Module Descriptions

Bachelor in CHEMISTRY EDUCATION

UNIVERSITAS SYIAH KUALA

2025

Module designation	FEDU1001 Fundamental of Education
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Prof. Dr. Drs. Bahrun, M.Pd.
Language	Indonesian, English
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	Lecture, group discussion, problem-based learning,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	✔ Through student-centered instructional strategies, students demonstrate the ability to correctly articulate the concepts of human nature and the fundamental essence of education. ✔ Through contextual learning, students are able to accurately and comprehensively explain the principles and foundations of education. ✔ Through problem-based learning, students are able to accurately explain and analyze the Indonesian education system, including its challenges and innovations.

Content	This course focuses on understanding and analyzing the fundamental concepts of the foundations of education, beginning with an exploration of the nature of human beings, the nature of education, and the various foundations of education as a basis for understanding educational issues and innovations. The course content includes: • The Nature of Human Beings According to Several Perspectives • The Human Dimension and Its Implications in Education • The Nature of Education and Education as a System • Elements/Components/Factors of Education • Foundations of Education • Historical and Socio-Cultural Foundations • Psychological Foundations • Science, Technology, and Innovation Foundations in the Learning Process • Religious Foundations • Principles of Education • The Tri-Center of Education • Educational Trends and Their Implications • Issues and Innovations in Education • Education from an Economic and Globalization Perspective
Exams and assessment formats	Assignments, case presentation, Q&A
Study and examination requirements	✔ Participatory Activities: 50% ✔ Cognitive/Knowledge: Assignment: 15% Quiz: 5% Exam 1: - Exam 2: 30%
Recommended literature	1. Basri, H. (2013). *Landasan pendidikan*. Bandung: Pustaka Setia. 2. Daryanto, & Rahardjo, M. (2012). *Model pembelajaran inovatif*. Yogyakarta: Gava Media. 3. Marsaty, T., & Faryadi, Q. (2012). *Teaching the Qur'anic recitation with Harakatt: A multimedia-based interactive learning method*. Bandar Baru Nilai: Universitas Sains Islam Malaysia. 4. Teras, N. M. (2011). *Perencanaan pembelajaran berbasis karakter*. Surabaya: IAIN Sunan Ampel. 5. Siregar, E., & Nara, H. (2011). *Teori belajar dan pembelajaran*. Bogor: Ghalia Indonesia.
Date of list amendment	August 12, 2024

Module designation	MKWU 1001 Pancasila
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Hasbi Ali, S.Pd, M.Si
Language	Indonesian
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	Lecture, case method and Team-Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Able to explain the process of the emergence of the Pancasila ideology. 2. Able to explain the position of Pancasila as the nation's philosophical foundation and paradigm. 3. Able to explain Pancasila as the foundation and ideology of the state (in opposition to radicalism and terrorism) 4. Able to explain Pancasila as philosophy and ethics in the development of science.

Content	This course is a compulsory part of the curriculum, aimed at helping students actively understand and develop their potential to acquire knowledge, character, and skills in accordance with their respective study programs. Furthermore, students are expected to make constructive contributions to society, the nation, and the state by adhering to the values of Pancasila. The course covers the following topics: • The Importance of Pancasila Education in National and State Life • Pancasila in the History of the Indonesian Nation • Pancasila as the Foundation of the Indonesian State • Pancasila as the State Ideology of Indonesia • Pancasila as a Philosophical System • Pancasila as an Ethical System • Pancasila as the Foundation of Values for Scientific Development It serves as an orientation course to help students articulate and strengthen their perspectives and personal development by exploring Pancasila as the ideology of the Indonesian nation—viewed from the historical perspective of Indonesia, as the foundation of the Unitary State of the Republic of Indonesia, as a philosophical system, and as an ethical system in the development of science and knowledge.
Exams and assessment formats	written examinations, case method, and team-based project
Study and examination requirements	1. Case methods:23% 2. Project: 27% 3. Assignment: 29,5% 4. Quiz: 10% 5. Midterm: 3,5% 6. Final exam: 7%

Recommended literatur	Primary reading list : 1. Kemenristek Dikti RI Dirjen Belmawa. 2016. Pendidikan Pancasila untuk Perguruan Tinggi. Jakarta: Dirjen Belmawa. 2. Admoredjo, Sudjito bin. 2009. Negara Hukum dalam Perspektif Pancasila. Makalah dalam Kongres Pancasila di UGM Yogyakarta, 30 Mei-1 Juni 2009. 3. Aiken, H.D. 2009. Abad Ideologi. Yogyakarta: Relief. 4. Ali, As'ad Said. 2009. Negara Pancasila Jalan Kemaslahatan Berbangsa. Jakarta: LP3ES. 5. Bakry, Noer Ms. 2010. Pendidikan Pancasila. Yogyakarta: Pustaka Pelajar. Supplementary reading list : 6. Kaelan, MS. 2013. Negara Kebangsaan Pancasila: Kultural, Historis, Filosofis, Yuridis, dan Aktualisasinya. Yogyakarta: Paradigma. 7. Koentjaraningrat. 2004. Kebudayaan, Mentalitas, dan Pembangunan. Gramedia Pustaka Utama. 8. Latif, Yudi. 2011. Negara Paripurna: Historisitas, Rasionalitas, dan Aktualitas Pancasila. Jakarta: Gramedia Pustaka Utama.
Date last of amendment	August 12, 2024

Module designation	MKWU 1003 Indonesian Language
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Prof. Dr.Drs. Razali, M.P
Language	Indonesian
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	Lecture, case method and Team-Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Upon completing the course (C), students (A) are able to explain (B) the essence, position, function, and appropriate attitudes toward the use of the Indonesian language accurately (D). 2. Upon completing the course (C), students (A) are able to apply (B) spelling, diction, affixation, reduplication, and composition accurately in Indonesian writing (D) 3. Upon completing the course (C), students (A) are able to use (B) sentence elements correctly and write (B) and develop (B) paragraphs in proper Indonesian (D). 4. Upon completing the course (C), students (A) are able to write (B) letters, scientific papers, and various types of technical reports in proper and correct Indonesian (D).

Content	**General Indonesian Language** is a compulsory course that must be taken by all students. This course is designed, among other purposes, to strengthen students' character development. It is offered in both odd and even semesters. The scope of the course covers the history and development of the Indonesian language, its status and functions, the general guidelines of Indonesian spelling, word formation processes, word choice (diction), sentence construction and effective sentences, paragraphs and their development patterns, academic writing, popular scientific writing, comprehension of academic books, exploration of library resources, and the writing of official letters. The course covers the following topics: • The nature of Indonesian as a national and official language • Indonesian standardized spelling system (Enhanced Indonesian Spelling/EYD) • Words and diction • Morphology (word formation) • Sentence structure: basic sentence patterns, effective sentences, and sentence types • Paragraph development and organizational patterns • Student Creativity Program (PKM) and popular scientific writing, including writing techniques, types, characteristics, structure, and distinctions between formal and semi-formal popular scientific works • Scientific articles: types, textual structure, analysis of article models, and guided and independent scientific writing • Academic reading and comprehension • Library literacy and information exploration • Correspondence: definition, types of letters, and formal writing conventions
Exams and assessment formats	written examinations, case method, and team-based project
Study and examination requirements	1. Case methods:23% 2. Project: 27% 3. Assignment: 29,5% 4. Quiz: 10% 5. Midterm: 3,5% 6. Final exam: 7%

Recommended literature	1. Azwardi, dkk. 2019. Bahasa Indonesia "Materi Kuliah MKWU Berbasis General Education". Banda Aceh: USK Press. 2. Subhayni. 2023. Bahasa Indonesia Umum. Banda Aceh: Adek Abang Printing. 3. Akhadiah, Sabarti dkk. 1999/1988. Pembinaan Kemampuan Menulis Bahasa Indonesia. Jakarta: Erlangga. 4. Alwasilah, A. Chaedar. 1985. Sosiologi Bahasa. Bandung: Angkasa. 5. ----------. 1997. Politik Bahasa dan Pendidikan. Bandung: Remaja Rosdakarya. Alwi, Hasan dkk. 2001. Tata Bahasa Baku Bahasa Indonesia. Jakarta: Balai Pustaka. 6. Arifin, E. Zaenal & Amran Tasai. 1995. Cermat Berbahasa Indonesia. Jakarta: Akademika Pressindo. 7. Arifin, E. Zainal. 1987a. Berbahasa Indonesialah dengan Benar: Petunjuk Praktis untuk Pelajar, Mahasiswa, dan Guru. Jakarta: PT Mediyatama Sarana Perkasa. 8. ----------. 1987b. Penggunaan Bahasa Indonesia dalam Surat Dinas. Jakarta: PT Mediyatama Sarana Perkasa 9. ----------. 1989. Penulisan Karangan Ilmiah dengan Bahasa yang Benar. Jakarta: Mediyatama Sarana Perkasa Badudu, J.S. 1983a. Ejaan Bahasa Indonesia. Bandung: Pustaka Prima. 10. ----------. 1983b. Membina Bahasa Indonesia Baku. Bandung: Pustaka Prima. 11. ----------. 1984. Pelik-Pelik Bahasa Indonesia. Bandung: Pustaka Prima.
Date of last amendment	August 12, 2024

Module designation	MKWU 1005 Disaster Management and Environment
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Dr. Ahmad Nubli Gadeng, S.Pd., M.Pd
Language	Indonesian
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	Lecture, case method and Team-Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Demonstrates positive behavior related to disaster risk reduction and environmental preservation within course contexts. 2. Able to make appropriate decisions based on the analysis of information and data to solve problems within their area of expertise, integrated into course learning. 3. Able to design a simple contingency plan as a crucial step in disaster preparedness, applied within the context of the course. 4. Able to design a simple project aimed at preventing environmental degradation and promoting environmental sustainability, integrated into the course content.

Content	The General Course on Disaster and Environmental Studies represents Syiah Kuala University's concrete initiative, launched in 2016, to enhance the capacity of human resources with strong character who are capable of playing an active role in disaster risk reduction efforts following the 2004 tsunami. This course aims to shape and equip students with basic humanities competencies to address disaster and environmental challenges that continue to evolve over time. This course also seeks to provide guidance on character development expected to grow in students, enabling them to take an active role in solving various disaster and environmental issues. This course content includes: • Introduction, History, Terminology, and My Positive Change Diary • History of Disaster Events and Disaster Terminology • Disaster Management Paradigm, Disaster Management Cycle, and the Roles and Responsibilities of Institutions and Organizations in Disaster Management • Basic Principles of Disaster Risk Reduction (DRR) • Disaster Risk Analysis Parameters and Mapping, and Contingency Plan Development • Emergency Response Management and Post-Disaster Recovery • Community Resilience in Facing Disasters • Community Participation in Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) • Introduction to Environmental Ethics, Ecofeminism, Environmental Degradation, Climate Change Issues, and the Leuser Ecosystem Area • Characteristics of Environmental Degradation and Climate Change • Environmental Conservation Policies, Introduction to the Leuser Ecosystem Area (LEA), and Handling the Impacts of Climate Change • Disaster-Prepared Campus Simulation Practice • Case Studies of Disasters and the Impacts of Environmental Damage
Exams and assessment formats	written examinations, case method, and team-based project

Study and examination requirements	1. Case methods: 25% 2. Project: 25% 3. Assignment: 20% 4. Quiz: 10% 5. Midterm: 10% 6. Final exam: 10%

Recommended literature	Primary reading list : 1. Alexander, D. (2015). Recovery from Disaster. London: Routledge. 2. Butt, S., Lyster, R., & Stephens, T. (2015). Climate change and forest governance: lessons from Indonesia. Routledge. 3. Button, G. V., & Schuller, M. (2016). Contextualizing disaster. Berghahn Books. 4. Dekens, J. (2007). Local knowledge for disaster preparedness: A literature review. International Centre for Integrated Mountain Development (ICIMOD). 5. Djalante, R., Garschagen, M., Thomalla, F., & Shaw, R. (2017). Introduction: Disaster risk reduction in Indonesia: Progress, challenges, and issues. In Disaster risk reduction in Indonesia (pp. 1-17). Springer, Cham. 6. Djalante, R., Jupesta, J., & Aldrian, E. (Eds.). (2020). Climate Change Research, Policy and Actions in Indonesia: Science, Adaptation and Mitigation. Springer Nature. 7. Easthope, L. (2018). The Recovery Myth: The Plans and Situated Realities of Post-Disaster Response. Springer. 8. Enarson, E., Fothergill, A., & Peek, L. (2018). Gender and disaster: Foundations and new directions for research and practice. In Handbook of disaster research (pp. 205-223). Springer, Cham. 9. Glasson, J., & Therivel, R. (2019). Introduction to environmental impact assessment. Routledge. 10. Hartman, C. W., Squires, G., & Squires, G. D. (Eds.). (2006). There is no such thing as a natural disaster: Race, class, and Hurricane Katrina. Taylor & Francis. 11. Klepp, S., & Chavez-Rodriguez, L. (Eds.). (2018). A critical approach to climate change adaptation: Discourses, policies and practices. Routledge. 12. Kumar, V., Singh, J., & Kumar, P. (Eds.). (2020). Environmental Degradation: Causes and Remediation Strategies (Vol. 1). Agro Environ Media, Publication Cell of AESA, Agriculture and Environmental Science Academy. Supplementary reading list : 13. Kutz, M. (2018). Handbook of environmental degradation of materials. William Andrew. 14. McEntire, D. A. (2021). Disaster response and recovery: strategies and tactics for resilience. New York: John Wiley & Sons. 15. Nurdin, N., Rafliana, I., Hidayati, S., Oktari, R. S., & Djalante, R. (2017). Integrating Disaster Risk Reduction and Climate Change Adaptation into School Curricula: From National Policy to Local Implementation. In Disaster Risk Reduction in Indonesia (pp. 213-234). Springer, Cham.

	16. Oktari, R. S., Kamaruzzaman, S., Fatimahsyam, F., Sofia, S., & Sari, D. K. (2021). Gender mainstreaming in a Disaster-Resilient Village Programme in Aceh Province, Indonesia: Towards disaster preparedness enhancement via an equal opportunity policy. International Journal of Disaster Risk Reduction, 52, 101974. 17. Pacheco, E. M., Bisaga, I., Oktari, R. S., Parikh, P., & Joffe, H. (2021). Integrating psychosocial and WASH school interventions to build disaster resilience. International Journal of Disaster Risk Reduction, 65, 102520. 18. Paton, D., & Johnston, D. (2017). Disaster resilience: an integrated approach. Charles C Thomas Publisher. 19. Peraturan Gubernur Aceh No. 43 Tahun 2020 tentang Pelaksanaan Pengarusutamaan Gender dan Inklusi Sosial dalam Pembangunan Bidang Lingkungan Hidup dan Kehutanan Aceh. 20. Perry, R. W. (2018). Defining disaster: An evolving concept. In Handbook of disaster research (pp. 3-22). Springer, Cham. 21. Rahman, A., Sakurai, A., & Munadi, K. (2018). The analysis of the development of the Smong story on the 1907 and 2004 Indian Ocean tsunamis in strengthening the Simeulue island community's resilience. International journal of disaster risk reduction, 29, 13-23. 22. Shaw, R., Shiwaku, K., & Takeuchi, Y. (Eds.). (2011). Disaster education. Emerald Group Publishing. 23. Syamsidik, Oktari, R. S., Nugroho, A., Fahmi, M., Suppasri, A., Munadi, K., & Amra, R. (2021). Fifteen years of the 2004 Indian Ocean Tsunami in Aceh-Indonesia: Mitigation, preparedness and challenges for a long-term disaster recovery process. International Journal of Disaster Risk Reduction, 54, 102052. 24. Venkatramanan, V., Shah, S., & Prasad, R. (2020). Global Climate Change and Environmental Policy. Springer Singapore.
Date of last amendment	August 12, 2024

Module designation	**MKWU1006** Character Building 1
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	drh. Baidillah Zulkifli, M.Si
Language	Indonesian
Relation to curriculum	Selective modules for 1st semester students.
Teaching methods	Lecture, small group discussion, Case methods.
Workload (incl. contact hours, self-study hours)	
Credit points	0 SKS = 0 ECTS
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	Students possess strong character values and a religious spirit, and they are able to recognize and read verses of the Qur'an through the integrated Iqro method.
Content	This course is a compulsory subject offered in the first (odd) semester, covering activities such as Qur'an reading guidance, basic Islamic education, complemented by Subuh Education activities and General Lectures focusing on character development and USK values. The course content includes: • competencies, including: • Introduction to Arabic letters from "Alif" to "Kha" • Introduction to Arabic letters from "Dal" to "Dha" • Introduction to Arabic letters from "Tha" to "Kaf" • Introduction to Arabic letters from "Lam" to "Ya" • Introduction to Makharij al-Huruf (articulation points and differences in letter sounds) • Basic Islamic Skills Training • Shubuh Education • Introduction to reading with Kasrah and Dammah • Fathatain (Double Fathah) • Huruf Sukun (Silent letters) • Rules of Tajwid when encountering stressed pronunciation (Tasydid) • Nun Sukun and Tanwin
Exams and assessment formats	Non case methods

Study and examination requirements	Final semester examination : 100%
Recommended literature	1. Learning Guidebook for Reading and Writing the Qur'an with the 10-Session Pattern (Integrated Iqro Method) 2. Iqro Books 1–6 3. Syiah Kuala University Book: "History and Values"
Date of last amendment	August 12, 2024

Module designation	**SEDC1001** BASIC CHEMISTRY I
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Ratu Fazlia Inda Rahmayani, S.Pd., M.Sc.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	-

Module objectives/intended learning outcomes	1. Through discussions and question-and-answer sessions, students are able to analyze and solve problems related to: conversion factors, significant figures in measurements, precision and accuracy; the nature, classification, and states of matter; submicroscopic representations of elements, compounds, and mixtures; types of matter changes and their indicators; intensive and extensive properties of matter; atomic concepts and the development of atomic theory, with an emphasis on Dalton's atomic theory; the history, usefulness, and function of the periodic system; atomic structure and electron configuration; Lewis structures; an introduction to chemical bonding; bond polarity; and the balancing of chemical equations—accurately and thoroughly. 2. Through discussions and question-and-answer sessions, students are able to analyze and solve problems related to the nomenclature of inorganic compounds; fundamental laws of chemistry and their applications; the concepts of molecular and structural formulas; writing structural formulas; and limiting reagents—accurately and thoroughly. 3. Through discussions and question-and-answer sessions, students are able to analyze and solve problems related to oxidation numbers and their rules (for both inorganic and organic compounds); the development of redox reactions; redox reaction balancing; solutions—their processes and properties; solubility and the factors affecting it, including unsaturated, saturated, and supersaturated conditions; as well as carbon, organic, and inorganic compounds—their properties, reactions, and the unique characteristics of reactions involving carbon and organic compounds—accurately and thoroughly.

Content	This course is designed to strengthen students' knowledge and understanding of fundamental chemical concepts, including: conversion factors, significant figures in measurements, precision and accuracy; the nature, classification, and states of matter; submicroscopic representations of elements, compounds, and mixtures; types of matter changes and their indicators; intensive and extensive properties of matter; atomic concepts and the development of atomic theory, with emphasis on Dalton's atomic theory; the history, functions, and significance of the periodic table; atomic structure and electron configuration; Lewis structures; an introduction to chemical bonding and bond polarity; balancing chemical equations; the nomenclature of inorganic compounds; fundamental laws of chemistry and their applications; the concepts of molecular and structural formulas, structural formula writing, and limiting reagents; oxidation numbers and their rules (for both inorganic and organic compounds); the development and balancing of redox reactions; the nature and properties of solutions; solubility and influencing factors, including unsaturated, saturated, and supersaturated states; as well as carbon, organic, and inorganic compounds—their properties, reactions, and the unique characteristics of reactions involving carbon and organic compounds. This course content includes : • Matter (Classification of matter, physical and chemical properties of materials, measurement, units, and unit conversion) • Atomic theories • Atomic structure, Electron configuration • Chemical formula, binnary compounds, chemical reactions. • Inorganic compound nomenclatures • Basic laws in Chemistry • Mol and limited reactants • Chemical bonds • Solutions and their properties • Introduction to redox reactions • Carbon chemistry (formation of organic molecules, organic compound nomenclature, bonds, molecular formula, empiric formula, and structural formula).
Exams and assessment formats	written examinations, student presentations, and guided class discussions

Study and examination requirements	1. Quiz: 7.5% 2. Assignment: 35.5% 3. Midterm: 42% 4. Final exam: 15%

Recommended literature	Gilbert, T. R., Kirss, R. V., Foster, N., & Bretz, S. L. (2018). Chemistry an Atoms-Focused Approach. In *Chemistry an Atoms-Focused Approach*. W. W. Norton & Company, Inc. Hein, M., Arena, S., & Willard, C. (2016). Foundation of College Chemistry. John Wiley & Sons Hill, J. W., & McCreary, T. W. (2015). *Chemistry For Changing Times*. Pearson IUPAC. (2014). *Compendium of Chemical Terminology: Gold Book*. IUPAC. https://doi.org/10.1002/9783527626854.ch7 Leigh, G. J., Favre, H. A., & Metanomski, W. V. (1999). *Principles of Chemical Nomenclature. A Guide to IUPAC Recommendations Edited by G. J. Leigh. Blackwell Science, Oxford, U.K* Petrucci, R. H., Herring, F. G., Madura, J. D., & Bissonnette, C. (2011). *General Chemistry Principles and Modern Applications* (tenth edit). Pearson. Stuart, M. S., & Amateis, P. G. (2021). *Chemistry : the molecular nature of matter and change* (ninth edit). McGraw Hill. https://doi.org/10.31399/asm.hb.v02.a0001116 **Recommended Articles** Alcántara, J., de la Fuente, D., Chico, B., Simancas, J., Díaz, I., & Morcillo, M. (2017). Marine atmospheric corrosion of carbon steel: A review. *Materials*, *10*(4). https://doi.org/10.3390/ma10040406 Davidowitz, B., Chittleborough, G., & Murray, E. (2010). Student-generated submicro diagrams: A useful tool for teaching and learning chemical equations and stoichiometry. *Chemistry Education Research and Practice*, *11*(3), 154–164. https://doi.org/10.1039/c005464j Schindelholz, E., Risteen, B. E., & Kelly, R. G. (2014). Effect of Relative Humidity on Corrosion of Steel under Sea Salt Aerosol Proxies. *Journal of The Electrochemical Society*, *161*(10), C450–C459. https://doi.org/10.1149/2.0221410jes **Problem-Silving Exercises** Macnow, A. S. (2020). *MCAT® General Chemistry Review*. Kaplan Publishing. Mascetta, J., & Kernion, M. (2016). SAT Subject Test Chemistry. In *Syria Studies* (Vol. 7, Issue 1). Barron's Educational Series, Inc. Moore, J. T., & Langley, R. H. (2017). *5 Steps to a 5 AP Chemistry*. McGraw Hill. Franek, R., Cornelius, C., Garrick, M. B., Coppock, S., & Cato, C. (2014). *Cracking teh SAT Chemistry Subject Test*. Random House LLC

Date of last amendment	August 12, 2024

Module designation	**SEDC1003** Basic Chemistry Practicum I
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	case methods and project
Workload (incl. contact hours, self-study hours)	1 x 45 hours per semester, comprising: ✔ 170 minutes structured tasks per week
Credit points	1 SKS = 1.67 ECTS (45 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Through laboratory practice (C), students (A) are able to appropriately and responsibly **implement** (B) the basic rules of chemical laboratory safety; demonstrate the proper use of essential laboratory equipment and common laboratory reagents; and perform fundamental laboratory skills with accuracy and accountability (D) 2. Through laboratory activities (C), students (A) are **skilled in demonstrating** (B) separation techniques (sublimation, filtration, recrystallization, distillation, decantation, and centrifugation); various types of chemical reactions; the properties of electrolytes and nonelectrolytes; and determining the amount of substance (in moles) involved in a chemical reaction accurately and responsibly (D). 3. Through laboratory activities (C), students (A) are **able to demonstrate** (B) a sense of responsibility, adherence to scientific principles, and effective self-management in accordance with scientific ethics when conducting all laboratory activities (D).

Content	This course is designed to reinforce students' understanding of laboratory procedures and the scientific method, as well as to enhance their investigative skills in the following areas: determining the density of liquids and solids; applying various separation techniques; identifying the properties of ionic and covalent compounds; measuring the electrical conductivity of substances; and observing heat changes during dissolution and chemical reactions. To achieve these objectives, students are expected to accurately and efficiently comprehend and follow laboratory guidelines, perform experiments with caution and discipline, and demonstrate the ability to collaborate effectively. In addition, students are encouraged to further develop laboratory manuals by seeking accurate and reliable information from credible sources. This course content includes: • Introduction to Laboratory Equipment and Materials • Basic Laboratory Skills • Distinguishing the Properties of Ionic and Covalent Compounds • Electrical Conductivity of Aqueous Solutions • Colloidal Systems and Colligative Properties of Solutions • Corrosion
Exams and assessment formats	written laboratory report, case studies, team-base project, self-discipline, and examination
Study and examination requirements	1. Case methods: 6,3% 2. Project: 58,5% 3. Laboratory Report: 9% 4. Quiz: 5,1% 5. Midterm: 5,1% 6. Participatory Activities (Attitude): 10% 7. Final exam: 6%
Recommended literature	1. Beran, J. A. (2014). Laboratory Manual for Principles of General Chemistry (10th ed.). Wiley. 2. Corwin, C. H. (2013). Laboratory Manual Introductory Chemistry Concepts and Critical Thinking. Pearson. https://doi.org/10.1016/b978-0-12-810425-5.00002-3 3. Seager, S., & Slabaugh, M. (2011). Safety-Scale Laboratory Experiments for Chemistry for Today: General, Organic, and Biochemistry. Brooks/Cole. 4. Slowinski, E. J., Wolsey, W. C., & Masterton, W. L. (2005). Chemical Principles in the Laboratory. Brooks/Cole. 5. Stanton, B., Zhu, L., & Atwood, C. H. (2010). Experiments in General Chemistry Featuring MeasureNet. Brooks/Cole, Cengage Learning. 6. Syahrial, Rahmayani, R.F.I., Fazli, R,R., dan Akmalia, N., (2024). *Penuntun Praktikum Kimia Dasar.* Laboratorium Pendidikan Kimia

	7. Mcgraw-Hill, G. (2011). Glencoe Chemistry Mattter and Change. McGraw Hill. 8. Thompson, R. B. (2008). Illustrated Guide to Home Chemistry Experiments All Lab, No Lecture. . O'Reilly Media, Inc. 9. Weiner, S. A., & Harrison, B. (2010). Introduction to Chemical Principles. Cole, Cengage Learning
Date of last amendment	August 12, 2024

Module designation	SEDC1005 Stoichiometry
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Drs. Rusman, M.Si
Language	Indonesian,
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	Lecture, small group discussion, recitation, and case study
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured task per week ✔ 120 minutes independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Through discussions on atomic theory analysis and the application of fundamental laws of chemistry, students are able to apply the mole concept and independently calculate the concentration of a substance in a chemical compound with accuracy. 2. Through lectures employing innovative approaches and diverse learning methods, students are able to accurately compare the number of moles of substances with the coefficients in chemical reaction equations and precisely formulate the required amount of substances in chemical processes based on the mole concept. 3. Through case studies, students are able to calculate the elemental content of commonly encountered samples in daily life while demonstrating environmental awareness by applying appropriate analytical methods.
Content	This course content includes: • The quantitative relationships between reactants and products in chemical reactions • Focusing on calculations involving the substances participating in the reactions including mass, number of moles, volume, and number of particles. • It also covers the analysis of the composition of each component in a compound in terms of mass ratios, mole ratios, percentage composition, and molar relationships.

