



STUDENT HANDBOOK

**Bachelor in Chemistry
Program**

**Faculty of Mathematics
and Natural Sciences
Mulawarman University**



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Preface

This Student Handbook is developed as a comprehensive guide for students enrolled in the Bachelor of Chemistry Program at the Faculty of Mathematics and Natural Sciences, Mulawarman University. It is intended to provide clear and structured information regarding academic regulations, curriculum design, learning outcomes, teaching and assessment strategies, as well as student support services throughout the study period.

The handbook serves as an essential reference to help students understand their academic journey, including course requirements, graduation criteria, and opportunities for academic and professional development. It is also designed to promote transparency and consistency in the implementation of academic policies and procedures within the program.

The curriculum of the Bachelor of Chemistry Program is developed based on the principles of Outcome-Based Education (OBE), where all teaching and learning activities are directed toward achieving clearly defined Program Learning Outcomes (PLOs). These outcomes are aligned with national standards, including the Indonesian Qualifications Framework (KKNI), as well as international benchmarks such as the European Qualifications Framework (EQF).

Furthermore, this handbook reflects the program's commitment to meeting international quality standards, particularly those outlined by ASIIN (Accreditation Agency for Study Programs in Engineering, Informatics, Natural Sciences, and Mathematics). Through this alignment, the program aims to ensure that graduates possess not only strong theoretical knowledge in chemistry but also practical skills, research competence, ethical awareness, and the ability to contribute to society, especially in areas related to tropical natural resources and environmental sustainability.

This handbook is expected to be used not only by students but also by academic staff and other stakeholders as a shared reference in supporting the implementation of quality education. As higher education continues to evolve, this handbook will be periodically reviewed and updated to reflect new developments, policies, and academic needs.

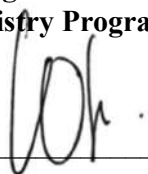
We hope that this handbook will assist students in successfully completing their studies and preparing for their future careers, whether in industry, academia, or further education.

APPROVAL SHEET
STUDENT HANDBOOK
Bachelor of Chemistry Program
Faculty of Mathematics and Natural Sciences Mulawarman University

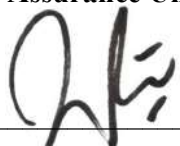
This Student Handbook has been reviewed and approved as an official academic guideline for students of the Bachelor of Chemistry Program, Faculty of Mathematics and Natural Sciences, Mulawarman University.

This document serves as a reference for academic policies, curriculum structure, learning processes, and student support services in accordance with the applicable academic regulations


Approved by
Head of Study Program
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CHAPTER 1. INTRODUCTION

1. 1. Program Identity

Item	Description
Program Name :	Bachelor of Chemistry
Degree :	S.Si (Bachelor of Science)
Faculty :	Faculty of Mathematics and Natural Sciences
University :	Mulawarman University
Study Duration :	4 Years (8 Semesters)
Total Credits :	144 credits

1.2. History of the Program

The Chemistry Study Program at Mulawarman University has progressively evolved into one of the prominent academic programs in East Kalimantan, particularly in advancing chemical sciences with a focus on tropical rainforest resources and environmental sustainability. Since its establishment, the program has continuously strengthened its academic foundation, institutional capacity, and relevance to regional and global challenges.

The program was officially established in 2001 based on the Decree of the Directorate General of Higher Education No. 2811/D/T/2001. This milestone responded to the increasing demand for qualified human resources in chemistry to support the sustainable utilization of natural resources in East Kalimantan. Institutional strengthening followed in 2006 with the establishment of the Faculty of Mathematics and Natural Sciences (FMIPA), which provided a more focused academic ecosystem for science-based disciplines. The operational license of the program was subsequently renewed in 2008, ensuring compliance with national higher education standards.

In terms of quality assurance and accreditation, the Chemistry Study Program has consistently demonstrated strong academic performance. The program was awarded an “A” accreditation by the National Accreditation Board for Higher Education (BAN-PT) in 2019, reflecting its high compliance with national standards in curriculum, academic processes, human resources, facilities, and governance.

More recently, the program achieved the highest national accreditation status, “Unggul,” from LAM-Sains (Lembaga Akreditasi Mandiri Sains Alam dan Ilmu Formal) in 2025. This recognition confirms the program’s excellence in implementing Outcome-Based Education (OBE), quality assurance systems, research productivity, and stakeholder engagement, as well as its relevance to current scientific and societal needs.

As part of its commitment to continuous improvement and global competitiveness, the program is also oriented toward international accreditation standards, particularly those set by ASIIN (Accreditation Agency for Study Programs in Engineering, Informatics, Natural Sciences, and Mathematics). This alignment ensures that the program adopts international

best practices in curriculum design, teaching and learning processes, and graduate competency development.

The Chemistry Study Program is further aligned with the Indonesian National Qualifications Framework (KKNI Level 6) and benchmarked against the European Qualifications Framework (EQF Level 6). This ensures that graduates possess internationally comparable competencies, including theoretical knowledge, practical laboratory skills, research capability, and professional attitudes.

Over time, the program has developed distinctive strengths in natural product chemistry, environmental chemistry, and the sustainable utilization of tropical rainforest resources. These areas reflect the strategic geographical position of Mulawarman University, located in one of Indonesia's richest biodiversity regions. The integration of local potential into academic activities strengthens the program's contribution to sustainable development and scientific innovation.

The continuous advancement of the program is supported by institutional policies emphasizing quality assurance, internationalization, and stakeholder engagement. Further information regarding the university's vision, mission, and strategic direction can be accessed through the official website: <https://unmul.ac.id>, while faculty-level information is available at: <https://fmipa.unmul.ac.id>.

Through sustained development, accreditation achievements, and strategic collaborations, the Chemistry Study Program remains committed to producing graduates who are competent, competitive, and capable of contributing to scientific advancement and societal needs at both national and international levels.

1.3. Vision, Mission, and Objectives

Vision

To become an excellent study program in delivering high-quality, integrated education, research, and application in chemical sciences, particularly based on tropical rainforest resources and their environment.

Mission

1. To deliver high-quality chemistry education aligned with the scientific focus on tropical rainforest resources and their environment, producing graduates who are competitive in the global workforce and excel in knowledge, skills, and professional attitudes.
2. To conduct creative and innovative research in chemical sciences, particularly research based on tropical rainforest resources (East Kalimantan's natural resources) and their environment.
3. To implement community service activities as an integrated application of chemical sciences, aimed at solving societal problems and enhancing environmental awareness.
4. To strengthen both the quantity and quality of collaborations with universities, government institutions, and industry partners, particularly in chemistry-related fields.

Program Objectives

1. Increased competitiveness and quality of graduates in terms of attitudes, knowledge, and skills.
2. Improved quality of educational implementation, including human resources, curriculum, infrastructure, and information systems.
3. Increased number of community service programs, community service grants, lecturers serving as resource persons, and student involvement in community engagement activities.
4. Enhanced collaboration in education, research, and community service with national and international universities, government institutions, and relevant industries in the field of chemistry.

CHAPTER 2. GRADUATE PROFILE AND LEARNING OUTCOMES

2.1 Program Learning Outcomes (PLOs)

Program Learning Outcomes (PLOs) describe the competencies that graduates of the Bachelor of Chemistry Program are expected to achieve upon completion of their studies. These outcomes encompass knowledge, practical and analytical skills, as well as professional attitudes, and are developed in accordance with Outcome-Based Education (OBE) principles. The PLOs serve as the foundation for curriculum design, teaching and learning processes, and assessment systems, ensuring alignment with national standards such as the Indonesian Qualifications Framework (KKNI Level 6) and international benchmarks including the European Qualifications Framework (EQF Level 6) and ASIIN criteria.

Table 1.1. Program Learning Outcomes (PLO) of Chemistry Study Program

PLO	Code	Description
Attitude	PLO 1	Demonstrating a lifelong learning attitude, taking responsibility for the work performed by applying ethics, discipline, professionalism, adhering to regulations, and being environmentally conscious
Knowledge	PLO 2	Understanding the basic concepts and theories in the field of chemistry, including physical chemistry, analytical chemistry, organic chemistry, inorganic chemistry, and biochemistry, as well as the principles of other related sciences
	PLO 3	Following recent advancements in chemistry, including the creation of chemical products, management of natural resources, and innovations in the chemical sector
	PLO 4	Understanding and integrating concepts from various other disciplines, both directly and indirectly related to the field of chemistry
General Skill	PLO 5	Able to communicate effectively, both orally and in writing, in conveying ideas, research findings, and solutions to problems related to chemistry
	PLO 6	Able to collaborate in building professional networks in the field of chemistry, across disciplines, and entrepreneurship, as well as demonstrating leadership and a sense of responsibility
Specific Skill	PLO 7	Able to design and conduct experiments and research systematically, considering occupational safety and health aspects, as well as analysing the data
	PLO 8	Able to interpret data generated from modern instruments in chemical analysis, such as chromatography, spectroscopy, and other analytical techniques
	PLO 9	Able to conduct fundamental research related to chemical-based products, such as pharmaceuticals, cosmetics, or industrial raw

PLO	Code	Description
		materials, using compounds from tropical rainforests in an innovative and efficient manner

PLO–CLO MAPPING MATRIX

Level Definition

The alignment between *Program Learning Outcomes (PLOs)* and *Course Learning Outcomes (CLOs)* is structured according to progressive levels of competency achievement. Each level reflects the depth of learning and the expected degree of student autonomy:

Level	Descriptor
1 – Introduced	The learning outcome is introduced at a fundamental level. Students are exposed to basic concepts and are expected to demonstrate limited understanding under guidance.
2 – Reinforced	The learning outcome is further developed through practice and application. Students demonstrate increased competence with partial independence and guided problem-solving.
3 – Mastery	The learning outcome is achieved at an advanced level. Students demonstrate comprehensive understanding, critical thinking, and the ability to apply knowledge independently in complex or unfamiliar contexts.

Program Learning Outcomes (PLOs)

Code	Description
PLO1	Demonstrating lifelong learning attitude, ethics, professionalism, discipline, and environmental awareness
PLO2	Understanding fundamental concepts in chemistry (organic, inorganic, analytical, physical, biochemistry)
PLO3	Following recent advancements in chemistry and innovation in chemical sectors
PLO4	Integrating interdisciplinary knowledge related to chemistry
PLO5	Communicating scientific ideas effectively (oral and written)
PLO6	Collaborating, networking, and demonstrating leadership
PLO7	Designing and conducting experiments with safety considerations and data analysis
PLO8	Interpreting data from modern analytical instruments
PLO9	Conducting research on chemical products based on tropical rainforest resources

PLO–CLO MATRIX (Chemistry Courses)

Course	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
General Chemistry	2	3	1	1	1	1	1	-	-
Basic Laboratory	2	2	1	1	1	2	3	1	-
Organic Chemistry	2	3	2	1	1	1	2	-	2
Inorganic Chemistry	2	3	1	2	1	1	2	-	1
Physical Chemistry	2	3	2	2	1	1	2	-	-
Analytical Chemistry	2	3	2	2	2	1	3	3	1
Instrumental Analysis	2	2	2	2	2	1	3	3	1
Biochemistry	2	3	2	2	1	1	2	-	2
Environmental Chemistry	3	2	3	3	2	2	2	2	3
Natural Product Chemistry	2	3	3	2	2	1	2	2	3
Research Methodology	2	2	2	2	3	2	3	2	2
Seminar	2	1	2	1	3	2	1	1	2
Internship / KKN	3	2	2	2	2	3	2	1	2
Undergraduate Thesis	3	2	3	2	3	2	3	3	3

Graduate Profile

Graduate Profile and Chemistry PLO

1. Academicians (PLO: 1, 2, 4, 5, 7, 8, 9) : Become lecturers and laboratory assistants in universities, teachers in schools, teaching staff in educational institutions, and continue their studies.
2. Industry Practitioners (PLO: 1, 3, 4, 5, 6, 8) : Become a laboratory head, GM Operations,

Laboratory Supervisor, quality control personnel, laboratory analysts, employees in industry, and environmental consultants.

