing	2	Elective Course (Even Semester)
					SINF6056	Natural Language Processing Practicum	1	Elective Course (Even Semester)
63	INF506	Cartography	3	Elective Course (Even Semester)	SINF6058	Cartography	2	Elective Course (Even Semester)

					SINF6060	Practicum of Cartography	1	Elective Course (Even Semester)
64	INF524	Remote Sensing	3	Elective Course (Even Semester)	SINF6062	Remote Sensing	2	Elective Course (Even Semester)
					SINF6064	Practicum of Remote Sensing	1	Elective Course (Even Semester)
65	INF542	Network Security Strategies	3	Elective Course (Even Semester)	SINF6066	Network Reliability	2	Elective Course (Even Semester)
					SINF6068	Practicum of Network Reliability	1	Elective Course (Even Semester)
66	INF534	Wireless Networks	3	Elective Course (Even Semester)	SINF6070	Wireless Networks	2	Elective Course (Even Semester)
					SINF6072	Practicum of Wireless Networks	1	Elective Course (Even Semester)
67	INF514	Data Security and Cryptography	3	Elective Course (Even Semester)	SINF6074	Optical Network Communication System	2	Elective Course (Even Semester)
					SINF6076	Practicum of Optical Network Communication System	1	Elective Course (Even Semester)
68	INF514	Data Security and Cryptography	3	Elective Course (Even Semester)	SINF6090	Data Security and Cryptography	2	Elective Course (Even Semester)
					SINF6092	Practicum of Data Security and Cryptography	1	Elective Course (Even Semester)
69	INF518	Software Project	3	Elective Course (Even Semester)	SINF6078	Software Project	2	Elective Course (Even Semester)

					SINF6080	Practicum of Software Project	1	Elective Course (Even Semester)
70	INF526	Component Based-Software Engineering	3	Elective Course (Even Semester)	SINF6082	Component Based-Software Engineering	2	Elective Course (Even Semester)
					SINF6084	Practicum of Component-Based Software Engineering	1	Elective Course (Even Semester)
71	INF528	Software Quality	3	Elective Course (Even Semester)	SINF6086	Software Quality	2	Elective Course (Even Semester)
					SINF6088	Practicum of Software Quality	1	Elective Course (Even Semester)
72	MPAP13	Science Teaching Practice A	18		SMPA6007	Science Teaching Practice A	18	
73	MPAP11	Village Project B	12		SMPA6006	Village Project B	12	
74	MPAP07	Industrial Internship A	17		SMPA6003	Industrial Internship A	17	
75	MPAP05	Entrepreneurial Practice	17		SMPA6001	Entrepreneurial Practice	17	
76	MPAP10	Village Project A	18		SMPA6005	Village Project A	18	
77	MPAP14	Science Teaching Practice B	12		SMPA6008	Science Teaching Practice B	12	
78	MPAP08	Industrial Internship B	11		SMPA6004	Industrial Internship B	11	

***For equivalency purposes only. Course discontinued.

3.8.2. List of Recognized Courses under the MBKM Program

In addition to the Shared Courses, the Faculty of Mathematics and Natural Sciences provides elective courses to accommodate the MBKM Program. These elective courses may be used for the conversion of each relevant MBKM activity and undertaken by students for a whole semester (20 SKS) or less than a semester (minimum of 10 SKS). The list of MBKM elective courses is provided in Table 3.12.

Tabel 3.13 Daftar Rekognisi Mata Kuliah MBKM

MBKM Program	Recognized Compulsory Course			Additional Elective Course Offered			Notes
	Course Name	Code	SKS	Course Name	Code	SKS	
Student Exchange							Conversion of Courses with Corresponding CLOs in the Study Program Curriculum
Entrepreneurship	Entrepreneurship	SMPA3013	2 (2 - 0)	Entrepreneurial Practice	SMPA6001	17 (0 - 17)	Duration: 6 Months
	Practicum of Entrepreneurship	SMPA3015	1 (0-1)				
Research	Research Proposal	SMPAP002	2 (0 - 2)	Scientific Publication	SMPAP004	11 (0 - 11)	The research must be conducted outside of USK with a minimum duration of one semester. The Scientific Publication course will not be recognized if there is no output produced.
	Final Project	SMPAPA01	4 (0 - 4)				
	Internship	SMPAP001	3 (0 - 3)				
Internship/Industrial Practice	Internship	SMPAP001	3 (0 - 3)	Industrial Internship A	SMPA6003	17 (0 - 17)	Duration: 5-6 Months