Examination forms	Essay, Final test, Midterm Test
Study and examination requirements	Quiz 20% Recitation 20% Midterm Test 20% Final Test 40%
Recommended literature	1. Hiskia Achmad & M.S Tupamahu, 2001, Stoikiometri dan energetika, Citra Aditya, Bandung 2. J.E Brady, 1999, Kimia Universitas Azas dan struktur, Edisi kelima, Jilid 1, Binarupa Aksara, Jakarta 3. Keenan, Klienfelter, dan Wood, 1990, E99Kimia Untuk Universitas Terjemahan Hadyana P. Adisi keenam, Jilid 1, Erlangga, Jakarta 4. Raymond Chang, 2003, Kimia dasar : Konsep-konsep Inti, jilid 1, Adisi ketiga, Erlangga, Jakarta 5. R.H. Petrucci & Suminar , 1992, Kimia Dasar Prinsip dan Terapan Modern, Edisi keempat, jilid I, Erlangga, Jakarta
Date of last amendment	August 12, 2024

Module designation	**SEDC1007** Computer Application
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Kana Puspita, S.Pd., M.Si.P.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective modules for 1st semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes of lecture and discussion per week ✔ 120 minutes of structured tasks per week ✔ 120 minutes of independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Through the integration of technology, students are able to employ office applications in accomplishing academic tasks, thereby enhancing their digital competencies and optimizing the learning process in chemistry. 2. By the end of the course, students are expected to be able to design simple applications with Microsoft Excel actively and innovatively.
Content	This course content includes: • Microsoft Word • Excel • Powerpoint and their applications • Artificial Intelligence tools.
Exams and assessment formats	written examinations, case studies, and guided class discussions
Study and examination requirements	1. Case Assignment: 5% 2. Quiz: 12.5% 3. Assignment: 42.5% 4. Midterm: 15% 5. Final exam: 25%

Recommended literature	1. Lee, C. 2011, 192 tip professional word. Elex media komputindo:Jakarta 2. http://www.microsoft.com 3. https://techwelkin.com/ms-word-tips-and-tricks-guide 4. https://support.office.com 5. https://d31kydh6n6r5j5.cloudfront.net/uploads/sites/158/2020/06/Canva-Userguide.pdf
Date of last amendment	August 12, 2024

Module designation	**SEDC1009** Chemistry Teaching Material Review I
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Nur Akmalia, M.Pd.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	Lecture, discussion, questions and answers, practice questions, independent assignments, group assignments, project based learning.
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Through group discussions and reference exploration (C) students (A) are able to analyze teaching materials that can be used in learning high school chemistry / equivalent class X (B) independently, correctly, and thoroughly (D). 2. Through group discussions and questions and answers (C), students (A) are able to solve practice problems related to high school chemistry / equivalent class X (B) correctly and thoroughly (D). 3. Students (A) are able to design high school chemistry teaching materials / equivalent class X (B) through PjBL learning (C) so that they can make teaching materials such as handouts and LKPD, in groups, precisely, and thoroughly (D).
Content	This course content includes: • The fundamental concepts of Learning resources • Teaching material • The essence of teaching materials • Grade X high school chemistry material.
Exams and assessment formats	written examinations, assigment, team based project, student presentations, and guided class discussions

Study and examination requirements	1. Team based project: 55% 2. Quiz: 4% 3. Midterm: 6% 4. Assignment: 22,5% 5. Final exam: 12,5%
Recommended literature	1. Effendy. 2012. A-Level Chemistry for Senior High School Students Based on KTSP and Cambridge Curriculum (Volume 1A). Malang: Indonesian Academic Publishing. 2. Effendy. 2017. Molekul, Struktur, dan Sifat-sifatnya: Seri Buku Ikatan Kimia dan Kimia Anorganik. Malang: Indonesian Academic Publishing. 3. International Union of Pure and Applied Chemistry. 2012. Compendium of Chemical Terminology, GoldBook. Version 2.3.2 4. James E., Jespersen, N.D., Brady J.E., & Hyslop, A. 2012. Chemistry: The Molecular Nature of Matter. New York: John Willey & Sons. 5. McMurry, J.E. & Fay, R.C. 2014. General Chemistry: Atoms First 2nd Ed. Boston: Pearson.
Date of last amendment	August 12, 2024

Module designation	SEDC1011 Mathematics for Chemistry
Semester(s) in which the module is taught	1st Semester
Person responsible for the module	Drs. Rusman, M.Si
Language	Indonesian
Relation to curriculum	Mandatory modules for 1st semester students.
Teaching methods	Lecture and Case method
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Through various learning models (C), students (A) are able to analyze (B) mathematical theories, concepts, and laws necessary (D) for chemical calculations involving stoichiometry, solution pH, chemical kinetics, solubility product (Ksp), quantitative analysis, and quantum chemistry). 2. Through various learning models and problem-solving methods (C), students (A) are able to apply (B) mathematical concepts, theories, and laws to solve chemical problems (D) related to stoichiometry, solution pH, chemical kinetics, solubility product (Ksp), and quantitative chemical analysis.

Content	Basic m**athematics** is a foundational subject that underpins the development of modern technology and plays a vital role across various disciplines while advancing human reasoning. This course provides students with essential mathematical knowledge required to solve problems in chemistry by integrating relevant mathematical concepts. The discovery and development of theories in chemistry are inseparable from the application of mathematical principles. Topics covered in this course include: • Exponents • Roots • Logarithms • Quadratic functions • Systems of linear equations • Trigonometry • Differentiation • Integration • Applications in the field of chemistry
Exams and assessment formats	case studies, assignment and written examinations.
Study and examination requirements	1. Case methods: 7,5% 2. Assignment: 32,5% 3. Quiz: 30% 4. Midterm: 15% 5. Final exam: 15%
Recommended literature	1. Anton H, Dasar Dasar Aljabar Linear, Binarupa Yogyakarta. 2. Haarry G. H,. 1990. Mathematics in Chemistry; Prentice-Hall, New Jessey 3. Martono, K. 1999. Kalkulus. Jakarta: Erlangga. 4. Masterton, W., 1970, Mathematical Preparation for General Chemistry, Saunder Company, London 5. Purcell, E. J. et. all. 2004. Kalkulus, Jilid 1, Edisi Kedelapan, terj. I Nyoman Susila. Jakarta: Erlangga 6. Surdia, N.M, 1984, Kimia Fisika II ; (terjemahan dari Alberty, 1980, Physical Chemistry 5 th Edition, John Wiley, Toronto), Erlangga, Jakarta. 7. Mursita, D, 2020, Matematika Dasar, Penerbit Rekayasa Sains, Jakarta. 8. http://elearning.usk.ac.id/
Date of last amendment	August 12, 2024

Module designation	**SEDC1004** Basic Chemical Practicum II
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Dr. Sri Winarni, S.Pd, M.Pd
Language	Indonesian, English (for lecture material)
Relation to curriculum	Compulsory module for 2nd semester students.
Teaching methods	Lecture, small group discussion, Team-Based Project,
Workload (incl. contact hours, self-study hours)	1 x 45 hours per semester, comprising: ✔ 170 minutes structured tasks per week
Credit points	1 SKS = 1.67 ECTS (45 hours)
Required and recommended prerequisites for joining the module	SEDC 1003 Basic Chemical Practicum I
Module objectives/intended learning outcomes	1. Through laboratory activities, students demonstrate proficiency in applying techniques to analyze factors affecting reaction rates, evaluate the rate of metal corrosion in both indoor and outdoor environments, investigate the contributing factors of corrosion, and accurately and responsibly identify acid–base indicators, including both natural and synthetic indicators, in acidic and basic solutions. 2. Through laboratory activities, students competently demonstrate their understanding of colloidal systems in everyday life, the differences in the solubility of sparingly soluble salts in water, and the effect of ion addition on solubility.
Content	This course content includes: Experiment I: Reaction Rate Experiment II: Chemical Equilibrium Experiment III: Solubility and Solubility Product Experiment IV: Acid–Base Indicators Experiment V: Buffers and Hydrolysis Experiment VI: Heat of Dissolution and Reaction
Exams and assessment formats	team-based project, Quiz, Task, Midterm, and Final examinations,

Study and examination requirements	1. Project: 73% 2. Task: 10% 3. Quiz: 5% 4. Midterm: 6% 5. Final exam: 6%
Recommended literature	1. Beran, J. A. (2014). Laboratory Manual for Principles of General Chemistry (10th ed.). Wiley. 2. Corwin, C. H. (2013). Laboratory Manual Introductory Chemistry Concepts and Critical Thinking. Pearson. https://doi.org/10.1016/b978-0-12-810425-5.00002-3 3. Seager, S., & Slabaugh, M. (2011). Safety-Scale Laboratory Experiments for Chemistry for Today: General, Organic, and Biochemistry. Brooks/Cole. 4. Slowinski, E. J., Wolsey, W. C., & Masterton, W. L. (2005). Chemical Principles in the Laboratory. Brooks/Cole. 5. Stanton, B., Zhu, L., & Atwood, C. H. (2010). Experiments in General Chemistry Featuring MeasureNet. Brooks/Cole, Cengage Learning. 6. Syahrial, Rahmayani, R.F.I., Fazli, R,R., Akmalia, N., dan Winarni, S. 2024. Penuntun Praktikum Kimia Dasar II. Laboratorium Pendidikan Kimia, FKIP, USK 7. Mcgraw-Hill, G. (2011). Glencoe Chemistry Mattter and Change. McGraw Hill. 8. Thompson, R. B. (2008). Illustrated Guide to Home Chemistry Experiments All Lab, No Lecture. . O'Reilly Media, Inc. 9. Weiner, S. A., & Harrison, B. (2010). Introduction to Chemical Principles. Cole, Cengage Learning.
Date of last amendment	January 13, 2025

Module designation	FEDU1002 Introduction to Educational Management
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Dr. Ismail, S.Pd., M.Pd.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Compulsory modules for 2nd semester students. This course introduces students to the foundational principles of educational management, including planning, organizing, directing, and evaluating educational institutions and processes. It supports CPL-4 and CPL-8 by equipping future educators with leadership insights and administrative competencies relevant to the operation of schools and educational programs. By bridging education theory with practical managerial tasks, it helps cultivate biology teachers who can contribute meaningfully to school development and academic leadership.
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain the concepts of human nature and the nature of education correctly using student-centred learning strategies. 2. Students are able to demonstrate responsibility and respect for others' opinions in group work when analysing school management case studies. 3. Students are able to compare the effectiveness of two management approaches applied in school management based on literature studies and observations. 4. Students are able to explain the differences between scientific management, human relations, administration, and bureaucracy approaches through concept mapping. 5. Students are able to explain basic concepts, codes of ethics, and professional teacher organisations through appropriate student-centred learning strategies.

Content	This course is designed to equip students with basic management concepts, covering various management approaches such as scientific management, human relations, administrative management, and bureaucracy. The discussion of these management approaches includes identifying the strengths and weaknesses of their application, particularly in educational organisations such as schools. Additionally, this course also covers learning management as applied in various educational organisations, particularly schools. This course content includes: • Student and personnel management • Curriculum management • Foundational concepts • Ethical codes • Teacher professional organisations.
Exams and assessment formats	written examinations, assignment, and team based project
Study and examination requirements	1. Quiz: 15% 2. Assignment: 20% 3. Midterm: 20% 4. Project: 25% 5. Final exam: 20%
Recommended literature	1. Bunyamin. 2022. Manajemen Pendidikan. Jakarta: PT. Usaha Terpadu UHAMKA. 2. Rodliyah. 2015. Manajemen Pendidikan Konsep Dan Aplikasi. IAIN Jember Press. 3. Surya, P. 2011. Educational Management, Handbook for School of Education Student. Yogyakarta: Yogyakarta State University. 4. Elbadiansyah. 2018. Manajemen Pendidikan. Malang: IRDH 5. Pal, K. 1982. Educational Management. New Delhi: Lovely Proffesional University. 6. Surachman, dan Alkhudri, A.T. 2015. Manajemen Pendidikan. Jakarta: LPP UNJ 7. Setiawan et al. 2022. Manajemen Pendidikan (Konsep Dasar Dan Ruang Lingkup Pada Lembaga Pendidikan Formal). Bandung: Widina Bhakti Persada.
Date of list amendment	January 13, 2025

Module designation	MKWU 1002 Civic Education
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Lia Sautunnida, S.H., M.C.L.
Language	Indonesian
Relation to curriculum	Mandatory modules for 2nd semester students.
Teaching methods	Lecture, case method and Team-Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Utilizing learning resources and ICT-based instructional media to search for data/information in order to identify and solve problems related to nationality and citizenship. 2. Identifying theoretical concepts of citizenship in the context of nationhood and statehood. 3. Demonstrating patterns of thinking, attitudes, and actions that reflect self-confidence and foster pride as Indonesian citizens and as part of the Indonesian nation, along with a love for the homeland. 4. Demonstrating responsible attitudes and behaviors that reflect the qualities of a good citizen in social, national, and state life. 5. Able to exercise the rights and responsibilities of a citizen. 6. Making decisions based on theoretical concepts of Civic Education to address relevant societal, national, and state issues.

Content	The Civic Education course is designed to provide education on nationalism, democracy, law, multiculturalism, and citizenship to students, in order to foster awareness of their rights and responsibilities as citizens. It aims to develop intelligent, skilled, and character-driven individuals who can be relied upon to contribute to nation-building based on Pancasila and the 1945 Constitution of the Republic of Indonesia, in accordance with their respective fields of study and professions. The course content includes: • The State and Nation • Systems of Government • National Identity • Citizenship Issues • National Resilience • The Concept of Democracy • Archipelagic Insight (Wawasan Nusantara) • National Politics and Strategy • Human Rights • Anti-Corruption • Values of Peace
Exams and assessment formats	written examinations, case method, and team-based project
Study and examination requirements	1. Case methods:23% 2. Project: 27% 3. Assignment: 29,5% 4. Quiz: 10% 5. Midterm: 3,5% 6. Final exam: 7%

Recommended literature	Primary reading list : 1. Al Hakim, S. dkk. 2012. Pendidikan Kewarganegaran dalam Konteks Indonesia. Malang: Universitas Negeri Malang Press. 2. Arif, DB. 2012. Pendidikan Kewarganegaraan. Yogyakarta: Kaukaba. 3. Asshidiqie, Jimly. 2004. Pengantar Ilmu Hukum Tata Negara II. Jakarta: Sekretariat Jenderal Kepaniteraan Mahkamah Konstitusi RI. 4. Budiardjo. 1986. Dasar-dasar Ilmu Politik. Jakarta: PT. Gramedia, cet. X. 5. Budiharjo, M. 1996. Demokrasi Indonesia: Demokrasi Parlementer dan Demokrasi Pancasila. Jakarta: Gramedia. 6. Cholisin. 2000. Ilmu Kewarganegaraan. Yogyakarta: FIS UNY. 7. Fuad, Ahmad Nur, Cekli Setya Pratiwi, dan M. Saiful Aris. 2010. Hak Asasi Manusia Perpektif Islam. Malang: Lembaga Penegakan Supremasi Hukum dan HAM PW Muhammadiyah Jawa Timur. 8. Islamy. M.I. 1997. Prinsip-Prinsip Perumusan Kebijakan Negara. Jakarta: Bumi Aksara. 9. Kamil, Sukron. 2002. Islam dan Demokrasi. Jakarta: Gaya Media Pratama. 10. Ria Fitri, Teuku Muttaqin Mansur, Ruslan, dkk. 2018. Pendidikan Pancasila dan Kewarganegaran (PPKn): Bermuatan General Education. Banda Aceh: UPT MKU Unsyiah. 11. Teuku Muttaqin Mansur, dkk, buku saku nilai-nilai keunsyiahan untuk kalangan mahasiswa, dicetak oleh UPT Percetakan dan penerbit Syiah kuala universiti press. Supplementary reading list : 12. Azra, Azyumardi. 2002. Paradigma Baru Pendidikan Nasional: Rekonstruksi dan Demokratisasi.Jakarta: Kompas. 13. Yudohusodo, Siswono. 2005. Pancasila, Globalisasi, dan Nasionalisme Indonesia. Jakarta: Buku Kompas. 14. Bagir, Zainal Abidin. 2011, Pluralisme Kewargaan, Arah Baru Politik Keragaman di Indonesia, Mizan dan CRCS, Bandung-Yogyakarta. 15. Bakry, Noor Ms, 2009, Pendidikan Kewarganegaraan. Yogyakarta: Pustaka Pelajar. 16. Kaelan, MS dan Achmad Zubaidi. 2007. Pendidikan Kewarganegaraan untuk Perguruan Tinggi berdasar SK Dirjen Dikti No 43/DIKTI/KEP/2006. Yogyakarta: Paradigma.
Date of last amendment	January 13, 2025

Module designation	MKWU1004 English
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Mrs. Nira Erdiana, S.Pd., M.Pd.
Language	English and Indonesian
Relation to curriculum	Mandatory modules for 2nd semester students.
Teaching methods	Lecture, case method and Team-Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Upon completing the course (C), students (A) are able to understand (B) TOEFL-related concepts in **Listening Skills** (D). 2. Upon completing the course (C), students (A) are able to understand (B) TOEFL-related concepts in **Reading Skills** (D). 3. Upon completing the course (C), students (A) are able to understand (B) TOEFL-related concepts in **Language Components (Structure and Written Expression)** (D) 4. Upon completing the course (C), students (A) are able to **practice speaking (B) (Communication Skills)** integrated into TOEFL instruction (D).

Content	This course is offered to all first-year students at Syiah Kuala University to develop their understanding of the concepts of **Listening**, **Reading**, and **language components**, particularly **Structure and Written Expression**. This course content includes: • Course orientation and general TOEFL strategies • Restatement and negative-related expressions • Suggestions and passive expressions • Who and Where questions and agreement expressions • Long conversations and long talks • Subject–verb structure and agreement • Present and past participles • Parallel structures and verb forms • Reading comprehension skills, including main idea, stated and unstated detail, implied, and where questions.
Exams and assessment formats	written examinations and assignment
Study and examination requirements	1. Assignment: 25% 2. Quiz: 25% 3. Midterm: 25% 4. Final exam: 25%
Recommended literature	1. Gear, R., & Gear, J. (2006). Cambridge Preparation for the TOEFL Test (Used for Homework). Cambridge: Cambridge University Press 2. Phillips, D. (2001). Longman complete course for the TOEFL test: Preparation for computer and paper test. White Plains, NY: Longman 3. Pyle, M. A., & Page, M. E. N. (2002). TOEFL preparation guide: Test of English as a foreign language. New Delhi: Wiley Dream tech India (P) Ltd 4. Rogers, B. (2011). The Complete Guide to the TOEFL Test: PBT Edition. Boston: Heinle Cengage Learning
Date of last amendment	January 13, 2025

Module designation	**MKWU1007** Character Building 2
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	drh. Baidillah Zulkifli, M.Si
Language	Indonesian
Relation to curriculum	Selective modules for 2nd semester students.
Teaching methods	Lecture, small group discussion, Case methods.
Workload (incl. contact hours, self-study hours)	-
Credit points	0 SKS = 0 ECTS
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Students possess character values and a religious spirit, and are able to implement them through attitudes and behavior as a true manifestation of Islam, in accordance with the application of USK values and the implementation of Islamic Sharia in Aceh. 2. Students are able to understand and practice worship as a reflection of proper Islamic understanding in accordance with the Qur'an and Sunnah.

Content	This course is a continuation of Character Development 1 and aims to strengthen the understanding and practice of Islamic values in daily life, both in the aspects of worship and character building as students of Syiah Kuala University. The course content includes: • Daily worship practices • Prayer practice (Shalat): recitation of the Adhan, supplication after Adhan, Iqamah, and obligatory congregational prayers • Religious practices and acts of worship • Funeral rites (Tajhiz al-Mayit) • Values and character development of Syiah Kuala University students • Shubuh Education • The importance of faith in Allah SWT • Modeling the Values of the Messengers of Allah • Islam as a way of life • Returning to the Qur'an • Ethics of social interaction in Islam • Character development in Islam • Ethics of dressing and socializing in Islam
Exams and assessment formats	Non case methods
Study and examination requirements	Midterm Examination : 50% Final semester examination : 50%
Recommended literature	4. Teuku Muttaqin Mansur et al., Universitas Syiah Kuala: History and Values, USK Press 5. Sayyid Sabiq, Fiqh al-Sunnah 6. Ari Atmiyanto, Practical Guide to Sunnah Worship 7. Abdullah bin Jarullah bin Ibrahim Al-Jarullah, Guidelines for Managing the Deceased 8. Al-Ummah Study Group, A Muslim's Creed 1 9. Dr. Limar Sulaiman Al-Asyqor, The Messengers and Their Messages, Pustaka Mantiq 10. Didin Hafidhuddin, Religion Handbook, IPB 11. Ibn Qayyim, The Love of Allah 12. Manna Khalil al-Qattan, Studies in Qur'anic Sciences 13. Marzuki, Youth Relationships 14. Daud Rasyid, Al-Ghazw al-Fikri in the Light of Islam 15. Abdul Rahman H., Western Methods of Corrupting Morality
Date of last amendment	January 13, 2025

Module designation	**SEDC1002 BASIC CHEMISTRY II**
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Ratu Fazlia Inda Rahmayani, S.Pd., M.Sc.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 2nd Semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	passed Basic Chemistry I
Module objectives/intended learning outcomes	1. Upon completing the course through active participation, students are able to accurately analyze colloidal systems, colligative properties, elemental chemistry, redox and electrolysis processes, as well as reaction rates. This enables them to develop the skills necessary to independently and appropriately apply the fundamental chemical knowledge acquired to everyday life. 2. Upon completing the course through active participation, students are able to accurately analyze topics including solubility and solubility product, chemical equilibrium, acid-base theory, solution pH, buffer systems, and hydrolysis. This enables them to develop the skills necessary to independently and appropriately apply the fundamental chemical knowledge acquired to everyday life. 3. Upon completing the course through active participation, students are able to accurately analyze topics in thermochemistry; the structure, nomenclature, properties, and applications of carbon compounds—including haloalkanes, alkanols, alkoxy alkanes, alkanals, alkanones, alkanoic acids, alkyl alkanoates, polymers, carbohydrates, proteins, and lipids. This enables them to develop the skills necessary to independently and appropriately apply the fundamental chemical knowledge acquired to everyday life.

Content	This course content includes: • Colloidal systems • Colligative properties • Elemental chemistry • Redox and electrochemistry • Reaction rates • Solubility and solubility product • Chemical equilibrium • Acid-base theory, the pH of acidic and basic solutions and buffer systems, • hydrolysis, and thermochemistry. It also covers the structure, nomenclature, properties, and applications of carbon compounds such as haloalkanes, alkanols, and alkoxy alkanes; alkanals, alkanones, alkanoic acids, and alkyl alkanoates; as well as the structure, nomenclature, properties, and classification of macromolecules including polymers, carbohydrates, and proteins; and the structure, nomenclature, classification, properties, and uses of lipids. Students are expected to think critically, demonstrate self-confidence, and exercise discipline in solving problems and addressing assigned tasks.
Exams and assessment formats	written examinations, student presentations, and guided class discussions
Study and examination requirements	1. Quiz: 4.5% 2. Assignment: 38.5% 3. Midterm: 36% 4. Final exam: 21%
Recommended literature	1. Mc Murry, J.E., Fay, R.C., & Fantini, J. (2012) Chemistry, 6th Ed., Pearson Prentice Hall, Bostonh. 2. Chang, R. & Goldsby, K.A. (2016) Chemistry. 12th Ed., McGraw Hill, New York. 3. [3] Oxtoby, D.W., Gillis, H.P., & Butter, L.J. (2016) Principles of Modern Chemistry, 8th Ed., Cengage Learning, Boston. 4. James E., Jespersen, N.D., Brady J.E., & Hyslop, A. (2012) Chemistry: the molecular nature of matter, John Willey & Sons, New York. 5. Petrucci, R.H., Herring, F.G., Madura, J.D., & Bissonnete,C. (2017) General Chemistry: principles and modern applications, Pearson, Canada.
Date of last amendment	January 13, 2025

Module designation	**SEDC1006** Chemical Solutions
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Drs. Rusman, M.Si
Language	Indonesian
Relation to curriculum	Mandatory modules for 2nd semester students.
Teaching methods	Lecture, small group discussion, case method, team-based project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester,comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Through the analysis of concepts, theories, and methods of solution preparation in chemistry practicum and research activities, students are able to handle solutions in chemistry laboratories and research with accuracy and responsibility. 2. Through lectures employing innovative approaches and diverse learning methods, students are able to accurately perform solution concentration calculations and formulate the steps for solution preparation based on the type of concentration for chemistry learning and research correctly and carefully. 3. Through case studies and group projects, students are able to design procedures for determining the concentration of a solute (such as acetic acid in commercial vinegar or HCl in floor cleaners) in a solution using appropriate methods.