3. Government and private sector practitioners (PLO: 1, 4, 6) : Become an employee in a company, an employee in a government agency, or a private or state official
4. Entrepreneurs (PLO: 1, 3, 6) : Become an entrepreneur

Table . The Matrix of Relevance between ASIIN SSC and Chemistry PLO

SSC 09 Chemistry	PLO Chemistry Study Program
Specialist competences	
Graduates of Bachelor's degree programmes in the field of chemistry:	
<ul style="list-style-type: none"> • have gained chemistry-relevant fundamental knowledge of mathematics and the natural sciences 	PLO 4
<ul style="list-style-type: none"> • have sound knowledge of the core subjects of chemistry, including inorganic, organic, and physical chemistry, as well as of analytical chemistry 	PLO 2
<ul style="list-style-type: none"> • have gained knowledge in one or several other special areas in the natural sciences or humanities 	PLO 4
<ul style="list-style-type: none"> • can carry out practical chemistry work and have learnt how to handle chemicals independently and safely in lab work 	PLO 7
<ul style="list-style-type: none"> • have knowledge of safety and environmental issues and the legal fundamentals 	PLO 7
<ul style="list-style-type: none"> • have gained methodological competence in chemistry and can apply this in other contexts 	PLO 9
<ul style="list-style-type: none"> • have interdisciplinary knowledge and skills, such as in economics, ethics, or philosophy 	PLO 4
Such graduates are able to:	
<ul style="list-style-type: none"> • obtain, interpret, and evaluate data of scientific and technical relevance, and draw sound conclusions, which take into account scientific, technological, and ethical findings 	PLO 7, PLO 8
<ul style="list-style-type: none"> • solve problems of a scientific/application-oriented nature independently, and present the results, as well as 	PLO 5
<ul style="list-style-type: none"> • pursue lifelong learning 	PLO 1
Social competences	
Graduates of Bachelor's degree programmes in the field of chemistry:	
<ul style="list-style-type: none"> • can communicate with colleagues working in the field as well as with the broader public, about chemistry-related content and problems, also in a foreign language and on an intercultural basis 	PLO 5
<ul style="list-style-type: none"> • are aware of social and ethical responsibility in their actions and are familiar with the professional ethical principles and standards of chemistry 	PLO 1, PLO 6
<ul style="list-style-type: none"> • are able to work both alone and as a member of international, mixed-gender groups 	PLO 6

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| <ul style="list-style-type: none"> • are familiar with the basic principles for the conduct of projects and can develop appropriate leadership responsibility | PLO 6 |
| <ul style="list-style-type: none"> • are prepared to enter professional life in an industrial or academic environment. Graduates of bachelor's degree programmes in chemistry should have adequate practical relevance to the degree programme. | PLO 3 |

2.3. Alignment with Standards

The Bachelor of Chemistry Program at the Faculty of Mathematics and Natural Sciences, Mulawarman University, is systematically designed to align with national and international qualification frameworks as well as discipline-specific accreditation standards. This alignment ensures that the program produces graduates with competencies that are globally comparable, professionally relevant, and responsive to scientific and societal developments.

Alignment with the Indonesian Qualifications Framework (KKNI Level 6)

The program is aligned with Level 6 of the Indonesian Qualifications Framework (Kerangka Kualifikasi Nasional Indonesia—KKNI), which defines the expected competencies of bachelor-level graduates. At this level, graduates are required to demonstrate the ability to apply scientific knowledge, master theoretical concepts, and solve problems in their respective fields.

In accordance with KKNI Level 6 descriptors, graduates of the Chemistry Program are expected to:

- Apply fundamental and advanced concepts of chemistry in solving scientific and practical problems
- Utilize appropriate methods and analytical tools in laboratory and field-based investigations
- Make informed decisions based on data analysis and scientific reasoning
- Take responsibility for their own work and contribute effectively within team settings
- Communicate scientific ideas clearly in both written and oral forms

The curriculum, teaching strategies, and assessment methods are structured to ensure that these competencies are achieved progressively throughout the study period.

Alignment with the European Qualifications Framework (EQF Level 6)

To ensure international comparability, the program is also aligned with Level 6 of the European Qualifications Framework (EQF). This alignment reflects the program's commitment to producing graduates who are capable of engaging in professional practice or pursuing further studies at an international level.

EQF Level 6 emphasizes advanced knowledge, critical understanding, and the ability to manage complex technical or professional activities. In this context, graduates of the Chemistry Program demonstrate:

- Advanced knowledge of chemical principles, including theoretical and practical aspects
- Critical understanding of scientific methodologies and their limitations

- The ability to solve complex and unpredictable problems in chemistry and related disciplines
- Competence in managing laboratory work, including planning, execution, and evaluation
- Responsibility for decision-making and professional development in diverse environments

This alignment facilitates graduate mobility, international recognition, and compatibility with global higher education systems.

Alignment with ASIIN Subject-Specific Criteria (SSC – Chemistry)

The program is further aligned with the Subject-Specific Criteria (SSC) for Chemistry defined by ASIIN, which serve as a benchmark for international accreditation in science and engineering disciplines. These criteria emphasize both theoretical knowledge and practical competencies required for professional chemists.

In accordance with ASIIN SSC, the program ensures that graduates possess the following core competencies:

1. Fundamental Knowledge

Graduates have a solid foundation in core areas of chemistry (organic, inorganic, analytical, and physical chemistry), as well as supporting disciplines such as mathematics and natural sciences.

2. Experimental and Laboratory Skills

Graduates are capable of conducting independent laboratory work, including designing experiments, operating instruments, and applying standard safety procedures.

3. Problem-Solving Ability

Graduates can analyze scientific problems, develop appropriate methodologies, and propose evidence-based solutions, particularly in areas related to environmental and natural resource chemistry.

4. Communication and Teamwork

Graduates are able to communicate scientific findings effectively and work collaboratively in multidisciplinary teams.

5. Professional and Ethical Responsibility

Graduates demonstrate ethical awareness, responsibility, and adherence to professional standards in scientific practice.

Integrated Alignment and Continuous Improvement

The alignment with KKNi, EQF, and ASIIN SSC is implemented through an integrated approach that includes:

- Outcome-Based Education (OBE) framework
- Mapping of Program Learning Outcomes (PLOs) to course-level outcomes (CLOs)
- Periodic curriculum review based on stakeholder feedback
- Benchmarking with national and international institutions
- Continuous quality improvement through the Plan–Do–Check–Act (PDCA) cycle

Through this comprehensive alignment, the Chemistry Study Program ensures that its graduates are academically competent, professionally prepared, and globally competitive.

2.4 Stakeholder Involvement

The development and continuous improvement of the Chemistry Study Program actively involve key stakeholders, including industry partners, alumni, and professional organizations such as the Indonesian Chemical Society (HKI).

Industry stakeholders contribute by providing input on current workforce needs, ensuring that the curriculum remains relevant to industrial practices and technological advancements. Alumni offer valuable feedback based on their professional experiences, particularly through tracer studies, which help evaluate graduate competencies and career readiness.

In addition, professional bodies such as HKI play a crucial role in aligning the program with national standards and developments in chemical sciences. Their involvement ensures that the program maintains academic rigor, professional relevance, and adherence to ethical standards.

Through this collaborative approach, the program ensures that its learning outcomes and curriculum are responsive, up-to-date, and aligned with both national and global expectations.

CHAPTER 3. CURRICULUM FRAMEWORK

3.1 Curriculum Design Principles

The curriculum of the Bachelor of Chemistry Program at Mulawarman University is designed to ensure that students acquire the knowledge, skills, and competencies needed for academic and professional success. The curriculum is developed based on two main principles: Outcome-Based Education (OBE) and stakeholder-driven design.

Outcome-Based Education (OBE)

The program applies the Outcome-Based Education approach, where all learning activities are designed to achieve clearly defined learning outcomes. These outcomes describe what students are expected to know and be able to do upon graduation.

In practice, this means:

- Courses are designed to support the achievement of program learning outcomes
- Teaching methods encourage active student participation
- Assessments are used to measure students' understanding and skills
- Learning is focused not only on knowledge, but also on practical skills and attitudes

Stakeholder-Driven Design

The curriculum is also developed based on input from various stakeholders to ensure its relevance to real-world needs.

These stakeholders include:

- Industry partners, who provide insights into job market requirements
- Alumni, who share feedback based on their professional experiences
- Professional organizations such as the Indonesian Chemical Society (HKI)
- Academic institutions for benchmarking purposes

Their input helps ensure that the curriculum remains up-to-date, relevant, and aligned with developments in science and industry.

Table 1.4. Compulsory Course Structure of Chemistry program

No	Course	Category	Credit Unit (CU)			
			Theory	Practice	Total	
Semester I						
1	Indonesian Language	Compulsory	2		2	4,5
2	English	Compulsory	3		3	4,5
3	Fundamental Chemistry	Compulsory	2	1	3	1,2,5,7
4	Pancasila	Compulsory	2		2	1,4
5	Fundamental Physics	Compulsory	2	1	3	1,2,5,7
6	Elementary Calculus	Compulsory	2	1	3	1,2,5,7

No	Course	Category	Credit Unit (CU)			
			Theory	Practice	Total	
7	Basics Social and Cultural Sciences	Compulsory	2		2	1,4,6
8	Laboratory Techniques	Compulsory	2		2	1,7
Total			17	3	20	
Semester II						
1	Religious Education	Compulsory	2	1	3	1,4,6
2	Civics	Compulsory	2		2	1,4
3	Advanced Chemistry	Compulsory	2	1	3	1,2,5,7
4	Chemical Element	Compulsory	2		2	2,5,7
5	Fundamentals of Statistics	Compulsory	2	1	3	1,2,5,7
6	General of Biology	Compulsory	2	1	3	1,2,5,7
7	Organic Chemistry I	Compulsory		1	3	1,2,5,7
Total				5	19	
Semester III						
1	Chemical Energetics	Compulsory		1	3	1,2,5,7
2	Structural Inorganic Compounds	Compulsory	2	1	3	1,2,5,7
3	Analytical Chemistry I	Compulsory	2	1	3	1,2,5,7
4	Structure and Function of Biomolecules	Compulsory	3	1	4	1,2,5,7
5	Organic Chemistry II	Compulsory	2	1	3	1,2,5,7
6	Principle Inorganic Chemistry	Compulsory	2		2	1,2,5,7
7	Entrepreneurs hip	Compulsory	2		2	1,4,6
8	Environmental Chemistry	Compulsory	2		2	1,2,4
Total			17	5	22	
Semester IV						

No	Course	Category	Credit Unit (CU)			
			Theory	Practice	Total	
1	Chemical Phase System	Compulsory	2	1	3	1,2,5,7
2	Coordination Chemistry	Compulsory	2	1	3	1,2,5,7
3	Analytical Chemistry II	Compulsory	2	1	3	1,2,5,7
4	Organic Chemistry Of Natural Products	Compulsory	2		2	2,3,8,9
5	Physical Organic Chemistry	Compulsory	3		3	2,5,8
6	Metabolism and Genetic Information	Compulsory	3	1	4	1,2,5,7
7	Separation Chemistry and Spectroscopy	Compulsory	3		3	2,8
8	Practice: Principle In Inorganic Chemistry	Compulsory		1	1	1,2,5,7
Total			17	5	22	
Semester V						
1	Chemical Bonding and Structures	Compulsory	3		3	2,4,8
2	Synthesis and Characterization of Inorganic Compounds	Compulsory	2		2	3,5,6,8
3	Structure Elucidation	Compulsory	3		3	3,5,8
4	Chemical Instrumentation	Compulsory	2	1	3	1.2.5.6,7
5	Chemical Kinetics	Compulsory	3		3	2,4,8
6	Research Methodology	Compulsory	3		3	4,5,7
7	Organic Synthesis Chemistry	Compulsory	3		3	3,8,9

No	Course	Category	Credit Unit (CU)		
			Theory	Practice	Total
	Total		19	1	20
Semester VI					
1	Student Service Community	Compulsory	4		4
	Total		4		4
Semester VII					
1	Thesis	Compulsory	6		6
	Total		6	0	6
Semester VIII					
1	Thesis	Compulsory	6		6
	Total		6		6

7. Teaching and Learning Approach

The program adopts student-centered learning approaches:

- Problem-Based Learning (PBL)
- Project-Based Learning
- Laboratory-Based Learning
- Research-Based Learning

8. Course Descriptions

General Chemistry

This course introduces fundamental principles including atomic structure, bonding, thermodynamics, and equilibrium.

Organic Chemistry

Focuses on structure, reactions, and synthesis of organic compounds.

Analytical Chemistry

Covers qualitative and quantitative analysis methods such as spectroscopy and chromatography.

Physical Chemistry

Explores thermodynamics, kinetics, and quantum mechanics.

Inorganic Chemistry

Studies coordination chemistry and material properties.

This section provides descriptions for all courses offered in the curriculum.

1) Indonesian (2 SKS)

This course discusses the Indonesian language as a manifestation of nationalistic spirit in preserving the unity of the Unitary State of the Republic of Indonesia (NKRI); the use of Indonesian in accordance with language variations; the rules of using Indonesian in academic writing; and Indonesian as a means of communication for processing, reasoning, and presenting information through scientific writing.

2) English (3 SKS)

This course covers conversation in English; parts of speech in English; types of paragraphs in English; expressing ideas orally in English; essay structure; MUEPT Listening Comprehension; MUEPT Reading Comprehension; and MUEPT Grammar.

3) Fundamental of Chemistry (3 SKS)

The basic chemistry course discusses matter and changes in matter, atomic structure, the periodic table of elements, elemental chemistry, stoichiometry, chemical kinetics, molecular structure and covalent bonds, molecular orbitals in chemical bonds, hydrocarbon compounds, functional groups in organic compounds and the basics of biomolecular chemistry.