				Industrial Internship B	SMPA6004	11 (0 - 11)	Duration: 3-4 Months
Village Project	Community Service Program	MKWUP001	2 (0 - 2)	Village Project A	SMPA6005	18 (0 - 18)	Duration: 5-6 Months
				Village Project B	SMPA6006	12 (0 - 12)	Duration: 3-4 Months
Teaching in Schools	Community Service Program	MKWUP001	2 (0 - 2)	Science Teaching Practice A	SMPA6007	18 (0 - 18)	Duration: 5-6 Months
				Science Teaching Practice B	SMPA6008	12 (0 - 12)	Duration: 3-4 Months
Humanitarian Project							To be offered in the following semester
Independent Study/Project							Conversion of Courses with Corresponding CLOs in the Study Program Curriculum and Can Be Combined with Elective MBKM Courses

The Bachelor of Informatics Study Program offers several University-recognized courses as options for converting relevant MBKM courses.

MKRU	Course Name	SKS
MKRU1001	Communication and Group Collaboration	2
MKRU1002	Creative, Critical and Innovative Thinking	2
MKRU1004	Talent Development	2
MKRU1007	Community Development	2
MKRU1005	Event and Project Management	3

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

<https://singkat.usk.ac.id/g/y1DnIjjjB3>

3.10. Example of Lecture Contract for the Study Program

<https://singkat.usk.ac.id/g/7bK8ZPuGLU>

CHAPTER IV

PROGRAM LEARNING EVALUATION DESIGN

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

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

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

*The coding of CPL and Graduate Profile (PL) is determined by each respective study program.

Explanation: L = Low (0–40); M = Medium (41–70); H = High (71–100)

To track graduate competencies, the following matrix showing the relationship between SKL (based on SNDIKTI/KKNI) and CPL can be used.

Table 4.2. Matrix of the Relationship Between ILO (SNDikti/KKNI) and SKL Components (Attitude, Knowledge, General Skills, Specific Skills)

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 (CLOs).

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

Courses and Intended Learning Outcomes are closely related within the context of higher education. Intended Learning Outcomes (ILOs) represent the expected final achievements of a specific educational program. They encompass the skills, knowledge, and attitudes that a graduate is expected to possess upon completing their study program.

Each course included in the study program is designed to contribute to the attainment of the Intended Learning Outcomes. The following courses are aligned with the Intended Learning Outcomes:

Table 4.3. Weight Calculation Matrix of Intended Learning Outcomes (ILOs) in the Informatics Study Program at USK

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
1	1	MKWU1002	Civic Education	2	2	0	0	0	0	2
2	1	MKWU1005	Disaster Management and Environment	2	0	0	0	0	2	2
3	1	MKWU1006	<i>Character Building I</i>	0	0	0	0	0	0	0
4	1	SMPA1001	Introduction to Calculus	3	0	0	0	0	3	3
5	1	SMPA1003	Introduction to Physics	2	0	0	0	0	2	2
6	1	SMPA1005	Introduction to Chemistry	2	0	0	0	0	2	2
7	1	SMPA1007	Introduction to Biology	2	0	0	0	0	2	2
8	1	SMPA1009	Introduction to Industrial Revolution	2	0	0	0	0	2	2
9	1	SINF1001	Programming	3	0	1,35	0,9	0,75	0	3
10	1	SINF1003	Practicum of Programming	1	0	0,45	0,3	0,25	0	1
11	1	SINF1005	Practicum of Introduction to Industrial Revolution	1	0	0,5	0	0,5	0	1
12	2	MKWU1001	Pancasila	2	1	0	0	0	1	2
13	2	MKWU1003	Indonesian Language	2	1	0	0	0	1	2
14	2	MKWU1004	English	2	1	0	0	0	1	2
15	2	MKWU1007	<i>Character Building II</i>	0	0	0	0	0	0	0
16	2	SMPA1011	Statistical Methods	2	0	0	0	1	1	2