Content	This course content includes • solution concentrations and their applications • concentration expressions (percent, mole fraction, molarity, molality, and normality) for solid substances and concentrated solutions. It will also cover the design and analysis of solution concentration using titration and spectrophotometric methods, as well as the preparation of standard and reagent solutions.
Exams and assessment formats	written examinations, case method, and team based project
Study and examination requirements	1. Case methods: 38% 2. Team based project: 15% 3. Quiz: 27%% 4. Midterm: 20%
Recommended literature	1. Ahmad, H. 1990. Kimia Larutan, ITB Press: Bandung 2. James E. Brady, Neil D. Jespersen, dan Alison Hyslop. 2012. Chemistry. New York: John Willey & Sons 3. Petrucci, dkk.Kimia Dasar, Prinsip-prinsip dan Aplikasi Modern. Jakarta: Erlangga. 4. Rusman; Ratu, FIR; dan Mukhlis (2009) "Kimia Larutan", Syiah Kuala University Press, Banda Aceh
Date of last amendment	January 13, 2025

Module designation	**SEDC1008** Chemical Solutions Practicum
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Nur Akmalia, M.Pd.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 2nd semester students.
Teaching methods	Practicum, discussion, question and answer, direct assignment, team based project.
Workload (incl. contact hours, self-study hours)	1 x 45 hours per semester, distributed as follows: ✔ 170 minutes structured tasks per week
Credit points	1 SKS = 1.67 ECTS (45 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Through laboratory practicum, students are able to solve the problem of providing solutions with the required concentration through correct and thorough calculations and work steps. 2. Through practicum activities, students are able to calibrate and standardize solutions by titration, and make reagent solutions appropriately and responsibly. 3. After completing practicum lectures, students are able to manage chemicals needed for chemistry practicum and research carefully and responsibly.
Content	This course content includes: • Fundamental concepts of Preparation of solutions in concentrations of Mole fraction, percent, molarity, normality, molality, ppm, and ppb • Solution Standardization • Determination of solution concentration through absorbance measurement.
Exams and assessment formats	written examinations, team based project, and guided class discussions
Study and examination requirements	1. Team based project: 50% 2. Quiz: 20% 3. Midterm: 17,5% 4. Assignment: 5% 5. Final exam: 7,5%

Recommended literature	1. Beran, J.E. 2007. Laboratory Manual for Principles of General Chemistry, 8th Ed. John Wiley & Sons, New York. 2. Chang, R. & Goldsby, K.A. 2016. Chemistry. 12th Ed., McGraw Hill, New York. 3. James E., Jespersen, N.D., Brady J.E., & Hyslop, A. 2012. Chemistry: the molecular nature of matter, John Willey & Sons, New York. 4. Silvano, W. 2004. Hands-On Chemistry Experiments-Grades K-2. School Specialty Pulishing. Michigan. 5. Thompson, R.B. 2008. Illustrated Guide to Home Chemistry Experiments, First Edition. O'Reilly Books. U.S.A. 6. Walker, P and Elaine, W. 2011. Facts on File Science Experiments. Infobase. New York. 7. Bucat, R.B. (Supervising Editor). 1987. Elements of Chemistry: Earth, Air, Fire & Water. Australian Academy of Science: Canberra. 8. Glencoe/McGraw-Hill Team. 2001. Chemistry: Matter and Change, Laboratory Manual. Glencoe/McGraw-Hill: New York. 9. VanCleave, J.. 1993. A+ Projects in Chemistry Winning Experiments for Science Fairs and Extra Credit. John Wiley & Sons, Inc. New York.
Date of last amendment	January 13, 2025

Module designation	**SEDC1010** Chemistry Teaching Material Review II
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Dr. Sri Winarni, S.Pd, M.Pd
Language	Indonesian, English (for lecture material)
Relation to curriculum	Compulsory module for 2nd semester students.
Teaching methods	Lecture, small group discussion, Team-Based Project,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	SEDC 1009 Chemistry Teaching Material I
Module objectives/intended learning outcomes	1. Through reference exploration and discussion (C), students (A) are able to critically and accurately (D) analyze scientific literacy in Grade XI chemistry teaching materials (B) 2. Students (A) are able to accurately and precisely (D) solve practice questions related to Grade XI high school chemistry topics (B) through discussion and interactive questioning (C)). *3.* Students (A) are able to design Grade XI chemistry teaching materials in the form of handouts and student worksheets (LKPD) (B) through Project-Based Learning (PjBL) (C) in a thorough, responsible, and independent manner (D).
Content	Grade XI Chemistry Learning Materials Aligned with the Applicable National Curriculum This course content includes: • Learning Resources • Instructional Materials • The Nature of Teaching Materials • Content: Grade 10 Senior High School Chemistry Material

Exams and assessment formats	team-based project, Quiz, Task, and Midterm examinations,
Study and examination requirements	1. Project: 61% 2. Task: 13.5% 3. Quiz: 15% 4. Midterm: 10.5%
Recommended literature	1. Ramli, M., Saridewi, M., Budhi, T. M., & Suhendar, A. (2022). Kimia SMA/MA Kelas XI. Kementerian Pendidikan, Kebudayaan, Riset, Dan Teknologi. 2. Effendy. 2012. A-Level Chemistry for Senior High School Students Based on KTSP and Cambridge Curriculum (Volume 3A). Malang: Indonesian Academic Publishing. 3. Effendy. 2017. Molekul, Struktur, dan Sifat-sifatnya: Seri Buku Ikatan Kimia dan Kimia Anorganik. Malang: Indonesian Academic Publishing. 4. International Union of Pure and Applied Chemistry. 2012. Compendium of Chemical Terminology, GoldBook. Version 2.3.2 5. James E., Jespersen, N.D., Brady J.E., & Hyslop, A. 2012. Chemistry: the molecular nature of matter, John Willey & Sons, New York 6. McMurry, J.E. & Fay, R.C. 2014. General Chemistry: Atoms First 2nd Ed. Boston: Pearson. 7. Ibrahim, Muslimin .2005. Pembelajaran Berdasarkan Masalah. Surabaya: Unesa University Press. 8. Johnson, Elaine, B. 2002. Contextual Teaching and Learning: What it is and Why It's Here to Stay. USA: Corwin Press. 9. Ratumanan, TG, .2004. Belajar dan Pembelajaran. Ambon. Unesa University Press.
Date of last amendment	January 13, 2025

Module designation	**SEDC1012** ICT In Chemistry Learning
Semester(s) in which the module is taught	2rd Semester
Person responsible for the module	Kana Puspita, S.Pd., M.Si.P.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective modules for 2nd semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes of lecture and discussion per week ✔ 180 minutes of structured tasks per week ✔ 180 minutes of independent learning per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	Passed Computer Application
Module objectives/intended learning outcomes	1. Through the use of technology, students are able to design various structures and reaction mechanisms of organic and inorganic compounds using ChemDraw, and to develop an interactive acid–base titration learning media with Microsoft Excel. 2. By the end of the course, students are expected to be able to design simple web pages using HTML and produce animated videos through VideoScribe creatively and innovatively.
Content	This course content includes: • Ms. Office • ChemDraw • HTML • VideoScribe.
Exams and assessment formats	written examinations, case studies, project, and guided class discussions
Study and examination requirements	1. Case Assignment: 32.5% 2. Quiz: 17.5% 3. Project: 50%

Recommended literature	1. Gilbert W. Castellan, 1983, Physical Chemistry, Third Edition, Addison-Wesley Publishing Company, Inc. 2. Atkins, P.W., 1990, Physical Chemistry, edisi ke 4, Oxford University Press. 3. Bantford, C.H., Tipper, C.F.H., dan Compton, P.G., 1985, Comprehensive Chemical Kinetics, Elsivier Sciences Publishers
Date of last amendment	January 13, 2025

Module designation	**SEDC1014** Gas and Thermodynamics
Semester(s) in which the module is taught	2nd Semester
Person responsible for the module	Prof. Dr. M. Hasan, M.Si..
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 2nd semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Through problem-solving activities and group discussions, students are able to explain the fundamental concepts of ideal and real gases, including gas laws and compressibility factors, and apply these concepts to solve thermodynamic problems related to gas behavior.. 2. By conducting thermochemical calculations and presenting case studies, students are able to demonstrate an understanding of the First Law of Thermodynamics, including internal energy and enthalpy changes, and analyze energy transformations in physical and chemical systems.. 3. Through simulations, individual reflections, and collaborative analysis, students are able to evaluate thermodynamic processes based on the Second and Third Laws of Thermodynamics, with emphasis on entropy, spontaneity, and the concept of absolute zero

Content	This course provides a comprehensive introduction to the fundamental principles of gases and thermodynamics, essential for understanding various physical and chemical processes. The course begins by exploring the behavior of ideal gases, guided by classical gas laws such as Boyle's, Charles's, and Avogadro's laws, and then extends to the real gas behavior by introducing the concepts of intermolecular interactions, deviations from ideality, and compressibility factors.The next part of the course focuses on the First Law of Thermodynamics, emphasizing the concepts of internal energy, heat, work, and enthalpy. Students will also study thermochemistry, including the use of calorimetry and Hess's Law to analyze heat changes in chemical reactions.In the final section, the course delves into the Second and Third Laws of Thermodynamics. Here, students will explore the concepts of entropy, spontaneity of processes, Gibbs free energy, and the theoretical foundation of absolute zero, enabling them to analyze the directionality and limitations of energy transformations.Throughout the course, students engage in problem-solving sessions, group discussions, presentations, and simulations to deepen their conceptual understanding and develop critical scientific thinking. This course content includes: • Ideal and Real Gases and Their Properties • Ideal Gas Equation and Real Gas Equations • The First, Second, and Third Laws of Thermodynamics • Applications of the First, Second, and Third Laws of Thermodynamics in Chemistry
Exams and assessment formats	written examinations, student presentations, and guided class discussions
Study and examination requirements	1. Quiz: 7.5% 2. Assignment: 35.5% 3. Midterm: 42% 4. Final exam: 15%

Recommended literature	Atkins, P., & de Paula, J. (2018). *Physical chemistry* (11th ed.). Oxford University Press. Engel, T., & Reid, P. (2013). *Thermodynamics, statistical thermodynamics, & kinetics* (3rd ed.). Pearson Education McQuarrie, D. A., & Simon, J. D. (1999). *Molecular thermodynamics*. University Science Books Van Ness, H. C., & Abbott, M. M. (2008). *Introduction to chemical engineering thermodynamics* (7th ed.). McGraw-Hill Education Levine, I. N. (2009). *Physical chemistry* (6th ed.). McGraw-Hill. **Recommended Articles** Lemmon, E. W., McLinden, M. O., & Friend, D. G. (2020). Thermophysical properties of fluid systems. In P. J. Linstrom & W. G. Mallard (Eds.), *NIST Chemistry WebBook, NIST Standard Reference Database Number 69*. National Institute of Standards and Technology. Çengel, Y. A., & Boles, M. A. (2015). *Thermodynamic analysis of systems using energy and entropy balances*. *International Journal of Thermodynamics*, 18(2), 107–122 Vázquez, J., & Vázquez, A. (2013). The first and second laws of thermodynamics in chemical engineering education. *Education for Chemical Engineers*, 8(3), e73–e80. https://doi.org/10.1016/j.ece.2013.02.001 Labib, M. E. (2019). Entropy and its misinterpretations: A review. *Journal of Thermodynamics & Catalysis*, 10(1), 1–6. https://doi.org/10.35248/2157-7544.19.10.204 Moran, M. J., Shapiro, H. N., Boettner, D. D., & Bailey, M. B. (2014). *Thermodynamic principles in energy systems design*. *Journal of Energy Resources Technology*, 136(4), 040901. https://doi.org/10.1115/1.402764 **Problem-Silving Exercises** Atkins, P., & de Paula, J. (2018). *Physical chemistry* (11th ed.). Oxford University Press Engel, T., & Reid, P. (2013). *Thermodynamics, statistical thermodynamics, & kinetics* (3rd ed.). Pearson Education Levine, I. N. (2009). *Physical chemistry* (6th ed.). McGraw-Hill. Çengel, Y. A., & Boles, M. A. (2015). *Thermodynamics: An engineering approach* (8th ed.). McGraw-Hill Education. Laidler, K. J., Meiser, J. H., & Sanctuary, B. C. (2003). *Physical chemistry* (4th ed.). Houghton Mifflin
Date of last amendment	January 13, 2025

Module designation	**SEDC2025** Chemistry Teaching Material Review III
Semester(s) in which the module is taught	3rd Semester
Person responsible for the module	Dr. Sri Winarni, S.Pd, M.Pd
Language	Indonesian, English (for lecture material)
Relation to curriculum	Compulsory module for 3rd semester students.
Teaching methods	Lecture, small group discussion, Team-Based Project,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	SEDC 1010 Chemistry Teaching Material II
Module objectives/intended learning outcomes	1. Students are able to master and demonstrate proficiency in solving chemistry practice problems in accordance with the scope and sequence of Grade XII senior high school (or equivalent) curriculum. 2. Students are able to analyze misconceptions found in chemistry teaching materials, particularly those aligned with the scope and sequence of the Grade XII senior high school curriculum, through literature review, group discussion, and document (teaching material) observation, and present the findings in the form of a scientific paper). 3. Students are able to systematically develop simple teaching materials (student worksheets and handouts) through collaborative group work with skill and accuracy.
Content	This course content includes: • Grade XII Chemistry Learning Materials Aligned with the Applicable National Curriculum • Misconception of Chemistry
Exams and assessment formats	team-based project, Quiz, and Task
Study and examination requirements	1. Project: 61% 2. Task: 21.0% 3. Quiz: 16.5%

Recommended literature	1. Yuliani, G., Dianhar, H., & Suhendar, A. (2022). Kimia untuk SMA/MA Kelas XII. Kementerian Pendidikan, Kebudayaan, Riset, Dan Teknolog. https://buku.kemdikbud.go.id 2. Effendy. 2012. A-Level Chemistry for Senior High School Students Based on KTSP and Cambridge Curriculum (Volume 3A). Malang: Indonesian Academic Publishing. 3. Effendy. 2017. Molekul, Struktur, dan Sifat-sifatnya: Seri Buku Ikatan Kimia dan Kimia Anorganik. Malang: Indonesian Academic Publishing. 4. International Union of Pure and Applied Chemistry. 2012. Compendium of Chemical Terminology, GoldBook. Version 2.3.2 5. James E., Jespersen, N.D., Brady J.E., & Hyslop, A. 2012. Chemistry: the molecular nature of matter, John Willey & Sons, New York 6. McMurry, J.E. & Fay, R.C. 2014. General Chemistry: Atoms First 2nd Ed. Boston: Pearson. 7. Ibrahim, Muslimin .2005. Pembelajaran Berdasarkan Masalah. Surabaya: Unesa University Press. 8. Johnson, Elaine, B. 2002. Contextual Teaching and Learning: What it is and Why It's Here to Stay. USA: Corwin Press. 9. Ratumanan, TG, .2004. Belajar dan Pembelajaran. Ambon. Unesa University Press. 10. Winarni, S., Effendy, E., Budiasih, E., & Wonorahardjo, S. (2022). Constructing 'Concept Approval Strategy,' a chemistry learning idea to prevent misconceptions. Educación Química, 33(2), 159–180. https://doi.org/10.22201/fq.18708404e.2022.2.79841 11. Winarni, S., & Syahrial, S. (2022). Revealing chemical misconceptions through the microteaching process in the era of the covid-19 pandemic. Jurnal Kimia Dan Pendidikan Kimia, 7(1), 50–63. https://doi.org/10.20961/jkpk.v7i1.55587
Date of last amendment	August 12, 2024

Module designation	**FEDU2001** Psychology in Educational
Semester(s) in which the module is taught	3rd Semester
Person responsible for the module	Dr. Fajriani, S.Pd., M.Ed.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Compulsory modules for 3rd semester students. This course explores psychological theories and principles relevant to the teaching and learning process. It supports CPL-3 and CPL-8 by providing insights into cognitive development, motivation, individual differences, and classroom behavior—knowledge essential for creating effective and inclusive learning environments. In line with ASIIN's focus on pedagogical competence and learner-centered education, the course enables prospective biology educators to apply psychological concepts in understanding how students learn and how instruction can be tailored to meet diverse educational needs. Students are trained to interpret learning challenges, manage student behavior, and foster positive classroom dynamics—skills that are fundamental to their role as reflective, empathetic, and effective teachers.
Teaching methods	Lecture, discussion, questions and answers, brainstorming, assignments, case methods, and team-based project.
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain the concept of educational psychology in the development of learning and study skills. 2. Students are able to explain various psychological concepts that influence the learning process. 3. Students are able to use learning theories to analyze educational problems both inside and outside the classroom.

Content	This course content includes: • Cognitive Development, • Social and Moral Development, • Psychological Concepts of Intelligence, Talent, and Learning Styles, • Behaviorism Theory in Learning, • Cognitive Theory in Learning, • Constructivism Theory in Learning, • Common problems experienced by students in school, • Review and intervention of student problems: Motivation to learn, • Review and intervention of student problems: Learning difficulties, • Review and intervention of student problems: Off Task Behavior, • Overview and intervention of student problems: Teacher-student interaction, • Review and intervention of student problems: Aggressiveness and Bullying • Teacher Professionalism • Implementation of Guidance and Counseling Services.
Exams and assessment formats	written examinations, case studies, team based project, student presentations, and guided class discussions
Study and examination requirements	1. Case methods: 40% 2. Team based project: 10% 3. Quiz: 5% 4. Midterm: 5% 5. Assignment: 30% 6. Final exam: 10%
Recommended literature	1. Woolfolk, A. (2017). Educational Psychology (13th Ed.). Pearson 2. Mulyasa, H. E. (2023). Implementasi Kurikulum Merdeka. Bumi Aksara. 3. Kelly, A.V. (2009). The curriculum: Theory and practice (6th ed.). Thousand Oaks, CA: Sage. 4. Suparman, T. (2020). Kurikulum dan Pembelajaran. Penerbit CV. SARNU UNTUNG. 5. Frederickson, N., Miller, A., Cline, T., Gulliford, A., & Birch, S. (2015). Educational psychology. Routledge.
Date of list amendment	August 12, 2024

Module designation	**MKWU 2001** Religion Education
Semester(s) in which the module is taught	6st Semester
Person responsible for the module	Syafrizal, S.Pd.I, M.A
Language	Indonesian
Relation to curriculum	Mandatory module for 3rd semester students.
Teaching methods	Lecture, small group discussion, Project Based Learning
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Be devoted to God Almighty, embody a humanistic character, uphold integrity, and value diversity. 2. Actively participate as responsible citizens, demonstrate a spirit of nationalism, uphold the rule of law, and engage effectively in global interactions 3. Uphold USK values and support the implementation of Islamic law (Shari'ah) in Aceh. 4. Skilled in logical, critical, systematic, and innovative thinking when applying the learning outcomes of MKWK courses to advancements in knowledge and technology. 5. Skilled in continuous self-development and committed to lifelong learning. 6. Concerned with national and societal issues, actively involved in disaster response and addressing social problems, particularly those related to narcotics and illegal drugs, while fostering an anti-corruption mindset. 7. Capable of working independently, with quality and measurable outcomes, to accomplish tasks assigned in MKWU courses.

Content	The Religious Education course is designed to provide students with an in-depth understanding of the values, teachings, practices, and social contexts of specific religions or multiple religions studied. This course particularly includes theological, philosophical, ethical, ritualistic, and historical aspects of religions and how they influence and shape the culture, morality, and social identity of individuals and communities. The course content emphasizes knowledge, attitudes, and skills rooted in critical thinking, analysis, and problem-solving concerning the essence of humanity and religion, primary sources of Islamic teachings, fundamental Islamic principles, and broader insights into Islamic perspectives. This course content includes: • The Essence of Islam (Ad-Dīn al-Islām): concepts of religion and Islam, values, and critical thinking • Islamic Ethics (Akhlaq): ethics toward Allah, the Messenger, parents, educators, society, and the environment • Islamic Law (Qanun Syariat Islam) in Aceh: history, principles, institutions, regulations, and objectives • Sources of Islamic Law: Qur'an, Hadith, Ijtihad, and Qiyas • Islamic Creed (Aqidah): Tawhid, Ahl al-Sunnah wa al-Jama'ah, and issues of deviation • Family Development in Islam: marriage, divorce, inheritance-related family issues, and problem-solving • Mu'amalah: principles, classifications, and prohibited practices • Islam as a Discipline of Knowledge: Islamic civilization and contributions to science • Proxy War Perspectives: comparative and contemporary analyses • Covering Aurat and Gender Interaction Ethics • Fiqh al-Mawaris (Islamic Inheritance Law) • Mental Revolution: concepts, urgency, and the role of youth
Exams and assessment formats	written examinations and Project
Study and examination requirements	1. Quiz: 10% 2. Assignment: 29.5% 3. Midterm: 3.5% 4. Final exam: 7% 5. Project: 27% 6. Participative Activity 23%

Recommended literature	Alma, B., & Priansa, D. J. (2009). Sharia Business Management. Department of Religion. (2004). Compilation of Islamic Law. Department of Religion. (2007). Towards a Sakinah Family. Jakarta: Research and Development Agency and Training of the Department of Religion. Department of Religion. (2007). Psychology of Marriage and Family. Jakarta: Research and Development Agency and Training of the Department of Religion. Sharia Islam Office of Aceh. (2009). Compilation of Presidential Decrees, Regional Regulations/Qanun, Governor's Instructions, and Governor's Circulars Related to the Implementation of Sharia Islam (7th ed.). Efrinaldi. (2007). Fiqh of Siyasah and the Foundations of Islamic Political Thought. El Hafidy. (1982). Streams of Beliefs and Heresies in Indonesia. Jakarta: Ghalia Indonesia. Politzer, G. (1954). Principles of Philosophy. Paris: Editions Sociales. Hamka. (1983). Philosophy of Divinity. Surabaya: Karunia. Yahya, H. (2003). The Collapse of the Theory of Evolution in 20 Questions. Surabaya: Risalah Gusti. Ross, H. (1991). The Fingerprint of God. Orange, CA: Promise Publishing Co. Jumu'ah, A. (2013). Responding to the Salafi Movement: Scientific Answers to the Da'wah Methods of the Salafi Wahhabi. Jakarta: Khatulistiwa Press. Kosasih, A. (2017). Destiny: Problems That Have Emerged. Lickona, T. (2013). Character Education: A Complete Guide to Educating Students to Be Smart and Good (Trans.). Bandung: Nusa Media. Fachruddin, M. F. (1966). Philosophy and Wisdom of Islamic Sharia. Jakarta: Bulan Bintang. Hatta, M. (1957). Greek Thought II. Jakarta: Timtamas.

	Mardani. (2017). Islamic Religious Education for Higher Education. Depok: Kencana. Bucaille, M. (1989). The Origin of Man According to the Bible, Qur'an, and Science. Bandung: Mizan. Abdurrahman, M. (2014). How to Have Noble Character. Banda Aceh: 'Adnin Foundation Publisher. Razak, N. (1993). Dienul Islam. Bandung: Alma'rif. Qaradhawi, Y. (2011). Halal and Haram in Islam. Solo: PT. Era Adicitra Intermedia. Sailah, I. (2008). Development of Soft Skills in Higher Education. Jakarta: Directorate General of Higher Education Soft Skill Development Team. Islamic Religious Education Team, University of Brawijaya. (2007). Islamic Religious Education. Malang: PPA Unibraw. Idris, M., et al. (1980). Islamic Religious Education II. Malang: Leppa IKIP Malang. Ibrahim, S. Z. H., et al. (2008). Towards a Comprehensive Islam: Thoughts and Experiences of Acehnese Students in Pursuing Knowledge and Its Relationship to Real Actions. Banda Aceh: Lapena. Ali, M. D. (2011). Islamic Religious Education. Jakarta: Rajawali Press. Adz-Dzahabi, A. S. A. A. M. bin A. U. (n.d.). Major Sins (Trans. Abdurrahman Nuryaman). Publisher: Sheikh Eid Mohammad Al-Thani Foundation.
Date of list amendment	August 12, 2024

Module designation	**SEDC2017** Chemical Qualitative Analysis
Semester(s) in which the module is taught	3rd Semester
Person responsible for the module	Dr. Ibnu Khaldun, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 3rd semester students.
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. **Explain the basic concepts and principles of qualitative chemical analysis** Students are able to describe the theoretical foundations of qualitative analysis, including types of chemical reactions used in identifying ions. 2. **Classify cations and anions based on their chemical properties** Students are able to categorize common cations and anions into analytical groups and explain their behavior in various chemical environments. 3. **Predict the outcomes of qualitative reactions based on chemical theory** Students are able to anticipate the formation of precipitates, color changes, or gas evolution during qualitative analysis using their understanding of chemical equilibria and solubility rules. 4. **Analyze systematic procedures used in the identification of inorganic ions** Students are able to interpret and evaluate flowcharts and logic sequences in classical qualitative analysis without conducting laboratory experiments. 5. **Interpret reaction equations and ionic interactions involved in qualitative tests** Students are able to write and balance ionic and molecular equations related to qualitative tests and explain the chemical principles underlying these reactions.

Content	Qualitative Analytical Chemistry is a branch of chemistry focused on the identification of inorganic ions based on their chemical properties and characteristic reactions, without involving quantitative measurements. The course content covers fundamental principles of qualitative analysis, classification of cations and anions into analytical groups, and an understanding of key reactions such as precipitation, complex formation, and redox reactions. Students learn the theoretical basis behind the formation of precipitates, color changes, and gas evolution during ion identification processes, as well as how to write and balance molecular and ionic equations for these reactions. Additionally, students are trained to comprehend and analyze systematic procedures used in the identification of inorganic ions through logical and scientific reasoning, enabling them to evaluate analytical pathways even without conducting hands-on laboratory experiments. This course content includes: • Fundamentals of Qualitative Analysis • Laboratory Safety and Techniques • Analysis of Group I and Group II Cations • Analysis of Group III Cations • Analysis of Group IV and Group V Cations • Anion Analysis • Mixed Ion Analysis
Exams and assessment formats	written examinations, assignment, and team based project
Study and examination requirements	1. Quiz: 15% 2. Assignment: 20% 3. Midterm: 20% 4. Project: 25% 5. Final exam: 20%

Recommended literature	1. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry* (9th ed.). Belmont, CA: Brooks/Cole Cengage Learning. 2. Harris, D. C. (2015). *Quantitative Chemical Analysis* (9th ed.). New York, NY: W. H. Freeman and Company. 3. Day, R. A., & Underwood, A. L. (1991). *Quantitative Analysis* (6th ed.). Englewood Cliffs, NJ: Prentice Hall. 4. Christian, G. D., O'Reilly, J. E., & Feldman, J. (2013). *Analytical Chemistry* (7th ed.). Hoboken, NJ: John Wiley & Sons. 5. Vogel, A. I., & Jeffery, G. H. (1989). *Vogel's Qualitative Inorganic Analysis* (5th ed.). New York, NY: Longman Scientific & Technical. 6. Bassett, J., Denney, R. C., Jeffery, G. H., & Mendham, J. (1978). *Vogel's Textbook of Quantitative Inorganic Analysis* (4th ed.). London: Longman. 7. Willard, H. H., Merritt, L. L., Dean, J. A., & Settle, F. A. (1988). *Instrumental Methods of Analysis* (7th ed.). Belmont, CA: Wadsworth Publishing Company. 8. Mahin, L. L. (1970). *Qualitative Chemical Analysis: Principles and Methods*. New York, NY: McGraw-Hill. 9. Hein, M., Arena, J., & Willard, H. H. (1999). *Foundations of College Chemistry* (11th ed.). New York, NY: Wiley. 10. Ginzburg, A. S. (1964). *Qualitative Analysis: An Introduction to the Analytical Chemistry*. New York, NY: Macmillan.
Date of last amendment	August 12, 2024

Module designation	**SEDC2013** Monofunctional Organic Chemistry
Semester(s) in which the module is taught	3rd Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 3rd semester students.
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	passed basic chemistry courses 1st and 2nd

Module objectives/intended learning outcomes	1. After actively participating in the course (C), students (A) are able to **analyze and distinguish organic compounds** based on their sources, functional groups, structures, nomenclature, isomers, isomer conformations, and biosynthesis (B, C5); and are able to **apply this understanding (P4)** to **accurately classify the organic compounds** (D, A4). 2. After actively participating in the course (C), students (A) are able to **analyze and differentiate** the physical and chemical properties of organic compounds based on their structures and elemental compositions, including: carbon and hydrogen (C, H), carbon, hydrogen, and halogens (C, H, X), carbon, hydrogen, and oxygen (C, H, O), carbon, hydrogen, oxygen, and halogens (C, H, O, X), carbon, hydrogen, and nitrogen (C, H, N), carbon, hydrogen, nitrogen, and oxygen (C, H, N, O), carbon, hydrogen, and sulfur (C, H, S), carbon, hydrogen, nitrogen, and sulfur (C, H, N, S) (B, C5); and are able to **apply the data on these properties (P4)** to **accurately verify the characteristics of the compounds** (D, A5). 3. After actively participating in the course (C), students (A) are able to **analyze and distinguish the uses of organic compounds** based on their structures and elemental compositions, including: carbon and hydrogen (C, H), carbon, hydrogen, and halogens (C, H, X), carbon, hydrogen, and oxygen (C, H, O), carbon, hydrogen, oxygen, and halogens (C, H, O, X), carbon, hydrogen, and nitrogen (C, H, N), carbon, hydrogen, nitrogen, and oxygen (C, H, N, O), carbon, hydrogen, and sulfur (C, H, S), carbon, hydrogen, nitrogen, and sulfur (C, H, N, S) (B, C5); and are able to **apply these compounds (P4)** and **demonstrate their appropriate uses accurately** (D, A5).