4) Pancasila (2 SKS)

This course discusses the position, background, and objectives of Pancasila education; the history of the Indonesian nation's struggle from the pre-independence era to the post-independence period; the process of formulating and ratifying Pancasila as the foundation of the state; Pancasila as the foundation of the life of the nation and the Republic of Indonesia; Pancasila as political ethics; Pancasila as an ideology among other major world ideologies; Pancasila in the context of the constitutional system of the Republic of Indonesia; the implementation of Pancasila as a development paradigm; and the actualization of Pancasila in the life of the Indonesian nation within the campus environment.

5) Fundamental of Physic (3 SKS)

This course covers introductory materials, including measurement, quantities and units, models, theories, laws, significant figures, and vectors; the concept of particle kinematics in solving physical system problems; the concept of particle dynamics in solving physical problems; the concept of work and energy and their applications in the development of science and technology; the fundamental concepts of momentum and impulse comprehensively; the relationship between angular momentum, torque, the law of conservation of momentum, and moment of inertia; equilibrium of rigid bodies under various conditions, as well as elasticity, stress, and strain; the concepts of vibration, waves, sound, and hearing, along with their applications in daily life; the laws of static fluids; the laws of dynamic fluids; the concepts of heat and gases; and the basic concepts and laws of thermodynamics.

6) Elementary Calculus (3 SKS)

This course covers the Real Number System; Coordinate Systems and Functions; functions and operations on functions; calculation of limits; continuity; the concept of derivatives; derivatives of specific functions; derivatives in basic mathematical problems; derivatives in applied mathematical problems; and the concept of integrals.

7) Basics Social and Cultural Sciences (2 SKS)

This course discusses the foundational concepts, vision, mission, objectives, interdisciplinary approaches, and alternative learning models of ISBD (Social and Cultural Sciences Education); the manifestation, substance, characteristics, and systems of culture; humans as determinants of culture; humans and civilization; the essence of human life and modernization; humans as individuals and social beings; humans, values, morals, and law; humans, diversity, and equality; humans, science, technology, and art; and humans and the environment.

8) Laboratory Techniques (2 SKS)

This course discusses the meaning, function, types, infrastructure, and laboratory rules; laboratory accidents; K3 in the laboratory; waste management of hazardous and toxic chemicals; laboratory equipment, how to use, and maintain it; simple instrumentation tools; analytical balance and techniques for making solutions, techniques for using separating funnels; and titration techniques.

9) Islam (3 SKS)

This course discusses the definition of Islam along with its scope; the nature of human beings in Islam; the meaning and essence of aqidah (creed); the concept of sharia, worship, and social transactions (muamalah); the essence of Islam and knowledge; the concept of morality in Islam; insights into moderate Islam; and social interactions in Islam.

10) Roman Catholicism (3 SKS)

This course discusses the human vocation according to the Holy Scriptures; the relationship of humans with themselves, others, the environment, and God; living out religion and faith in a pluralistic society; Jesus Christ; the essence and meaning of the Kingdom of God as the core and manifestation of Jesus' mission in the world; the meaning of the Passion, Death, and Resurrection of Jesus Christ; the meaning of the Most Holy Trinity, and the Church and socially integrated faith.

11) Protestantism (3 SKS)

This course discusses religion and its function in human life; God in the Christian faith; human beings according to Christian teachings; ethics and the formation of Christian character; the relationship between Christian faith and science and technology; fostering interreligious harmony; and proper social interaction.

12) Hinduism (3 SKS)

This course discusses the values of Yadnya and the Ramayana; the teachings of Upadewa; the teachings of Dharsana; and Catur Asmara.

13) Buddhism (3 SKS)

This course discusses actions and their consequences in human life and beyond; living with full awareness (mindfulness) in daily life; the attitudes and behaviors of ethical individuals as agents of social transformation in building the nation's civilization; the Noble Eightfold Path;

Right View and Right Thought as part of the practice of the Noble Eightfold Path; the concept of the universe and realms of existence; the concept of meditation and clear insight; social issues from the perspective of Buddhism; a conceptual map of realms of existence; living mindfully in daily life; and life issues in accordance with Buddhist teachings.

14) Civics (2 SKS)

This course discusses the spirit of patriotism; human dignity and worth; rights and obligations as citizens; national defense; a democratic spirit; the characteristics and diversity of Indonesia; the mentality and character of the younger generation; and national interests aimed at creating societal welfare.

15) Advanced Chemistry (3 SKS)

This course studies solution chemistry; colligative properties of solutions; acids and bases; hydrolysis; buffers; colloids; chemical equilibrium; gaseous states; thermodynamics; redox and electrochemistry; voltaic/galvanic cells and electrolysis; nuclear chemistry; and radiochemistry.

16) Chemical Element (2 SKS)

This course discusses the abundance of elements and trends in nature; the distribution of elements and the composition of elements in the earth's crust in the form of compounds; types of elements that are metallic in nature; the presence of hydrogen in nature, the degree of oxidation of hydrogen in compounds, and how to form hydride salts; the properties of group 1 and 2 elements, preparation and use of elements, the formation of compounds both ternary and binary and diagonal relationships between elements; group 13 elements include properties, preparation and use of elements, as well as the formation of both ternary and binary compounds; properties of group 14 elements, preparation and use of elements, as well as the formation of both ternary and binary compounds; electronic properties, how to obtain, and applications of group 15, 16, 17 and 18 elements; properties, existence, abundance, isolation, and use of transition group elements; and lanthanide, actinide, and transactinide elements.

17) Fundamental of Statistic (3 SKS)

This course discusses the meaning of statistics; data; probability-related calculations; probability distributions; discrete random variables; continuous random variables; statistical inference; statistical inference for a single sample; and statistical inference for two samples.

18) General of Biology (3 SKS)

This course covers the definition, scope, and objectives of General Biology learning; theories of the origin of life, including the theory of evolution, abiogenesis, biogenesis, and population genetics; the structure and function of organism cells; cell reproduction; cell transport; photosynthesis; respiration; the structural components of chromosomes, the chemical structure of genes (DNA and RNA), DNA replication, and protein synthesis; Mendel's laws; the concept of biological classification systems; the division and structure of

basic tissues in animals and plants; ecological concepts; biotechnology; and the steps of the scientific method.

19) Organic Chemistry I (3 SKS)

This course discusses Carbon Compounds; Molecular Orbitals; Alkane compounds; Alkene Compounds; Alkyne Compounds; Stereochemistry of organic compounds; benzene compounds; benzene derivative compounds (Phenol and aryl halide); Free Radical Reactions; Alkyl Halides; Alcohol Compounds; and ether compounds.

20) Chemical Kinetics (3 SKS)

This course discusses the basic concepts of gases; real gases and ideal gases; basic concepts of Thermodynamics; Thermodynamic Law 1 and deriving the equations of Thermodynamic Law 1 differential and integral systems; Thermodynamic Law 2 and deriving the equations of Thermodynamic Law 2 differential and integral systems; the concept of Thermodynamic Law 3 and deriving the equations of Thermodynamic Law 3 differential and integral systems; and the concept of Thermochemistry.

21) Structural In Inorganic Compounds (3 SKS)

Classical atomic theory, Dalton and Thomson atomic theory, Rutherford atomic structure concept, Bohr atomic theory, wave mechanics theory, Schrodinger theory, Electron configuration, history of the development of the periodic system of elements Lavoisier, Dobereiner, Newlands, Mendeleev, Moseley, Properties of elements based on S.P.U., S.P.U. Trend, Molecular structure, Chemical bonding model, valence electron spin pair repulsion model, Structure of solids, Structure of metals, Applications of solids and metals in daily life.

22) Analytical Chemistry I (3 SKS)

This course discusses the scope of analytical chemistry and its problems; the difference between qualitative and quantitative analysis, as well as the stages in qualitative analysis; the concept of acid base and its application in qualitative analysis; the concept of precipitate formation reaction and its application in qualitative analysis; the concept of complex compound formation reaction and its application in qualitative analysis; the concept of redox reaction and its application in qualitative analysis; cation preliminary test analysis; cation classification and identification of class I cations; identification of class II cations, identification of class III cations; identification of class IV and V cations; anion classification scheme and anion preliminary test; and anion identification.

23) Structure and Function of Biomolecules (4 SKS)

This course discusses the definition of biochemistry; macromolecules that make up organisms; Fields related to biochemistry; Benefits of biochemistry in various fields; Structure and function of carbohydrates; Structure and function of lipids; Structure and function of membranes; Transport systems; Structure, properties and functions of amino acids; Peptide bonds; Definition of proteins; Structure of proteins; Denaturation and factors causing it; Definition, Structure, Mechanism of action, Naming, and Kinetics of Enzymes,

Michaelis Menten Equation, K_m and K_{cat} , Various enzyme inhibitions; Enzyme regulation; Structure of Coenzymes and Cofactors; Function of Coenzymes and Cofactors; Mechanism of action of Coenzymes and Cofactors; Structure of Nucleic Acids; DNA and RNA; Function of DNA; and Function of RNA.

24) Organic Chemistry II (3 SKS)

This course discusses compounds with carbonyl groups; methods of isolation and synthesis of carboxylic acid compounds; methods of synthesis of carboxylic acid derivatives; amine compounds; methods of isolation and synthesis of carbohydrate macromolecules; amino acids and protein macromolecules; and methods of synthesis of lipid macromolecules.

25) Principle In Inorganic Reaction (2 SKS)

This course discusses the theory of thermodynamics; Chemical Kinetics; Principle of free energy and spontaneity of chemical reactions; Principle of entropy and chemical structure; Principle of enthalpy and strength of chemical bonds; Definition of Solution; Various Solvents Size of central atom; Solvent system; Non-water proton solvents; Non-water non-proton solvents; Acid-base reactions; Redox reactions; Reactions in HF medium; Reactions in SO_2 medium; and Reactions in HCN and acetic acid medium.

26) Entrepreneurship (2 SKS)

This course discusses the concept of entrepreneurship and the scope of entrepreneurship; the development of entrepreneurship and the differences between workers and entrepreneurs; characteristics of the attitude and personality of an entrepreneur; factors for business success and failure; creativity theory and its principles; the concept of business management and strategies in winning business competition; differences between macro and micro functions of entrepreneurship; effective and efficient work; how to study problems, formulate problems, identify problems, and solve problems. in entrepreneurship; data and problem analysis using the SWOT analysis method; Marketing Management and Business Promotion; Selling and Negotiation Skills in entrepreneurship; and how to make a business plan.

27) Environmental Chemistry (2 SKS)

This course explains the introduction to environmental chemistry; the concept of three environmental wheels and environmental chemistry; history of environmental problems; the impact of chemistry on environmental pollution; toxicology and heavy metals; mechanisms of heavy metal toxicity; chemical pollution that affects the balance of nature; pollution in the air environment; the concept of handling air pollution; pollution in the soil environment; handling pollution in the soil environment; pollution in the aquatic environment; and radioactive pollution.

28) Hazardous Material And Toxic Chemistry (2 SKS)

This course discusses the definition of hazardous and toxic chemicals; sources of chemicals; classification of hazardous and toxic materials; labeling techniques and Material Safety Data

Sheet (MSDS); chemical exposure and its impacts; B3 exposure metabolism system; effects of chemicals on humans; handling of gas chemicals; Air Pollution and Distribution of B3 Gas; Handling of Solid Chemicals; Soil Pollution and Distribution of Solid B3; Handling of Liquid/Solvent Chemicals; Water pollution and distribution of liquid B3; and B3 liquid waste processing technology.

29) Green Chemistry (2 SKS)

This course discusses the basic concepts of green chemistry; the concept of atomic economy; the twelve principles of green chemistry; the concept of waste minimization; renewable raw materials; solvent-free and solvent-less applications; and sources and applications of new renewable energy.

30) Management Industrial Chemistry (2 SKS)

This course discusses the introduction; management and organization; Operations Management and Quality Management; Introduction to ISO 9000 and its derivatives (ISO 9001, etc.); Introduction to ISO 14000 and its derivatives (ISO 14001, etc.); Introduction to ISO 17025, and Human Resource Management.

31) Chemical Industry (2 SKS)

This course discusses the concept of Chemistry in Industrial Processes and the Environment; The concept of Chemical Processes and quality control processes in the petroleum and Natural Gas processing industry, Urea & NPK Fertilizer Products of PT Pupuk Kaltim, and Liquid Ammonia Products of PT Pupuk Kaltim; concepts from the topic of Good Laboratory Practice: Based On ISO/IEC 17025:2017; the concept of Coal Processing and the chemical processes involved in it; The concept of Soap and Detergent Processing and the quality control process in the Soap and Detergent Industry; the concept of Paper Processing, the quality control process in the Paper Industry; and the Potential Chemical Industry in East Kalimantan.

32) Coal Chemistry (2 SKS)

This course discusses the introduction of coal and peat in general; the process of coal formation and its content; classification of coal quality and knowing coal reserves, production and consumption; the concept of coal processing technology; the benefits of coal as a source of fuel and energy; applications of coal in everyday life; the impact of coal on the environment; the impact of coal use; the concept of coal desulfurization technology; coal flotation separation technology; characterization of coal quality references, methods of sampling and preparation of coal samples; and Proximate and Ultimate Analysis of Coal.

