

UNIVERSITAS NEGERI MANADO



# CURRICULAR OVERVIEW

Bachelor of Chemistry

UNIVERSITAS NEGERI MANADO  
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN BAHAS  
JURUSAN KIMIA  
PROGRAM STUDI KEPENDIDIKAN DAN NON KEPENDIDIKAN

2023



## **I. VISION, MISSION, GOALS, AND STRATEGY OF THE STUDY PROGRAM**

### **A. Vision**

To become a superior and innovative study program based on MAPALUS in the development and application of chemical science based on local resources and wisdom.

### **B. Mission**

1. Implementing education and teaching to produce competent graduates in the field of chemistry.
2. Developing chemistry knowledge through innovative research.
3. Disseminating the results of chemical research through community service activities.
4. Realizing good governance of study programs based on information and communication technology.
5. Developing cooperation with various parties both domestically and internationally to support the development of study programs.

### **C. Objective**

1. To produce graduates in chemistry who are faithful and devoted to God Almighty and possess scientific responsibility.
2. To provide quality, effective, and efficient education in the field of chemistry.
3. To produce outstanding, innovative graduates who are competitive at the national and international levels.
4. To generate innovative research in the development of chemical science.
5. To establish cooperation in the fields of education, research, and community service.

### **D. Strategy**

1. To implement education and teaching through the development of curriculum, learning tools, and regular evaluations.
2. To encourage the improvement of faculty quality through further studies, training,



seminars, and scientific publications.

3. Encouraging students to be active in academic and non-academic activities such as seminars, competitions, and entrepreneurship.
4. Developing research and community service activities collaboratively and publishing them in scientific journals.
5. Establishing cooperation with government agencies, private sectors, and universities both nationally and internationally.
6. Developing scientific publication facilities through national and international journals.

### E. University Value

The organization of Universitas Negeri Manado as a State University is based on values and culture that serve as motivational strengths and cultural moral foundations that inspire the academic community within it. These values and culture form the identity as the personal and institutional character of Universitas Negeri Manado. The values held are crystallized into a work culture with a framework that can be seen in Table 1.

**Table 1.** Values of Universitas Negeri Manado

<b>Value Category</b>	<b>Type of Value</b>	<b>Work Culture</b>
Core values are those that are permanent, which are contained in Pancasila, and values that are universal.	<ol style="list-style-type: none"><li>1. Truth</li><li>2. Honesty</li><li>3. Loyalty</li><li>4. Unity</li><li>5. Faith</li><li>6. Justice</li></ol>	<ol style="list-style-type: none"><li>1. Honest with oneself and others</li><li>2. Open and communicative</li><li>3. Discipline, commitment, dedication</li></ol>



<p>Instrumental values Values derived from fundamental values reflected in various laws and regulations.</p>	<ol style="list-style-type: none"><li>1. Educational</li><li>2. Scientific</li><li>3. Visionary</li><li>4. Professional</li><li>5. Patriotism</li><li>6. Innovative</li><li>7. High performing</li><li>8. Efficiency</li><li>9. Effective</li><li>10. Ethical and legal</li><li>11. Welfare</li><li>12. Devotion</li></ol>	<ol style="list-style-type: none"><li>4. Hardworking, diligent, resilient</li><li>5. Responsible</li><li>6. Performance-oriented, quality, and results</li><li>7. Cooperation in partnership</li><li>8. Critically, meticulously, analytically, working in a measured way.</li></ol>
<p>Practical values are the values reflected in the practice of life and the organization's management, as well as in the overall activities of Unima citizens.</p>	<ol style="list-style-type: none"><li>1. Tolerance</li><li>2. Transparent</li><li>3. Accountable</li><li>4. Democracy</li><li>5. Competition</li><li>6. Productive</li><li>7. Objective</li><li>8. Aesthetical</li></ol>	<ol style="list-style-type: none"><li>9. Brave in making decisions and being solution-oriented towards various problems</li><li>10. Creative in Tasks and Responsibilities</li><li>11. Prioritizing collaborative and communicative work</li></ol>



## II. GRADUATE PROFILE (GP) AND GRADUATE LEARNING OUTCOMES (CLO)

### A. Graduate Profile

The Bachelor of Chemistry program is designed to produce graduates who are not only competent in mastering chemical concepts but also capable of applying their knowledge in diverse professional contexts. The graduate profiles outlined below reflect the program's commitment to preparing students for careers in **research and analysis, education, and entrepreneurship**, while ensuring alignment with technological advancements, industry needs, and societal development. Each profile emphasizes a balance between theoretical mastery and practical application, equipping graduates with the skills to contribute meaningfully to scientific progress, educational innovation, and sustainable industrial practices.