Content	This course content includes: • Hydrocarbon and organic molecule formation; hydrocarbon compounds (alkanes, cycloalkanes, alkenes, alkynes, and arenes) • Organic compounds containing halogens (haloalkanes); organic compounds containing oxygen (alcohols, ethers, epoxides, aldehydes, ketones, carboxylic acids, acid anhydrides, acyl halides, and esters) • Organic compounds containing nitrogen (amines, amides, nitrates, nitrites, nitriles, nitro, nitroso, imines, imides, azides, cyanates, isocyanates, and azo compounds) • Organic compounds containing sulfur (thiols, sulfides, disulfides, sulfoxides, sulfones, sulfinic acids, sulfonic acids, sulfonate esters, thiocyanates, isothiocyanates, thials, and thioketones) • Organic compounds containing phosphorus (phosphines). The discussion emphasizes the **structure of functional groups** (except for alkanes and cycloalkanes), **nomenclature** (both trivial and IUPAC), **physical and chemical properties**, and **applications** of the compounds. In addition, the course also covers **types of isomerism and stereochemistry**.
Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Case methods: 50,3% 2. Quiz: 8,5% 3. Midterm: 8,25% 4. Participatory Activities (Attitude, Discussion, and Presentation): 16,5% 5. Final exam: 16,5%

Recommended literature	1. McMurry, J. 2023. Organic Chemistry: A Tenth Edition, Rice University, Houston, Texas USA 2. Favre, H.A. & Powell, W.H. (Eds.). 2013. Nomenclature of Organic Chemistry: IUPAC Recommendations and Preferred Names 2013. 1st Ed. Royal Society of Chemistry, United Kingdom 3. Dean, J.A. 1999. Lange's Hand Book of Chemistry. Fifteent Edition. New York: McGraw-Hill-Inc. 4. Fessenden, R.J. & Fessenden, J.S. 1991. Kimia Organik. Edisi Ketiga. Jilid 1 & 2. (Terjemahan Pudjaatmaka, A.H.). Jakarta: Erlangga 5. Gani, A., Adlim, M., Rahman, M.W., & Nazar, M. 2024. Immobilization of activated carbons on yarn as the adsorbent for dissolved iron in traditional well water. South African Journal of Chemical Engineering, 49: 136-145. https://doi.org/10.1016/j.sajce.2024.03.019 6. Gani, A., Adlim, M., Rahmayani, R.F.I., Hanum, L., & Nabila, R. 2024. Preparation and characterization of coconut shell liquid smoke and the properties of preserving tofu. Kuwait Journal of Science, 51: 100289. https://doi.org/10.1016/j.kjs.2024.100289 7. Pine, S.H., Hendrickson, J.B., Cram, D.J. & Hammond, G.S. 1988. Kimia Organik. Terbitan Keempat, Jilid 1 & 2. Terjemahan Joedodibroto, R. Bandung: ITB. 8. Credible online sources, such as: (https://pubchem.ncbi.nlm.nih.gov), (https://www.khanacademy.org/science/organic-chemistry), (https://www.rsc.org), and (https://chem.libretexts.org)
Date of last amendment	August 12, 2024

Module designation	**SEDC2015** Teaching and Learning Strategy
Semester(s) in which the module is taught	3rd Semester
Person responsible for the module	Dra. Latifah Hanum, M. Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 3rd semester students.
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	1. After actively participating in the course (C), students (A) are able to **analyze the nature of teaching and learning strategies and accurately analyze** (D) the individual characteristics and learning difficulties of students in chemistry learning (B). 2. After actively participating in the course (C), students (A) are able to accurately (D) **identify basic teaching skills and teaching stages based on instructional steps**, and distinguish between approaches, methods, and models **that can be applied in chemistry learning** (B). 3. After actively participating in the course (C), students (A) are able to accurately (D) **design learning activities** based on models, approaches, and methods aligned with the subject matter in chemistry education (B). 4. After actively participating in the course (C), students (A) are able to accurately and effectively (D) **describe teaching variations and feedback techniques applicable** in the classroom, and **design classroom management strategies** including remedial and enrichment activities based on the analysis of information and data (B)

Content	This course content includes: • Learning theories related to instruction • Student characteristics and learning difficulties • Basic teaching skills • Stages of teaching • Instructional models, approaches, and methods • The design of learning activities based on appropriate models, approaches, and methods in relation to the subject matter • Variations in teaching and feedback techniques • Classroom management • Remedial and enrichment programs in chemistry education.
Exams and assessment formats	written examinations, case studies, student presentations, simulation, and guided class discussions
Study and examination requirements	1. Case methods: 50% 2. Quiz: 10% 3. Midterm: 10% 4. Participatory Activities (Attitude, Discussion, and Presentation): 20% 5. Final exam: 10%

Recommended literature	1. Ahmadi, Abu. (1997). Strategi Belajar Mengajar. Bandung: Pustaka Setia. 2. Arikunto, Suharsimi. (1988). Pengelolaan kelas dan Siswa Sebuah Pendekatan Evaluatif. Jakarta : Rajawali Pers. 3. Depdiknas (2002) Pendekatan Kontekstual (Contextual Teaching and Learning). Jakarta: Dirjen Dikdasmen. 4. De Porter, Bobbi , dkk, (2000). Quantum Teaching, (teorj). Bandung: Kaifa 5. Ibrahim, Muslimin (2005) Pembelajaran Berdasarkan Masalah. Surabaya: Unesa University Press. 6. Djamarah, Syaiful Bahri. (2002). Strategi Belajar Mengajar. Jakarta : Rineka Cipta 7. Johar, Rahmah; Cut Nurfadhilah, dan Latifah Hanum (2006). Strategi Belajar Mengajar. Bahan Ajar. Universitas Syiah Kuala 8. Johnson, Elaine, B. (2002). Contextual Teaching and Learning: What it is and Why It's Here to Stay. USA: Corwin Press. 9. Nur, Mohamad, dan P.R. Wikandari. (2000). Pengajaran Berpusat kepada Siswa dan Pendekatan Kontruktivis dalam Pengajaran. Surabaya: Pusat Studi MIPA Unesa. 10. Pidarta, Made. (1986). Pengelolaan Kelas. Surabaya : Usaha Nasional 11. Ratumanan, TG, (2004). Belajar dan Pembelajaran. Ambon. Unesa University Press. 12. _____. (2001). Strategi Belajar Mengajar. Jakarta : Rineka Cipta 13. Soekamto, Toeti, (1997). Teori Belajar dan Model-model Pembelajaran. Jakarta. Depdikbud-Dikti.
Date of last amendment	August 12, 2024

Module designation	**SEDC2019** Structure and Reactivity of Inorganic Compounds
Semester(s) in which the module is taught	3rd Semester
Person responsible for the module	Prof. Dr. Adlim, M.Sc.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 3rd semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	passed basic chemistry courses I and basic chemistry II
Module objectives/intended learning outcomes	1. Students are able to analyze the differences among various acid-base concepts through individual and group assignments by relating them to specific cases in chemical reactions. 2. Students are able to explain the concept of redox and its applications in industry and daily life, both independently and in groups, by discussing relevant case studies. 3. Students explain the thermodynamic and electrochemical aspects of metal extraction, corrosion, and battery technology through individual or group assignments by analyzing relevant case studies.

Content	This course provides students with foundational knowledge to understand acid-base reactions and properties based on the Arrhenius, Brønsted-Lowry, and Lewis theories; the reactions and characteristics of hard and soft acids and bases (HSAB): classifying Lewis acids and bases and their applications in inorganic compound synthesis; classifying hard and soft acids and bases and estimating the acidity level of acids; applying the HSAB concept in the synthesis of inorganic compounds; predicting the outcome of acid-base (neutralization) reactions; and conducting experiments related to acid-base reactions (neutralization). Furthermore, the course covers acid-base chemistry applications; redox reaction concepts in metal extraction, electrochemistry, and other redox reactions: distinguishing between reduction and oxidation reactions, as well as disproportionation and comproportionation reactions; describing redox processes in metal extraction via element substitution (based on the electrochemical series), reduction methods (using C, Al, Mg, Na), and electrolysis; predicting the outcomes of redox reactions; understanding the application of redox concepts in daily life and industry. In terms of thermodynamic aspects, the course discusses the extraction of elements through the reduction of metal oxide ores (via chemical reduction and electrolysis) and the oxidation of halogen elements; students also learn to use Ellingham diagrams and the Nernst equation to explain thermodynamic principles. This course content includes: • Acid–Base Reactions and Properties According to the Arrhenius, Brønsted–Lowry, and Lewis Theories • Hard and Soft Acids and Bases (HSAB) Theory • Applications of Acid–Base Chemistry • Redox Reaction Concepts in Metal Extraction, Electrochemistry, and Other Redox Processes • Thermodynamic Aspects of Elemental Extraction
Exams and assessment formats	written examinations, student presentations, and guided class discussions
Study and examination requirements	1. Assignment: 40% 2. Midterm: 42% 3. Final exam: 18%

Recommended literature	1. Adlim. (2010). Kimia Anorganik. Syiah Kuala University Press. Banda Aceh. 2. Fitri, Zarlaida. (2015). Modul Anorganik. 3. Atkins, P., et. al (2010) Inorganic Chemistry. 5th Ed. W. H. Freeman and Co., New York. 4. Bowser, J. R. (1993) Inorganic Chemistry, Wadsworth, Inc., California 5. Cotton, F. A., Wilkinson, G., Gaus, P. L. (1995) Basic Inorganic Chemistry, 3rd ed., John Wiley and Sons, Singapore. 6. Cox, P.A. (1989) The Elements, Oxford University Press, Oxford. 7. Douglas, B., McDaniel, D., and Alexander, J. (1994) Concepts and Models of Inorganic Chemistry, 3rd ed., John Wiley and Sons, Singapore. 8. Emeleus, H.J. and Sharpe, A. G. (1973) Modern Aspect of Inorganic Chemistry, 4th ed., Routlede and Kegan Paul, London. 9. Emsley, J. (1989) The Elements, Clarendon Press, Oxford. 10. Greenwood, G. and Hill H.O.A. (1982) Oxygen and life, Chemistry in Britain, 18: 194. 11. Greenwood, N. N. and Earnshaw, A. (1997) Chemistry of the Elements, 2nd ed., Butterworth Heinemann, Oxford. 12. Grochala, Wojciech (2007). "Atypical compounds of gases, which have been called noble". Chemical Society Reviews 36 (: 1632–1655. 13. House, J. E. (2008) Inorganic Chemistry.Elsevier Inc., Oxford. 14. Huheey, J. E., Keitter, E. A., and Keiter, R. L. (1993) Inorganic Chemistry Principles of Structure and Reactivity, 4thed., Harper Collins College Publisher, New York. 15. Jolly, W. L. (1991) Modern Inorganic chemistry, 2nd ed., McGraw Hill, New York. 16. Lee, J. D. (1994) Concise Inorganic Chemistry. 4th ed., Chapman & Hall, London. 17. Mackay, K. M. and Mackay, R. A. (1989) Introduction to ModernInorganic Chemistry, Prentice Hall, New Jersey. 18. Miessler, G. L. and Tarr, D.A. (2004) Inorganic Chemistry, 3rd ed., Pearson Prentice Hall, New Jersey. 19. Rayner-Canham, Geoffrey. (2000) Descriptive Inorganic Chemistry. 2nd ed., W.H. Freeman and Co., New York. 20. Saunders, M.; Jiménez-Vázquez, H. A.; Cross, R. J.; Poreda, R. J. (1993). "Stable compounds of helium and neon. He@C60 and Ne@C60". Science 259: 1428–1430. 21. Sharpe, A. G. (1992) Inorganic Chemistry. 3rd ed., Longman Scientific & Technical, Singapore.

	22. Wells, A. F. (1984) Structural Inorganic Chemistry, 5th ed., Oxford University Press, Oxford. 23. Wulfsberg, G. (1991) Principles of Descriptive Inorganic Chemistry, University Science Books, California.
Date of last amendment	August 12, 2024

Module designation	**SEDC2021** Chemical Bonds
Semester(s) in which the module is taught	3rd Semester
Person responsible for the module	Prof. Dr.M. Hasan, M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 3rd semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	passed basic chemistry courses I and basic chemistry II
Module objectives/intended learning outcomes	1. Through discussions and question-and-answer sessions, students are able to understand the principles of quantum mechanics in accurately explaining the behavior of microscopic particles, while demonstrating responsibility in their learning. 2. Through discussions and question-and-answer sessions, students are able to apply quantum theory concepts to accurately explain the movement of electrons in hydrogen atoms and multi-electron atoms, as well as the concept of atomic orbitals, while demonstrating responsibility in their learning 3. Through discussions and question-and-answer sessions, students are able to understand quantum theory concepts to accurately explain chemical bond formation, while demonstrating responsibility in their learning.

Content	This course content includes: • Development of Atomic Theory, the Origin of Quantum Theory, and Simple Quantum Mechanical Systems • Hückel Molecular Orbital Theory, Quantum Theory of the Hydrogen Atom, Many-Electron Atoms, Term Symbols, and the Concept of Orbitals • Ionic Bonding and the Born–Haber Cycle • Covalent Bonding (Valence Bond Theory (VSEPR) and Molecular Orbital Theory) • Van der Waals Forces and Hydrogen Bonding • Metallic Bonding and Band Theory of Semiconductors; Electrical Properties of Insulators, Semiconductors, Conductors, and Superconductors Students are also guided to develop skills in solving problems independently, with honesty and discipline.
Exams and assessment formats	written examinations, student presentations, and guided class discussions
Study and examination requirements	1. Assignment: 30% 2. Midterm: 40% 3. Final exam: 30%
Recommended literature	1. Hasan, Zarlaida, Ratu. 2017. Buku Ajar Ikatan Kimia. Syia University Press 2. Chandra. Introduction to Quantum Chemistry, Tata McGra 3. Effendi. 2007. Perspektif Kimia Koordinasi.Bayumedia Pub Malang 4. Effendi. 2008. Ikatan ionik dan Cacat-cacat kristal pada Kr Bayumedia Publishing. Malang 5. Effendi. 2010. Logam, Aloi, Semikonduktor dan Superkond Bayumedia Publishing. Malang 6. Hanna, M. Quantum Mechanics In Chemistry Edition 7. Nuraini.1994. Ikatan Kimia. Gadjah Mada University Press
Date of last amendment	August 12, 2024

Module designation	**SEDC2023** Chemical And Phase Equilibria
Semester(s) in which the module is taught	3rd Semester
Person responsible for the module	Drs. Rusman, M. Si.
Language	Indonesian
Relation to curriculum	Elective module for 3rd semester students
Teaching methods	Lecture, Collaborative Learning, Case Study Method
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester,comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-.
Module objectives/intended learning outcomes	1. After participating in lectures using student-centered learning models and methods, students will be able to analyze the concepts of dynamic equilibrium, equilibrium constants, factors affecting chemical equilibrium, and the thermodynamics of chemical equilibrium. 2. After participating in lectures using student-centered learning models and methods, students will be able to understand the concepts of phase equilibrium, phase rules, components, degrees of freedom, and phase diagrams. 3. Through discussions and analyses of the Clapeyron and Clausius-Clapeyron equations, students will be able to formulate and calculate the relationship between pressure and temperature in single- or two-component liquid systems, as well as apply this knowledge in calculating the colligative properties of solutions and the boiling point of water at various altitudes above sea level.
Content	This course content includes: • Chemical equilibrium (dynamic equilibrium, equilibrium constants, factors affecting chemical equilibrium, equilibrium shifts, and equilibrium thermodynamics) • Phase equilibrium (phases, components, degrees of freedom, and the Clapeyron and Clausius-Clapeyron equations).

Exams and assessment formats	Case Method and Team-Based Project
Study and examination requirements	Case Method 50% Task 20% Midterm 10% Final Exam 20%
Recommended literature	Atkins, P.W., 1989, Physical Chemistry, Third Edition, Oxford University Press, Oxford E-learning Mata kuliah Kesetimbangan Kimia dan Fasa Rusman, 2009, Kimia Fisik, Syiah Kuala University Press Surdia, N.M, 1984, Kimia Fisika II ; (terjemahan dari Alberty, 1980, Physical Chemistry 5 th Edition, John Wiley, Toronto), Erlangga, Jakarta
Date of last amendment	August 12, 2024

Module designation	**SEDC2020** Evaluation in Chemistry Teaching
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Drs. M. Nasir, M.Si
Language	Indonesian (Part of the references and instructional materials are provided in English)
Relation to curriculum	Mandatory modules for 4th semester students.
Teaching methods	Lecture, case method, and Team-Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Upon completing this course, students will be able to evaluate the objectives, functions, principles, and techniques of chemistry learning assessment. 2. Upon completing this course, students will be able to design appropriate assessment and evaluation strategies for chemistry learning using both manual and digital approaches 3. Upon completing this course, students will be able to analyze assessment instruments and evaluation results to develop effective follow-up action plans.

Content	This course is designed to prepare students with the knowledge and skills necessary for conducting evaluations in chemistry education. This course content includes: • Develop test instruments based on various commonly used taxonomies in educational evaluation, along with appropriate scoring guidelines, assessment criteria, or rubrics; • Design non-test instruments for chemistry learning in a valid and measurable manner, including rubrics for non-test assessments; • Develop authentic assessment instruments; • Demonstrate proficiency in conducting both quantitative and qualitative item analysis accurately; • Analyze evaluation results and use them as the basis for formulating follow-up action plans; • Prepare comprehensive reports on the outcomes of chemistry learning assessments; and • Effectively utilize digital applications to address problems related to chemistry learning evaluation, demonstrating digital competence in gathering reliable information from credible sources.
Exams and assessment formats	case studies, team-based project, assignment and written examinations,
Study and examination requirements	1. Case methods: 9% 2. Project: 70% 3. Assignment: 40% 4. Quiz: 30%

Recommended literature	1. Brookhart, Susan M. 2010. *How to Assess Higher-Order Thinking Skills in Your Classroom*. Alexandria, Virginia: ASCD. 2. Kemendikbud. 2016. *Salinan Permendikbud Nomor 23 Tahun 2016 Tentang Standar Penilaian Pendidikan*. Jakarta: Kemendikbud 3. Lorin W. Anderson, and David R. Krathwohl. 2001. Book1 A *Taxonomy for Learning Teaching and Assessing_ a Revision of Bloom`s Taxonomy of Educational Objetives*. New York: Longman. 4. Marzano, Robert J, and John S Kendall. 2008. *Designing & Assessing Educational Objectives: Applying the New Taxonomy*. Thousand Oak: Corwin Press. 5. Mohamed, Razmawaty, and Othman Lebar. 2017. "Authentic Assessment in Assessing Higher Order Thinking Skills." *International Journal of Academic Research in Business and Social Sciences* 7(2): 466. 6. Nitko, A. J., and S. M Brookhart. 2014. *Educational Assessment of Students*. Edinburgh: Pearson Education Limited. 7. Popham, W. James. 2017. *Classroom Assessment: What Teachers Need to Know*. Boston: Pearson. 8. Pusmenjar. 2020. *Buku Saku Asesmen Diagnosis Kognitif Berkala*. Jakarta: Kemendikbud. 9. Puspendik. 2019a. *Panduan Penilaian Kinerja (Performance Assessment)*. Jakarta: Kemendikbud. 10. ———. 2019b. *Panduan Penilaian Tes Tertulis*. Jakarta: Kemendikbud. 11. ———. 2019c. *Panduan Penulisan Soal HOTS-Higher Order Thinking Skills*. Jakarta: Kemendikbud. 12. ———. 2019d. Penilaian Portofolio. Jakarta: Kemendikbud. 13. ———. 2019e. *Model Penilaian Karakter*. Jakarta: Kemendikbud 14. Stevens, Dannelle D., and Antonia Levi. 2005. *Introduction to Rubrics : An Assessment Tool to Save Grading Time, Convey Effective Feedback, and Promote Student Learning*. Sterling, Virginia: Stylus Publishing, LLC All. 15. Sudijono, A . *Pengantar Evaluasi Pendidikan*. 2010. Jakarta Raja Grafindo Persada
Date of last amendment	January 13, 2025

Module designation	**FEDU2002** Curriculum and Learning
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Prof. Dr. Drs. Bahrun, M.Pd.
Language	Indonesian, English
Relation to curriculum	Mandatory modules for 4th semester students.
Teaching methods	Lecture, group discussion, problem-based learning, field trip, SCL
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	✔ Demonstrates an accurate understanding of the basic concepts of curriculum through the implementation of suitable instructional strategies. ✔ Through the application of contextual instructional strategies, students demonstrate the ability to accurately analyze the interconnections between curriculum components and instructional practices in schools. ✔ Demonstrates the ability to accurately apply and communicate contemporary curriculum innovations, the integration of technology, and the role of teachers as curriculum agents through student-centered instructional approaches.

Content	This course explains the definition of curriculum, the philosophy of curriculum, the basic concepts of curriculum, curriculum dimensions, the interrelation between curriculum and its dimensions, as well as the functions and roles of the curriculum. By the end of the course, students are expected to be able to apply the principles of curriculum development in schools and within their field of study. This course content includes: • History, Philosophy, Development, and Fundamental Concepts of Curriculum • Curriculum Development and Implementation in Teaching and Learning • Curriculum Innovations in Indonesia and Globally • Models of Curriculum Development and Evaluation • Integration of Technology and Research in the Field of Curriculum
Exams and assessment formats	Assignments, written examination
Study and examination requirements	✔ Cognitive/Knowledge: Assignment: 30% Quiz: 15% Exam 1: 25% Exam 2: 30%
Recommended literature	1. Ministry of Culture and Education of the Republic of Indonesia. (2012b). *Dokumen Kurikulum 2013*. Jakarta: Kementerian Pendidikan dan Kebudayaan. 2. Mulyasa, H. E. (2023). *Implementasi Kurikulum Merdeka*. Bumi Aksara. 3. Lalor, A. D. M. (2016). *Ensuring high-quality curriculum: How to design, revise, or adopt curriculum aligned to student success*. Alexandria, VA: ASCD.
Date list of amendment	January 13, 2025

Module designation	**FEDU2003** Philosophy of Education
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Prof. Dr. Drs. Bahrun, M.Pd.
Language	Indonesian, English
Relation to curriculum	Mandatory modules for 4th semester students.
Teaching methods	Lecture, SCL, inquiry approach, create a concept map about branches of philosophy related to education, group discussion, Q&A, PBL, paper
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	✔ Students are able to accurately explain the fundamental concepts of philosophy through student-centered learning strategies. ✔ Through problem-solving strategies, students are able to explain the aspects of educational philosophy and accurately apply its implementation in education.
Content	This course content includes: • The relationship between philosophy and education, • The meaning of philosophy of education, • The benefits of studying philosophy of education for educators, • Schools of philosophical thought and their implications for education, • Schools of educational philosophy, • Pancasila educational philosophy, • Islamic educational philosophy.
Exams and assessment formats	Presentation, Q&A, written examination

Study and examination requirements	✔ Cognitive/Knowledge: Assignment: 30% Quiz: 10% Exam 1: 30 Exam 2: 30%
Recommended literature	1. Amri, A. (2017). *Studi filsafat pendidikan*. Banda Aceh: Yayasan Pena. 2. Soelaiman, D. A. (2014). *Pengantar filsafat umum dan filsafat pendidikan*. Banda Aceh: FKIP Unsyiah. 3. Suhartono, S. (2015). *Sejarah pemikiran filsafat modern*. Yogyakarta: Ar-Ruzza Media. 4. Ramayulis, & Nizar, S. (2017). *Filsafat pendidikan Islam*. Jakarta: Kalam Mulia. 5. Tim Dosen IKIP Malang. (2014). *Dasar-dasar pendidikan*. Surabaya: Usaha Nasional. 6. Tafsir, A. (2015). *Filsafat pendidikan Islam*. Bandung: Remaja Rosda Karya.
Date of last amendment	January 13, 2025

Module designation	**SEDC2024** Chemical Quantitative Analysis
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Dr. Ibnu Khaldun, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 4th semester students.
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-

Module objectives/intended learning outcomes	1. Explain the basic principles and applications of various quantitative analysis methods Students are able to explain the chemical principles and fundamental reactions behind gravimetric methods, acid-base titration, redox titration, complexometric titration, and argentometric titration, as well as their applications in content determination. 2. Analyze and differentiate titration types based on reaction mechanisms Students are able to identify and distinguish types of titration (neutralization, redox, complex formation, and precipitation) and select the appropriate indicators. 3. Perform quantitative calculations based on titration or precipitation data Students are able to calculate the concentration or amount of a substance in a sample using titration and gravimetric data with proper accuracy and precision. 4. Evaluate the validity of quantitative analysis results based on chemical principles and experimental data Students are able to assess the correctness of calculations and data reliability using reaction stoichiometry, equivalence point interpretation, and criteria for quantitative precipitation. 5. Integrate basic chemical concepts in solving quantitative analysis problems Students are able to apply concepts such as stoichiometry, chemical equilibria, and solution properties to solve problems related to substance determination using quantitative analytical methods.