33) Geochemistry (2 SKS)

This course discusses the origin and natural abundance of chemical elements; the structure and composition of the earth; estimation of the composition of the universe; thermodynamic aspects of magma crystallization; and the basis of isotope geochemistry.

34) Chemical Phase System (3 SKS)

This course discusses the concept of interactions between molecules; real gases and ideal gases; basic concepts of solutions; basic concepts of colligative properties of solutions and non-solutions; basic concepts of phase diagrams; and the concept of osmotic pressure.

35) Coordination Chemistry (3 SKS)

This course discusses Metal Compound Names; about types of ligands, central atoms, names, classical theories of complex compound formation; valence bonds in coordination compounds; Crystal field theory in coordination compounds; Molecular orbital theory in the formation of complex compounds; and about the Jahn-Teller effect and geometry as well as stability and mechanism of complex compound formation.

36) Analytical Chemistry II (3 SKS)

This material discusses quantitative analysis and the stages in qualitative analysis; quantitative data treatment and describing the kinds of errors; gravimetric method and gravimetric determination of analyte levels; volumetric method and types of volumetric analysis; acid-base titration; precipitate formation titration; redox titration; and complex formation titration.

37) Organic Chemistry Of Natural Products (2 SKS)

This course discusses the process of isolation and identification of natural compounds; knowing the classification and biosynthesis of terpenoids; cyclization and Wagner-Meerwein rearrangement; classification, structure and properties of steroids; the concept of steroid structure and activity; classification and origin of phenylpropanoids; structure, biosynthesis, properties, and synthesis of phenylpropanoids and polyketides; classification and structure of flavonoids; interconversion and synthesis of flavonoids; classification and structure of alkaloids; and rearrangement and synthesis of alkaloids.

38) Physical Organic Chemistry (3 SKS)

This course discusses the types of reactions that may occur in organic compounds; localized chemical bonds; delocalized chemical bonds and aromaticity; bond breaking and formation and factors influencing the presence of electrons; types of reagents and types of organic chemical reactions; acid-base strength of organic compounds; energetics and kinetics of chemical reactions; mechanisms of chemical reactions; nucleophilic substitution reactions at saturated carbon atoms; carbocations and their reactions; and nucleophilic and electrophilic substitution reactions in aromatic systems.

39) Metabolism and Genetic Information (4 SKS)

This course discusses Bioenergetics and Introduction to Metabolism; Digestive system; Carbohydrate Metabolism; Carbohydrate Anabolism; citric acid cycle; Oxidative phosphorylation; Lipid Metabolism Amino acid metabolism and its control; replication; transcription, its stages and control; translation, its control and post-translation; and post-translation and mutation.

40) Separation Chemistry and Spectroscopy (3 SKS)

This course discusses the basic principles of separation; distillation; liquid-liquid extraction; solid phase extraction; basic principles of chromatography; column chromatography; planar chromatography; basic principles of spectrophotometry; interaction of matter and energy; Lambert Beer Law; molecular spectrometry; UV-Vis spectrophotometry; IR spectrophotometry; atomic spectrophotometry; atomic absorption spectrophotometry; and atomic emission spectrophotometry.

41) Practice: Principle In Inorganic Reaction (1 SKS)

This course discusses the types and properties of inorganic compounds and elements; qualitative reactions of inorganic compounds; the effect of acids and bases on metals; oxidation-reduction reactions in some compounds; corrosion properties of some metals in gel medium; and corrosion characteristics of metals (iron, copper and magnesium).

42) Agrochemistry (2 SKS)

This course discusses Introduction to Agrochemistry; Classification of agrochemicals; Agrochemical Fertilizers; Agrochemical Insecticides; Agrochemical Pesticides; Agrochemical Herbicides; Agrochemical Fungicides; Agrochemical Algicides; Agrochemicals and their effects; Effects of Agrochemicals on soil; Effects of Agrochemicals on water; Effects of Agrochemicals on air; Effects of Agrochemicals on humans; and Prospects for the development of agrochemicals.

43) Chemical Minerals (2 SKS)

This course discusses the origin of rocks; definitions of minerals and rocks and their differences; classification of rocks; formation processes, types of minerals, areas found, and applications of rocks for subgroup A and B sedimentary rock excavation materials; plutonic intrusion excavation materials acidic and ultra-basic rocks; residual sediment excavation materials and sedimentary deposits; hydrothermal alteration processes; and malachite rock excavation materials.

44) Sampling Techniques (2 SKS)

This course discusses the basic principles of sampling, planning, preparation, types of sampling and samples, sample preservation; river, lake or reservoir water sampling techniques; estuary, sea and groundwater sampling techniques; wastewater sampling techniques; ambient air sampling techniques; roadside air sampling techniques, and factors affecting air emission sampling; air sampling techniques for mobile source emissions, stationary source emissions; soil and plant sampling techniques; water and air sample preparation techniques; plant and animal tissue sample preparation techniques; soil and food sample preparation techniques; and sampling practice.

45) Inorganic Material (2 SKS)

This course discusses the concepts of inorganic materials and their classification; physical and chemical properties of inorganic materials and their characterization methods; the relationship between the structure and chemical physical properties of several metal group

materials and their applications; the relationship between the structure and chemical physical properties of several ceramic group materials and their applications; the relationship between the structure and chemical physical properties of several inorganic polymer group materials and their applications; and the relationship between the structure and chemical physical properties of several composite group materials and their applications.

46) Chemical Bonding and Structures (3 SKS)

This course discusses the history of modern physics and quantum chemistry; the law of quantized energy; quantum mechanics for electron and atomic particles; Schrodinger and its applications; the concept of the Quantum Tunneling effect phenomenon; the concept of Hydrogen Atom Orbitals and energy; non-hydrogen atomic orbitals and energy; determination of the arrangement of electron configurations and the periodic table of elements; the concept of simple molecules; conjugated chemical bonds and resonance; quantized energy in molecules; quantized energy in molecules: Molecular Vibration; Applied Quantum Chemistry in the Development of Computational Chemistry; and Molecular Spectroscopy.

47) Synthesis and Characterization of Inorganic Compounds (2 SKS)

This course discusses the principles of synthesis; inorganic synthesis techniques; synthesis of inorganic solid materials; characteristics and structure of materials through inorganic solid materials; characteristics of inorganic solid materials; and applications of synthesized inorganic materials.

48) Structure Elucidation (3 SKS)

This course discusses the basic concepts of spectroscopy; basic principles of UV-Vis Spectrophotometry; characteristic absorption of organic compounds against UV and Visible radiation absorption; interpretation of FTIR spectra; interpretation of UV-Vis and FTIR data; principles and interpretation of ^1H and ^{13}C -NMR data, Mass Spectrometry and molecular ionization; fragmentation pattern preparation; and determination of molecular structure based on UV, IR, NMR, and MS spectrum data.

49) Chemical Instrumentation (3 SKS)

This course discusses the basics of chromatography, gas chromatography, liquid chromatography, potentiometry, electromagnetic radiation, instruments for spectroscopy, UV-Vis spectroscopy, absorption and emission spectroscopy (AAS-AES), nuclear magnetic resonance spectroscopy (NMR), mass spectroscopy.

50) Chemical Kinetics (3 SKS)

This course discusses the scope of chemical kinetics limitations and kinetic quantities; integration rate laws; reaction rate determination methods to determine the value of reaction rates and reaction rate constants; the effect of temperature on reaction rate constants; complex reaction kinetics, complex reaction rate constant values and complex

reaction rate equations; homogeneous catalysis and enzyme catalysis processes; and the basic principles of heterogeneous catalysis.

51) Research Methodology (3 SKS)

This course discusses the concept of research methodology; meaning of research, types of research; initial steps in conducting research; literature review; research ethics and research misconduct; literature review; citation of literature sources; research variables, research data; scientific writing techniques, drawing conclusions, scientific ethics; abstract preparation, writing objectives; thought framework structure; writing techniques; and research powerpoint.

52) Organic Synthesis Chemistry (3 SKS)

This course discusses active groups in synthesis; retrosynthesis analysis; chemoselective reactions, protecting groups, esterification and interesterification reactions; stereo control and ring formation; molecular rearrangement; C-C bond formation through condensation reactions; C-C bond formation through acid-catalyzed condensation reactions, and C-C bond formation using organometallic reactions.

53) Advanced Material Chemistry (2 SKS)

This course discusses the concept of smart materials; piezoelectric crystal and polymer systems; magnetostriction principles; electroactive materials; shape memory materials, and electro- and magneto-rheological fluids; low-strain smart sensors; the concept of smart actuators; magnetostrictive actuation; several types of actuators; several types of controls on smart actuators; the concept of smart composites; composite beams; and advances in smart structures and materials.

54) Colloid And Surface Chemistry (2 SKS)

This course discusses the definition of colloids; the uses of colloids; physical properties of colloids; chemical properties of colloids; colloidal stability; reactions to make colloidal compounds; recent developments in colloidal chemistry for industry; introduction to surface chemistry; gas-liquid surfaces and their examples; liquid-liquid surfaces and their examples and applications; gas-solid surfaces and their examples; liquid-solid surfaces and their examples; the concept of macromolecules; and future applications of macromolecules.

55) Polymer Chemistry (2 SKS)

This course discusses the definition of polymers, basic concepts of polymers, and the history of the development of polymer chemistry; naming of polymer compounds and classification of polymers; stages in polymerization; degree of polymerization and average molecular weight of a polymer and determination of average molecular weight, number and average weight; polymer structure; polymer/plastic processing technology and the concept of rheology in polymer materials; polymer characterization and analysis; types of polymerization reactions and polymerization reaction mechanisms; condensation polymerization reaction mechanisms; free radical vinyl polymerization; vinyl polymerization

with ion initiators and group transfer; polymer modification; and organic polymers and natural polymers.

56) Chemical Palm (2 SKS)

This course discusses the Palm Oil Industry; harvesting and Processing of Palm Oil Products; Palm Oil Quality Standards; Palm Oil Processing; Laboratory Analysis of Palm Oil; Palm Oil Products; Fatty Acids from palm oil products; Palm Oil content; Processing of Margarine from palm oil; and Processing of palm oil into biodiesel.

57) Radiochemistry (2 SKS)

This course discusses the Definition and Historical Development of Radiochemistry; Basic Principles of Atomic Nuclei; Radioactivity in Nature, Isotopes, Isobars, Isotones, and Radionuclides; Radioactive Decay Processes; Radioactive Decay and Growth Equations; Various Interactions of Radiation with Matter; Principles and Methods of Detection and Measurement of Radiation; Labeling Techniques with Radioactive Elements; Application of Radiochemistry in Various Fields; Enrichment of Nuclear Materials and Nuclear Energy; Use of Nuclear Reactors; and Impact of the Use of Nuclear Reactors from Positive and Negative Aspects.

58) Nanotechnology and Nanomaterial (2 SKS)

This course discusses the definition of nanoscience, nanotechnology, and nanomaterials; nanomaterial properties; structure and chemical physical properties of Nano structures; Nano material synthesis methods and techniques; Nanostructured material characterization; Nanomaterial applications; and trends in the use of nanomaterials in the Industrial 4.0 era.

59) Environmental Analysis (2 SKS)

This course discusses environmental pollution, the pollution cycle, and the importance of environmental analysis; the function, classification, and feasibility of water; water sample sampling techniques; water quality parameters and their analysis; definition of water pollution, sources and classifications as well as supervising legal entities; soil analysis techniques; sediment analysis techniques; and air analysis techniques.

60) Plantation Crops Analysis (2 SKS)

This course discusses the scope, role, and basics of plantation product analysis; the objectives of plantation product analysis as well as analysis strategies and their designation; the potential of oil palm plantations in East Kalimantan; palm oil analysis; basic techniques for general analysis of plantation products; differences in laboratory scale procedures with SNI; chemical - physical testing of water content; testing of vitamin carbohydrates such as vitamins A, C and E, testing of additives in plantation product processing; and testing of additives such as BTM (food additives).

61) Advanced Biochemistry (2 SKS)

This course discusses the structure and function of membranes, membrane transport processes, antigens and antibodies, the immune system, the endocrine system, the nervous system's parts and how it works, squeezing system chemistry, olfactory system chemistry, auditory system chemistry, visual system chemistry, and viral chemistry.

62) Biochemical Foodstuffs (2 SKS)

This course discusses nutrition including macronutrients (carbohydrates, proteins, and fats) and micronutrients (vitamins, water, and minerals), with a study of their structure, physicochemical properties, distribution in food, and benefits to the body. Food processing and preservation through temperature regulation, water activity, and radiation, as well as the use of natural and synthetic food additives, are also discussed. Packing aspects, including definitions, functions, regulations, and examples of food additives and impurities are also introduced, along with a discussion of foodborne diseases and the concept of nutrigenomics.

63) Student Service Community (4 SKS)

This course discusses the objectives, scope, and materials of Community Service Lectures; identification of problems and potentials in the village or Community Service Lecture location; program plans and potentials in the village or Community Service Lecture location; Community Service Lecture problems at the location where it is implemented; Community Service Lecture design at the location where it is implemented; application of courses in the village or Community Service Lecture location; integration of courses at the Community Service Lecture location; and finalization of Community Service Lecture outputs.