**Table 2.** Graduate Profile and Its Description

No.	Graduate Profile	Description of Graduate Profile
<b>GP1</b>	<b>Analyst</b>	Able to analyse research data precisely and accurately in accordance with developments in information technology, skilled in operating supporting instruments for chemical analysis, and mastering minimalist theoretical concepts in the use of living creatures to support chemical research.
<b>GP2</b>	<b>Educator</b>	Able to master minimal theoretical concepts in the field of chemistry learning, such as Chemistry Curriculum and Learning, Chemistry Learning Strategies, Chemistry Learning Media, and Resources.
<b>PL3</b>	<b>Entrepreneur</b>	Able to master minimal theoretical concepts in the field of entrepreneurship, such as management, accounting, marketing strategies, and have knowledge of industrial management,



		especially the chemical industry, in a safe, efficient, and effective manner.
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## B. Formulation of Graduate Learning Outcomes

The competency framework of the Bachelor of Chemistry program is structured to align with ASIIN accreditation standards, ensuring that graduates develop not only subject-specific expertise but also general and social competences essential for professional and societal engagement. The framework is organized into four key aspects: Attitude (A), which emphasizes ethical, moral, and spiritual values; General Skills (GS), which highlight responsibility, decision-making, communication, and global adaptability; Knowledge (K), which ensures mastery of chemical concepts, laboratory safety, and scientific methods; and Special Skills (SS), which focus on applying interdisciplinary foundations and innovating solutions to chemical problems. Together, these learning outcomes (LOs) provide a holistic profile of graduates who are scientifically competent, ethically grounded, globally minded, and capable of contributing to both academic and industrial advancements.

**Table 3.** Relationship between SSC and LO of Chemistry Study Programme

Competency SSC- ASIIN	Aspect	LO	Description
General and Social Competences	Attitude (A)	LO- A1	Be devoted to God Almighty and uphold human values in carrying out duties based on religion, morality, and ethics.
		LO- A2	Contribute to improving the quality of life in society, possess a sense of nationalism, and show responsibility toward the nation and state.
		LO- A3	Internalize the spirit of independence, perseverance, and entrepreneurship.



<b>Competency SSC- ASIIN</b>	<b>Aspect</b>	<b>LO</b>	<b>Description</b>
	General Skills (GS)	LO- GS1	Demonstrate responsibility for work within the area of expertise independently.
		LO- GS2	Be able to make appropriate decisions based on the analysis of information and data, providing guidance in selecting various alternative solutions both individually and in groups.
		LO- GS3	Communicate ideas, thoughts, and research findings in the field of chemistry through various scientific media in a proper and ethical manner.
		LO- GS4	Be able to document, store, secure, and retrieve data to ensure validity and prevent plagiarism.
		LO- GS5	Adapt, collaborate, create, contribute, and innovate in applying scientific knowledge within organizational and societal life as globally minded citizens.
		LO- GS6	Be proficient in using at least one international language, both orally and in writing.
Subject- Specific Competences	Knowledge (K)	LO- K1	Demonstrate mastery of concepts, principles, and skills in chemistry, including structure, dynamics, energetics, and measurement, with a focus on life skills.
		LO- K2	Possess knowledge in chemistry related to processes of identification, isolation, transformation, and chemical synthesis to



Competency SSC-ASIIN	Aspect	LO	Description
			develop alternative solutions for real-life problems.
		LO-K3	Master the principles of Occupational Health and Safety (OHS), laboratory management, equipment usage, and operation of chemical instruments.
		LO-K4	Understand the fundamentals of scientific methods and the principles of using Information and Communication Technology (ICT) for data storage, evaluation, analysis, processing, and collection in the fields of chemistry, research, and industry.
	Special Skills (SS)	LO-SS1	Apply basic concepts of physics, biology, chemistry, and mathematics to innovate in solving chemical problems.
		LO-SS2	Apply knowledge in the field of chemistry related to processes of identification, isolation, transformation, and synthesis.
		LO-SS3	Be skilled in developing scientific knowledge and the contextual implementation of chemistry to solve chemical problems and create alternative solutions based on chemical research.