Content	Quantitative Analytical Chemistry is a branch of analytical chemistry that focuses on determining the amount or concentration of a substance in a sample through well-defined chemical reactions. This course content includes: • Fundamental principles and applications of various quantitative methods, including gravimetric analysis, acid-base titration, redox titration, complexometric titration, and argentometric titration • Each method is examined based on the type of reaction involved, optimal reaction conditions, selection of appropriate indicators, and accurate calculations using stoichiometric principles. Students learn to distinguish suitable methods for specific analytes, perform quantitative calculations from titration or precipitation data, and evaluate the accuracy and precision of analytical results by considering sources of error and uncertainty. This knowledge forms a critical foundation for developing analytical thinking and scientific decision-making in both academic and industrial chemical contexts.
Exams and assessment formats	written examinations, assignment, and team based project
Study and examination requirements	1. Quiz: 15% 2. Assignment: 20% 3. Midterm: 20% 4. Project: 25% 5. Final exam: 20%
Recommended literature	1. Harris, D. C. (2015). *Quantitative Chemical Analysis* (9th ed.). New York, NY: W. H. Freeman and Company. 2. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of Analytical Chemistry* (9th ed.). Belmont, CA: Brooks/Cole Cengage Learning. 3. Day, R. A., & Underwood, A. L. (1991). *Quantitative Analysis* (6th ed.). Englewood Cliffs, NJ: Prentice Hall. 4. Christian, G. D. (2004). *Analytical Chemistry* (6th ed.). Hoboken, NJ: John Wiley & Sons. 5. Bassett, J., Denney, R. C., Jeffery, G. H., & Mendham, J. (1978). *Vogel's Textbook of Quantitative Inorganic Analysis* (4th ed.). London, UK: Longman. 6. Harvey, D. (2000). *Modern Analytical Chemistry*. New York, NY: McGraw-Hill. 7. Rubinson, K. A., & Rubinson, J. F. (2000). *Contemporary Chemical Analysis* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.
Date of last amendment	January 13, 2025

Module designation	SEDC2016 Chemical Kinetics
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Drs. Rusman, M.Si
Language	Indonesian (Part of the references and instructional materials are provided in English)
Relation to curriculum	Mandatory modules for 4th semester students.
Teaching methods	Lecture, and case method
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After completing the lectures with various models and strategies, students are able to analyze the properties of chemical kinetics through the ideal gas kinetic theory approach in relation to the factors affecting reaction rate, reaction mechanism, and activation energy 2. After completing the lectures using the case method along with various methods and strategies, students are able to conclude the reaction rates of first-, second-, and third-order reactions based on experimental graphs, calculate their rate constants, and correctly and systematically analyze chain, branched, and equilibrium reaction mechanisms 3. Through problem analysis and review of relevant research findings, students are able to apply research results to solve reaction kinetics problems in adsorption, biodegradation, and chemical kinetics related to their own research

Content	This course covers the theory of gas kinetics, Maxwell–Boltzmann distribution, collision theory, and transport properties of substances as determinants of the rate of chemical reactions, including elementary reactions, consecutive reactions, unimolecular reactions, and complex reactions, as well as their mechanisms. Upon completing this course, students are expected to be able to predict the time required for a chemical reaction to occur through the rate-determining step, forecast the possible mechanisms, and analyze the dynamic properties and energy changes involved in various processes. Gas Kinetic Theory This course content includes: 1. Reaction Rate, Factors Affecting Reaction Rate, and Half-Life 2. Arrhenius Equation, Its Applications, and Activation Energy 3. Reaction Kinetics: First-, Second-, and Third-Order Reactions, Chain Reactions, Branched Reactions, and Equilibrium Reactions 4. Reaction Mechanisms, Catalytic Reactions, and Surface Reactions *5.* Kinetics of Changes in Adsorption Processes, Biodegradation, and Chemical Kinetics Related to Research
Exams and assessment formats	case studies, team-based project, assignment and written examinations,
Study and examination requirements	1. Case methods: 51% 2. Assignment: 16% 3. Quiz: 16% 4. Midterm Test: 8% 5. Final Test: 9%
Recommended literature	1. Atkins, P.W., 1989, Physical Chemistry, Third Edition, Oxford University Press, Oxford 2. e-learning Mata kuliah Kinetika Kimia 3. Rusman, 2019, Kinetika KImia, Syiah Kuala University Press 4. Surdia, N.M, 1984, Kimia Fisika II ; (terjemahan dari Alberty, 1980, Physical Chemistry 5 th Edition, John Wiley, Toronto), Erlangga, Jakarta 5. M Hasan, I Khaldun, I Zatya, R Rusman, M Nasir, 2023, Facile fabrication and characterization of an economical active packaging film based on corn starch–chitosan biocomposites incorporated with clove oil, Journal of Food Measurement and Characterization, Springer US
Date of last amendment	January 13, 2025

Module designation	**SEDC2018** Polyfunctional Organic Chemistry
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 4th semester students.
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	passed Monofunctional Organic Chemistry
Module objectives/intended learning outcomes	1. After actively participating in the course (C), students (A) are expected to accurately analyze (B, C4) the characteristics of each class of difunctional and polyfunctional organic compounds, thereby developing (P4) the skills to utilize these compounds by selecting (A4) appropriate reactions based on their structural groups independently, accurately, and in a measurable manner (D). 2. After actively participating in the course (C), students (A) will be able to accurately analyze (B, C4) the characteristics of various classes of compounds, including bicyclic, polycyclic, heterocyclic, and heteroaromatic compounds. They will also be able to develop (P4) the skills required to utilize these compounds by independently, appropriately, and measurably selecting (A4) relevant reactions based on compound classification and structural features (D). 3. After actively participating in the course (C), students (A) will be able to accurately analyze (B, C4) the characteristics of each class of biomolecular compounds. Furthermore, they will be able to develop (P4) the skills to utilize these compounds by independently, appropriately, and measurably selecting (A4) relevant chemical reactions based on the structural classification of the compounds (D).

Content	This course is designed to strengthen students' understanding of difunctional and polyfunctional compounds. This course contetnt includes: • Nomenclature, properties, and applications. It also covers biomolecular compounds, • Structures, classification, nomenclature, properties, detection methods, and functions. • Bicyclic, polycyclic, heterocyclic, and heteroaromatic compounds, emphasizing their structures, classification, nomenclature, properties, and applications. The course supports the development of students' analytical and application skills relevant to organic compound characterization and utilization, aligned with outcome-based learning.
Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Case methods: 50,3% 2. Quiz: 8,5% 3. Midterm: 8,25% 4. Participatory Activities (Attitude, Discussion, and Presentation): 16,5% 5. Final exam: 16,5%

Recommended literature	1. McMurry, J. 2023. Organic Chemistry: A Tenth Edition, Rice University, Houston, Texas USA 2. Favre, H.A. & Powell, W.H. (Eds.). 2013. Nomenclature of Organic Chemistry: IUPAC Recommendations and Preferred Names 2013. 1st Ed. Royal Society of Chemistry, United Kingdom 3. Dean, J.A. 1999. Lange's Hand Book of Chemistry. Fifteent Edition. New York: McGraw-Hill-Inc. 4. Fessenden, R.J. & Fessenden, J.S. 1991. Kimia Organik. Edisi Ketiga. Jilid 1 & 2. (Terjemahan Pudjaatmaka, A.H.). Jakarta: Erlangga 5. Gani, A., Adlim, M., Rahman, M.W., & Nazar, M. 2024. Immobilization of activated carbons on yarn as the adsorbent for dissolved iron in traditional well water. South African Journal of Chemical Engineering, 49: 136-145. https://doi.org/10.1016/j.sajce.2024.03.019 6. Gani, A., Adlim, M., Rahmayani, R.F.I., Hanum, L., & Nabila, R. 2024. Preparation and characterization of coconut shell liquid smoke and the properties of preserving tofu. Kuwait Journal of Science, 51: 100289. https://doi.org/10.1016/j.kjs.2024.100289 7. Pine, S.H., Hendrickson, J.B., Cram, D.J. & Hammond, G.S. 1988. Kimia Organik. Terbitan Keempat, Jilid 1 & 2. Terjemahan Joedodibroto, R. Bandung: ITB. 8. Credible online sources, such as: (https://pubchem.ncbi.nlm.nih.gov), (https://www.khanacademy.org/science/organic-chemistry), (https://www.rsc.org), and (https://chem.libretexts.org)
Date of last amendment	January 13, 2025

Module designation	**SEDC2022** Main Group Elements and Compounds
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Kana Puspita, S.Pd., M.Si.P.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective modules for 4th semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes of lecture and discussion per week ✔ 180 minutes of structured tasks per week ✔ 180 minutes of independent learning per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	Passed basic chemistry courses I and basic chemistry II
Module objectives/intended learning outcomes	1. Students are able to explain the chemical and physical properties, extraction/production methods, and the uses of elements and their compounds from groups 1, 2, and 13 in the periodic table through literature studies related to current issues in the field of inorganic chemistry, either in groups or individually. 2. Students are able to explain the chemical and physical properties, extraction/production methods, and the uses of elements and their compounds from groups 14 and 15 in the periodic table through studies related to current issues in the field of inorganic chemistry, either in groups or individually. 3. After attending this course, students are able to explain the chemical and physical properties, extraction/production methods, and the uses of elements and their compounds from groups 16, 17, and 18 in the periodic table through case discussions related to current issues in the field of inorganic chemistry, either in groups or individually.

Content	This course content includes: • Physical and chemical properties • Extraction/production methods, and the uses of elements and their compounds from main group element chemistry, • Namely hydrogen and elements from groups 1, 2, 13, 14, 15, 16, 17, and 18. Assignments are given to train students' independence, accuracy, and critical thinking processes.
Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Quiz: 28 % 2. Assignment: 28.8% 3. Midterm: 24% 4. Final exam: 19.3%
Recommended literature	1. Adlim (2009). Kimia Anorganik, Syiah Kuala Press 2. Atkins, P., et. al (2010) Inorganic Chemistry. 5th Ed. W. H. Freeman and Co., New York 3. Catherine Housecroft, Alan G. (2012) Sharpe-Inorganic Chemistry 4th ed-Prentice Hall, Barcelona, Spain 4. Cotton, F. A., Wilkinson, G., Gaus, P. L. (1995) Basic Inorganic Chemistry, 3rd ed., John Wiley and Sons, Singapore
Date of last amendment	January 13, 2025

Module designation	**SEDC2026** Chemistry Teaching Plan
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Nur Akmalia
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 4th semester students.
Teaching methods	Lecture, small group discussion, team based project.
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Students (A) are able to develop (B) chemistry learning tools based on the K-13 curriculum and the independent curriculum through case study and project activities (C) by working together and carefully (D). 2. Students (A) are able to develop (B) assessments and scoring rubrics for chemistry learning tools based on the K-13 and Merdeka curriculum through case study and project activities (C) by working cooperatively and attentively (D) 3. Students (A) are able to evaluate (B) chemistry learning tools adopted from various sources that are oriented towards TPACK and 21st-century skills through case study activities (C), independently and confidently (D).

Content	This course content includes: • Fundamental concepts of Effective Week • Annual Program • Semester Program • Syllabus • Learning Implementation Plan • Flow of Kurmer Learning Objectives (ATP) • Kurmer Teaching Module • Assessment and Rubric • Minimum Completeness Criteria (KKM) • Media, LKPD, Teaching Materials, and Analysis of lesson plans and teaching modules.
Exams and assessment formats	written examinations, team based project, and guided class discussions
Study and examination requirements	1. Team based project: 57% 2. Quiz: 22% 3. Midterm: 9% 4. Final exam: 12%
Recommended literature	1. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 20-24 Tahun 2016 tentang Standar Kompetensi Lulusan Pendidikan Dasar dan Menengah. 2. Uno, H. (2009). Perencanaan Pembelajaran. Jakarta: PT. Bumi Aksara. 3. JBloom, B. S. (Ed). (1956). Taxonomy of Educational Objectives., The Classification of Educational Goals. Handbook I: Cognitive Domain. New York: Longman. 4. Hanum, L. (2017). Perencanaan Pembelajaran. Banda Aceh: Unsyiah Press. 5. Hamalik. (2002). Perencanaan Pengajaran Berdasarkan Pendekatan Sistem. Jakarta: Bumi Aksara. 6. Haryanto. (2003). Perencanaan pengajaran. Jakarta: Rineka Cipta. 7. Majid, A. (2011). Perencanaan Pembelajaran. Mengembangkan Standar Kompetensi Guru. Bandung: PT. Remaja Rosda karya. 8. Poerwati, L.E dan Amri, S. 2013. Panduan Memahami Kurikulum 2013. Jakarta: PT. Prestasi Pustaka. 9. Purwanto, N. (2010). Prinsip-prinsip dan Teknik Evaluasi Pengajaran. Bandung: PT. Remaja Rosdakarya. 10. Uno, H. (2007). Model Pembelajaran Menciptakan Proses Belajar Mengajar yang Kreatif dan Efektif. Jakarta: PT. Bumi Aksara. 11. Rusman. (2017). Belajar dan Pembelajaran Berorientasi Standar Proses Pendidikan. Jakarta: Kencana. 12. Popham, J dan Baker, E. (1992). Teknik Mengajar Secara Sistematis. Jakarta: PT. Rineka Cipta.
Date of last amendment	January 13, 2025

Module designation	**SEDC2028** Physical Chemistry Practicum
Semester(s) in which the module is taught	4th Semester
Person responsible for the module	Dr. Muhammad Nazar, S.Pd., MSCST
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 4th semester students.
Teaching methods	Lecture, small group discussion, Project Based Learning
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 340 minutes structured tasks per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	Basic Chemistry Practicum I and Basic Chemistry Practicum II
Module objectives/intended learning outcomes	1. Upon completing the course through experimental methods, students are capable of analyzing and drawing conclusions about the relationship between measured variable data and dependent variable data based on experimental results. 2. Upon completing laboratory practical activities, students are capable of demonstrating responsibility in conducting accurate and precise measurements of variables (such as temperature, pressure, heat or energy, rate, and other physical properties) in the laboratory. 3. Upon completing laboratory practical activities, students are capable of performing measurements of key variables (such as temperature, pressure, heat or energy, reaction and flow rate, viscosity, acidity, conductivity, surface tension, adsorption, etc.) to accurately and correctly analyze the relationship between these variables and other dependent variables.
Content	This course is designed to strengthen students' ability to conduct practical works of Physical Chemistry and the following topics are covered by the course: • Thermochemistry • Synthesis and Characterization of CQDs • Surface Tension • Viscosity and Activation Energy • Solubility and Temperature • Activation Energy of Reactions • Reaction Order in Saponification • Emulsion Demulsification

Exams and assessment formats	written examinations, Project, quiz, Practical Reports and labskills
Study and examination requirements	1. Quiz: 10% 2. Report: 20% 3. Journal: 20% 4. Final exam: 20% 5. Practical Exam: 10% 6. Lab Skills: 20%
Recommended literature	Dhaduk, B. (2019). *Textbook of Physical Chemistry Practicals*. Lap Lambert Academic Publishing. https://www.researchgate.net/publication/330674639 IUPAC. (2014). *Compendium of Chemical Terminology: Gold Book*. IUPAC. https://doi.org/10.1002/9783527626854.ch7 **Recommended Articles** Nammahachak, N., Aup-Ngoen, K. K., Asanithi, P., Horpratum, M., Chuangchote, S., Ratanaphan, S., & Surareungchai, W. (2022). Hydrothermal synthesis of carbon quantum dots with size tunability via heterogeneous nucleation. *RSC Advances*, *12*(49), 31729–31733. https://doi.org/10.1039/d2ra05989d Nazar, M., Hasan, M., Wirjosentono, B., Gani, B. A., & Nada, C. E. (2024). Microwave Synthesis of Carbon Quantum Dots from Arabica Coffee Ground for Fluorescence Detection of Fe3+, Pb2+, and Cr3+. *ACS Omega*, *9*(18), 20571–20581. https://doi.org/10.1021/ACSOMEGA.4C02254 Akbar, S. A., Hasan, M., Nazar, M., Zulfahmi, I., Miswar, E., Iqhrammullah, M., & Jalil, Z. (2025). Fluorescent carbon quantum dots from Syzygium aromaticum as a selective sensor for Fe3+ and Cd2+ detection in aqueous solution. *Case Studies in Chemical and Environmental Engineering*, *11*, 101166. https://doi.org/10.1016/J.CSCEE.2025.101166
Date of last amendment	January 13, 2025

Module designation	**FEDU2004** Profession of Education
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Prof. Dr. Nasir Usman, M.Pd.
Language	Indonesian, English
Relation to curriculum	Mandatory modules for 5th semester students.
Teaching methods	Lecture, group discussion, problem-based learning,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	✔ Demonstrates the ability to understand the fundamental concepts of the teaching profession, including its characteristics and requirements, the roles and responsibilities of teachers, the professional code of ethics, professional development, and teacher professional organizations. ✔ Demonstrates the ability to apply teacher/education personnel competencies in efforts to improve and enhance the professional competencies of teachers and educational staff. ✔ Demonstrates the ability to apply and communicate the competencies and skills essential for teachers in improving the quality of education.

Content	This course content includes: • Profession, professional, professionalization, and professionalism; • The requirements of a profession; • The duties and responsibilities of teachers; • Teaching skills; • The professional code of ethics and teacher professional organizations; • Teacher/education personnel competencies; • Teacher performance; • The role of teachers in educational administration; • Professional career development of teachers/education personnel; • Performance evaluation of teachers/education personnel.
Exams and assessment formats	Assignments, presentation, Q&A
Study and examination requirements	Cognitive/Knowledge: Assignment: 15% Quiz: 5% Exam 1: - Exam 2: 30%
Recommended literature	1. Alma, B. (2012). *Guru profesional (Menguasai metode dan terampil mengajar)*. Bandung: CV. Alfabeta. 2. Danim, S., & Khairil. (2012). *Profesi kependidikan*. Bandung: Alfabeta. 3. AR, Murniati, & Usman, Nasir. (2022). *Who wants to be a teacher? Menyiapkan guru profesional di era global society 5.0*. 4. Priansah, D. J. (2014). *Kinerja profesionalisme guru*. Bandung: Alfabeta. 5. Saud, U. S. (2014). *Pengembangan profesi guru*. Bandung: Alfabeta. 6. Sagala, S. (2012). *Supervisi pembelajaran*. Bandung: Alfabeta. 7. Soetjipto, K. R. (1999). *Profesi keguruan*. Jakarta: Rineka Cipta. 8. Suhardan, D. (2014). *Supervisi profesional*. Bandung: PT. Alfabeta. 9. Uno, H. B. (2012). *Profesi kependidikan*. Jakarta: Bumi Aksara.
Date of last amendment	August 12, 2024

Module designation	**SEDC3029** Statistics
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Drs. M. Nasir, M.Si
Language	Indonesian
Relation to curriculum	Mandatory modules for 5th semester students.
Teaching methods	Lecture and Team-Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Through discussions and interactive questioning (C), students (A) are able to apply (B) fundamental statistical concepts to accurately present and analyze data (D) 2. Through project-based learning (C), students (A) are able to analyze and interpret (B) statistical data to solve research problems using manual methods or statistical software applications (D).
Content	This course is designed to strengthen students' understanding of statistics, enabling them to use it as a tool when writing their final script. This course content includes: • Fundamental concepts in educational statistics, such as distributions, probability, and data analysis techniques including t-tests, correlation (r) • ANOVA, as well as hypothesis testing. Graduates are expected to apply various statistical methods in analyzing educational data.
Exams and assessment formats	case studies, team-based project and written examinations,
Study and examination requirements	1. Case methods: 4% 2. Project: 50% 3. Midterm: 16% 4. Final exam: 30%

Recommended literature	1. Husaini Usman, Purnomo Setiady, *Pengantar Statistika* edisi 2 Bumi Aksara, Yogyakarta.2009. 2. Supranto, J. (2008) *Statistik: Teori dan Aplikasi*, Jilid 1 dan 2, Edisi Ketujuh, Jakarta: Erlangga. 3. Sutrisno Hadi, Prof. Drs. MA, *Statistik*. Yogyakarta : Andi Yogyakarta tahun 2004. 4. Coladarci, T. *et al.* (2011) *Fundamentals of Statistical Reasoning in Education*. Hoboken, New Jersey: John Wiley & Sons, Inc. 5. Pallant, J. (2011) *SPSS Survival Manual website*. New York: Open University Press.
Date of last amendment	August 12, 2024

Module designation	**SEDC3027** Fundamentals of Chemical Separations
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Dr. Ibnu Khaldun, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 5th semester students.
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain the fundamental principles of various separation techniques in chemistry. 2. Students can identify suitable separation methods based on the physical and chemical properties of substances. 3. Students are able to perform basic separation techniques such as filtration, distillation, and extraction in the laboratory. 4. Students can evaluate the efficiency and effectiveness of separation methods in chemical analysis. 5. Students are able to design separation procedures for specific applications based on appropriate scientific principles.

Content	The *Fundamentals of Chemical Separation* course explores the principles, techniques, and applications of various separation methods used in chemistry, both in laboratory settings and industrial processes. This course content includes: • Separation based on physical and chemical differences such as filtration, centrifugation, extraction, crystallization, distillation, ion exchange, adsorption, and chromatographic techniques. • Fundamental concepts like distribution coefficient, selectivity, separation efficiency, and retention factors. • Practical sessions to develop skills in accurately and efficiently applying separation methods. • Foundation for advanced studies in analytical, industrial, and environmental chemistry.
Exams and assessment formats	written examinations, assignment, and team based project
Study and examination requirements	1. Quiz: 15% 2. Assignment: 20% 3. Midterm: 20% 4. Project: 25% 5. Final exam: 20%
Recommended literature	1. Harris, D. C. (2020). *Quantitative chemical analysis* (10th ed.). W. H. Freeman. 2. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of analytical chemistry* (9th ed.). Cengage Learning. 3. Christian, G. D., & Griffiths, J. (2013). *Analytical chemistry* (7th ed.). Wiley. 4. Settle, F. A. (Ed.). (1997). *Handbook of instrumental techniques for analytical chemistry*. Prentice Hall. 5. Kellner, R., Mermet, J. M., Otto, M., Valcárcel, M., & Widmer, H. M. (2004). *Analytical chemistry: A modern approach to analytical science* (2nd ed.). Wiley-VCH. 6. Pecsok, R. L., Shields, L. D., Cairns, T., & McWilliam, I. G. (1976). *Modern methods of chemical analysis* (2nd ed.). Wiley. 7. Braun, R. D. (1987). *Introduction to instrumental analysis*. McGraw-Hill. 8. Khopkar, S. M. (2008). *Basic concepts of analytical chemistry* (3rd ed.). New Age International. 9. Manahan, S. E. (2017). *Environmental chemistry* (10th ed.). CRC Press. 10. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2007). *Principles of instrumental analysis* (6th ed.). Cengage Learning.
Date of last amendment	August. 12, 2024

Module designation	**SEDC3033 Organic Compound Reactions**
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian (English just for the Course Material)
Relation to curriculum	Mandatory modules for 5th semester students.
Teaching methods	Lecturer, group discussion, and assignment
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	Have passed SEDC2004 Polyfunctional Organic Chemistry courses
Module objectives/intended learning outcomes	1. After actively participating in the lectures (C), students (A) are able to analyze (B) bond-breaking and bond-forming processes in organic compounds based on the mechanisms of oxidation, reduction, and radical reactions (C4), thereby enabling them to construct the reaction mechanisms of various organic compounds (P2) to clearly illustrate each reaction step accurately (D, A3). 2. After actively participating in the lectures (C), students (A) are able to analyze (B) bond-breaking and bond-forming processes in organic compounds based on the mechanisms of electrophilic and nucleophilic substitution reactions (C4), thereby enabling them to construct the reaction mechanisms of various organic compounds (P2) to clearly illustrate each reaction step accurately (D, A3). 3. After actively participating in the lectures (C), students (A) are able to analyze (B) bond-breaking and bond-forming processes in organic compounds based on the mechanisms of elimination, addition, and pericyclic reactions (C4), thereby enabling them to construct the reaction mechanisms of various organic compounds (P2) to clearly illustrate each reaction step accurately (D, A3).

Content	This course content includes: • Provides an in-depth study of bond-breaking and bond-forming processes in organic compounds, focusing on the reaction mechanisms of various organic transformations. • Oxidation and reduction reactions; electrophilic substitution in aliphatic, cyclic, and aromatic systems; nucleophilic substitution in aromatic compounds; • Unimolecular (SN1) and bimolecular (SN2) nucleophilic substitutions; elimination reactions; radical reactions; addition reactions; and pericyclic reactions. • Emphasis is placed on understanding and constructing detailed reaction mechanisms throughout the course.
Exams and assessment formats	Lecturer, group discussion, and assignment
Study and examination requirements	1. Quiz: 12% 2. Midterm: 12% 3. Final exam: 12% 4. Assignment: 64%
Recommended literature	1. McMurry, J. 2023. Organic Chemistry: A Tenth Edition, Rice University, Houston, Texas USA 2. Ralp J. Fessenden & Joan S. Fessenden. 1991. Kimia Organik. Edisi Ketiga. Jilid 1 & 2. (Terjemahan A. H. Pudjaatmaka). Jakarta: Erlangga 3. Solomons, T.W.G. & Fryhle, C.B. 2011. Organic Chemistry. Tenth Edition. John Willey & Sons, New York 4. Knipe, A.C. & W. E. Watts. 2001. Organic Reaction Mechanisms. New York: John Willey & Sons 5. Smith, M.B. & Jerry March. 2007. March's Advanced Organic Chemistry: Reaction Mechanisms and Structure. New York: John Willey & Sons 6. Firdaus. 2014. Kimia Organik Sintesis. Modul Kuliah Prodi Kimia FMPIPA UNHAS. Makassar: Universitas Hasanuddin 7. Laurie S. Starkey. 2012. Introduction to Strategies for Organic Synthesis. New Jersey: John Willey & Sons. 8. Internet
Date of last amendment	August 12, 2024

Module designation	**SEDC3031** Transition Elements and Coordination Chemistry
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Prof. Dr. Adlim, M.Sc.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 5th Semester students.
Teaching methods	Lecture, small group discussion
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	passed structure and reactivity of inorganic compounds
Module objectives/intended learning outcomes	1. Students explain the chemical and physical properties, extraction methods, and applications of transition elements through individual or group assignments by analyzing relevant case studies. 2. Students explain the nomenclature of coordination compounds and Crystal Field Stabilization Energy (CFSE) through contextual individual or group assignments. 3. Students explain the isomerism and reactivity of transition element compounds through contextual individual or group assignments.