64) Applied Chemistry (2 SKS)

This course explains the outline of the application of chemistry in everyday life; industrial process technology; industrial waste processing; drinking water processing; soil chemistry, fertilizers, and pesticides; drugs and radiochemistry; food analysis and preservation; natural product chemistry; and chemical applications and manufacturing of household products.

65) Waste Treatment Techniques (2 SKS)

This course explains about the introduction, Identification of B3 waste, and characterization of B3 waste, Classification of B3 waste, Regulations on B3 Waste Management in Indonesia, B3 Waste management (labeling, storage and transportation); Management of Medical Waste and radioactive waste; Soil pollution; Chemical waste treatment; Stabilization and Solidification processes and their applications in industry; Biological Waste Treatment (Composting, land treatment, soil heaping, bioremediation); Thermal waste treatment; Types of waste incinerators; and B3 waste landfills.

66) Field Work Practice (2 SKS)

This course discusses the profile of the internship location; Production process; Types and procedures of analysis; Practice; Reports of internship results; and Presentation.

67) Chemistry of Drugs and Cosmetics (2 SKS)

This course discusses the introduction to medicinal plants and cosmetics; medicinal plants reviewed from ethnobotany and chemotaxonomy; types of medicinal product ingredients; phytochemical tests, extraction techniques and isolation of active compounds from natural materials; bioactive screening, secondary metabolite content and the relationship between structure and activity of medicinal plants; the role of drugs in health services and the drug manufacturing process; basic aspects and classification of cosmetic preparation ingredients; instrumental and non-instrumental methods of analyzing cosmetic preparation components; and physicochemical properties of cosmetic preparation ingredients.

68) Techniques for Natural Product Research (2 SKS)

This course discusses natural materials and their chemical and biological characteristics; development of natural material chemistry research techniques; the role of natural materials as a source of new drugs; major discoveries in the field of natural material chemistry; development of methods in organic chemistry of natural materials; development of organic chemical synthesis methods of natural materials; phytochemical screening and stages of natural material sample preparation; natural material extraction techniques; fractionation in natural material research; chromatography columns; vacuum, flash and gravity liquid chromatography columns; and comparing the differences between the three adsorption chromatography columns; eluent combinations used in liquid chromatography columns with adsorption separation mechanisms; exclusion separation mechanisms; radial chromatography and how to make chromatotron plates with various thicknesses; radial chromatography; the final stage of compound purification and how to ensure that the isolated compound is pure; spectroscopic methods in determining the structure of compounds; and simple bioassay screening methods.

69) Bioassay Techniques in Natural Product (2 SKS)

This course discusses the definition of bioassay; types of bioassays such as in vitro, in vivo, and preclinical tests; ethics of research using test animals; acute toxicity tests, subchronic or subacute toxicity tests, chronic toxicity tests, potentiation tests, ketaragonics tests, and chemutagenic tests; definition and classification of antioxidants, types of antioxidant tests, calculation of IC50 values, definition and classification of bacteria; definition and classification of fungi, types of antibacterial and antifungal tests; types of anti-inflammatory drugs; types of anti-inflammatory tests; anti-inflammatory test procedures; the effect of UV rays from the sun on human skin; and the working principles of sunscreens, types of natural compounds that have the potential as sunscreens, and sunscreen test procedures.

70) Pulp and Paper Chemistry (2 SKS)

This course discusses the chemistry of pulp and paper; pulp and paper industry; impacts of pulp and paper waste; impacts of the pulp and paper industry; components of wood chemical compounds; making pulp from softwood; bleaching and delignification; pulp from low plants (algae); analysis of SO₂ in the air using pulping technology I; analysis of pulping technology II; and conventional pulping processes.

71) Petroleum Chemistry (2 SKS)

This course discusses petroleum chemistry; downstream and upstream industries; petroleum raw materials and petroleum utilization; petroleum processing process; the concept of crude oil processing process and hydrocarbon production as petroleum raw materials; Naphtha Cracking process; Petroleum conversion process; Plastic, Rubber, and Fiber Formation Process; and the Petroleum Industry in East Kalimantan.

72) Fundamental of Oleochemistry (2 SKS)

This course discusses the basic concepts of oleochemistry; characterization of sources and utilization of glycerol and conversion of glycerol through biotechnology and thermochemistry pathways; extraction techniques and extraction processes of palm oil; fatty alcohols and fatty amines, physical and chemical properties, and their synthesis and applications; soaps and detergents; definition, types, manufacture of butter, margarine and shortening; definition and classification, synthesis, characterization and application of surfactants; petroleum fuels and biodiesel as alternative fuels; basics of polymers, biodegradable polymers and several polymers from vegetable oils and their applications; basic concepts of cosmetics and their sources from nature and stem cells, and the use of cosmetics; and sample preparation techniques, chemical analysis, and instrumentation.

73) Capita Selecta in Organic Chemistry (2 SKS)

This course discusses the scope of selected chapters, basic concepts of the development of organic chemistry, aspects of organic chemistry, and current research on several specific topics in organic chemistry.

74) Chemistry of Essential Oil (2 SKS)

This course discusses the chemistry of essential oils; Types and Classification of Essential Oils; methods of isolating chemical components of essential oils and techniques of essential oil distillation; physical properties and chemical composition of essential oils; and production, isolation and modification of the main components of fennel oil, clove oil, patchouli oil, production, citronella oil, turpentine oil, star anise oil, piperment oil, nutmeg oil, eucalyptus oil, cinnamon oil, and agarwood oil.

75) Astrochemistry (2 SKS)

This course discusses the basic concepts of astrochemistry; the concept of chemical evolution; fusion reactions in supernovae and black holes; the chemistry of the Planetary Nebula and Supernova Nebula; the chemistry of the earth's atmosphere; ionization reactions of the earth's atmosphere; ozone chemistry; and the chemistry of the atmospheres of the planets of the solar system.

76) Electrochemistry (2 SKS)

This course discusses the concepts of oxidation and reduction; the concept of oxidation state; electrochemical cells; types of electrochemical cells; the concept of electrochemical cell measurement; the concept of batteries; applied fuel cells; the concept of comparison

electrodes; thermodynamics of electrochemical cells; single electrode potential; electromotive force (EMF); dependence of EMF on concentration and temperature; the concept of electrolysis; and electrolysis applications.

77) Catalyst Chemistry (2 SKS)

This course discusses the definition of catalysts and the background of the use of catalysts in research and industry; types of catalysts; the requirements of a material as a catalyst; heterogeneous catalysts; acid sites and catalyst acidity; homogeneous catalysts; reaction principles on acid-base catalysts; reaction principles on radical initiator and metal ion catalysts; and reaction principles on enzymes as homogeneous catalysts.

78) Renewable Energy (2 SKS)

This course discusses the basic concepts of energy and conventional energy sources (fossil fuels); basic concepts about the laws of thermodynamics; hydrogen production and storage and its catalytic process; Fuel Cells; the use of solar energy, solar cells and various components used in energy production in connection with their applications; the concept of biomass energy sources, thermochemical processes and biochemical processes to produce energy; and nuclear energy.

79) Solid State Chemistry (2 SKS)

This course discusses the basic concepts of solids; Molecular Interactions in Solids; the concept of Simple Crystal Structures; Crystalline Solids; the concept of X-ray Diffraction; Crystal Damage; solid solutions; the concept of Phase Diagrams and Thermal Analysis; solid preparation methods; Solid Characterization Techniques; Optical Properties of Solids; and Magnetic Properties of Solids.

80) Capita Selecta in Physical Chemistry (2 SKS)

This course discusses the scope of the capita selecta of physical chemistry and the basic concepts of Physical Chemistry in the development of Physical Chemistry research; theoretical basis of Physical Chemistry and Physical Chemistry research techniques in journals; simple Physical Chemistry research design; and theoretical basis of Physical Chemistry and Biochemistry research techniques in research design.

81) Computational Chemistry (2 SKS)

This course discusses the History and Applications of computational chemistry; applications of the Schrodinger equation calculated by computer; levels of calculation accuracy (level of theory): Molecular mechanics, Semi empirical, ab initio, and density functional theory; applications of computational chemistry: chemical reaction mechanisms; potential energy surface calculations; surface reaction calculations; drug design and QSAR calculations; molecular docking; scanning tunneling effect; nano molecules; and interactions between molecules.

82) Molecular Reaction Dynamics (2 SKS)

This course discusses the definition and introduction of Molecular Reaction dynamics; Microscopic to Macroscopic; potential energy surfaces; bimolecular reactions and Reactive collision dynamics; reaction rate constants and reactive fluxes; transition state theory; unimolecular reactions; Arrhenius parameters on microscopic interpretations; introduction to condensed phase dynamics: transition state theory; dynamic solvent effects; and Kramers theory.

83) Inorganic Reaction Mechanisms (2 SKS)

This course discusses the nomenclature of complex compounds; stereochemistry of transition metals; structural isomers of transition/complex compounds; reactions of complex compounds; substitution reactions and reaction kinetics; oxidation reactions of complex compounds; and Redox Processes and Reactions between Two Complexes Electron-Transfer Reactions.

84) Inorganic Chemistry: Structure and Reactivity (2 SKS)

This course discusses Molecular symmetry, group theory, determination of molecular point groups, symmetry studies in chemistry, the structure of coordination compounds with certain coordination numbers and their causal factors, reverse bonding and its identification based on infrared spectroscopic evidence, reverse bonding and its identification based on crystallographic evidence, infrared spectroscopy of coordination compounds, synthesis and reactions of coordination compounds, kinetics of coordination compounds, and uses of coordination compounds.

85) Capita Selecta in Inorganic Chemistry (2 SKS)

This course discusses porous materials research topics; Metalloenzymes and Medical Inorganic Chemistry; Coordination Chemistry; Ionic liquids; Green chemistry in nanoparticle formation; Composite Materials; Industrial Inorganic Chemistry; and Crystal structure and superconductive properties.

86) Bioinorganic Chemistry (2 SKS)

This course discusses the history of the development of bioinorganic chemistry; elements present in the bodies of living things; central atoms, stability of ions/complex compounds and crystal field theory as well as the formation of phi bonds; molecular metabolism; cell membrane transformation and transition metals; and proteins (enzymes) and oxidation-reduction reactions.

87) Organometal (2 SKS)

This course discusses the definition, history and scope of organometallic and its relationship with other fields of science; structure and tendency of bond types formed in Organometallic compounds; basic concepts of ligands involved in the formation of organometallic compounds; structure and bonding in alkene complexes; the concept of reactivity of organic compounds versus organometallic; reaction types for organometallic compounds and their reaction mechanisms; and types of organometallic compounds.

88) Trace Analysis (2 SKS)

This course discusses the importance of trace element analysis; differences in trace speciation analysis; sample preparation process; preconcentration techniques; instrumentation tools used for separation; instrumentation tools used for detection to measurement; Tandem technique and Hypend technique; heavy metal trace analysis techniques; pesticide runoff analysis techniques; runoff analysis techniques for other organic contaminants such as preservatives and colorants; runoff analysis techniques that include the use of HPLC instrumentation, gas chromatography, AAS, UV-Vis spectro, preconcentration techniques for metal ions based on flow injection analysis (FIA); hydride generation methods; and development of generation methods for the analysis of Hg, As, Se, Sb, Cr, and Sn.

89) Specific Analysis (2 SKS)

This course discusses the identification of pollutants; Hg analysis using CV-AAS; Hg speciation analysis using GC-CVAAS; Arsenic analysis using HGAAS; Arsenic speciation analysis using GC-HGAAS; Selenium analysis using Fi-MW-HGAAS; analysis of particulate Pb and Cd in FAAS air; Analysis of air contaminants using near IR; Analysis using GC with special detectors and analysis of organic compounds using GC ECD detectors; Analysis of organic compounds using GC FTD and FPD detectors; analysis of SO₂ in air using Coulometric Titration; potentiometry-based electrochemical sensor analysis; and particle analysis using PSA and microscopy.

90) Analysis of Pollution Control (2 SKS)

This course discusses the concept of entrepreneurship and the scope of entrepreneurship; the development of entrepreneur-ship and the differences between workers and entrepreneurs; characteristics of the attitude and personality of an entrepreneur; factors for business success and failure; creativity theory and its principles; the concept of business management and strategies in winning business competition; differences between macro and micro functions of entrepreneurship; effective and efficient work; how to study problems, formulate problems, identify problems, and solve problems. in entrepreneurship; data and problem analysis using the SWOT analysis method; Marketing Management and Business Promotion; Selling and Negotiation Skills in entrepreneurship; and how to make a business plan.

91) Validation Methods (2 SKS)

This course discusses Data Analysis and Data Classification in Method Validation; Correlation Analysis and Anova Analysis; F Test and t Test; Regression Analysis on Spectrophotometric Data Collection; Regression Analysis on Chromatographic Data Collection; Regression Analysis on Electrometric Data Collection; Calibration Curves; Validation and Verification; Precision and Accuracy; Linearity and Working Area; Limit of Detection (LOD) and Limit of Quantization (LOQ); Ruggedness and Robustness of Test Methods; and Measurement Uncertainty.