### C. Matrix of PL Relationship with CPL

Courses are designed based on the Learning Outcomes (LO) assigned to each



course, along with the corresponding study materials that align with these outcomes. The Bachelor of Chemistry program adopts a competency framework that integrates general, social, and subject-specific competences. This framework ensures that graduates are not only proficient in chemical knowledge and laboratory skills but also demonstrate strong ethical attitudes, communication abilities, and global adaptability. The learning outcomes (LOs) are categorized into four aspects: Attitude (A), which emphasizes moral, spiritual, and national values; General Skills (GS), which highlight responsibility, decision-making, communication, and collaboration; Knowledge (K), which ensures mastery of chemical principles, occupational safety, and scientific methods; and Special Skills (SS), which focus on interdisciplinary application and innovation in solving chemical problems. Together, these competencies form a holistic foundation that prepares graduates to excel in research, education, industry, and entrepreneurship while contributing responsibly to society and global scientific development.



**Table 4.** Learning Outcome and New Course Matrix

No	Course	Attitude			Knowledge				Specific Skills			Generic Skills					
		S1	S2	S3	P1	P2	P3	P4	KK1	KK2	KK3	KU1	KU2	KU3	KU4	KU5	KU6
<b>Semester-1</b>																	
1.	Religious Education	√										√					
2.	Pancasila Education	√	√													√	
3.	Civic Education	√	√										√				
4.	Mathematics for Chemistry								√				√				
5.	Physics for Chemistry				√				√				√				
6.	Biology for Chemistry								√				√				
7.	Basic Chemistry								√				√				
8.	Basic Chemistry Laboratory				√				√						√		



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Semester-2																
1.	Indonesian Language		√													√
2.	English Language		√													√
3.	Entrepreneurship Education			√							√			√		
4.	Monofunctional Organic Compounds Laboratory					√								√		
5.	Monofunctional Organic Compounds					√						√		√		
6.	Inorganic Nonmetallic Chemistry Laboratory				√								√	√		
7.	Inorganic Nonmetallic Chemistry				√								√			
8.	Physical Chemistry I Laboratory				√									√		
9.	Physical Chemistry I				√								√			
10.	Fundamentals of Analytical Chemistry Laboratory					√								√		





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10.	Practicum on Structure and Function of Biomolecules						√						√				
<b>Semester-4</b>																	
1.	English for Chemistry								√					√			
2.	Statistical Methods							√							√		
3.	Reactivity and Mechanism of Organic Reactions						√			√			√				
4.	Inorganic Physical Chemistry					√											
5.	Chemical Thermodynamics Practicum					√									√		
6.	Chemical Thermodynamics					√							√				
7.	Instrumental Analysis Practicum						√			√					√		
8.	Instrumental Analysis						√			√					√		
9.	Metabolism and Genetic Information Practicum						√							√	√		



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<b>Semester-5</b>																	
1.	Green Chemistry						√	√			√			√			
2.	Chemical Research Methodology							√		√		√	√				
3.	Polymer Chemistry								√	√			√				
4.	Organic Chemistry of Natural Materials								√							√	
5.	Structural Elucidation							√		√			√	√			
6.	Organic Synthesis							√									
7.	Advanced Analytical Chemistry							√		√			√				
<b>Semester-6</b>																	
1.	Environmental Impact Assessment Chemistry		√	√								√	√			√	
2.	Food Chemistry					√				√			√				
3.	Stereochemistry					√				√							



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4.	Medicinal Chemistry					√				√			√				
5.	Chromatography					√				√					√		
6.	Computational Chemistry					√				√		√					
7.	Entrepreneurship Education					√				√				√			
8.	Elective Courses																
<b>Semester-7</b>																	
1.	Internship		√	√							√	√	√		√		
2.	Catalysis Chemistry							√							√	√	
3.	Elective Courses									√				√			
<b>Semester-8</b>																	
1.	Thesis		√	√					√		√	√	√	√	√	√	