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
17	2	SINF1002	Discrete Structures	3	0,3	1,5	0,6	0,3	0,3	3
18	2	SINF1004	Data Structures and Algorithms	2	0	0,8	0,6	0,6	0	2
19	2	SINF1006	Practicum of Data Structures and Algorithms	1	0	0,1	0,5	0,4	0	1
20	2	SINF1008	Computer Networks	2	0	0,6	0	1,2	0,2	2
21	2	SINF1010	Practicum of Computer Networks	1	0	0,3	0	0,7	0	1
22	2	SINF1012	Database I	2	0	0,8	0	1	0,2	2
23	2	SINF1014	Practicum of Database I	1	0	0	0	0,7	0,3	1
24	3	MKWU2001	Religion Education	2	2	0	0	0	0	2
25	3	SINF2007	Logics	2	0,2	1	0,4	0,2	0,2	2
26	3	SINF2009	Linear Algebra	2	0,2	1	0,4	0,2	0,2	2
27	3	SINF2011	Numerical Computation	2	0	0,8	0,6	0,4	0,2	2
28	3	SINF2013	Practicum of Numerical Computation	1	0	0,4	0,3	0,2	0,1	1
29	3	SINF2015	Object-Oriented Programming	2	0	0,4	0,4	0,4	0,8	2
30	3	SINF2017	Practicum of Object-Oriented Programming	1	0	0,4	0,2	0,4	0	1
31	3	SINF2019	Database II	2	0	0,4	0	0,4	1,2	2
32	3	SINF2021	Practicum of Database II	1	0	0,2	0,2	0	0,6	1
33	3	SINF2023	Operation Systems	2	0,6	0,6	0,2	0,6	0	2
34	3	SINF2025	Practicum of Operation Systems	1	0,3	0,3	0,1	0,3	0	1
35	3	SINF2027	Human Computer Interaction	2	0,2	0,3	0,3	0,6	0,6	2

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
36	3	SINF2029	Practicum of Human Computer Interaction	1	0,33	0,33	0,34	0	0	1
37	4	SINF2016	Practicum of Human Computer Interaction	2	2	0	0	0	0	2
38	4	SINF2018	Graph Theory	2	0	1,3	0,2	0	0,5	2
39	4	SINF2020	Software Engineering	2	0,4	0,4	0,4	0,4	0,4	2
40	4	SINF2022	Practicum of Software Engineering	1	0,33	0,33	0,34	0	0	1
41	4	SINF2024	Geographical Information System	2	0	1	0	0,4	0,6	2
42	4	SINF2026	Practicum of Geographical Information System	1	0	0,1	0	0,4	0,5	1
43	4	SINF2028	Data Communications	2	0,6	0,6	0,2	0,6	0	2
44	4	SINF2030	Practicum of Data Communications	1	0,3	0,3	0,1	0,3	0	1
45	4	SINF2032	Web Programming	2	0	0,6	0,6	0,4	0,4	2
46	4	SINF2034	Practicum of Web Programming	1	0	0,3	0,3	0,2	0,2	1
47	4	SINF2036	Data Visualization	2	0,2	0,8	0,2	0,4	0,4	2
48	4	SINF2038	Practicum of Data Visualization	1	0,2	0,3	0	0,5	0	1
49	5	SMPA3013	Entreneurship	2	2	0	0	0	0	2
50	5	SMPA3015	Practicum of Entrepreneurship	1	1	0	0	0	0	1
51	5	SINF3031	Artificial Intelligence	2	0	1	0,6	0	0,4	2
52	5	SINF3033	Practicum of Artificial Intelligence	1	0	0	0,7	0	0,3	1
53	5	SINF3035	Data Mining	2	0	0,4	0,6	0,4	0,6	2
54	5	SINF3037	Practicum of Data Mining	1	0,2	0,25	0,25	0,3	0	1