Content	This course content includes: • Physical and Chemical Properties and Extraction Techniques of Transition Elements • Physical and Chemical Properties and Synthesis Techniques of Transition Element Compounds • Applications of Transition Elements and Their Compounds • Valence Bond Theory (VBT), Crystal Field Theory (CFT), and Ligand Field Theory in the Formation of Complex Compounds • Nomenclature of Coordination Compounds; Types of Ligands and Their Applications in the Synthesis of Coordination Compounds; Stability, Kinetics, Mechanisms, Geometry, and Applications of Coordination Compound.
Exams and assessment formats	written examinations, student presentations, and guided class discussions
Study and examination requirements	1. Assignment: 40% 2. Midterm: 42% 3. Final exam: 18%

Recommended literature	1. Adlim. (2010). Kimia Anorganik. Syiah Kuala University Press. Banda Aceh. 2. Fitri, Zarlaida. (2015). Modul Anorganik. 3. Atkins, P., et. al (2010) Inorganic Chemistry. 5th Ed. W. H. Freeman and Co., New York. 4. Bowser, J. R. (1993) Inorganic Chemistry, Wadsworth, Inc., California 5. Cotton, F. A., Wilkinson, G., Gaus, P. L. (1995) Basic Inorganic Chemistry, 3rd ed., John Wiley and Sons, Singapore. 6. Cox, P.A. (1989) The Elements, Oxford University Press, Oxford. 7. Douglas, B., McDaniel, D., and Alexander, J. (1994) Concepts and Models of Inorganic Chemistry, 3rd ed., John Wiley and Sons, Singapore. 8. Emeleus, H.J. and Sharpe, A. G. (1973) Modern Aspect of Inorganic Chemistry, 4th ed., Routlede and Kegan Paul, London. 9. Emsley, J. (1989) The Elements, Clarendon Press, Oxford. 10. Greenwood, G. and Hill H.O.A. (1982) Oxygen and life, Chemistry in Britain, 18: 194. 11. Greenwood, N. N. and Earnshaw, A. (1997) Chemistry of the Elements, 2nd ed., Butterworth Heinemann, Oxford. 12. Grochala, Wojciech (2007). "Atypical compounds of gases, which have been called noble". Chemical Society Reviews 36 (: 1632–1655. 13. House, J. E. (2008) Inorganic Chemistry.Elsevier Inc., Oxford. 14. Huheey, J. E., Keitter, E. A., and Keiter, R. L. (1993) Inorganic Chemistry Principles of Structure and Reactivity, 4thed., Harper Collins College Publisher, New York. 15. Jolly, W. L. (1991) Modern Inorganic chemistry, 2nd ed., McGraw Hill, New York. 16. Lee, J. D. (1994) Concise Inorganic Chemistry. 4th ed., Chapman & Hall, London. 17. Mackay, K. M. and Mackay, R. A. (1989) Introduction to ModernInorganic Chemistry, Prentice Hall, New Jersey. 18. Miessler, G. L. and Tarr, D.A. (2004) Inorganic Chemistry, 3rd ed., Pearson Prentice Hall, New Jersey. 19. Rayner-Canham, Geoffrey. (2000) Descriptive Inorganic Chemistry. 2nd ed., W.H. Freeman and Co., New York. 20. Saunders, M.; Jiménez-Vázquez, H. A.; Cross, R. J.; Poreda, R. J. (1993). "Stable compounds of helium and neon. He@C60 and Ne@C60". Science 259: 1428–1430. 21. Sharpe, A. G. (1992) Inorganic Chemistry. 3rd ed., Longman Scientific & Technical, Singapore.

	22. Wells, A. F. (1984) Structural Inorganic Chemistry, 5th ed., Oxford University Press, Oxford. 23. Wulfsberg, G. (1991) Principles of Descriptive Inorganic Chemistry, University Science Books, California.
Date of last amendment	August 12, 2024

Module designation	**SEDC3035** Organic Chemistry Practicum
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Prof. Dr. Drs. Abdul Gani, M.Si.
Language	Indonesian
Relation to curriculum	Selective modules for 5th semester students.
Teaching methods	Case methods and Team based project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 340 minutes structured tasks per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After actively participating in the practicum activities (C), students (A) are able to conclude the presence of carbon and hydrogen elements in organic compounds, functional groups such as alkenes, alkyl halides, alcohols, aldehydes, ketones, aromatic compounds (phenols), amines, as well as the applications of simple organic compound reactions and molecular configurations (B, C6), through carefully and thoroughly conducted practicum activities, thereby being able to apply them (P4) to verify them accurately (D, A4). 2. After actively participating in the practicum activities (C), students (A) are able to conclude the presence of alkaloids, terpenoids, steroids, flavonoids, and saponins, as well as the application of extraction, distillation, and chromatography methods (B, C6), through practicum activities using organoleptic methods and phytochemical screening carried out carefully and thoroughly, thereby being able to apply them (P4) to verify them accurately (D, A4).

Content	This course provides an in-depth study of methods for • Identifying carbon and hydrogen elements in organic compounds, functional groups such as alkenes, alkyl halides, alcohols, aldehydes, ketones, phenols, aromatic compounds, and amines, as well as the applications of simple organic reactions. • Identification of alkaloids, terpenoids, steroids, flavonoids, and saponins, along with the molecular configurations of organic compounds. • Isolate organic compounds through practicum activities using extraction, distillation, and chromatography methods.
Exams and assessment formats	case methods and task
Study and examination requirements	1. Case methods: 60% 2. Task: 40%
Recommended literature	1. Adri Nora, M.Si. 2017. Modul Praktikum Kimia Organik. Universitas Esa Unggul. Jakarta 2. Ermiziar Tarmizi, Singgih Hartanto, Lin Marlina, & Adam Malik. 2018. Penuntun Praktikum Kimia Organik.Institut Teknologi Indonesia, Serpong Banten 3. Sulastri & Erlidawati. 2018. Penuntun Praktikum Kimia Organik. Departemen Pendidikan Kimia, FKIP Universitas Syiah Kuala Banda Aceh 4. Ellsya Angeline Rawar, M.Farm. 2021. Petunjuk Praktikum Kimia Organik. UKRIM Yogyakarta. 5. Fessenden, R.J. & Fessenden, J.S. 1991. Kimia Organik. Edisi Ketiga. Jilid 1 & 2. (Terjemahan Pudjaatmaka, A.H.). Jakarta: Erlangga 6. Gani, A., Adlim, M., Rahman, M.W., & Nazar, M. 2024. Immobilization of activated carbons on yarn as the adsorbent for dissolved iron in traditional well water. South African 7. Gani, A., Adlim, M., Rahmayani, R.F.I., Hanum, L., & Nabila, R. 2024. Preparation and characterization of coconut shell liquid smoke and the properties of preserving tofu. Kuwait Journal of Science, 51: 100289. https://doi.org/10.1016/j.kjs.2024.100289 8. Internet
Date of last amendment	August 12, 2024

Module designation	**SEDC3037** Analytical Chemistry Practicum
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Dr. Ibnu Khaldun, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 5th semester students.
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 340 minutes structured tasks per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to understand and apply laboratory safety procedures in analytical chemistry practices. 2. Students can operate basic laboratory equipment and perform accurate analytical measurements. 3. Students are able to conduct various types of quantitative and qualitative analyses, such as titration, gravimetry, and ion tests. 4. Students can analyze and interpret experimental results using concepts of accuracy, precision, and basic statistics. 5. Students are able to compile practical reports in a systematic and scientifically appropriate format.

Content	The *Practical Analytical Chemistry* course is designed to equip students with hands-on skills in performing both qualitative and quantitative chemical analyses systematically. Students will learn and apply classical analytical methods such as acid-base titration, redox titration, complexometric titration, gravimetric analysis, and qualitative testing of cations and anions. The course also includes an introduction to basic spectrophotometric and chromatographic techniques. In addition, students are trained to properly use laboratory equipment, understand the importance of accuracy, precision, and laboratory safety, and prepare scientific reports based on experimental data. This course provides a fundamental foundation for understanding analytical chemistry principles and their applications in both academic and industrial settings. This course content includes: • Dry Substance Analysis • Group I Cations • Group IIA Cations • Group III Cations • Group IV Cations • Group V Cations • Oxidation–Reduction (Redox) Titration • Beer's Law and the Wavelength of Colored Salts • Determination of Co(II) Concentration • Determination of Iron Content by Spectrophotometry
Exams and assessment formats	written examinations, assignment, and team-based project
Study and examination requirements	1. Quiz: 15% 2. Assignment: 20% 3. Midterm: 20% 4. Project: 25% 5. Final exam: 20%

Recommended literature	1. Harris, D. C. (2020). *Quantitative chemical analysis* (10th ed.). W. H. Freeman. 2. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2014). *Fundamentals of analytical chemistry* (9th ed.). Cengage Learning. 3. Christian, G. D. (2004). *Analytical chemistry* (6th ed.). Wiley. 4. Kellner, R., Mermet, J. M., Otto, M., & Widmer, H. M. (2004). *Analytical chemistry: A modern approach to analytical science* (2nd ed.). Wiley-VCH. 5. Day, R. A., & Underwood, A. L. (1991). *Quantitative analysis* (6th ed.). Prentice Hall. 6. Bassett, J., Denney, R. C., Jeffery, G. H., & Mendham, J. (1989). *Vogel's textbook of quantitative inorganic analysis* (5th ed.). Longman Scientific & Technical. 7. Daniel, S. S., & Skoog, D. A. (2013). *Laboratory manual for principles of instrumental analysis* (6th ed.). Cengage Learning.
Date of last amendment	August 12, 2024

Module designation	**SEDC3039** Biochemistry
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Dr. Rahmad Rizki Fazli, S.Pd., M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 5th semester students.
Teaching methods	Lecture, small group discussion, case methods.
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After completing the lecture process which is carried out actively, students are able to accurately analyze (B, C4) the philosophy of biochemistry, cells and their constituent parts, enzymes, enzyme reaction kinetics, bioenergetics, general metabolism, carbohydrate metabolism and the respiratory chain, so that they are able to develop (P4) the skills to implement the biochemical knowledge obtained in everyday life (A4) independently, accurately and measurably. 2. After completing the lecture process which is carried out actively, students are able to accurately analyze (B, C4) the Krebs cycle, electron transport and oxidative phosphorylation, photosynthesis processes and products, fat metabolism, amino acid metabolism, protein biosynthesis, nucleic base metabolism, so that they are able to develop (P4) the skills to implement the biochemical knowledge obtained in everyday life (A4) independently, accurately and measurably.

Content	This course content includes: • Introduction and Function of Biochemistry • Cells and their Components • Enzymes • Enzyme Reaction Kinetics • Bionergetics • General Metabolism • Carbohydrate Metabolism and the Respiratory Chain • Krebs Cycle • Electron Transport and Oxidative Phosphorylation • Photosynthesis • Fat Metabolism • Amino Acid Metabolism • Protein Biosynthesis • Nucleic Base Metabolism.
Exams and assessment formats	case methods and task
Study and examination requirements	1. Case methods: 80% 2. Task: 20%
Recommended literature	1. Lehninger, A.L. 1993. Principles of Biochemistry. 2nd edition. Worth. 2. David S. Page. 1981. Dasar-dasar Biokimia. Edisi kedua. Terjemahan oleh R. Soendoro. Erlangga, Jakarta. 3. Martoharsono Soeharsono. 2006. Biokimia, jilid 1 dan 2. UGM Press, Yogyakarta. 4. Styrer L. 1995. Biokimia, edisi 4, volume 1-3. Sjahbanar Soebianto Zahir (editor). EGC, Jakarta. 5. Brady, J. E. 1999. General Chemistry Principles & Structure. a.b. Sukmariah Maun; Kamianti Anas & Tilda S. sally. Binapura Aksara: Jakarta.
Date of last amendment	August 12, 2024

Module designation	**SEDC3041** Biochemistry Practicum
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Dr. Rahmad Rizki Fazli, S.Pd., M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 5th semester students.
Teaching methods	Team Based Project
Workload (incl. contact hours, self-study hours)	1 x 45 hours per semester, comprising: ✔ 170 minutes structured tasks per week
Credit points	1 SKS = 1.67 ECTS (45 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After completing the practical process which is carried out actively, students are able to accurately analyze (B, C4) experiments on testing carbohydrates, proteins, and fats, so that they are able to develop (P4) skills in implementing the biochemical knowledge obtained in everyday life (A4) independently, accurately and measurably. 2. After completing the practical process carried out actively, students are able to accurately analyze (B, C4) enzyme activity, sterilization, and simple microbiology techniques so that they are able to develop (P4) the skills to implement the biochemical knowledge obtained in everyday life (A4) independently, accurately and measurably.
Content	This course discusses material to improve students' skills in using basic equipment in the Biochemistry Laboratory according to its function, skilled in identifying carbohydrates, skilled in identifying lipids, skilled in identifying proteins and amino acids and able to investigate enzyme performance and understand simple microbiology techniques. This course content includes: • Carbohydrate • Protein • Lipid • Enzymes • Microbiological Techniques

Exams and assessment formats	Team-based project
Study and examination requirements	1. Project: 100%
Recommended literature	1. Anonymous (1980), Penuntun Praktikum Biokimia, Edisi 5, Jakarta: Bagian Biokimia Fakultas Kedokteran UI. 2. Djas, M. J. Harmaini dan Abdul Ghani Haji (1992), Penuntun Praktikum Biokimia, Darussalam: Seksi Biokimia Bagian Kimia LIPA Unsyiah. 3. Girindra, A. (1986), Biokimia 1, Jakarta : Gramedia. 4. Lehninger, L.A. (1994), Dasar-dasar Biokimia (Terjemahan Maggy Thenawijaya), Jakarta Erlangga. 5. Soedarmo, M. Djoko (1988), Penuntun Praktikum Biokimia, Bogor : PAU IPB. 6. Soedigdo, P., Muliawati dan M. Wirahadikusumah (1987), Penuntun Praktikum Biokimia Dasar, Bandung PAU Bioteknologi ITB.
Date of last amendment	August 12, 2024

Module designation	**SEDC3043** Applied Chemistry
Semester(s) in which the module is taught	5th Semester
Person responsible for the module	Prof. Dr. Adlim, M.Sc.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 5th semester students.
Teaching methods	Lecture, small group discussion, case methods.
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After actively attending lectures (C), students (A) are able to conclude the factors that influence success in business in general and those related to chemistry in producing various products used in everyday life (B, C4), so that they are able to produce these materials (P2) and manage them appropriately (D, A4). 2. After actively carrying out lectures (C), students (A) can propose innovations to increase added value which, as far as possible, involve chemical concepts (B, C3), so that they are able to make products (P2) to convince consumers on a limited basis (D, A3). 3. After actively carrying out lectures (C), students (A) can explain the process of making several chemical products that are popular in everyday life (B, C3), so that they are able to open up insights into chemical applications (P2) for learning purposes at school (D, A3).

Content	This course discusses the factors that influence business success in general and those related to chemistry. It also discusses innovations that increase the added value of products from several materials resulting from the application of chemical concepts This course content includes: • Essential oil distillation • The manufacture of medical salt, bioethanol, biodiesel, soy sauce, syrup, butter, margarine, herbal medicines, soap, and cosmetics. Furthermore, it can also be required to gain experience through practical work in the manufacture of several products resulting from the application of chemical concepts on a home industry scale, with an emphasis on the description of materials, composition, work procedures, product analysis, and product marketing.
Exams and assessment formats	Quiz, Assesment, and Task
Study and examination requirements	1. Quiz: 34% 2. Assesment: 33% 3. Task: 33%
Recommended literature	1. A.K.Haghi, dkk. (Ed.). 2018. Applied chemistry and chemical engineering, Volume 2. New York: Academic Press Inc 2. Kementerian Perdagangan Republik Indonesia. 2019. Laporan Informasi Intelijen Bisnis 2019. Margarine HS 1517. Indonesian Trade Promotion Centre, Osaka-Jepang 3. Badan POM. 2006. Pedoman Cara Pembuatan Obat yang Baik. Badan Pengawas Obat dan Makanan Republik Indonesia. 4. SNI. 2010. Gula Kristal bagian 3: Putih. Standar Nasional Indonesia, SNI 3140.3 5. SNI. 2010. Garam Konsumsi Beriodium. Standar Nasional Indonesia, SNI 3556 6. SNI. 1995. Mentega. Standar Nasional Indonesia, SNI 01. 7. AZ Kurniullah, HMP Simarmata, AP Sari, Fajrillah, dkk. 2021. Kewirausahaan dan Bisnis. Yayasan Kita Menulsi. Banda Aceh. 8. A Wibowo. 2020. Pengantar Kewirausahaan. Yayasan Prima Agus Teknik. Semarang.
Date of last amendment	August 12, 2024

Module designation	**FEDUP001** Micro Teaching
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Drs. Mukhlis, M.Hum.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Compulsory modules for 6th semester students. This course provides students with the opportunity to practice and refine their teaching skills in a structured, simulated environment. It supports CPL-8 by enabling students to plan lessons, deliver instruction, and receive peer and instructor feedback—building their confidence and pedagogical competence. With its emphasis on competency-based teacher training and reflective practice, Microteaching emphasizes student-centered instruction, teaching effectiveness, and continuous improvement. By engaging in cycles of teaching, observation, and revision, students develop professional communication, classroom management strategies, and the ability to adapt their instruction to diverse learning needs—critical capabilities for their future roles as biology educators.
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes learn to be independent per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	Introduction to Educational Management and Psychology Education.

Module objectives/intended learning outcomes	1. Students (A) are **able to examine and analyze** approaches and 21st-century learning models (B), and **design curriculum-based instructional tools** including lesson plans, teaching materials, student worksheets, assessments, and instructional media in an innovative and creative manner through the use of ICT and analysis of video case studies available on the learning LMS (C), and present them in the form of accurately and thoroughly planned written documents (D). 2. Students (A) are **able to simulate limited teaching skill practices** (B) through the **use of ICT** in accordance with the components of basic microteaching skills (C), and effectively present the outcomes of the simulation in the form of limited instructional videos (D). 3. Students (A) are **able to apply various ICT-assisted teaching strategies,** approaches, models, methods, media, and assessment instruments (B) through integrated teaching skill simulations based on microteaching evaluation indicators in collaboration with lecturers and peers (C), and effectively present the results in the form of integrated instructional videos (D).
Content	This course content includes: • Students to plan, develop, and practice effective and innovative learning activities • Practice or simulation in order to directly train their basic teaching skills in a simplified classroom or instructional setting.
Exams and assessment formats	Case studies, student presentations, simulation, and team-based project
Study and examination requirements	1. Team-Based Project 100%
Recommended literature	1. Permenristekdikti No. 55 Tahun 2017 tentang Standar Pendidikan Guru. 2. Direktorat Jenderal Pembelajaran dan Kemahasiswaan. (2017). Panduan Program Pengenalan Lapangan Persekolahan Program Sarjana Pendidikan. Jakarta: Kemenristekdikti. 3. Bagian PLP FKIP USK. (2022). Buku Pedoman Pembelajaran Mikro. Banda Aceh: Universitas Syiah Kuala
Date last of amendment	January 13, 2025

Module designation	**FEDUP002** School Internship
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 6th semester students.
Teaching methods	case methods and team-base project
Workload (incl. contact hours, self-study hours)	192 hours per semester, comprising: ✔ 4 x 3 hours/ week = 12 hours per week, 12 hours x 16 meetings = 192 hours ✔ 192 hours/ 27.5 hours per ECTS = 6.98 ECTS
Credit points	4 SKS = 6.98 ECTS (192 hours)
Required and recommended prerequisites for joining the module	passed Micro teaching

Module objectives/intended learning outcomes	1. After completing field practice (C), students (A) are able to critically examine (B) instructional materials, school administrative systems, and classroom learning processes through observation activities, and to formulate appropriate follow-up plans based on their observation findings (D). 2. After completing the field practice (C), students (A) are able to design (B) innovative and creative instructional tools (lesson plans, media, student worksheets, teaching materials, and assessment instruments) by utilizing ICT, based on the analysis of observation results, through effective verbal and non-verbal communication and collaboration with mentor teachers and academic supervisors (D). 3. After completing the field practice (C), students (A) are proficient in applying (B) various instructional strategies, approaches, models, methods, media, and assessment instruments in managing ICT-supported classrooms during the teaching and learning process (D). 4. After completing the field practice (C), students (A) are proficient in collaboratively carrying out (B) non-teaching activities, including co-curricular and extracurricular programs, together with mentor teachers and the entire school community (D). 5. After completing the field practice (C), students (A) are able to develop a school field introduction report (B) based on valid and original data (D).
Content	The School Field Introduction course is a core component of the undergraduate teacher education program, scheduled in the sixth semester and offered in both odd and even semesters. • Strengthen students academic and pedagogical competencies in their field of study through various school-based activities • Practical and authentic experiences in their roles as subject-matter teachers or educational counselors, while also serving as a platform to apply and assess the competencies acquired in the microteaching course. • The scope of plp covers the full spectrum of teacher responsibilities, including both academic tasks (curricular, co-curricular, and extracurricular) and non-academic duties (administrative and social tasks), carried out in collaboration with the school community.
Exams and assessment formats	Observation, Case studies, and project

Study and examination requirements	1. Observation report: 30% 2. Case methods: 10% 3. Project report: 30% 4. Project-video: 30%
Recommended literature	1. Permenristekdikti No. 55 Tahun 2017 tentang Standar Pendidikan Guru 2. Direktorat Jenderal Pembelajaran dan Kemahasiswaan. (2017). Panduan Program Pengenalan Lapangan Persekolahan Program Sarjana Pendidikan. Jakarta: Kemenristekdikti 3. Bagian PLP FKIP USK. (2022). Buku Panduan Program Pengenalan Lapangan Persekolahan (PLP). Banda Aceh: Universitas Syiah Kuala
Date of last amendment	January 13, 2025

Module designation	**SEDC3030** Chemistry Seminar
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Rahmad Rizki Fazli, S.Pd., M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 6th semester students.
Teaching methods	Lecture, small group discussion, Project,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Students are able to plan simple research in the field of science or other innovative activities individually or in groups related to science and technology or entrepreneurship. 2. Students are able to conduct simple research carried out through literature reviews/lab activities/entrepreneurial products and report the results in the form of posters/product demonstrations/performance.

Content	This course aims to train students in compiling simple project proposals related to chemistry and/or chemistry education by developing creative ideas that emerge, then the proposal is expected to be included in PKM. At the end of the semester, this course will hold an expo or presentation by showcasing products or simple research results obtained by students. This course content includes: • Journal Searching Using Artificial Intelligence (AI) • Seminar Topic Screening and Research Logbook Preparation • Literature Writing Using Mendeley • Adjustment of the Seminar Proposal Template and Determination of the Chemistry Seminar Proposal Title • Adjustment of the Final Report Template and Presentation of Chemistry Seminar Research Results
Exams and assessment formats	case methods and project based.
Study and examination requirements	1. Case methods: 20% 2. Project: 80%
Recommended literature	1. APA Referencing Style 6th Edition, www2.eit.ac.nz/library/ls_guides_apareferencing.html. 2. Chicago Manual of Style (CMS), 16th Edition. A 3. Council of Science Editors (CSE) Scientific Style and Format manual, 7th edition. 4. Lester, J. D & Lester Jr, J. D. (2017). Writing Research Papers, Boston: Pearson. 5. Erlidawati, Halim, H., Fadhil, R. 2025. Socio-Technopreunership: Transformasi Digital dalam Kewirausahaan Sosial. Yayasan Kita Menulis.Banda Aceh.
Date of last amendment	January 13, 2025

Module designation	**SEDC3032** Instrumental Chemical Analysis
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Ibnu Khaldun, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 6th semester students.
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	passed basic chemistry courses 1st and 2nd
Module objectives/intended learning outcomes	1. To provide an in-depth understanding of the working principles and applications of instrumental analytical techniques in modern chemistry. 2. To equip students with the skills to operate instruments and analyze data obtained from spectroscopic and spectrometric methods. 3. To prepare students to interpret spectra and instrumental data for the purpose of identifying compounds and determining their concentrations. 4. To develop critical and analytical thinking skills in selecting appropriate instrumental methods based on specific analytical needs.

Content	This course explores the principles, instrumentation, and applications of modern analytical techniques in chemistry, focusing on various spectroscopic and spectrometric methods. Topics include UV/Visible spectrophotometry for quantitative and qualitative analysis based on electronic transitions; Fourier Transform Infrared (FTIR) spectroscopy for identifying functional groups through vibrational modes; Nuclear Magnetic Resonance (NMR) spectroscopy for elucidating molecular structures based on nuclear spin behavior; and Mass Spectrometry (MS) for determining molecular masses and fragmentation patterns. The course also covers Atomic Absorption Spectroscopy (AAS) and Atomic Emission Spectroscopy (AES) as essential techniques for the detection and quantification of metal elements. Emphasis is placed on understanding the theoretical background, operational procedures, data interpretation, and the selection of appropriate methods for specific chemical analysis tasks. This course content includes: • Fundamental Principles of UV/Vis Spectroscopy and Its Application in Quantitative Analysis • Fundamental Principles of FTIR Spectroscopy for the Identification of Functional Groups in Organic and Inorganic Compounds • Interpretation of UV/Vis and FTIR Data for Molecular Structure Analysis • Fundamental Principles of Mass Spectrometry (MS) and Its Application in Determining Relative Molecular Mass • Fundamental Principles of NMR Spectroscopy and Its Application in Determining the Structure of Organic Compounds • Analysis and Interpretation of MS and NMR Data for Molecular Structure Elucidation • Fundamental Principles of X-Ray Diffraction (XRD) and Interpretation of Diffraction Patterns for Crystal Structure Determination
Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Case methods: 50,3% 2. Quiz: 8,5% 3. Midterm: 8,25% 4. Participatory Activities (Attitude, Discussion, and Presentation): 16,5% 5. Final exam: 16,5%

Recommended literature	1. Ibnu Khaldun, 2018, Kimia Analisa Instrumen, Syiah Kuala University Press. 2. Creswell, C.F., Runquist, O.A., dan Campbell, M.M., 1982. *Analisis Spektrum Senyawa Organik,* Diterjemahkan oleh Kosasih Padmawinata. 1985. Bandung: ITB 3. Day, J.R. dan Underwood, A.I. 2002. *Analisis Kimia Kuantitatif*. Edisi keenam. Diterjemahkan oleh Iis Sopyan. 2001. Jakarta: Erlangga 4. Harvey, D. 2000. *Modern Analytical Chemistry*. New York: Mc Graw Hill 5. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). *Principles of instrumental analysis* (7th ed.). Cengage Learning. 6. Harris, D. C. (2020). *Quantitative chemical analysis* (10th ed.). W. H. Freeman and Company. 7. Pavia, D. L., Lampman, G. M., Kriz, G. S., & Vyvyan, J. R. (2015). *Introduction to spectroscopy* (5th ed.). Cengage Learning. 8. Settle, F. A. (Ed.). (1997). *Handbook of instrumental techniques for analytical chemistry*. Prentice Hall. 9. Christian, G. D., Dasgupta, P. K., & Schug, K. A. (2014). *Analytical chemistry* (7th ed.). Wiley.
Date of last amendment	January 13, 2025

Module designation	**SEDC3034** Inorganic Chemistry Practicum
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Kana Puspita, S.Pd., M.Si.P.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective modules for 6th semester students.
Teaching methods	Lecture, small group discussion, case methods
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes of lecture and discussion per week ✔ 120 minutes of structured tasks per week ✔ 120 minutes of independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	Passed basic chemistry courses I and basic chemistry II
Module objectives/intended learning outcomes	1. Students are able to practice the synthesis of several inorganic elements/compounds based on chemical concepts through practical activities and performance reports, carried out carefully and responsibly. 2. Students are able to practice science process skills related to inorganic chemistry in the laboratory in a creative, careful, and responsible manner.
Content	The Inorganic Chemistry Laboratory Course is designed to provide students with understanding and skills to synthesize compounds from their elements, produce or extract elements from a compound, and investigate the properties of elements and inorganic compounds, including complex compounds, in a collaborative, creative, and responsible manner. This course content includes: • Modification of Sulfur • Preparation of Potassium Aluminum Sulfate Dodecahydrate ($KAl(SO_4)_2 \cdot 12H_2O$) • Salting Reactions • Element Extraction Methods • Ligand Field Strength in Cu(II) Complexes • Construction of a Simple Battery
Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions

Study and examination requirements	1. Quiz: 10 % 2. Project: 50% 3. Assignment: 5% 4. Midterm: 22.5% 5. Final exam: 12.5%
Recommended literature	1. Adlim (2009). Kimia Anorganik, Syiah Kuala Press 2. Atkins, P., et. al (2010) Inorganic Chemistry. 5th Ed. W. H. Freeman and Co., New York 3. Catherine Housecroft, Alan G. (2012) Sharpe-Inorganic Chemistry 4th ed-Prentice Hall, Barcelona, Spain 4. Fackler, J.P. and Falvello, L.R. (2011) Techniques in Inorganic Chemistry, CRC Press, Boca Raton. 5. Beran, J. A. (2007) Laboratory Manual for Principles of General Chemistry . John Wiley and Sons, Canada.
Date of last amendment	January 13, 2025

Module designation	**SEDC3036** Laboratory Management
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Rahmad Rizki Fazli, S.Pd., M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 6th semester students.
Teaching methods	Lecture, small group discussion, Project,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After completing the lecture process which is carried out actively, students are able to accurately analyze (B, C4) the function and role of the laboratory in supporting chemistry learning, laboratory management standards, and health risks, work safety in the laboratory, so that they are able to develop (P4) the skills to implement basic chemistry knowledge obtained in everyday life (A4) independently, accurately and measurably. 2. After completing the lecture process which is carried out actively, students are able to accurately analyze (B, C4) the function and advantages of instrumentation in the chemistry lab, calibrate measuring instruments in the chemistry lab, so that they are able to develop (P4) the skills to implement basic chemistry knowledge obtained in everyday life (A4) independently, accurately and measurably.