### III. CURRICULUM STRUCTURE

The curriculum structure of the Bachelor of Chemistry study program is based on the Rector's Regulation of Unima Number: 12/UN41/PS/2021 concerning Curriculum Development Policy, which is organized into the Core Curriculum and the Institutional Curriculum. The Core Curriculum is part of the higher education curriculum that is nationally applied to every study program, containing: educational objectives, knowledge content, and the minimum competencies that students must achieve to complete a study program. Meanwhile, the Institutional Curriculum consists of additional study materials and courses developed beyond the core curriculum, tailored to the conditions, developments in science and technology, and the specific needs that characterize the faculty and study program at Unima.

The Core and Institutional Curricula of the undergraduate program have a minimum credit load of 144 credits, with 40-80% allocated to the Core Curriculum and 20-60% to the Institutional Curriculum. The curriculum components of the Bachelor of Chemistry study program are composed of: General Compulsory Courses (MKU), Basic Expertise Courses (MKLK), Field Expertise Courses (MKBK), and Elective Courses (MKP). The credit allocation for each course group is determined according to the Merdeka Belajar-Kampus Merdeka Curriculum as follows:

**Table 5.** Percentage of Credit Allocation

No.	Course Group	Credit Allocation (%)
1.	General Courses	8 - 10
2.	MKLK	8 - 10
3.	MKBK	75 - 85
4.	Elective Courses	3 - 5



## A. List of Course Distribution Each Semester

The distribution pattern of courses in the Merdeka Belajar-Kampus Merdeka (MBKM) curriculum for the Chemistry Study Program, according to the study period, is presented in Table 7. The course distribution is organized based on core and supplementary courses, as well as the locations where the courses can be taken, either within Unima or externally.

**Table 6.** List of Courses by Semester

No	Course Code	Course	Units			
			T	P	L	Total
<b>1<sup>st</sup> Semester</b>						
1.	30112101	Religious Education	2	0	0	2
2.	30112102	Pancasila Education	2	0	0	2
3.	30112103	Civic Education	2	0	0	2
4.	30122104	Mathematics for Chemistry	2	0	0	2
5.	30122105	Physics for Chemistry	2	0	0	2
6.	30122106	Biology for Chemistry	2	0	0	2
7.	30136107	Basic Chemistry	6	0	0	6
8.	30132108	Basic Chemistry Practicum	0	2	0	2
<b>Total credits 1<sup>st</sup> Semester</b>			<b>18</b>	<b>2</b>	<b>0</b>	<b>20</b>
<b>2<sup>nd</sup> Semester</b>						
1.	30112209	Indonesian Language	2	0	0	2
2.	30132221	Philosophy of Science	2	0	0	2
3.	30131212	Practical Organic Monofunctional Compounds	0	1	0	1
4.	30133213	Organic Monofunctional Compounds	3	0	0	3
5.	30131214	Practical Inorganic Nonmetal Chemistry	0	1	0	1
6.	30133215	Inorganic Nonmetal Chemistry	3	0	0	3
7.	30131316	Physical Chemistry Practicum	0	1	0	1
8.	30133317	Physical Chemistry	3	0	0	3
9.	30131218	Basic Analytical Practicum	0	1	0	1
10.	30133219	Basic Analytics	3	0	0	3
<b>Total credits 2<sup>nd</sup> Semester</b>			<b>18</b>	<b>4</b>	<b>0</b>	<b>20</b>