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
55	5	SINF3039	Automata and Language Theory	2	0	0,94	0	0	1,06	2
56	5	SINF3041	Practicum of Automate and Language Theory	1	0,2	0,6	0	0	0,2	1
57	6	SINF3040	Information System	2	0	1	0	0	1	2
58	6	SINF3042	Research Methodologies	2	1	1	0	0	0	2
59	6	SINF3044	Mobile Programming	2	0	0,6	0,6	0,4	0,4	2
60	6	SINF3046	Practicum of Mobile Programming	1	0	0,3	0,3	0,2	0,2	1
61	6	SINF3048	Business Communication and Interpersonal Skill	2	2	0	0	0	0	2
62	7	MKWUP001	Community Services Program	2	1,6	0,4	0	0	0	2
63	7	SMPAP002	Research Proposal	2	0,4	0,4	0,4	0,4	0,4	2
64	7	SINF4043	Seminar	2	0,7	0,7	0	0	0,6	2
65	8	SMPAP001	Internship	3	0,6	0,6	0,6	0,6	0,6	3
66	8	SMPAPA01	Final Project	4	0,8	0,8	0,8	0,8	0,8	4
67	Elective Course (Odd Semester)	SINF6045	Information Retrieval	2	0	0,4	0,4	0,4	0,8	2
68	Elective Course (Odd Semester)	SINF6047	Practicum of Information Retrieval	1	0	0,2	0,2	0,2	0,4	1
69	Elective Course (Odd Semester)	SINF6049	Computer Vision	2	0,2	0,3	0,3	0,7	0,5	2

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
70	Elective Course (Odd Semester)	SINF6051	Practicum of Computer Vision	1	0,2	0,25	0,25	0,3	0	1
71	Elective Course (Odd Semester)	SINF6053	Bioinformatics	2	0	0,6	0	0,8	0,6	2
72	Elective Course (Odd Semester)	SINF6055	Practicum of Bioinformatics	1	0,3	0,3	0	0,4	0	1
73	Elective Course (Odd Semester)	SINF6057	Image Processing	2	0	0,6	0,4	0,4	0,6	2
74	Elective Course (Odd Semester)	SINF6059	Practicum of Image Processing	1	0,2	0,25	0,25	0,3	0	1
75	Elective Course (Odd Semester)	SINF6061	Advanced Geographical Information System	2	0	0,8	0	0,6	0,6	2
76	Elective Course (Odd Semester)	SINF6063	Practicum of Advanced Geographical Information System	1	0	0,15	0	0,55	0,3	1
77	Elective Course (Odd Semester)	SINF6065	Survey and Mapping Management	2	0,4	0	0	0,8	0,8	2
78	Elective Course (Odd Semester)	SINF6067	Practicum of Survey and Mapping Management	1	0,2	0	0	0,3	0,5	1

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
79	Elective Course (Odd Semester)	SINF6069	Cyber Security	2	0	0,8	0	1	0,2	2
80	Elective Course (Odd Semester)	SINF6071	Practicum of Cyber Security	1	0	0,3	0	0,7	0	1
81	Elective Course (Odd Semester)	SINF6073	Advanced Network Protocol	2	0,6	0,6	0,2	0,6	0	2
82	Elective Course (Odd Semester)	SINF6075	Practicum of Advanced Network Protocol	1	0,3	0,3	0,1	0,3	0	1
83	Elective Course (Odd Semester)	SINF6077	Software Development and Operations	2	0,2	0,3	0,3	0,6	0,6	2
84	Elective Course (Odd Semester)	SINF6079	Practicum of Software Development and Operations	1	0,25	0,5	0,25	0	0	1
85	Elective Course (Odd Semester)	SINF6081	Software Architecture	2	0	0,4	0,4	0,4	0,8	2
86	Elective Course (Odd Semester)	SINF6083	Practicum of Software Architecture	1	0	0,2	0,2	0,2	0,4	1
87	Elective Course (Odd Semester)	SINF6085	Big Data and Data Analytics	2	0	0,6	0,8	0,6	0	2