92) Capita Selecta in Analytical Chemistry (2 SKS)

This course discusses the Synthesis of silver and gold, Properties of silver and gold nanoparticles, Gold and silver nanoparticles as colorimetric detection, Gold and silver nanoparticles as drug delivery, Nanoparticle modification, Complexing agents as UV-Vis spectrophotometric detection, Molecular Imprinted polymer (MIP), Electrochemical uric acid detection (potentiometry), manufacture of ion selective electrodes, Use of modern instruments as analysis, and Exhaust gas analysis using ORSAT instruments.

93) Advanced Chemical Instrumentation (2 SKS)

This course discusses the basic principles of tandem/hyphen technique instruments; basic principles of flow injection analysis instruments; hydride generation instrument techniques; basic concepts of membrane-based electro ionic separation; application of chemical instrument applications; basic principles of ICP-AES spectrometry; basic principles of ICP-MS Spectrometry; basic principles of XRD spectrometry; basic principles of fluorescence spectroscopy; basic principles of SEM and TEM; and basic principles of raman spectroscopy.

94) Electroanalysis (2 SKS)

This course discusses the definition of electroanalysis, basic principles of electroanalysis, Electrodes, basic principles and applications of pH meters, basic principles and applications of Potentiometry, basic principles of Coulometry, Electrogravimetry, basic principles of Voltammetry, basic principles of Amperometric Titration, basic principles of Ion Selective Electrodes (ESI), and basic principles of Membranes and sensors.

95) Medicinal Biochemistry (2 SKS)

This course discusses the history of medicinal chemistry and its relationship with other fields of science; The character of the atoms that make up the drug compound and its relationship with the chemical physical properties of the drug compound; Drug interaction with receptors through chemical bonds; Relationship between structure, solubility and biological activity Drug-cell membrane interaction; Review of neuron cell anatomy and physiology; Acetylcholine as a messenger in the cholinergic nervous system; Activity of cholinergic nervous system blocking compounds and their use in pathological conditions, glaucoma, myasthenia gravis and Alzheimer's disease; Types of antibiotics; Mechanisms of action of antibiotic, antidiabetic, and anticancer drugs; Bioactivation and biotoxification processes in drug metabolism; Drug metabolic changes due to oxidation; reduction and hydrolysis reactions of drug moieties; Conjugated, acetylation, and methylation reactions of drug moieties associated with biological activity; and Drug design.

96) Biochemistry Research Method (2 SKS)

This course discusses the basic principles of biochemical research; Centrifugation techniques; spectroscopic techniques; separation methods in biochemistry; protein purification techniques by adsorption and partition chromatography; protein purification techniques by FPLC chromatography; protein purification techniques by ion exchange and

affinity chromatography; isolation and purification of DNA; DNA electrophoresis; Protein electrophoresis and Zymogram; Polymerase Chain Reaction (PCR); and; DNA sequence determination

97) Biotechnology (2 SKS)

This course discusses Introduction to Biotechnology; Fermentation Biotechnology; Types of Fermentation and its development; Enzyme Biotechnology; Plant Biotechnology; Applications of various types of biotechnology; Introduction to Genetic Engineering; Gene Cloning; Techniques for obtaining insert DNA; Vectors; Transformation; Characterization of clones; and Gene expression.

98) Analysis Foodstuffs (2 SKS)

This course discusses how to take food samples; analyze of water content in food; analysis of ash and mineral content; analysis of carbohydrate content; analysis of protein content and nitrogenous compounds; analysis of fat/oil content; analysis of vitamin content and analysis of food additive content (BTM); and errors that may occur in each analysis.

99) Capita Selecta in Biochemistry (2 SKS)

This course discusses the basic concepts of Biochemistry in the development of current Biochemistry research, discussion of scientific literature, case studies, and presentation of current research results.

100) Biochemical of Enzyme (2 SKS)

This course discusses the definition and history of enzymes; the development of enzyme research; the protein structure of enzymes; the mechanism of enzyme action; factors affecting enzyme activity; allosteric enzymes; reaction equations in enzymes; definition and types of inhibitors; the relationship between enzyme inhibition and metabolism; control of metabolism by enzyme action; allosteric; covalent modification; coenzyme and cofactor mechanisms; enzymes in industry and their development; and several examples of enzymes in industry and health.

101) Thesis (6 SKS)

This course contains Determination of thesis topic, search for scientific literature as a theoretical basis; background, formulation of the problem, objectives, and benefits of the research; preparation of a literature review; preparation of research methods; implementation of proposal seminars; implementation of research; interpretation of research data; research results; discussion; conclusions and suggestions; attachments; implementation of results seminars; revision of thesis drafts; and final thesis seminar.

CHAPTER 5. TEACHING AND LEARNING STRATEGY

5.1 Learning Approach

The Bachelor of Chemistry Program implements a student-centered learning (SCL) approach in accordance with the Academic Regulations of Mulawarman University (2020) and aligned with the Indonesian National Higher Education Standards (SN-Dikti) and the Indonesian National Qualifications Framework (KKNI).

This approach is designed to ensure that students actively construct knowledge, develop critical thinking, and achieve the intended Program Learning Outcomes (PLOs).

Student-Centered Learning (SCL)

In this approach, students are positioned as active participants in the learning process, while lecturers function as facilitators, mentors, and evaluators. Learning activities are structured to promote independence, responsibility, and lifelong learning skills.

Problem-Based Learning (PBL)

Problem-Based Learning is implemented through real-world and contextual chemical problems. Students work individually or collaboratively to analyze problems, formulate hypotheses, and propose evidence-based solutions.

This approach supports students in:

- Developing critical and analytical thinking
- Enhancing problem-solving skills
- Applying theoretical knowledge to practical and societal contexts

Project-Based Learning (PjBL)

Project-Based Learning is applied through structured projects involving experimental work, data analysis, and scientific communication. Projects may address topics such as environmental chemistry, natural products, and applied chemical technologies.

Through this approach, students:

- Gain experiential learning
- Develop teamwork and communication skills
- Foster creativity, innovation, and responsibility

5.2 Learning Methods

To support the above approaches, the program adopts a combination of instructional methods as regulated in the academic system of Mulawarman University.

Lectures

Lectures are conducted to deliver fundamental concepts and theoretical frameworks. Interactive strategies such as discussions, case-based learning, and multimedia integration are employed to enhance student engagement.

Practicum (Laboratory Work)

Laboratory activities are a core component of chemistry education. Students perform experiments to apply theoretical knowledge, develop technical competencies, and understand scientific methodologies in a controlled environment.

Practicum activities enable students to:

- Develop laboratory and safety skills
- Analyze and interpret experimental data
- Understand real chemical phenomena

Research-Based Learning

Research-based learning is integrated throughout the curriculum, particularly in advanced courses and the final thesis. Students are engaged in mini-research projects, literature studies, and independent research under academic supervision.

This method enables students to:

- Develop scientific inquiry and research skills
- Understand research design and methodology
- Prepare for professional or academic research careers

Additional Note (for Quality Assurance)

The integration of various learning approaches and methods ensures alignment with Outcome-Based Education (OBE) principles and supports continuous improvement in teaching and learning processes.

CHAPTER 6. ASSESSMENT AND EVALUATION

6.1 Assessment Principles

Assessment in the Bachelor of Chemistry Program is designed in accordance with the Academic Regulations of Mulawarman University (2020) and aligned with the Indonesian National Higher Education Standards (SN-Dikti).

The assessment system follows the principles of:

- Validity – assessment measures the intended learning outcomes
- Reliability – assessment is consistent and objective
- Transparency – criteria and grading are clearly communicated
- Fairness – equal opportunity is provided to all students
- Accountability – assessment processes are documented and auditable

Assessment is aligned with Course Learning Outcomes (CLOs) and contributes to the achievement of Program Learning Outcomes (PLOs) within an Outcome-Based Education (OBE) framework.

6.2. Assessment Components

Student performance in the Bachelor of Chemistry Program is evaluated through a combination of theoretical and practical assessments. The assessment system is designed to measure students' understanding, skills, and overall achievement of learning outcomes.

The general composition of assessment components is as follows:

Component	Percentage
Assignments	20–30%
Mid-Term Examination	25–30%
Final Examination	30–40%
Laboratory Work	20–30%

Assignments may include homework, quizzes, presentations, reports, and group projects. Laboratory work evaluates students' practical skills, data analysis, and ability to follow experimental procedures.

The exact percentage for each component may vary depending on the course, but all courses follow this general assessment framework.

Types of Assessment

A variety of assessment methods are used to evaluate students' knowledge, skills, and attitudes:

a. Formative Assessment

Conducted throughout the semester to monitor student progress:

- Assignments
- Quizzes
- Class participation
- Laboratory reports
- Presentations

b. Summative Assessment

Conducted at the end of a learning period to evaluate achievement:

- Mid-term examination (*UTS*)
- Final examination (*UAS*)
- Final project or course project

Assessment Methods

Assessment methods are selected to match the nature of the learning outcomes:

- Written Examinations
To assess conceptual understanding and analytical ability
- Laboratory Assessment
Includes performance in experiments, lab reports, and safety compliance
- Project-Based Assessment
Evaluation of group or individual projects, including reports and presentations
- Research and Thesis Evaluation
Assessment of final-year research (*skripsi*), including proposal, implementation, report, and defense

6.3. Grading System

Student performance is evaluated using a letter grade system in accordance with university regulations:

Grade Grade Point Description

A	4.00	Excellent
B	3.00	Good
C	2.00	Satisfactory
D	1.00	Passing
E	0.00	Fail

The final grade is calculated based on weighted components such as assignments, exams, and practical work, as specified in each course syllabus (*RPS*).

Assessment of Laboratory Work

Laboratory-based courses apply specific assessment criteria, including:

- Pre-lab preparation
- Experimental performance
- Data analysis and interpretation
- Laboratory reports
- Compliance with safety procedures

Thesis and Final Project Evaluation

The final thesis (*skripsi*) is evaluated through:

- Proposal seminar
- Research implementation
- Written thesis
- Oral defense (*ujian skripsi*)

Assessment is conducted by a panel of examiners and based on standardized rubrics.

Feedback Mechanism

Students receive feedback through:

- Graded assignments and exams
- Lecturer comments on reports and presentations
- Academic advising sessions

Feedback is intended to support continuous improvement in student learning.

6.4 Evaluation Policy

Transparency

The assessment process is conducted transparently. At the beginning of each course, lecturers provide students with clear information regarding:

- Assessment components and their percentages
- Evaluation criteria and grading methods
- Course expectations and requirements

Students are also given access to their assessment results and feedback to support their learning progress.

Continuous Assessment

The program applies a continuous assessment approach, where students are evaluated throughout the semester rather than relying solely on final examinations. This includes assignments, quizzes, laboratory performance, and class participation.

Continuous assessment helps to:

- Monitor student progress regularly
- Provide timely feedback for improvement
- Encourage consistent learning habits

Quality Assurance and Continuous Improvement

The study program implements a continuous evaluation system to ensure the quality of teaching and learning:

- Course evaluation by students (*End-of-Semester Evaluation*)
- Review of assessment results and grade distribution
- Curriculum review meetings
- Monitoring of PLO achievement

The results of these evaluations are used to improve teaching strategies, assessment methods, and curriculum design.

Academic Integrity

Students are required to uphold academic integrity in all forms of assessment. Plagiarism, cheating, and other forms of academic misconduct are strictly prohibited and subject to sanctions in accordance with university regulations.

CHAPTER 7. ACADEMIC REGULATIONS

7.1 Attendance

Students are required to attend a minimum of 80% of the total scheduled lectures for each course. Attendance is a prerequisite for eligibility to participate in the Mid-Term Examination and Final Examination.

Attendance is recorded through the official academic system of the university. Students who do not meet the minimum attendance requirement may not be allowed to take examinations or may receive academic penalties in accordance with university regulations.

Active participation during lectures, discussions, and laboratory sessions is strongly encouraged as part of the learning process.

7.2 Academic Integrity

Students of the Bachelor of Chemistry Program are expected to uphold the highest standards of academic integrity and ethical conduct in all academic activities.

Academic misconduct includes, but is not limited to:

- **Plagiarism**, defined as presenting another person's work or ideas without proper acknowledgment
- **Cheating** during examinations or assignments
- **Data falsification or fabrication**, particularly in laboratory reports or research activities
- **Unauthorized collaboration**

All academic work must be original and properly referenced. Violations of academic integrity will result in disciplinary actions in accordance with the university's academic regulations, which may include grade penalties, course failure, or further sanctions.