<b>3<sup>rd</sup> Semester</b>						
1.	30133433	Chemical Structure and Bonding	3	0	0	3
2.	30121322	Practical of Multifunctional Organic Compounds	0	1	0	1
3.	30123323	Multifunctional Organic Compounds	3	0	0	3
4.	30131324	Inorganic Metal Chemistry Practicum	0	1	0	1
5.	30133325	Inorganic Metal Chemistry	3	0	0	3
6.	30131326	Chemical Kinetics Practicum	0	1	0	1
7.	30133327	Chemical Kinetics	3	0	0	3
8.	30131328	Chemical Separation Practicum	0	1	0	1
9.	30133329	Chemical Separation	3	0	0	3
10.	30131330	Practicum on Structure and Function of Biomolecules	0	1	0	1
11.	30133331	Structure and Function of Biomolecules	2	0	0	2
<b>Total credits 3<sup>rd</sup> Semester</b>			<b>18</b>	<b>5</b>	<b>0</b>	<b>22</b>
<b>4<sup>th</sup> Semester</b>						
1.	30112210	English for Chemistry	2	0	0	2
2.	30122332	Statistical Methods	3	0	0	3
3.	30133434	Reactivity and Mechanism of Organic Reactions	3	0	0	3
4.	30133435	Inorganic Physical Chemistry	3	0	0	3
5.	30131436	Chemical Thermodynamics Practicum	0	1	0	1
6.	30133437	Chemical Thermodynamics	3	0	0	3
7.	30131438	Instrumental Analysis Practicum	0	1	0	1
8.	30133439	Instrumental Analysis	3	0	0	3
9.	30131440	Metabolism and Genetic Information Practicum	0	1	0	1
10.	30133441	Metabolism and Genetic Information	2	0	0	2
<b>Total credits 4<sup>th</sup> Semester</b>			<b>20</b>	<b>3</b>	<b>0</b>	<b>22</b>
<b>5<sup>th</sup> Semester</b>						
1.	30132651	Green Chemistry	2	0	0	2
2.	30133543	Chemical Research Methodology	3	0	0	3
3.	30133544	Polymer Chemistry	3	0	0	3
4.	30133545	Organic Chemistry of Natural Materials	3	0	0	3



5.	30133546	Structural Elucidation	3	0	0	3
6.	30133547	Organic Synthesis	3	0	0	3
7.	30133548	Advanced Analytical Chemistry	3	0	0	3
8.	30133542	Laboratory Techniques and Management	2	0	0	2
<b>Total credits 5<sup>th</sup> Semester</b>			<b>16</b>	<b>0</b>	<b>0</b>	<b>22</b>
<b>6<sup>th</sup> Semester</b>						
1.	30132650	Environmental Impact Assessment Chemistry	2	0	0	2
2.	30132652	Food Chemistry	2	0	0	2
3.	30132653	Stereochemistry	2	0	0	2
4.	30132654	Medicinal Chemistry	2	0	0	2
5.	30132655	Chromatography	2	0	0	2
6.	30132656	Computational Chemistry	2	0	0	2
7.	30112211	Entrepreneurship Education	2	0	0	2
8.	30112420	Mapalus in a Global Perspective	2	0	0	2
9.		MKP	4	0	0	4
<b>Total credits 6<sup>th</sup> Semester</b>			<b>16</b>	<b>0</b>	<b>4</b>	<b>20</b>
<b>7<sup>th</sup> Semester</b>						
1.	30133656	Internship	0	0	4	4
2.	30132657	Catalysis Chemistry	2	0	0	2
3.		Elective Courses	8	0	0	8
<b>Total credits 7<sup>th</sup> Semester</b>			<b>10</b>	<b>0</b>	<b>4</b>	<b>12</b>
<b>8<sup>th</sup> Semester</b>						
1.	30136893	Thesis	0	0	6	6
<b>Total Credits 8<sup>th</sup> Semester</b>			<b>0</b>	<b>0</b>	<b>6</b>	<b>6</b>
<b>Total Credits all semester</b>						<b>144</b>

Table 8 showed a cluster of advanced chemistry electives, each carrying two credits entirely allocated to theory-based learning. None of the courses include practicum or fieldwork components, which indicates that their primary purpose is to strengthen students' conceptual understanding rather than laboratory or applied practice. The subjects span a wide range of specialized areas, from industrial and applied chemistry (Process Chemistry, Catalysis Chemistry, Applied Analysis) to frontier topics



(Nanomaterials, Radiochemistry, Organometallic Chemistry), as well as environmental and interdisciplinary fields (Ecotoxicology, Marine Chemistry, Coconut Chemistry). Natural product-oriented courses such as Essential Oil Chemistry and Bioactive Compounds further highlight the integration of local resources and global scientific trends. Overall, this structure reflects a curriculum design that emphasizes breadth of theoretical knowledge in specialized domains, complementing core modules that may already provide practical and field-based experiences.