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
88	Elective Course (Odd Semester)	SINF6087	Practicum of Big Data and Data Analytics	1	0,3	0,3	0,2	0,2	0	1
89	Elective Course (Odd Semester)	SINF6089	Cloud Computing	2	0	0,6	0,8	0,6	0	2
90	Elective Course (Odd Semester)	SINF6091	Practicum of Cloud Computing	1	0,15	0,3	0,35	0,2	0	1
91	Elective Course (Odd Semester)	SINF6093	Informatics Research	11	2,2	2,2	2,2	2,2	2,2	11
92	Elective Course (Even Semester)	SINF6050	Machine Learning	2	0	0,4	0,6	0,6	0,4	2
93	Elective Course (Even Semester)	SINF6052	Practicum of Machine Learning	1	0,3	0	0,3	0,25	0,15	1
94	Elective Course (Even Semester)	SINF6054	Natural Language Processing	2	0	0,4	0,6	0,6	0,4	2
95	Elective Course (Even Semester)	SINF6056	Natural Language Processing Practicum	1	0,3	0	0,3	0,25	0,15	1
96	Elective Course (Even Semester)	SINF6058	Cartography	2	0	0,2	0	1,4	0,4	2

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
97	Elective Course (Even Semester)	SINF6060	Practicum of Cartography	1	0	0,5	0	0,5	0	1
98	Elective Course (Even Semester)	SINF6062	Remote Sensing	2	0	0,8	0	0,4	0,8	2
99	Elective Course (Even Semester)	SINF6064	Practicum of Remote Sensing	1	0	0,3	0	0,3	0,4	1
100	Elective Course (Even Semester)	SINF6066	Network Reliability	2	0	0,8	0	1	0,2	2
101	Elective Course (Even Semester)	SINF6068	Practicum of Network Reliability	1	0	0,4	0	0,6	0	1
102	Elective Course (Even Semester)	SINF6070	Wireless Networks	2	0,6	0,6	0,2	0,6	0	2
103	Elective Course (Even Semester)	SINF6072	Practicum of Wireless Networks	1	0,3	0,3	0,1	0,3	0	1
104	Elective Course (Even Semester)	SINF6074	Optical Network Communication System	2	0,6	0,6	0,2	0,6	0	2
105	Elective Course (Even Semester)	SINF6076	Practicum of Optical Network Communication System	1	0,3	0,3	0,1	0,3	0	1

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
106	Elective Course (Even Semester)	SINF6078	Software Project	2	0,4	0,4	0,4	0,4	0,4	2
107	Elective Course (Even Semester)	SINF6080	Practicum of Software Project	1	0,33	0,33	0,34	0	0	1
108	Elective Course (Even Semester)	SINF6082	Component Based-Software Engineering	2	0	0,8	0,6	0,6	0	2
109	Elective Course (Even Semester)	SINF6084	Practicum of Component-Based Software Engineering	1	0,33	0,33	0,34	0	0	1
110	Elective Course (Even Semester)	SINF6086	Software Quality	2	0	0,6	0,7	0,7	0	2
111	Elective Course (Even Semester)	SINF6088	Practicum of Software Quality	1	0	0	0,4	0,6	0	1
112	Elective Course (Even Semester)	SINF6090	Data Security and Cryptography	2	0	0,6	0	0,8	0,6	2
113	Elective Course (Even Semester)	SINF6092	Practicum of Data Security and Cryptography	1	0	0,3	0	0,4	0,3	1
114	Elective Course (Even Semester)	SINF6094	Game Development	2	0	0,6	0	1	0,4	2