Content	This course is designed to provide students with the understanding and skills to manage the administration, equipment, and materials in Chemistry and Science laboratories at school. The material covered in this course includes laboratory management knowledge, equipment and materials handling, hazardous waste management, laboratory safety, instrument introduction, and laboratory equipment calibration. This couse content includes: • Laboratory Organization Management • Arrangement and Inventory of Laboratory Equipment • Administration of Equipment and Material Usage • Introduction to Laboratory Instruments and Maintenance Techniques • Instrument Calibration • Techniques for Assembling Laboratory Apparatus • School Laboratory Visit • Laboratory Standard Operating Procedures (SOP) • Occupational Safety and First Aid (P3K) • Hazardous and Toxic Substances, Material Safety Data Sheets (MSDS), and Chemical Hazard Symbols • Hazardous Waste Management • School Laboratory Visit and Recommendations for Laboratory Improvement
Exams and assessment formats	team-based project, quiz, and task
Study and examination requirements	1. Project: 60% 2. Quiz: 20% 3. Task: 20%
Recommended literature	1. Reynolds M. Salerno, Jennifer Gaudioso, 2015, Laboratory Biorisk Management: Biosafety and Biosecurity. 2. Donna Gibson, John A. Suchocki, 2006, Laboratory Manual for Conceptual Chemistry. 3. Harmening, D. M. (2020). Laboratory Management: Principles and Processes (4th ed.). Lippincott Williams & Wilkins. 4. Garcia, L. S. (Ed.). (2024). Clinical Laboratory Management (3rd ed.). Wiley. 5. Pillai, S. P., & Fox, E. (2025). Laboratory quality management system fundamentals. Frontiers in Bioengineering and Biotechnology, 13. 6. Theodorou, D., & Giannelos, P. (2015). Medical laboratory quality systems – a management review. International Journal of Health Care Quality Assurance, 28(3), 267–273.

Date of last amendment	January 13, 2025

Module designation	**SEDC3038** Molecular Spectroscopy
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Muhammad Nazar, S.Pd., MSCST
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 6th semester students.
Teaching methods	Lecture, small group discussion, Project Based Learning
Workload (incl. contact hours, self-study hours)	3 x 45 hours per semester, comprising: ✔ 150 minutes lecture and discussion per week ✔ 180 minutes structured tasks per week ✔ 180 minutes independent learning per week
Credit points	3 SKS = 5.01 ECTS (135 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. After participating in lectures delivered through various methods, models, and strategies, students are capable of analyzing the role of UV-Vis, IR, and NMR spectroscopy in chemical compound analysis, as well as accurately calculating the moment of inertia, rotational energy, and bond length. 2. After participating in lectures delivered through various methods, models, and strategies, students are capable of analyzing molecular symmetry, determining the point group of compounds based on molecular geometry, understanding the concepts of photochemistry including fluorescence, phosphorescence, and LASER, and accurately analyzing their applications in the structural determination of chemical compounds. 3. Through the Project-Based Learning (PjBL) method, students are capable of synthesizing Carbon Quantum Dots using various natural materials and characterizing them accurately and precisely using UV lamps and UV-Vis spectroscopy.

Content	Molecular Spectroscopy explores the fundamental principles and applications of various spectroscopic techniques, focusing on their critical role in chemical compound analysis and structural determination. This course content includes: • The interaction between matter and electromagnetic radiation through UV-Vis, IR, and NMR spectroscopy. • Molecular symmetry, point group determination, photochemical phenomena such as fluorescence, phosphorescence, and laser technologies, emphasizing their applications in advanced chemical research. • Synthesize and characterize Carbon Quantum Dots using natural materials, applying spectroscopic methods to analyze their properties accurately.
Exams and assessment formats	written examinations, Project, and guided class discussions
Study and examination requirements	1. Quiz: 10% 2. Assignment: 10% 3. Midterm: 30% 4. Final exam: 30% 5. Project: 20%

Recommended literature	1. **Pavia, D. L., Lampman, G. M., Kriz, G. S., & Vyvyan, J. R. (2015). *Introduction to spectroscopy* (5th ed.). Cengage Learning.** 2. **Atkins, P. W.** (2024). *Concepts in Physical Chemistry* (2nd ed.). Royal Society of Chemistry. https://doi.org/10.1039/9781837674244 books.rsc.org+15books.rsc.org+15books.rsc.org+15 3. **Rumble, J. R.** (Ed.). (2024). *CRC Handbook of Chemistry and Physics* (105th ed.). CRC Press. 4. **Hirayama, S., & Yamamoto, M.** (2025). *Physical Chemistry Problems and Solutions: Atoms, Molecules and Thermodynamics* (2024th ed.). Springer. 5. **Kuhn, H., Waldeck, D. H., & Försterling, H.-D.** (2024). *Principles of Physical Chemistry* (3rd ed.). Wiley 6. **Peverati, R.** (2024). *The Live Textbook of Physical Chemistry 1* (5th ed.). Florida Institute of Technology. **Recommended Articles** Akbar, S. A., Hasan, M., Nazar, M., Zulfahmi, I., Miswar, E., Iqhrammullah, M., & Jalil, Z. (2025). Fluorescent carbon quantum dots from Syzygium aromaticum as a selective sensor for Fe3+ and Cd2+ detection in aqueous solution. *Case Studies in Chemical and Environmental Engineering*, *11*, 101166. https://doi.org/10.1016/J.CSCEE.2025.101166 Burrell, M. C. (2001). Chemical Analysis, Electron Spectroscopy. *Encyclopedia of Materials: Science and Technology*, 1142–1149. https://doi.org/10.1016/B0-08-043152-6/00214-X Dutta, A. (2017). Fourier Transform Infrared Spectroscopy. *Spectroscopic Methods for Nanomaterials Characterization*, *2*, 73–93. https://doi.org/10.1016/B978-0-323-46140-5.00004-2 Hasan, M., Nurfathinah, D., Gani, A., Khaldun, I., Rahmayani, R. F. I., & Nazar, M. (2024). Thermomechanical properties of bio-nanocomposite film based on sugar palm starch/chitosan nanoparticles matrices loaded with N-CQD from dragon fruit peel extract. *Case Studies in Chemical and Environmental Engineering*, *10*, 101026. https://doi.org/https://doi.org/10.1016/j.cscee.2024.101026

Date of last amendment	January 13, 2025

Module designation	SEDC3040 Research Methodology
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Prof. Dr. Adlim, M.Sc
Language	Indonesian (Part of the references and instructional materials are provided in English)
Relation to curriculum	Mandatory modules for 6th semester students.
Teaching methods	Lecture, case method, and Team-Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After attending lectures, engaging in discussions, and reviewing relevant literature (C), students (A) are able to accurately (D) analyze (B) the development of theories and the stages of educational research. 2. After attending lectures, participating in discussions and practice sessions, and referring to appropriate literature (C), students (A) are able to accurately (D) design (B) a research plan or proposal, develop research instruments, conduct research, and analyze research data.
Content	This course content includes: • Writing their final script. • distributions, probability, and data analysis techniques including t-tests, correlation (r), and ANOVA, as well as hypothesis testing. • Graduates are expected to apply various statistical methods in analyzing educational data
Exams and assessment formats	case studies, team-based project, assignment and written examinations,

Study and examination requirements	1. Case methods: 20% 2. Project: 30% 3. Assignment: 10% 4. Quiz: 15% 5. Midterm: 10% 6. Final exam: 15%
Recommended literature	1. Bogdan, R. C. and Bikken, S. K. (1982). *Qualitative Research for Educcation: An Introduction to Theory and Methods*. Boston: Allyn and Bacon Inc. 2. Creswell, J. W. (1994). *Research Design: Qualitative and Quantitative Approaches*.London: Sage Publications. 3. Fowles, J. (1984*). Handbook of Fuutures Research*. London: Greenwood Press. 4. Lincoln, Y. S. and Guba, E. G. (1985). *Naturalistic Inquiry*. London: Sage Publications. 5. McTaggart, R. (1993). *Action Research: A Short Modern History*. Victoria, Australia: Deakin University. 6. Moleong, L. Y. (2001). *Metode Penelitian Kualitatif*. Bandung: PT Penerbit Remaja Rosdakarya. 7. Riyanto, Y. (2001). *Melodologi Penelitian Pendidikan*. Surabaya: Penerbit SIC. 8. Sudjana, D. (2001). *Penilaian Dalam Manajemen Program Pendidikan*. Bandung: CV Fallah Production. 9. Sudjana, N. dan Ibrahim (2001). *Penelitian dan Penilaian Pendidikan*. Bandung: Penerbit Sinar BaruAlgesindo. 10. Suryabrata, S. (2000). *Metodologi Penelitian*. Jakarta: PT Raja Grafindo Persada. 11. Tim Pelatih Proyek PGSM (1999). *Penelitian Tindakan Kelcrs (Classroom Action Rese(irch*). Jakarta: Depdiknas, Proyek PGSM.
Date of last amendment	January 13, 2025

Module designation	**SEDC3042** Chemistry Entrepreneurship
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Muhammad Nazar, S.Pd., MSCST
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective modules for 6th semester students.
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes of lecture and discussion per week ✔ 120 minutes of structured tasks per week ✔ 120 minutes of independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to analyze the characteristics of successful entrepreneurs, including their personality, motivation, traits, and skills needed to enhance productivity. 2. Students are able to develop business plans that incorporate the utilization of Information Technology-based business opportunities, marketing, management, and financial strategies within the context of technopreneurship.

Content	This course is designed to cultivate entrepreneurial interest and prepare students to face real-world challenges in business and industry. It encourages chemistry education students to utilize their chemical knowledge to design entrepreneurial products based on chemical transformation with added economic value. The course also promotes the use of information technology for product design, branding, and marketing. Students are encouraged to start small businesses and use platforms such as Kedaireka, Shopee, and Bukalapak to market products and services. Social responsibility and empathy to improve community welfare by utilizing local natural resources are also emphasized. This course content includes: • Introduction to Entrepreneurship and Its Role • Concepts of Entrepreneur and Entrepreneurship • Identifying the Key Characteristics of Successful Entrepreneurs • Entrepreneurial Motivation and Personality, Including Women Entrepreneurs • Marketing Concepts and Business Planning • Information Technology–Based Business Opportunities • Developing a Business Plan Covering Marketing, Financial, and Technopreneurship Aspects • Related Case Studies: Strategies for Identifying Business Opportunities; Business Inspiration and Opportunities
Exams and assessment formats	written examinations, student presentations, and Project
Study and examination requirements	1. Project 1: 25% 2. Project 2: 25% 3. Project 3: 25% 4. Assignment: 25%
Recommended literature	Sarasvathy, S. D. (2008). *Effectuation: Elements of entrepreneurial expertise.* Edward Elgar Publishing. Sarasvathy, S. D., Dew, N., Read, S., & Wiltbank, R. (2011). *Effectual entrepreneurship.* Routledge. Schramm, C. J. (2018). *Burn the business plan: What great entrepreneurs really do.* Scribner. Thiel, P., & Masters, B. (2014). *Zero to one: Notes on startups, or how to build the future.* Crown Business.

Date of last amendment	January 13, 2025

Module designation	**SEDC3044** Chemistry Entrepreneurship Practice
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Muhammad Nazar, S.Pd., MSCST
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective modules for 6th semester students.
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	1 x 45 hours per semester, comprising: ✓ 50 minutes lecture and discussion per week ✓ 60 minutes structured tasks per week ✓ 60 minutes learn to be independent per week
Credit points	1 SKS = 1.67 ECTS (45 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	Through project-based learning, students are able to apply the principles of chemistry to produce entrepreneurial products in the form of goods or services that are good and safe by prioritizing the principles of honesty, accuracy and community welfare.

Content	This course is designed to provide students with practical experience in integrating the principles of chemistry with entrepreneurship. Through a project-based learning approach, students will learn to design, develop, and produce innovative products in the form of goods or services that are safe, beneficial, and economically valuable. During the learning process, students will apply chemical concepts creatively and responsibly, while upholding the principles of honesty, accuracy, and sustainability for the welfare of society. In addition, this course promotes the development of entrepreneurial skills such as identifying business opportunities, production planning, resource management, and marketing strategies. Through hands-on activities and direct evaluations, students are expected to produce products that not only meet safety and quality standards but also possess market competitiveness. This course provides an essential foundation for students to become professional and ethical chemistry-based entrepreneurs. This course content includes: • Entrepreneurial Character • Market Analysis and Business Opportunities • Project 1: Developing a Simple Business Idea • Project 2: Designing a Small Service or Product-Based Business • Project 3: Starting a Small Business with Limited Capital Marketing and E-Commerce
Exams and assessment formats	Small Business Plan Project
Study and examination requirements	1. Participatory: 25% 2. Project 1: 25% 3. Project 2: 25% 4. Project 3: 25%

Recommended literature	Harnish, V. (2002). *Mastering the Rockefeller habits: What you must do to increase the value of your fast-growth firm.* Gazelles Inc. Harnish, V. (2014). *Scaling up: How a few companies make it... and why the rest don't.* Gazelles Inc. Kawasaki, G. (2004). *The art of the start: The time-tested, battle-hardened guide for anyone starting anything.* Penguin Group. Mazzucato, M. (2013). *The entrepreneurial state: Debunking public vs. private sector myths.* Anthem Press. Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses.* Crown Business.
Date of last amendment	January 13, 2025

Module designation	SEDC6047 Community Service Program
Semester(s) in which the module is taught	7th Semester
Person responsible for the module	Fathurahmi, M.Si
Language	Indonesian
Relation to curriculum	Compulsory
Teaching methods	Case Method
Workload (incl. contact hours, self-study hours)	192 hours per semester, comprising: ✓ 8 hours/day x 6 days = 48 hours per week of community service ✓ 48 hours/week x 4 weeks = 192 hours ✓ 192 hours/27.5 hours per ECTS = 6.98 ECTS
Credit points	2 SKS = 6.98 ECTS (192 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Students are able to respect diversity, adapt to different environments, learn, and contribute to solving societal problems.
Content	This course prepares graduates to be able to adapt, learn, socialize with the community, and contribute to addressing societal problems.
Exams and assessment formats	Report
Study and examination requirements	Participatory Activities (Affective & Psychomotoric) Case 1 (Activities Planning): 10% Case 2 (Performance and discipline): 10% Case 3 (Logbook and Media): 10% Case 4 (Implementation of service program): 50% Case 5 (Report): 50%
Reading list	1. USK Community Service Program (KKN) Guidebook
Date of last amendment	August 12, 2024

Module designation	**FEDUPA01 Final Script**
Semester(s) in which the module is taught	8th Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Mandatory modules for 8th semester students..
Teaching methods	Lecture (in the beginning), Discussion, Project.
Workload (incl. contact hours, self-study hours)	480 hours per semester, comprising: ✓ 4 hours/day x 5 days = 20 hours per week ✓ 20 hours/week x 4 weeks = 80 hours ✓ 80 hours x 6 months = 480 hours ✓ 480 hours/27,5 hours per ECTS = 17.45 ECTS
Credit points	4 SKS = 17.45 ECTS (480 hours)
Required and recommended prerequisites for joining the module	Completed the course: SEDC3029; EDUP001; SEDC3040; FEDUP002; and has successfully fulfilled a minimum of 120 credit hours or 192 ECTS
Module objectives/intended learning outcomes	1. To understand and master the proper procedures for preparing a final script in accordance with the guidelines for undergraduate final projects 2. To be able to write a final script correctly and effectively, following the established guidelines for undergraduate final projects. 3. To demonstrate responsibility in final script writing, including avoiding plagiarism and showing a strong commitment to completing the final project.

Content	The Undergraduate Final Script course is a compulsory course managed by the Faculty and is mandatory for all study programs within the Faculty of Teacher Training and Education (FKIP). This course is offered in both the odd and even semesters. The course aims to provide students with hands-on experience in conducting research, preparing research reports in accordance with the established academic guidelines, presenting their research findings, and defending them in a final script examination. Students may gain this experience in schools, laboratories, or other relevant settings aligned with their field of study. The learning process is conducted using a **Project-Based Learning** approach. For theses in the field of education, the course particularly emphasizes the application of **Technological Pedagogical Content Knowledge (TPACK)**. Assessment is based on the quality of the final script document, students' presentation skills, and their ability to defend their script during the examination.
Exams and assessment formats	Project and Presentation
Study and examination requirements	Project: 100% consist of: 1. Product (The Script quality): 50% 2. Performance Assessmente: 50%
Recommended literature	1. Tim FKIP, 2014, Pedoman Penulisan Skripsi, FKIP, Banda Aceh 2. Creswell, J. W., & Creswell, J. D. (2018). Research Design Qualitative, Quantitative, and Mixed Methods Approaches. Sage Publications, Inc. https://doi.org/10.4324/9780429469237 3. Ghayas, A. (2020). Research Methodology (L. Jasrai (Ed.)). Lovely Professional University 4. Luft, J. A., & Jones, M. G. (Eds.). (2022). Handbook of Research on Science Teacher Education. Routledge 5. Pandey, P., & Pandey, M. M. (2015). Research Methodology: Tools and Techniques. Bridge Center. https://doi.org/10.1142/9789812792068_0002 6 .Ranjit, K. (2019). Research Methodology: A Step-by-Step Guide for Beginners - Ranjit Kumar - Research Methodology. In Sage (pp. 1–755). Sage Publications, Inc. 7. Siregar, I. (2024). Research Methodology "A Comprehensif and Holistic Viewpoint." National University Press. 8. Stephen, V., & Velmurugan., T. (2020). Research Methodology for Beginners. Skyfox Publishing Group.
Date of last amendment	January 13, 2025

Module designation	**SEDC6057** Chemistry of Waste Management
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Prof. Dr. Abdul Gani, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. After actively participating in the lectures, students are able to conclude waste-related problems based on their types, sources, and characteristics, so that they can identify them in order to manage them properly. 2. After actively participating in field study activities, students will be able to obtain information from the community and related officers at markets, temporary disposal sites (TPS), and final disposal sites (TPA) regarding waste management mechanisms, thereby documenting and preparing a survey report to present comprehensively in classroom discussion forums.
Content	This course content includes: • Market/urban waste problems and alternative solutions for their management. • Agricultural and plantation waste issues along with possible management solutions. • Waste sources (markets), temporary disposal sites (TPS), and final disposal sites (TPA), • Prepare reports on their observations related to the waste management process.
Exams and assessment formats	Quiz, assignment, written examinations, and team based project

Study and examination requirements	1. Assignment: 15% 2. Quiz: 10% 3. Project: 50% 4. Final: 25%
Recommended literature	1. Ayilara, M. S., Olanrewaju, O. S., Babalola, O. O., dan Odeyemi, O. 2020. Waste Management through Composting: Challenges and Potentials. Sustainability, 12(4456), 1-23. 2. Dewa. Institut Pertanian Bogor, Bogor, Indonesia. https://repository.ipb.ac.id/handle/123456789/40580. 3. Firmanti, A. 2010. Modul Pengelolaan Sampah Berbasis 3R. Jakarta: Pusat Penelitian dan Pengembangan Pemukiman Badan Penelitian dan Pengembangan Kementerian Pekerjaan Umum. 4. Haji, A.G. 2013. Komponen Kimia Asap Cair Hasil Pirolisis Limbah Padat Kelapa Sawit. Jurnal Rekayasa Kimia dan Lingkungan, 9(3), 109-116. 5. Haji, A.G., Mas'ud, Z.A., dan Pari, G. Pembuatan Arang Aktif dari Sampah Perkotaan dengan Metoda Pemanasan dan Steam. 2012. Jurnal Purifikasi, 12(3). 6. Migristin, R. 2009. Pengelolaan Sampah Plastik. Bandung: Titian Ilmu. Otto Soemarwoto. 1994. Ekologi, Lingkungan Hidup, dan Pembangunan. Jakarta: Djembatan. 7. Rini, W. N. E., Aswin, B., dan Hidayati, F. 2021. Pelatihan Pembuatan Kompos dari Sampah Organik Rumah Tangga dengan Komposter Ember. Jurnal Karya Abdi, 5(3), 116-121. 8. Sujarwo, Tristanti, dan Widyaningsih. 2014. Pengelolaan Sampah Organik dan Anorganik. Yogyakarta: Jurusan Pendidikan Luar Sekolah Universitas Negeri Yogyakarta. 9. Susila Herlambang, dkk. 2017. Petunjuk Teknis Pembuatan Biochar dengan Sistem Selongsong Putar. Yogyakarta: Universitas Pembangunan Nasional Veteran. 10. Zulkifli, A. 2014. Pengelolaan Limbah Berkelanjutan. Yogyakarta: Graha Ilmu.
Date of last amendment	August 12, 2024

Module designation	**SEDC6045** REVIEW OF VALUES IN CHEMISTRY LEARNING
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Dra. Sulastri, M.Si.
Language	Indonesian, English
Relation to curriculum	Elective Course
Teaching methods	Lecture, SCL, inquiry approach, create a concept map about branches of philosophy related to education, group discussion, Q&A, PBL, paper
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	✔ Able to manage a chemistry learning program containing religious values to strengthen the formation and development of Islamic character values through value-based chemistry learning. ✔ Able to master the concept of the nature of values and value education, morals, ethics, character; the foundation of value education; the development of value education; the relationship between value education and character education; factors that influence character value education, value systems and stages of character value development to educate prospective teachers who strengthen the character of students through chemistry learning. ✔ Able to analyze, map and master chemistry learning strategies and prepare chemistry learning tools containing religious values to integrate Islamic character values in learning.

Content	This course content includes: • Foundations and concepts of values education • Identification and analysis of values in science content • Mapping values within science learning materials • Strategies for internalizing values in science instruction • Designing value-based science learning • Integration of character values into attitudes and behavior • Role of science educators as character role models
Exams and assessment formats	Presentation, Q&A, written examination
Study and examination requirements	1. Case methods: 40% 2. Quiz: 10% 3. Midterm: 15% 4. Participatory Activities (Attitude, Discussion, and Presentation): 20% 5. Final exam: 15%

Recommended literature	1. Sulastri, Rusman and Asria Arifa, 2018, , Pengembangan Soal-Soal Kimia Bermuatan Nilai-Nilai untuk Memperkokoh Karakter Siswa SMA, JTK, 3 (2), p. 171-181, https://doi.org/10.15575/jtk.v3i2.3512 2. Yudianto, A. S., (2005), manajemen Alam Sumber pendidikan Nilai, Bandung, Mughni Sejahtera 3. Hakam, K.A. (2007), Model Pembelajaran Pendidikan Nilai, CV. Maulana, Bandung 4. Hakam, K.A. (2008), Pendidikan Nilai dalam kajian Filosofi Paedagogis, Bandung, CV. Jasindo Multi Aspek 5. Zubaedi, (2011), Desain Pendidikan Karakter Konsep dan aplikasinya dalam Lembaga Pendidikan. Kencana Prenada Media Group, Jakarta 6. Kevin C. Elliott, · Rebecca Korf, 2024, Values in science: what are values, anyway? , European Journal for Philosophy of Science (2024) 14:53, https://doi.org/10.1007/s13194-024-00615-3 7. Jeffrey Burkhardt, 2016, Scientific Values and Moral Education in teh Teaching of Science, Perspectives on Science 1999, vol. 7, no. 1, The Massachusetts Institute of Technology. 8. Ningsih, T, Sutrisno P., Muflihah, Desi W, 2022, Intergartion of Science and Religion in Value Education, IJORER, 3 (5), September 2022, p. 569-583 9. Saputro, A.N.C., Nurfina A., Srys F.P., 2022, Intergartion Mtheod of Religious Character Values in Chemistry Learning, JKPK, 7 (1), 2022, p. 111-124. 10. Mawaddah, Sulastri, Evendi, 2023, Fostering Trustworthy (Amanah) Character: Investigating teh Impact of Integrating Religious Values into Thermochemical Module, JTK, 8(2), DOI: https://doi.org/10.15575/jtk.v8i2.17566, p. 155-122.
Date of last amendment	August 12, 2024

Module designation	SEDC6047 Polymer Chemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Prof. Dr. M. Hasan, M.Si
Language	Indonesian (Part of the references and instructional materials are provided in English)
Relation to curriculum	Elective Course
Teaching methods	Lecture, and Team Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Upon completing the course, students will be able to analyze the concepts of macromolecules, conduct analysis and characterization of eco-friendly films derived from natural materials using advanced techniques, and evaluate the potential utilization of environmentally friendly plastic raw materials for packaging films. 2. Through project-based learning, students will be able to synthesize and characterize eco-friendly packaging films from renewable natural materials in an independent, meticulous, and measurable manner.