7.3 Study Duration Rules

The normal duration of study for the Bachelor of Chemistry Program is four (4) years, consisting of eight (8) semesters. Students are required to complete all academic requirements within a maximum study period as determined by university regulations, generally not exceeding seven (7) years or fourteen (14) semesters. Students who exceed the maximum study period may be subject to academic dismissal in accordance with institutional policies. To ensure timely graduation, students are advised to:

- Follow the recommended study plan
- Complete prerequisite courses on time
- Consult academic advisors regularly

CHAPTER 8. LABORATORY AND SAFETY

Laboratory activities are an integral component of the Bachelor of Chemistry Program at the Faculty of Mathematics and Natural Sciences, Mulawarman University. These activities are designed to develop students' practical skills, scientific thinking, and professional responsibility. The program ensures that all laboratory work is conducted in a safe, well-equipped, and controlled environment in accordance with national and international safety standards.

8.1 Laboratory Facilities

The Chemistry Study Program provides a range of laboratory facilities to support teaching, research, and community service activities. These include laboratories for:

- General Chemistry
- Organic Chemistry
- Inorganic Chemistry
- Analytical Chemistry
- Physical Chemistry
- BioChemistry

Each laboratory is equipped with essential instruments, glassware, chemicals, and safety equipment to support experimental learning. Facilities are regularly maintained and upgraded to ensure reliability and safety.

Students are required to use laboratory equipment responsibly and follow all operational guidelines provided by laboratory staff and lecturers.

8.2 Safety Regulations

Safety is a top priority in all laboratory activities. Students must comply with all safety regulations to prevent accidents and ensure a safe working environment.

General safety rules include:

- Wearing appropriate personal protective equipment (PPE), such as lab coats, safety goggles, and gloves
- Prohibiting eating, drinking, and smoking in laboratory areas
- Following all instructions provided by lecturers and laboratory supervisors
- Being aware of emergency procedures, including the location of safety equipment (fire extinguishers, eye wash stations, first aid kits)
- Reporting any accidents, injuries, or hazardous conditions immediately

Failure to comply with safety regulations may result in disciplinary actions and restricted access to laboratory activities.

8.3 Chemical Handling Procedures

Proper handling of chemicals is essential to ensure safety and prevent hazards. Students must follow standard procedures when working with chemicals:

- Read and understand **Material Safety Data Sheets (MSDS)** before handling chemicals
- Label all chemical containers clearly and accurately
- Use appropriate techniques for measuring, mixing, and transferring chemicals
- Avoid direct contact with hazardous substances

- Store chemicals according to compatibility and safety guidelines

Students must not perform unauthorized experiments or use chemicals without supervision. All laboratory work must be conducted under the guidance of lecturers or laboratory personnel.

8.4 Waste Management

Chemical waste must be managed properly to minimize environmental impact and ensure laboratory safety. The program applies responsible waste management practices in accordance with environmental regulations.

Key procedures include:

- Segregating waste based on type (organic, inorganic, hazardous, non-hazardous)
- Disposing of chemical waste in designated containers
- Avoiding disposal of chemicals into sinks unless permitted
- Following instructions for handling hazardous waste materials

Students are responsible for maintaining cleanliness and safety in their working areas and must ensure that all waste is disposed of correctly after each laboratory session.

CHAPTER 9. STUDENT SUPPORT SYSTEM

The Bachelor of Chemistry Program at the Faculty of Mathematics and Natural Sciences, Mulawarman University, provides comprehensive student support services to ensure academic success, personal development, and career readiness. These services are designed to support students throughout their academic journey, from admission to graduation.

9.1 Academic Advising

Each student is assigned an **academic advisor (Dosen Pembimbing Akademik)** who provides guidance on academic planning and progress. Academic advising plays an important role in helping students complete their studies effectively and on time.

The responsibilities of academic advisors include:

- Assisting students in planning their study program each semester
- Monitoring academic progress and performance
- Providing guidance on course selection and prerequisites
- Offering academic support and recommendations when needed
- Assisting students in addressing academic difficulties

Students are encouraged to consult their academic advisors regularly, especially before course registration and when facing academic challenges.

9.2 Career Services

Mulawarman University provides career support services to help students prepare for employment and professional development. These services are coordinated through university-level units and faculty initiatives.

Career services include:

- Career guidance and job readiness training
- Internship opportunities in collaboration with industry and government institutions
- Job vacancy information and career fairs
- Workshops on curriculum vitae (CV) writing and interview skills
- Networking opportunities with alumni and industry partners

These services aim to enhance students' employability and readiness to enter the workforce or pursue further studies.

9.3 Counseling

The university provides counseling services to support students' mental health and personal well-being. Counseling services are available through designated university units and are accessible to all students.

Counseling services include:

- Academic counseling for learning-related challenges
- Personal counseling for emotional and social issues
- Stress management and mental health support
- Guidance for adapting to university life

All counseling services are conducted confidentially and professionally to ensure students feel safe and supported.

9.4 Scholarships

Scholarship Opportunities

Mulawarman University, particularly the Faculty of Mathematics and Natural Sciences (FMIPA), provides a wide range of scholarship opportunities to support students financially and to foster academic excellence. These scholarships are offered through collaboration between the government, regional authorities, industry partners, and the university.

Types of scholarships available to FMIPA students include:

- **Government-Funded Scholarships**
Including national programs such as KIP Kuliah (formerly Bidikmisi), which covers tuition fees and living allowances for students from economically disadvantaged backgrounds.
- **Regional Government Scholarships (Kalimantan Timur)**
Such as *Beasiswa Kaltim Tuntas / Kaltim Cemerlang* and *Bantuan Pendidikan Mahakam*, which provide financial support for students originating from East Kalimantan.
- **University and Academic Scholarships**
Internal scholarships and academic performance-based assistance provided by Mulawarman University for high-achieving students.
- **Banking and Financial Institution Scholarships**
Including scholarships from:
 - Bank Indonesia
 - Bank Syariah programs
 - Bankaltimara (regional bank scholarships)
- **Industry and Corporate Scholarships (CSR Programs)**
Offered by national and regional companies, such as:
 - Pertamina Foundation (*Sobat Bumi*)
 - KPC Scholarship (PT Kaltim Prima Coal)
 - Other industry partners collaborating with the university
- **Private Foundation Scholarships**
Including competitive national programs such as:
 - Tanoto Foundation
 - Badan Amil Zakat Nasional (*Beasiswa Cendekia BAZNAS*)
 - BCA
- **Special and Thematic Scholarships**
 - Beasiswa afirmasi wilayah 3T (Terdepan, Terpencil, Tertinggal)
 - Beasiswa Etos ID
 - Beasiswa Unggulan (for high-achieving students at national level)
- **Faculty-Specific Opportunities (FMIPA)**
At the department level (e.g., Chemistry FMIPA), students may access scholarships such as:

- Beasiswa KIP Kuliah
- Beasiswa Kaltim Tuntas
- Beasiswa Pertamina Sobat Bumi

Information and Application Procedures

Information regarding scholarship availability, eligibility criteria, and application procedures is regularly disseminated through official university platforms, faculty announcements, and departmental communication channels.

Students are encouraged to actively monitor announcements and apply for scholarships that align with their academic performance, financial condition, and personal achievements.

CHAPTER 10. INTERNATIONALISATION

The Bachelor of Chemistry Program at the Faculty of Mathematics and Natural Sciences, Mulawarman University, is committed to enhancing its global engagement through internationalisation activities. These initiatives aim to broaden students' academic perspectives, improve intercultural competencies, and strengthen the program's alignment with international standards in chemical sciences, particularly in the areas of tropical natural resources and environmental chemistry.

Internationalisation is implemented through academic collaboration, research partnerships, mobility programs, and participation in global scientific communities.

10.1 Student Exchange

The program encourages students to participate in student exchange programs with partner universities at national and international levels. Through these programs, students have the opportunity to:

- Experience different academic environments and learning systems
- Enhance cross-cultural communication skills
- Gain international academic exposure and credits recognition
- Strengthen academic and personal development

Student mobility activities are facilitated through university programs such as **Merdeka Belajar–Kampus Merdeka (MBKM)**, bilateral agreements, and collaboration with partner institutions.

10.2 Joint Research

The Chemistry Study Program actively promotes collaborative research with national and international partners, including universities, research institutions, and industry.

These collaborations focus on areas such as:

- Natural product chemistry based on tropical biodiversity
- Environmental chemistry and sustainability
- Development of functional materials and applied chemistry

Students may be involved in research projects under the supervision of lecturers, allowing them to gain experience in scientific research, data analysis, and publication.

10.3 International Conferences

Students and lecturers are encouraged to participate in international conferences, seminars, and scientific forums. These activities provide opportunities to:

- Present research findings at the international level
- Engage with global scientific communities
- Expand academic networks
- Stay updated with recent developments in chemical sciences

Participation in international conferences is supported by the university and faculty through academic programs and research activities.

10.4 Visiting Lecturers

The program invites visiting lecturers and experts from national and international institutions to enrich the learning experience. These activities may include:

- Guest lectures and short courses
- Collaborative teaching sessions
- Research discussions and workshops

Visiting lecturers provide students with broader academic perspectives and exposure to global scientific practices.

CHAPTER 11. QUALITY ASSURANCE SYSTEM

The Bachelor of Chemistry Program at the Faculty of Mathematics and Natural Sciences, Mulawarman University, implements a structured quality assurance system to ensure continuous improvement in academic and non-academic activities. This system is aligned with the **Internal Quality Assurance System (SPMI)** applied at the university level and follows national higher education standards as well as international best practices. The quality assurance system is implemented at multiple levels, including university, faculty, and study program levels, ensuring that all academic processes are monitored, evaluated, and continuously improved.

11.1 Internal Quality Assurance System

Mulawarman University applies an **Internal Quality Assurance System (SPMI)** as the main framework for maintaining and improving academic quality. This system is implemented in accordance with national regulations and is integrated across all faculties, including FMIPA. The SPMI at Mulawarman University consists of interconnected components, including:

- **Quality standards** based on National Higher Education Standards (SN-Dikti)
- **Quality assurance units** at university and faculty levels
- **Internal audits (Audit Mutu Internal / AMI)** to evaluate program performance
- **Academic information systems** (e.g., AIS and STAR) to support monitoring and evaluation

The implementation of SPMI ensures that all academic processes—such as curriculum design, teaching, assessment, and student services—are carried out systematically and meet established quality standards.

11.2 PDCA Cycle (Plan–Do–Check–Act)

The quality assurance system at Mulawarman University follows the **PDCA (Plan–Do–Check–Act)** cycle, which is equivalent to the PPEPP model (Establishment–Implementation–Evaluation–Control–Improvement) used in Indonesian higher education.

Stage	Description
Plan	Curriculum design, formulation of learning outcomes (PLOs), and academic planning aligned with institutional goals
Do	Implementation of teaching and learning processes, research activities, and student services
Check	Evaluation through internal audits, course evaluations, student feedback, and performance indicators
Act	Continuous improvement through curriculum revision, policy updates, and enhancement of teaching and learning quality

This cycle is applied consistently at all levels, ensuring that quality assurance is not only planned but also implemented, monitored, and continuously improved.

11.3 Continuous Improvement

Continuous improvement is a key component of the quality assurance system and is supported by data-driven evaluation and stakeholder feedback.

Tracer Study

Mulawarman University conducts **tracer studies** to collect data on graduates' employment, career development, and relevance of competencies to the job market. Tracer studies are typically conducted within a certain period after graduation and serve as an important tool to:

- Evaluate the relevance of the curriculum to industry needs
- Assess graduate employability and career pathways
- Identify gaps between academic outcomes and professional requirements
- Support accreditation and institutional performance indicators

Tracer study activities are coordinated by university units such as the **UPT Pengembangan Karier dan Kewirausahaan (PERKASA)** and involve collaboration across faculties.

Stakeholder Feedback

Feedback from stakeholders is systematically collected and used as a basis for program improvement. These stakeholders include:

- Students (course evaluations and satisfaction surveys)
- Alumni (through tracer studies)
- Employers and industry partners
- Academic staff and institutional partners

This feedback is used to:

- Improve curriculum content and structure
- Enhance teaching and learning methods
- Strengthen graduate competencies
- Support strategic decision-making

Integrated Quality Assurance

Through the integration of SPMI, PDCA cycle, tracer studies, and stakeholder feedback, the Chemistry Study Program ensures that its quality assurance system is:

- **Systematic and sustainable**
- **Data-driven and evidence-based**
- **Aligned with national and international standards**
- **Focused on continuous improvement**

This approach ensures that graduates of the program are well-prepared, competitive, and relevant to the needs of society and the global scientific community.

Berikut narasi yang sudah dirapikan untuk bagian **Internationalisation** pada **Bachelor of Chemistry Program (BA Chemistry)** dengan gaya **akademik, ringkas, dan sesuai student handbook**:

CHAPTER 12. FACILITIES AND RESOURCES

The Bachelor of Chemistry Program at the Faculty of Mathematics and Natural Sciences, Mulawarman University, is supported by adequate facilities and resources to ensure the effective implementation of teaching, learning, research, and community service activities. These facilities are continuously improved to meet academic standards, support student learning outcomes, and align with developments in chemical sciences, particularly in the areas of natural products and environmental chemistry.