**Table 7.** Tabel of Elective Courses

No	Course Code	Course	Units			Total
			Theory	Practicum	Field	
1	30132758	Chemistry of Mineral Resources	2	0	0	2
2	30132759	Essential Oil Chemistry	2	0	0	2
3	30142760	Organometallic Chemistry	2	0	0	2
4	30142761	Inorganic Synthesis	2	0	0	2
5	30142762	Nanomaterials	2	0	0	2
6	30142763	Radiochemistry	2	0	0	2
7	30142764	Applied Analysis	2	0	0	2
8	30142765	Ecotoxicology	2	0	0	2
9	30142766	Catalysis Chemistry	2	0	0	2
10	30142767	Process Chemistry	2	0	0	2
11	30142768	Marine Chemistry	2	0	0	2
12	30142769	Coconut Chemistry	2	0	0	2
13	30142770	Bioactive Compounds	2	0	0	2

## B. Course Description

The course descriptions of the Bachelor of Chemistry program serve as a comprehensive guide to the academic journey undertaken by students, reflecting the program's vision to produce graduates who are scientifically competent, ethically grounded, and globally competitive. Each course is carefully structured to integrate theoretical foundations, applied practicum, and interdisciplinary perspectives, ensuring



alignment with the graduate profiles (Analyst, Educator, Entrepreneur) and the competency framework established by international accreditation standards.

The descriptions highlight the breadth of chemistry, ranging from fundamental disciplines such as inorganic, organic, biochemistry, physical, and analytical chemistry to specialized and emerging fields, including nanomaterials, bioactive compounds, environmental chemistry, and process chemistry. In addition, the curriculum emphasizes applied practicum components to strengthen laboratory skills, field-based learning to connect science with community and industry, and bilingual accessibility to enhance global communication. Each course description outlines objectives, content, and expected learning outcomes, ensuring transparency and consistency for students, faculty, and stakeholders.

By presenting a clear roadmap of knowledge and skills, the course descriptions demonstrate the program's commitment to fostering graduates who can analyze data with precision, teach chemistry effectively, and innovate within the chemical industry. They also reflect the integration of local resources and cultural heritage such as coconut chemistry and essential oil studies with global scientific developments, thereby positioning the program as both locally relevant and internationally recognized.

#### **IV. MANAGEMENT & IMPLEMENTATION MECHANISM OF THE CURRICULUM**

The management and implementation mechanism of the curriculum in the Bachelor of Chemistry Study Program is carried out systematically, structurally, and sustainably to ensure the achievement of graduate learning outcomes (CPL) and alignment with the development of science, technology, and labor market needs. This management refers to the Indonesian National Qualification Framework (KKNI), the National Higher Education Standards (SN-Dikti), and the Merdeka Learning-Independent Campus (MBKM) policy, so that the curriculum applied is adaptive, relevant, and oriented towards outcome-based learning. Curriculum management is carried out through main stages that include planning and organizing, actuating, and controlling and continuous improvement as part of the internal quality assurance cycle.



## 1. Planning and Organizing

The planning and organizing stage serve as the foundation in curriculum management aimed at ensuring that the developed curriculum has a systematic, integrated structure that aligns with the graduate learning outcomes (CPL). This process is carried out through a participatory approach involving lecturers, the curriculum development team, and external stakeholders such as alumni and employers of graduates.

Activities at this stage include:

1. Periodic curriculum review through academic meetings, workshops, and discussion forums
2. Formulation of graduate learning outcomes that encompass attitudes, knowledge, general skills, and specific skills
3. Determination of the Body of Knowledge (BoK) as the basis for learning study materials
4. Preparation of the curriculum structure that includes the distribution of courses, credit weight, and grouping of courses
5. Assignment of course instructors based on competencies and areas of expertise
6. Preparation of course and practical class schedules
7. Management of learning resources, including laboratories, learning media, and supporting technology

In addition, at this stage, the integration of the MBKM policy (MBKM integration) is carried out, which provides flexibility for students to gain learning experiences outside their study programs.