No	Semester	Course Code	Course	SKS	SKS to ILO Ratio					Total SKS Weight
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5	
115	Elective Course (Even Semester)	SINF6096	Practicum of Game Development	1	0	0,3	0	0,5	0,2	1
116	Elective Course (Even Semester)	SINF6098	Digital Marketing and Product Visualization	2	1,4	0,6	0	0	0	2
117	Elective Course (Even Semester)	SINF6100	Entrepreneur Finance Management	2	1,4	0,6	0	0	0	2
			TOTAL	201	35,42	49,86	26,31	43,85	45,56	201
			PERCENTAGE		17,62	24,81	13,09	21,82	22,67	100,00

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

1. An ILO can be achieved through several Course Learning Outcomes (CLOs) distributed across more than one course.
2. The CLO should remain consistent even if the course names change.
3. Each ILO should ideally be linked to no more than four courses to facilitate more straightforward calculation.
4. The number of CLOs per course should not exceed five, although it may be expanded with sub-CLOs.
5. The achievement of CLO 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 CLO.

Example of ILO Scores:

Name : Sri Azizah

NPM : 1908107010002

No	Semester	Course Code	Course	SKS	ILO Scores				
					CPL-01	CPL-02	CPL-03	CPL-04	CPL-5
1	1	MKWU1001	Pancasila	2	85	0	0	0	41
2	1	MKWU1003	Indonesian Language	2	68	0	0	0	49
3	1	MKWU1004	English	2	45	0	0	0	83
4	1	SMPA1011	Statistical Methods	2	0	0	0	55	80
5	4	SINF2024	Geographical Information System	2	0	44	76	0	60
6	4	SINF2026	Practicum of Geographical Information System	1	0	42	0	41	41
7	4	SINF2028	Data Communications	2	63	91	56	94	0
8	4	SINF2030	Practicum of Data Communications	1	51	91	50	91	0
9	4	SINF2036	Data Visualization	2	76	64	94	63	85
10	4	SINF2038	Practicum of Data Visualization	1	57	85	0	84	0
11	5	SINF3039	Automata and Language Theory	2	0	40	0	0	45
12	5	SINF3041	Practicum of Automate and Language Theory	1	52	50	0	0	67
13	7	SINF4043	Seminar	2	40	78	0	0	88
14	7	SINF6049	Computer Vision	2	70	80	70	70	88
15	7	SINF6051	Practicum of Computer Vision	1	75	75	88	90	0
ILO Scores					61,63	63,12	74,76	71,02	63,79

Note: The calculation of ILO scores is based on the weight of the course ILO to the total weight of that ILO.

Example of a Student ILO Transcript in the Informatics Study Program at USK:



MINISTRY OF EDUCATION, CULTURE,
RESEARCH, AND TECHNOLOGY
UNIVERSITAS SYIAH KUALA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF INFORMATICS

Jalan Syech Abdurrauf No. 3, Darussalam, Banda Aceh 23111, Building A 3rd Floor

Telephone: +6285101420565

Page: www.informatika.usk.ac.id, Email: informatika@fmipa.usk.ac.id

TRANSCRIPT OF INTENDED LEARNING OUTCOMES (ILO)

No. 305/UN11.1.8.5/PK.05.02/2024

Name	: Sri Azizah	Faculty	: MIPA
NPM	: 19081070 10002	Study Program	: Informatika
Place of Birth	: Banda Aceh	Education Program	: Sarjana
Date of Birth	: August 10, 2001	Date of Graduation	: August 28, 2023

No	Code	Learning Outcomes	Score	Category
1	CPL-01	Demonstrates strong social character in professional and community environments	74	Good
2	CPL-02	Able to think logically, critically, creatively, and systematically in problem-solving, as well as in the implementation, evaluation, and advancement of science and technology.	84	Excellent
3	CPL-03	Capable of designing and implementing algorithms to identify and solve problems involving software and computational thinking.	80	Good
4	CPL-04	Proficient in utilizing appropriate software or hardware tools in the application of informatics.	85	Excellent
5	CPL-05	Demonstrates mastery of informatics and the ability to apply it in conjunction with other multidisciplinary fields.	84	Excellent