12.1 Laboratories

Laboratory facilities are a core component of the Chemistry Program, providing hands-on experience and supporting the development of practical and analytical skills. The program offers several laboratories covering major areas of chemistry, including:

- General Chemistry Laboratory
- Organic Chemistry Laboratory
- Inorganic Chemistry Laboratory
- Analytical Chemistry Laboratory
- Physical Chemistry Laboratory
- Instrumentation and Environmental Chemistry Laboratory

Each laboratory is equipped with standard instruments, glassware, chemicals, and safety equipment necessary for experimental work. In addition, selected laboratories are equipped with analytical instruments such as spectrophotometers, chromatographic systems, and other supporting equipment for advanced analysis.

Laboratory activities are conducted under the supervision of qualified lecturers and laboratory technicians to ensure safe and effective learning. Regular maintenance, calibration, and inventory control are carried out to ensure that all equipment functions properly.

12.2 Library and Learning Resources

Students have access to comprehensive library facilities provided by the university and faculty. These include:

- Printed textbooks and reference materials in chemistry
- Access to national and international scientific journals
- Digital library services and online databases
- Thesis and research repositories

The availability of these resources supports independent learning, literature review, and research activities. Students are encouraged to utilize both physical and digital resources to enhance their academic performance.

12.3 Information Technology Facilities

The program is supported by modern information technology systems to facilitate academic and administrative activities. These include:

- Academic Information System (for course registration, grading, and academic records)
- E-learning platforms to support blended and online learning
- Internet and Wi-Fi access across campus
- Multimedia-equipped classrooms

These facilities enable efficient communication between students and lecturers, as well as access to digital learning materials and academic services.

12.4 Academic Staff

The Chemistry Program is supported by qualified academic staff with expertise in various fields of chemistry, including organic, inorganic, analytical, physical, and environmental chemistry. Lecturers hold academic qualifications ranging from master's degrees to doctoral degrees and are actively involved in teaching, research, and community service. Many academic staff members participate in national and international research collaborations and scientific publications. The roles of academic staff include:

- Delivering lectures and laboratory instruction
- Supervising undergraduate research and thesis projects
- Conducting research and publishing scientific work
- Contributing to community service activities

The program maintains an appropriate student-to-lecturer ratio and supports continuous professional development through training, research funding, and academic collaboration.

A detailed list of academic staff is provided in the appendix section of this handbook.

No .	Permanent Lecturer Name	Date of Birth	Academic Position	Academic Degree	Bachelor, Master, Doctoral Education and College Origin	Field of Expertise for Every Level of Education	Study Program Taught
-1	-2	-4	-5	-6	-7	-8	-9
1	Daniel	11-12-1966	Professor	S.Si., M.Si., Dr., Drs.	Bachelor - USU Master - USU Doctoral - USU	Bachelor - Chemistry Master - Chemistry Doctoral - Chemistry	Bachelor, Master, Doctoral
2	Aman Sentosa Panggabean	30-06-1975	Professor	S.Si., M.Si., Dr.	Bachelor - UNS Master - UNS Doctoral - ITB	Bachelor - Chemistry Master – Analytical Chemistry Doctoral - Separation and speciation of Analytical Chemistry	Bachelor, Master, Doctoral
3	Bohari	05-11-1973	Professor	Ir., M.Si., Dr.	Bachelor - UNHAS Master - UGM	Bachelor - Chemistry Master - Organic Chemistry	Bachelor, Master, Doctoral

					Doctoral - Universite de PAU et des Pays de l'Adour, Prancis	Doctoral - Organic Chemistry	
4	Erwin	01-10-1970	Professor	Ir., M.Si., Drs.	Bachelor - UNHAS Master - ITB Doctoral - UNHAS	Bachelor - Chemistry Master - Organic Chemistry Doctoral - Chemistry	Bachelor, Master, Doctoral
5	Subur P. Pasaribu	28-09-1972	Professor	S.Si., M.Si., Dr.	Bachelor – USU Master – USU Doctoral - USU	Bachelor - Chemistry Master - Analytical Chemistry Doctoral – Analytical Chemistry	Bachelor, Master, Doctoral
6	Rudi Kartika	05-02-1967	Professor	S.Si., M.Si., Drs.	Bachelor - USU Master - IPB Doctoral - USU	Bachelor - Chemistry Master - Biotechnology Doctoral - Chemistry	Bachelor, Master, Doctoral
7	Teguh Wirawan	20-02-1969	Professor	S.Si., M.Si., Dr.	Bachelor - UB Master - UGM Doctoral - UNAIR	Bachelor - Chemistry Master – Analytical Chemistry Doctoral - Analytical Chemistry	Bachelor, Master, Doctoral
8	Soerja Koesnarpadi	24-09-1974	Associate Professor	S.Si., M.Si., Dr.	Bachelor - UNDIP Master - UGM Doctoral - UGM	Bachelor - Chemistry Master - Chemistry Doctoral - Analytical Chemistry	Bachelor, Master, Doctoral

9	Saibun Sitorus	10-10-1966	Associate Professor	S.Si., M.Si., Dr.	Bachelor - UNIMED Master - UNHAS Doctoral - UNAIR	Bachelor - Chemistry Master - Inorganic Chemistry Doctoral - Physical Chemistry	Bachelor, Master, Doctoral
10	Alimuddin	07-08-1965	Associate Professor	S.Si, M.Si., Drs	Bachelor - UNHAS Master - UNAIR	Bachelor - Chemistry Master - Chemistry	Bachelor, Master
11	Abdul Aziz	10-11-1967	Associate Professor	S.Si., M.Si., Dr.	Bachelor – UNHAS Master – ITB Doctoral - ITB	Bachelor - Chemistry Master - Chemistry Doctoral – Physical Chemistry	Bachelor, Master, Doctoral
12	Chairul Saleh	31-03-1973	Associate Professor	S.Si., M.Si., Dr.	Bachelor - USU Master - UNPAD Doctoral - USU	Bachelor - Chemistry Master – Organic Chemistry Doctoral - Organic Chemistry	Bachelor, Master, Doctoral
13	Eva Marlina	02-03-1975	Associate Professor	S.Si., M.Si., Dr.	Bachelor - UGM Master - UNAND Doctoral - UNAIR	Bachelor - Chemistry Master - Chemistry Doctoral - Organic Chemistry	Bachelor, Master, Doctoral
14	Winni Astuti	03-03-1975	Lecturer	S.Si., M.Si., Dr.	Bachelor - ITB Master - ITB Doctoral - UNILA	Bachelor - Chemistry Master - Biochemistry Doctoral - Biochemistry	Bachelor, Master, Doctoral
15	Noor Hindryawati	13-12-1977	Associate Professor	S.Si., M.Si., Dr.	Bachelor - UNMUL Master - UGM Doctoral - University Malaysia Pahang	Bachelor - Chemistry Education Master - Chemistry Doctoral - Industrial Chemistry	Bachelor, Master, Doctoral

16	RR Dirgarini Julia Nurlianti Subagyono	15-07-1982	Associate Professor	S.Si., M.Sc., Dr.	Bachelor - UGM Master - Monash University, Australia Doctoral - Monash University, Australia	Bachelor - Chemistry Master - Chemistry Doctoral - Chemistry	Bachelor, Master, Doctoral
17	Veliyana Londong Allo	20-08-1989	Lecturer	S.Si., M.Si.	Bachelor - UNMUL Master - ITB	Bachelor - Chemistry Master – Physical Chemistry	Bachelor, Master

Research Field of Lecturer

No .	Permanent Lecturer Name	Academic Degree	Research Topic
1	Daniel	Prof. M.Si., Dr., Drs.	Organic Chemistry Synthesis
2	Aman Sentosa Panggabean	Prof. S.Si., M.Si., Dr.	Analytical Chemistry
3	Bohari	Prof. Ir., M.Si., Dr.	Analytical Chemistry
4	Erwin	Prof. Ir., M.Si., Dr.	Natural Product Organic Chemistry
5	Subur P. Pasaribu	Prof. S.Si., M.Si., Dr.	Organic Chemistry
6	Rudi Kartika	Prof., M.Si., Dr. Drs	Bioassay, biosorption
7	Teguh Wirawan	Prof., Drs. M.Si., Dr.	Analytical Chemistry and environment

8	Soerja Koesnarpadi	S.Si., M.Si., Dr.	Analytical Chemistry and Material
9	Saibun Sitorus	S.Si., M.Si., Dr.	Organic Chemistry
10	Alimuddin	S.Si., M.Si., Drs.	Analytical Chemistry

11	Soerja Koesnarpadi	Prof. S.Si., M.Si., Dr.	Analytical Chemistry
12	Chairul Saleh	S.Si., M.Si., Dr.	Natural Product Chemistry
13	Eva Marlina	S.Si., M.Si., Dr.	Natural Product Chemistry
14	Winni Astuti	S.Si., M.Si., Dr.	Enzymology
15	Noor Hindryawati	S.Si., M.Si., Dr.	Synthesis of Porous Inorganic Materials and Bioenergy
16	RR Dirgarini Julia Nurlianti Subagyo	S.Si., M.Sc., Dr.	Thermochemical Conversion and Catalysis
17	Veliyana Londong Allo	S.Si., M.Si.	Computation Chemistry

12.5 Supporting Facilities

In addition to laboratories and academic resources, the program provides various supporting facilities to create a conducive learning environment, including:

- Classrooms equipped with projectors and multimedia systems
- Discussion rooms and study spaces
- Faculty and administrative offices
- Student activity areas
- Access to campus facilities such as health services, worship spaces, and sports facilities

These facilities support both academic and non-academic activities, contributing to students' overall development and well-being.

12.6 Maintenance and Continuous Improvement

All facilities and resources are regularly monitored and maintained to ensure their quality and functionality. The program implements continuous improvement through:

- Periodic evaluation of facility usage and effectiveness
- Feedback from students and academic staff
- Upgrading of laboratory equipment and learning resources
- Alignment with technological advancements and educational needs

This ensures that the facilities remain relevant, safe, and supportive of high-quality education and research.

CHAPTER 13. COLLABORATION AND PARTNERSHIPS

The Bachelor of Chemistry Program at the Faculty of Mathematics and Natural Sciences, Mulawarman University, actively establishes and maintains collaborations with various partners at local, national, and international levels. These partnerships are essential to enhance academic quality, strengthen research capacity, and support the relevance of education to societal and industrial needs.

13.1 Collaboration with Universities

The program collaborates with universities both within Indonesia and abroad to support academic development and knowledge exchange. These collaborations include:

- Joint research and publications
- Academic exchanges (students and lecturers)
- Curriculum benchmarking and development
- Participation in academic forums and conferences

Such partnerships contribute to improving academic standards, fostering innovation, and ensuring alignment with global developments in chemical sciences.

13.2 Collaboration with Industry

Collaboration with industry partners plays a crucial role in ensuring that the curriculum remains relevant to current technological advancements and workforce demands. The Chemistry Program works with industries related to chemical manufacturing, environmental management, and natural resource utilization, particularly within East Kalimantan.

Forms of collaboration include:

- Internship (Praktik Kerja Lapangan/PKL) opportunities for students
- Industry-based research and problem-solving projects
- Guest lectures and professional seminars
- Support for graduate employability and career development

These collaborations enable students to gain practical experience and better understand real-world applications of chemistry.

13.3 Collaboration with Government

The program also collaborates with government institutions at regional and national levels, particularly in areas related to environmental management, natural resource utilization, and public service.

These collaborations include:

- Research projects addressing environmental and societal issues
- Community service programs (Pengabdian kepada Masyarakat)
- Policy-related studies and scientific consultations
- Participation in government-funded research and development programs

Through these partnerships, the program contributes to regional development and the sustainable management of natural resources, especially in East Kalimantan.

CHAPTER 14. GRADUATION REQUIREMENTS

To obtain a Bachelor of Science degree (S.Si) in Chemistry, students must fulfill all academic and administrative requirements established by Mulawarman University and the Faculty of Mathematics and Natural Sciences.

14.1 Credit Requirements

Students must complete a minimum of **144 credits (SKS)**, which include compulsory courses, elective courses, laboratory work, and final project requirements.

14.2 Grade Point Average (GPA)

Students must achieve a minimum **Grade Point Average (GPA) of 2.00** on a 4.00 scale. The GPA reflects the overall academic performance throughout the study period.

14.3 Undergraduate Thesis

Students are required to complete an **undergraduate thesis (skripsi)** as a final academic requirement. The thesis involves:

- Conducting independent research under academic supervision
- Applying scientific methods and analytical techniques
- Preparing a written scientific report
- Defending the thesis in a final examination

The thesis demonstrates students' ability to integrate knowledge, research skills, and scientific communication.

14.4 English Proficiency

Students are required to meet a minimum level of **English proficiency** as determined by university regulations. This requirement ensures that graduates are able to access scientific literature and communicate in an international academic environment.

14.5 Internship / Community Service (KKN)

Students must complete either:

- **Internship (Praktik Kerja Lapangan/PKL)** in relevant industries or institutions, or
- **Community Service Program (Kuliah Kerja Nyata/KKN)**

These activities aim to:

- Provide real-world experience
- Apply academic knowledge in practical settings
- Develop social responsibility and teamwork skills