## 2. Implementation of the Curriculum (Actuating)

The implementation of the curriculum is the execution of the planning that has been developed through a structured learning process that is student-centered (student-centered learning). All learning activities are carried out based on the Semester Learning Plan (RPS), which serves as a guideline for conducting lectures.

In its implementation, the learning process is conducted through various methods, including:

1. Interactive lecture (interactive lecture)



2. Discussion and case study (discussion and case study)
3. *Project-based learning and research-based learning*
4. Laboratory-based learning (laboratory-based learning)

Laboratory practical activities are an important part of chemistry as they serve to:

1. Develop experimental skills (experimental skills)
2. Train data analysis skills
3. Apply principles of occupational health and safety (laboratory safety)

In addition, the implementation of the curriculum also utilizes information and communication technology (ICT-based learning), such as the use of Learning Management System (LMS) and chemical analysis software. The implementation of MBKM is also carried out through activities such as internships (internship), student exchanges (student exchange), research (research), and entrepreneurship (entrepreneurship), which are recognized through the conversion of SKS.

### **3. Controlling and Evaluation of Curriculum Implementation (Controlling and Evaluation)**

Controlling and evaluation are conducted to ensure that the implementation of the curriculum runs according to the established plans and standards. This process is part of the internal quality assurance system that is carried out continuously.

The activities of controlling and evaluation include:

1. Monitoring and evaluation of learning (learning monitoring and evaluation) every semester
2. Evaluation of the compliance of course implementation with the RPS (RPS compliance evaluation)
3. Measurement of the achievement of CPL (learning outcomes assessment)
4. Evaluation of lecturer performance by students (student evaluation of teaching)
5. Internal quality audit (internal quality audit) by the quality assurance unit
6. Collection of feedback from students, alumni, and employers (stakeholder feedback)



The results of the evaluation are systematically analyzed to identify strengths and weaknesses in the implementation of the curriculum, which are then used as a basis for decision-making for improvements.

#### **4. Continuous Improvement**

The development of the curriculum is carried out continuously as a follow-up to the results of evaluations and needs analysis. This stage aims to ensure that the curriculum remains relevant, adaptive, and capable of addressing the challenges of scientific development and the needs of the workforce.

The curriculum development activities include:

1. Periodic review and revision of the curriculum (curriculum revision)
2. Updating study materials in accordance with developments in chemistry and technology (content updating)
3. Enhancement of research-based and project-based learning (research-based and project-based learning enhancement)
4. Improvement of practical training and laboratory facilities (laboratory improvement)
5. Strengthening graduate competencies based on tracer studies, particularly in:
  - a. Practical skills (practical skills)
  - b. Research skills (research skills)
  - c. Soft skills and digital literacy
6. Development of cooperation with industry, research institutions, and other universities (collaboration and partnership development)

The entire process is carried out within the framework of the PPEPP cycle (Plan-Do-Check-Act) to ensure the sustainability of curriculum quality improvement. Overall, the management and implementation mechanisms of the Chemistry Bachelor's Degree Program curriculum are conducted in an integrated and continuous manner through interrelated stages. This approach ensures that the curriculum is capable of producing graduates who are competent, professional, adaptive, and highly competitive at both national and international levels.



## V. CLOSING

Overall, the management and implementation mechanism of the Bachelor of Science in Chemistry curriculum is carried out in an integrated, systematic, and sustainable manner through the stages of planning and organizing, actuating, and controlling and continuous improvement. Each stage is designed to be interrelated to ensure the optimal achievement of graduate learning outcomes, as well as to ensure alignment between the learning process and the development of science, technology, and labor market needs. The approach applied emphasizes the principle of outcome-based education supported by an internal quality assurance system through the PPEPP cycle (Plan-Do-Check-Act). Through this mechanism, the curriculum is not only managed as an academic document but also as a dynamic system that is continuously evaluated and developed based on data, stakeholder feedback, and tracer study results. With adaptive management and continuous evaluation-based approaches, the Bachelor of Science in Chemistry program is committed to producing graduates with strong academic competencies, applicable practical skills, and critical and innovative thinking abilities. It is expected to enhance the competitiveness of graduates at both national and international levels, while also making a tangible contribution to the development of chemistry and solving problems in society.