Remarks : 81-100 : Excellent
61-80 : Good
51-60 : Fair
<51 : Poor

Banda Aceh, March 22, 2024
Head of Department,

Viska Mutiawani, B.IT., M.IT
NIP. 198008312009122003

To ensure that every student graduating from the USK Informatics Study Program has fulfilled all established Intended Learning Outcomes (ILO), the following steps are taken:

1. The Study Program sets the minimum ILO graduation standards, ILO attainment targets, and ILO graduation predicates (Excellent, Good, Fair, and Poor).
2. The Study Program monitors each student's ILO attainment level at the end of every academic year and provides recommendations to those whose ILO attainment has not met the established targets.
3. The Study Program issues an ILO Transcript in addition to the Academic Transcript for all graduates at the time of the graduation evaluation.

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

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

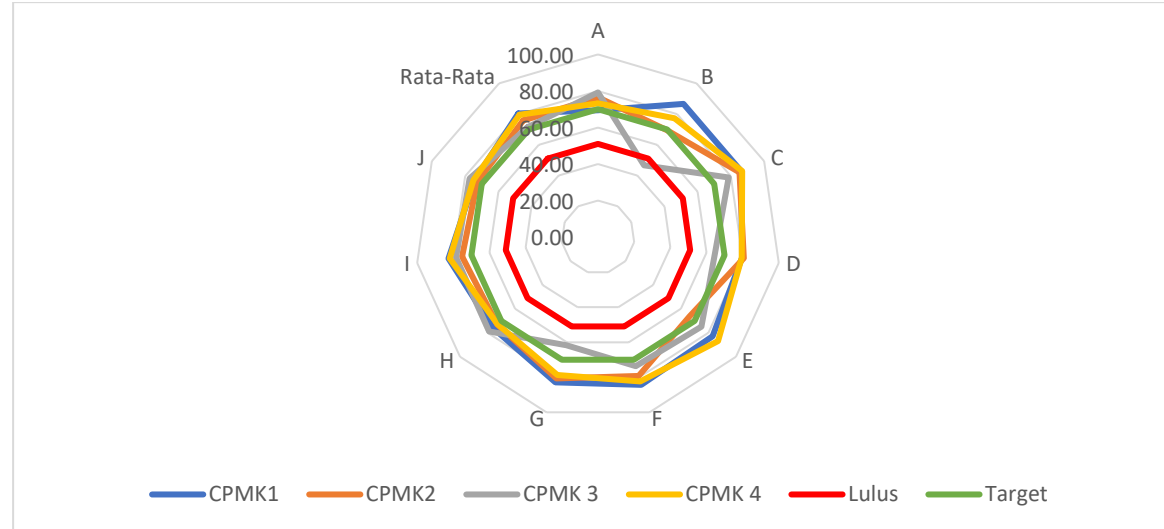
Monitoring of learning implementation and evaluation of Course Learning Outcome (CLO) attainment are conducted through the following procedures:

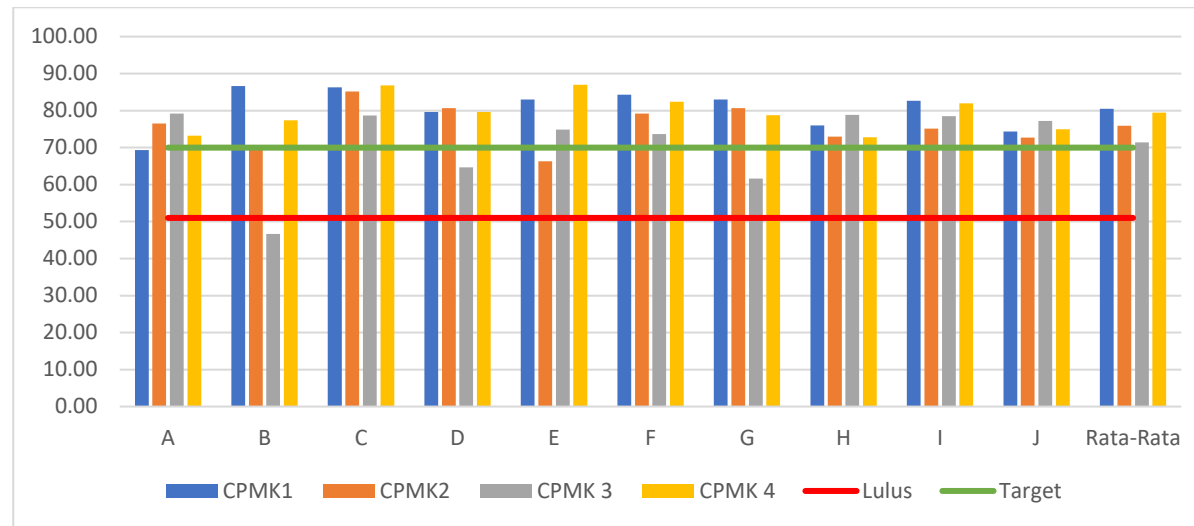
1. Each lecturer is required to prepare a course control document at the beginning of the semester.
2. Each lecturer must take attendance during every class session and complete a weekly learning implementation monitoring form.
3. In one semester, the lecturer conducts 16 class meetings, including the 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 study program coordinator 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 (CLO) attainment that can serve as a reference for study programs within Universitas Syiah Kuala.

Evaluation of Course Learning Outcome (CLO) Attainment: Student A

Student Name	Assessment Items											CLO Score				ILO Score		Final Score	
	Assignment 1	Assignment 2		Assignment 3		Assignment 4	Assignment 5		Midterm	Final		CPL-02		CPL-03		CPL-02	CPL-03		
	CPMK2	CPMK2	CPMK3	CPMK3	CPMK4	CPMK1	CPMK1	CPMK2	CPMK2	CPMK3	CPMK4	CPMK1	CPMK 4	CPMK 3	CPMK2				
	10%	5%	15%	10%	20%	10%	5%	5%	10%	5%	5%	15%	25%	30%	30%	40%	60%		
Student A	81	63	81	72	63	85	62	90	85	68	84	77	67	76	81	90	66	75	B
Student B	75	75	88	50	88	75	86	80	82	85	78	79	86	75	78	88	73	79	AB
Student C	48	68	77	87	71	89	77	73	79	81	72	85	71	81	66	81	70	75	B
Student D	61	82	47	45	78	82	77	76	71	71	78	80	78	50	70	83	58	68	BC
Student E	90	79	78	63	77	76	82	87	78	81	84	78	78	74	84	92	69	78	AB
Student F	75	50	41	63	79	84	75	80	85	75	90	81	81	54	75	87	61	71	B
Student G	70	49	84	85	89	79	88	90	70	83	73	82	86	84	70	83	78	80	AB
Student H	46	40	74	71	78	70	77	76	79	85	83	72	79	75	61	73	70	71	B
Student I	76	48	47	82	72	80	85	84	89	71	80	82	74	63	77	88	62	73	B
Student J	46	88	89	53	81	90	88	75	78	74	81	89	81	75	69	85	71	77	B





Analysis of Course Learning Outcome (CLO) Attainment:

- The passing score for CLO 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 CLO is 60 out of 100, or 60% for each CLO.
- The average CLO score across all students exceeds 60, or is above the target. However, there are 2 students (approximately 33.33% of the total 6 students) who have not met the minimum specified score for the Course Learning Outcome (CLO) that is for CPMK 1 and CPMK 4, as shown in the CPMK score column.
- The average ILO score for all students is above 60. However, 2 students have ILO 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 CLO scores were still below the minimum target. The observation revealed that both students had low scores in 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 the two students was their lack of preparedness for the examinations. 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. Additional practice in design and calculation-based problems should be incorporated more frequently in the classroom.
- 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 (ILO) are conducted by the Study Program at the end of each academic year to monitor and evaluate the ILO attainment of each student by cohort and as a material for consideration and continuous improvement of the learning process in the Informatics Study Program.