Content	The Polymer Chemistry course provides students with fundamental and applied knowledge of macromolecules, including their synthesis, properties, and applications. Emphasis is placed on the development and characterization of eco-friendly polymer films derived from renewable natural resources. Students will be engaged in project-based learning to design, synthesize, and analyze sustainable packaging materials using advanced techniques. The course aims to equip students with critical thinking, laboratory skills, and the ability to evaluate the potential of environmentally friendly polymers for industrial applications. The covered content are: 1. Introduction to Polymer Chemistry ● History and significance of polymers ● Classification of natural and synthetic polymers ● Polymer structures and molecular weight 2. Polymerization Mechanisms ● Addition and condensation polymerization ● Copolymerization ● Green polymerization methods 3. Macromolecular Properties ● Physical and chemical properties of polymers ● Crystallinity, thermal behavior, and degradation ● Biodegradability and environmental aspects 4. Characterization of Polymers ● Spectroscopic techniques (FTIR, NMR, UV–Vis) ● Thermal analysis (TGA, DSC) ● Microscopy (SEM, TEM, AFM) ● Mechanical property testing 5. Eco-Friendly Polymers and Biopolymers ● Renewable resources for polymer synthesis ● Bioplastics and biodegradable polymers ● Case studies of natural-based polymer materials 6. Polymer Film Development ● Methods of film preparation (casting, extrusion, etc.) ● Structural, mechanical, and barrier properties of films ● Functionalization of films for packaging 7. Project-Based Learning Component ● Synthesis of bio-based packaging films ● Characterization and performance evaluation ● Presentation of project findings 8. Applications and Future Trends ● Eco-friendly packaging innovations ● Nanocomposites in sustainable materials ● Advances in green polymer chemistry
Exams and assessment formats	Team Based Project, Cognitive, and assignment

Study and examination requirements	1. Team Based Project: 60% 2. Assignment: 20% 3. Written Test: 20%
Recommended literature	1. Hiemenz, P. C., & Lodge, T. P. (2007). *Polymer chemistry* (2nd ed.). CRC Press. 2. Matyjaszewski, K., & Möller, M. (Eds.). (2012). *Polymer science: A comprehensive reference* (Vols. 1–10). Elsevier. 3. Odian, G. (2004). *Principles of polymerization* (4th ed.). Wiley-Interscience. 4. Sperling, L. H. (2005). *Introduction to physical polymer science* (4th ed.). Wiley. 5. Stevens, M. P. (1999). *Polymer chemistry: An introduction* (3rd ed.). Oxford University Press. 6. Young, R. J., & Lovell, P. A. (2011). *Introduction to polymers* (3rd ed.). CRC Press. 7. M. Hasan, A. Utami, C. Siregar, L. Hanum, I. Khaldun, M. Nazar. 2025. Thermal, structural and mechanical characterization of bio nanocomposite films from purple sweet potato starch/chitosan nanoparticles integrated with anthocyanin extract, Results in Engineering, Volume 25, https://doi.org/10.1016/j.rineng.2025.104448. 8. M.Hasan, D. Nurfathinah, A. Gani, I. Khaldun, R. F. I. Rahmayani, M. Nazar, 2024. Thermomechanical properties of bio-nanocomposite film based on sugar palm starch/chitosan nanoparticles matrices loaded with N-CQD from dragon fruit peel extract, *Case Studies in Chemical and Environmental Engineering*, https://doi.org/10.1016/j.cscee.2024.101026. 9. M. Nazar, M. Hasan, B. Wirjosentono, B. A. Gani, 2024. Fabrication and characterization of bio-nanocomposite from sweet potato starch and Moringa oleifera leaf extract loaded with carbon quantum dots from Coffea arabica grounds, *Results in Engineering, 2024.* https://doi.org/10.1016/j.rineng.2024.102448. 10. M. Hasan, et al (2022). Bioplastik untuk pengemas makanan berbasis pati dan kitosan, Bandar Publishing: Banda Aceh
Date of last amendment	August 12, 2024

Module designation	**SEDC6049** Food Chemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Prof. Dr. Abdul Gani, M.Si
Language	Indonesian,
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, recitation, and case study
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured task per week ✔ 120 minutes independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After actively participating in the lectures, students are able to analyze chemical compounds classified as food and non-food materials based on their types, characteristics, uses, and sources, so that they can apply this knowledge to properly maintain their availability. 2. After actively participating in the lectures, students are able to analyze chemical compounds classified as food additives, including colorants, flavoring agents, additives, and toxic substances, so that they can make appropriate decisions regarding their use.
Content	This course content includes: • Natural and synthetic chemical compounds related to food materials, including water, ice, lipids, proteins, carbohydrates, vitamins, and minerals. • Covering their sources, types, functions, and the effects of their deficiency or excess. • food additives, including food colorants, flavoring agents, food additives, and toxic substances found in food.
Exam and Assesment formats	Case Method, Quiz, Recitation, Midterm Test, Final Test.

Study and examination requirements	Case Method 20% Quiz 20% Midterm Test 20% Final Test 40%
Recommended literature	1. Owen R. Fennema. 1996. Food Chemistry. Third edition. New York: Marcel Dekker 2. 2. John M. deMan. 1997. Kimia Makanan. Edisi kedua. (Terjemahan Kosasih Padmawinata). Bandung: ITB Press 3. 3. F. G. Winarno. 1997. Kimia Pangan dan Gizi. Jakarta: Gramedia Pustaka Utama 4. Anton Aprianto, Dedi Fardiaz, Ni Luh Puspitasari, Sedarnawati, dan Slamet Budiyanto. 1989. 4. Petunjuk Laboratorium: Analisis Pangan. Bogor: PAU Pangan dan Gizi IPB 5. Sumber lain yang relevan
Date of last amendment	August 12, 2024

Module designation	**SEDC6051** Teaching and Learning Theories in Chemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.32 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Upon completing this course (C), students (A) will be able to design instruction (B) based on behaviorist, cognitive, constructivist, and social learning theories (D) 2. After mastering the behaviorist, cognitive, constructivist, and social learning theories (C), students (A) are able to design STEAMC-based instructional tools integrated with Islamic values (B) in an appropriate and measurable manner (D). 3. After completing the course and engaging in independent and/or collaborative study of credible sources, as well as through case studies and/or project-based learning (C), students (A) are able to accurately (D) identify learning theories embedded in instructional materials and/or teaching practices implemented by a teacher (D)

Content	This course content includes: • Foundations and development of learning theories • Behaviorist learning theory • Cognitive learning theory • Social cognitive learning theory • Constructivist learning theory and derivative theories • Application of learning theories in chemistry education • Critical analysis of credible academic sources and independent learning skills
Exams and assessment formats	case studies, team-based project and written examinations,
Study and examination requirements	1. Case methods: 34% 2. Project: 24% 3. Quiz: 12% 4. Midterm: 21% 5. Final exam: 9%

Recommended literature	1. Bandura, A. (1999). *Self-efficacy in Changing Societies*. Cambridge University Press 2. O'Donohue, W., & Kitchener, R. (1999). *Handbook Behaviorism*. Academic Press, Inc. 3. Staats, A. W. (1996). *Behavior and Personality*. Springer Publishing Company, Inc. 4. Vygotsky, L. S. (1978). *Mind in Society*. In Memory: Vol. Mind in So. https://doi.org/(Original manuscripts [ca. 1930-1934]) 5. Zhou, M., College, D. S., Brown, D., & College, D. S. (2017). *Educational Learning Theories*: 2nd Edition Educational Learning Theories. In M. Zhou & D. Brown (Eds.), Educational Learning Theories : 2nd Edition Educational Learning Theories. University System of Georgia 6. Bandura, Albert. 1977. *Social Learning Theory*. New Jersey: Prentice Hall. 7. Martinez, Jaime E. 2017. *The Search for Method in STEAM Education*. Cham: Palgrave Macmillan. 8. Livengood, K., Lewallen, D. W., Leatherman, J., & Maxwell, J. L. (2012). The use and evaluation of scaffolding, student centered-learning, behaviorism, and constructivism to teach nuclear magnetic resonance and IR spectroscopy in a two-semester organic chemistry course. *Journal of Chemical Education*, 89(8), 1001–1006. https://doi.org/10.1021/ed200638g 9. Patil, A., & Kudte, S. (2017). Teaching Learning with Constructivist Approach. *International Journal of Engineering Development and Research,* 5(4), 308–312. https://www.ijedr.org/papers/IJEDR1704047.pdf 10. Taagepera, M., & Noori, S. (2000). Mapping Students' Thinking Patterns in Learning. *Journal Chemical Education*, 77(9). 11. Udogu, M. E., & Njelita, C. B. (2010). Effect of Constructivist - Based Instructional Model on Students' Conceptual Change and Retention on Some. *African Research Review*, 4(2), 219–229. 12. https://www.dar-alifta.org/en/article/details/114/the-theory-of-islamic-education. 13. Abuarqub, Mamoun. 2009. "Islamic Perspectives on Education." *Islamic Relief* (February):149–64. 14. Alias, Alizi, and Hariyati Shahrima Abdul Majid. 2005. "Psychology Of Learning From An Islamic Perspective." Pp. 1689–99 in 3rd *International Seminar on Learning and Motiva*tion (10- 12 September 2005). Vol. 5. 15. Alias, Alizi, and Hariyati Shahrima Abdul Majid. 2015. "Psychology of Learning: An Islamic Theory." *International Journal of Islamic Thought* 4(1):63–80.
Date of list amendment	August 12, 2024

Module designation	**SEDC6053** Green Chemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Drs. M. Nasir, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case study, and Problem-Based Learning (PBL)
Workload (incl. contact hours, self-study hours)	2 x 45 hours per week, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured task per week ✔ 120 minutes independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	No prerequisites
Module objectives/intended learning outcomes	1. After completing this course, students will be able to: 1. Explain the concept and principles of green chemistry accurately and scientifically. 2. Analyze the environmental impacts of conventional chemical processes. 3. Design environmentally friendly and sustainable chemical alternatives. 4. Demonstrate ethical and responsible scientific attitudes toward sustainability and environmental protection.
Content	This course content includes: • Philosophy and principles of Green Chemistry (12 principles by Anastas and Warner) • Sustainable chemical synthesis and renewable feedstocks • Green solvents, atom economy, catalysis, and energy efficiency • Waste prevention and environmentally benign chemical design • Green Chemistry and the Sustainable Development Goals (SDGs) • Problem-Based Learning (PBL) on environmental issues in chemical processes • Virtual experiments, case studies, and mini-projects on green applications in education and industry

Exams and assessment formats	Quiz: 15% Individual assignment: 20% Case-based discussion: 20% Project/mini design: 25% Midterm exam: 10% Final exam: 10%
Study and examination requirements	Students are required to attend at least 80% of sessions, actively participate in class discussions, complete assignments on time, and conduct a project that demonstrates understanding of green chemistry concepts and their real-world applications.
Recommended literature	Main References: 1. Anastas, P. T., & Warner, J. C. (2000). Green Chemistry: Theory and Practice. Oxford University Press. 2. Lancaster, M. (2016). Green Chemistry: An Introductory Text. Royal Society of Chemistry. 3. Clark, J. H., & Macquarrie, D. J. (2008). Handbook of Green Chemistry and Technology. Blackwell Science. 4. Hjeresen, D. L., Schutt, D. L., & Boese, J. M. (2000). Green Chemistry and Education. Journal of Chemical Education, 77(12), 1543. Supporting References: 5. Matlack, A. S. (2010). Introduction to Green Chemistry. CRC Press. 6. Cann, M. C., & Connelly, M. E. (2000). Real-World Cases in Green Chemistry. American Chemical Society. 7. Dicks, A. P., & Hent, A. (2015). Green Chemistry Metrics: A Guide to Determining and Evaluating Process Greenness. Springer. 8. Sheldon, R. A. (2018). Metrics of Green Chemistry and Sustainability: Past, Present, and Future. ACS Sustainable Chemistry & Engineering, 6(1), 32–48.
Date of last amendment	August 12, 2024

Module designation	**SEDC6055** FORENSIC CHEMISTRY
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course

Teaching methods	Lecture, small group discussion, case methods, and team-based project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After actively participating in the lectures (C), students (A) are able to describe (B) the various types of criminal evidence and the correct procedures for the collection, preservation, inventory, and transportation of such evidence accurately, rationally, and responsibly (D). 2. After completing the course (C), students (A) are able to analyze (B) the principles, theories, and applications of chemical technologies used in the accurate and specific analysis of forensic evidence (D). 3. After conducting laboratory practices (C), students (A) are able to acquire (B) knowledge on how to interpret meaningful data obtained from analytical/forensic measurements accurately and responsibly (D).
Content	This course content includes: • Introduction to forensic chemistry and its applications • Physicochemical principles in forensic analysis • Analysis of physical evidence: explosive residues and combustion by-products • Examination of trace evidence: hair, fibers, glass, paint, paper, ink, and soil • Basic laboratory techniques in forensic investigations • Simplified forensic case studies and practical applications
Exams and assessment formats	case studies, project, and written examinations,
Study and examination requirements	1. Case methods: 19,1% 2. Project: 36% 3. Quiz: 4,1% 4. Assignments: 3,2% 5. Midterm: 13,7% 6. Final exam: 23,9%

Recommended literature	1. Bell, Suzanne. 2022. Forensic Chemistry. Boca Raton: CRC Press. 2. Brettell, T. A., and R. Saferstein. 1983. Forensic Science. Vol. 55. Vermont: Oak Meadow, Inc.Catalano, 3. Thomas. 2014. Good Laboratory Practices for Forensic Chemistry. New York: Springer. 4. Elkins, Kelly M. 2019. Introduction to Forensic Chemistry. Boca Raton: Taylor & Francis. 5. Grossman, Michael. 2022. Forensic Chemistry Fundamental. Berlin: Walter de Gruyter GmbH. 6. Khan, JaVed I., Thomas J. Kennedy, and Donnell R. Christian. 2012. Basic Principles of Forensic Chemistry. New York: Springer. 7. Kobilinsky, Lawrence. 2012. Handbook Forensic Chemistry. Hoboken: John Wiley & Sons, Inc.
Date of last amendment	August 12, 2024

Module designation	**SEDC6059** Chemistry Learning Media
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Muhammad Nazar, S.Pd., MSCST
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case method, team-based project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Through problem analysis and literature review (C), students (A) are able to formulate criteria for selecting instructional media that align with the characteristics of the subject matter to solve chemistry learning problems in schools (B) accurately and measurably (D). 2. Through the Project-Based Learning (PjBL) method (C), students (A) are able to design and develop chemistry learning media by utilizing simple resources and/or ICT-based tools, including AI, AR, and VR, to enhance the quality of chemistry teaching (B), either collaboratively or individually (D).
Content	This course content includes: • The definition, functions, and uses of instructional media • The strengths and weaknesses of various learning media • The selection of instructional media based on the characteristics of the subject matter (senior high school chemistry topics) and learners (learning styles) • Environmental-based media, virtual media, visual media, audiovisual media, and the evaluation of instructional media.

Exams and assessment formats	written examination, assignments, case method, and team based project
Study and examination requirements	1. Case methods: 18% 2. Team based project: 42% 3. Assignment: 20% 4. Midterm: 20%
Recommended literature	1. Hamzah, P; Ahmad S. Wawan K.; Sayidiman, 2022, Media Pembelajaran, Badan penerbit UNM 2. Sadiman, Arief S.; Raharjo; Haryono, A. 1986, Media Pendidikan, Raja Grafindi, Jakarta 3. Stiowati, W ; Asmira, O dan Ariyana, Y;, Bestary, R (2019) Penilaian berorientasi Higer Order Thinking Skills, Kemdikbud 4. Van Cleave, Janice, 1993, Proyek-proyek Kimia, Memenangkan Percobaan Ilmiah untuk pameran ilmu pengetahuan dan untuk mendapatkan nilai tambah, Pakar Raya, Bandung 5. Nazar, M, Puspita, Kana, Rusman (2024) Media Pembelajaran Berbasis ICT, USK Press, Banda Aceh 6. Nazar, M (2018) ICT dalam pembelajaran kimia, USK Press: Banda Aceh 7. M. Nazar, R. Rusman, and K. Puspita (2022), Android-Based Mobile Learning Resource for Chemistry Students in Comprehending the Concept of Redox Reactions, International Journal of Interactive Mobile Technologies (iJIM) 16 (3), 123-135 8. M. Nazar, R Aisyi, RFI Rahmayani, L Hanum, R Rusman, K Puspita, (2019), Development of Augmented Reality application for learning the concept of molecular geometry, Journal of Physics: Conference Series 1460 (AICMSTE 2019) 9. M. Nazar, Zulfadli , Rahmatillah , Kana P , Sri Setiawaty and Sulastri, (2024), Development of augmented reality as a learning tool to improve student ability in comprehending chemical properties of the elements, Chemistry Teacher International, Vol. 6 Issue 3
Date of last amendment	August 12, 2024

Module designation	**SEDC6061** Inorganic Industrial Chemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Prof. Dr. Adlim, M.Sc
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes of lecture and discussion per week ✔ 120 minutes of structured tasks per week ✔ 120 minutes of independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	passed basic chemistry courses I and basic chemistry II
Module objectives/intended learning outcomes	1. After actively participating in the course, students are able to explain the production process of industrial gas, ammonia, and nitric acid through independent/group assignments in the context of pollution cases and efforts to overcome them 2. After actively participating in the course, students can explain the chemical industrial production process of sulfuric acid, inorganic fertilizers, and chlor-alkali synthesis through independent/group assignments in the context of pollution cases and efforts to overcome them. 3. After actively participating in the course, students can explain the chemical manufacturing process of cement and analyze the cases of handling inorganic industrial waste through independent/group assignments in the context of pollution cases and efforts to overcome them.
Content	This course content includes: • Applications of industrial inorganic chemistry • Industrial gases: H_2, N_2, O_2, noble gases, and CO_2 • Nitric acid and sulfuric acid industries • Fertilizer industry • Chlor-alkali industry • Cement industry • Chemical pollution and industrial waste management solutions

Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Case Assignment: 30% 2. Quiz: 20 % 3. Midterm: 20% 4. Participatory Activities (Attitude, Discussion, and Presentation): 10% 5. Final exam: 20%
Recommended literature	1. Brandin, J., Hulteberg, C., Kušar, H. 2017. A review of the thermos-chemical conversion of biomass into biofuels – focusing on gas cleaning and upgrading process steps. Sweden. ISBN 978-91-7729-366-8. 2. Büchel, K. H., Moretto, H-H., & Woditsch, P. 2000. Industrial Inorganic Chemistry, 2nd edition. New York: Wiley. DOI:10.1002/9783527613328. 3. Lv, B., Guo, B., Zhou, Z., & Jing, G. 2015. Mechanisms of CO2 Capture into Monoethanolamine Solution with Different CO2 Loading during the Absorption/Desorption Processes. Environmental Science & Technology, 49(17), 10728–10735. doi:10.1021/acs.est.5b02356 4. Singh, N. B., Nagpal, G., Agrawal, S., & Rachna. 2018. Water purification by using Adsorbents: A Review. Environmental Technology & Innovation, 11, 187–240. doi:10.1016/j.eti.2018.05.
Date of last amendment	August 12, 2024

Module designation	SEDC6063 Radiochemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Muhammad Nazar, S.Pd, MSCST
Language	Indonesian (Part of the references and instructional materials are provided in English)
Relation to curriculum	Elective Course
Teaching methods	Lecture, and Team Based Project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Through discussion and question-and-answer sessions, students are able to understand the concepts of nuclear chemistry, the emission processes of various radioactive rays, and the use of radiotracers in various fields in an appropriate and responsible manner 2. Through case studies, students are able to analyze the hazards as well as the prevention and mitigation efforts of radioactive radiation in an appropriate and responsible manner.

Content	This course introduces the principles and applications of radiochemistry, covering the fundamentals of nuclear chemistry, radioactive decay, and radiation–matter interactions. Students will learn methods of radiation detection and measurement, explore the use of radiotracers in chemistry, medicine, industry, and environmental studies, and examine nuclear reactions such as fission and fusion. The course also emphasizes radiation safety, waste management, and regulatory standards, supported by case studies and current research trends. This course content includes • Fundamentals of Nuclear Chemistry (Nuclear structure, radioactivity, decay modes, half-life) • Radiation Interaction and Measurement (Interaction with matter, biological effects, detection and instrumentation) • Radiotracers and Applications (Application in chemistry, medicine, biology, industry, and environment. • Nuclear Reactions (Fission, fusion, nuclear reactors, and actinide chemistry) • Environmental Radiochemistry (Natural/anthropogenic sources, monitoring, remediation) • Radiation Safety and Regulations (Protection principles, dosimetry, radioactive waste management) • Case Studies and Emerging Research (Nuclear accidents, radiochemistry in forensics, new research trends)
Exams and assessment formats	case studies, assignment and written examinations,
Study and examination requirements	1. Case methods: 55% 2. Assignment: 10% 3. Quiz: 10% 4. Midterm Test: 10% 5. Final Test: 15%

Recommended literature	1. Kratz, J.-V., & Lieser, K.-H. (2013). Nuclear and radiochemistry: Fundamentals and applications (4th ed., Vols. 1–2). Wiley-VCH. https://doi.org/10.1002/9783527655734 2. Vértes, A., Nagy, S., Klencsár, Z., Gáti, R., & Rösch, F. (Eds.). (2011). Handbook of nuclear chemistry (2nd ed.). Springer. https://doi.org/10.1007/978-1-4419-0720-2 3. Lewis, J. S., Windhorst, A. D., & Zeglis, B. M. (Eds.). (2019). Radiopharmaceutical chemistry. Springer. https://doi.org/10.1007/978-3-319-98947-1 4. Scott, P. J. H. (Ed.). (2015). Radiochemical syntheses, volume 2: Further radiopharmaceuticals for positron emission tomography and new strategies for their production. Wiley. https://doi.org/10.1002/9781118834114 5. Journal of Radioanalytical and Nuclear Chemistry. (Springer). https://www.springer.com/journal/10967 6. Applied Radiation and Isotopes. (Elsevier). https://www.sciencedirect.com/journal/applied-radiation-and-isotopes
Date of last amendment	August 12, 2024

Module designation	**SEDC6065** Action Research
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Prof. Dr. M. Hasan, M. Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, Collaborative Learning, Case Study Method
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	Students must have successfully completed the Research Methodology course.
Module objectives/intended learning outcomes	1. Explain the fundamental principles, concepts, and characteristics of Action Research in educational settings. 2. Identify and formulate classroom or educational problems suitable for investigation through Action Research. 3. Design a comprehensive Action Research plan following the cyclical process of planning, acting, observing, and reflecting 4. Apply appropriate data collection and analysis techniques for Action Research projects. 5. Interpret and evaluate the findings of Action Research to improve teaching and learning practices. 6. Present and communicate Action Research proposals and findings effectively in written and oral formats 7. Demonstrate collaboration, critical thinking, and reflective skills throughout the Action Research process

Content	This module introduces students to the fundamental concepts, principles, and processes of Action Research in educational contexts. The course begins with an exploration of the philosophy, characteristics, and purposes of Action Research, highlighting its role in improving teaching and learning practices. Students learn how to identify and formulate classroom or institutional problems that are relevant and researchable, followed by the development of clear research questions and objectives. This course content includes: • Philosophy, characteristics, and purposes of Action Research • Identification and formulation of classroom or institutional problems • Development of research questions and objectives • Cyclical process of Action Research: planning, action, observation, and reflection • Data collection methods (qualitative and quantitative) • Data analysis and interpretation • Collaborative problem-solving and critical reflection • Preparation and presentation of Action Research proposals and reports
Exams and assessment formats	Assessment in this module consists of a combination of formative and summative evaluations designed to measure students' understanding of Action Research concepts and their ability to apply them in practice. Formative assessments include quizzes, assignments, and class participation to ensure continuous learning and engagement throughout the semester. Summative assessments involve the development of an Action Research proposal, project implementation, presentation of findings, and a final written report. A midterm examination focuses on theoretical understanding, while the final assessment emphasizes practical application and reflective analysi

Study and examination requirements	1. **Quizzes and Class Participation:** 10% To assess students' understanding of key concepts and active involvement in discussions. 2. **Assignments and Structured Tasks:** 20% Individual or group assignments focusing on literature review, problem identification, and research planning. 3. **Midterm Examination:** 20% Written test assessing theoretical knowledge of Action Research principles and procedures. 4. **Action Research Proposal & Project Report:** 30% Design, implementation, and written documentation of the Action Research project. 5. **Oral Presentation and Reflection:** 20% Presentation of research findings followed by reflective analysis on the process and outcomes.
Recommended literature	Kemmis, S., McTaggart, R., & Nixon, R. (2014). *The Action Research Planner: Doing Critical Participatory Action Research*. Springer. Mills, G. E. (2017). *Action Research: A Guide for the Teacher Researcher* (6th Edition). Pearson. Stringer, E. T. (2013). *Action Research* (4th Edition). SAGE Publications. McNiff, J. (2017). *Action Research: All You Need to Know*. SAGE Publications. Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th Edition). Routledge. Burns, A. (2010). *Doing Action Research in English Language Teaching: A Guide for Practitioners*. Routledge. **Recommended Articles** Carr, W., & Kemmis, S. (2005). *Staying critical*. Educational Action Research, 13(3), 347–358. https://doi.org/10.1080/09650790500200316 Somekh, B. (2006). *Action Research: A Methodology for Change and Development*. McGraw-Hill Education. (Book chapter often cited in journal discussions) Elliott, J. (2009). *Building Educational Theory Through Action Research*. In *The Sage Handbook of Educational Action Research* (pp. 28–38). SAGE Publications. Kember, D. (2000). *Action learning and action research: Improving the quality of teaching and learning*. Routledge. Hine, G. S. C. (2013). *The importance of action research in teacher education programs*. Issues in Educational Research, 23(2), 151–163
Date of last amendment	January 13, 2025

Module designation	**SEDC6067** Chemistry Learning Problem Review
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Sri Winarni., S.Pd., M.Pd
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, Project,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Students are able to analyze the nature of learning, instructional processes, and the factors influencing learning through discussions supported by well-established references. 2. Students are able to examine students' learning difficulties in chemistry based on research findings and school-based case studies through systematic group work and exploration activities. 3. Students are able to propose solutions to problems in chemistry learning at school by composing scientific articles in an academic format.
Content	This course is designed to prepare students to identify and propose solutions to problems in chemistry education. This course content includes: • Analyzing issues that occur in school settings • Reviewing journal articles related to challenges in chemistry learning.
Exams and assessment formats	case methods, team-based project, quiz, and task
Study and examination requirements	1. Case methods: 22.5% 2. Project: 40% 3. Quiz: 16.5% 4. Task: 21.0%

Recommended literature	1. Ahmadi, A. (1997). *Strategi Belajar Mengajar.* Bandung: Pustaka Setia. 2. Arikunto, S. (1988). *Pengelolaan kelas dan Siswa Sebuah Pendekatan Evaluatif.* Jakarta : Rajawali Pers. 3. Depdiknas (2002) *Pendekatan Kontekstual (Contextual Teaching and Learning)*. Jakarta: Dirjen Dikdasmen. 4. De Porter, B. (2000). *Quantum Teaching, (teorj*). Bandung: Kaifa 5. Ibrahim, M. (2005) *Pembelajaran Berdasarkan Masalah.* Surabaya: Unesa University Press. 6. Djamarah, S.B (2002). *Strategi Belajar Mengajar.* Jakarta : Rineka Cipta 7. Johar, R., Nurfadhilah, C., dan Hanum, L. (2016). *Strategi Belajar Mengajar*. Bahan Ajar. Universitas Syiah Kuala 8. Johnson, E., B. (2002*). Contextual Teaching and Learning*: *What it is and Why It's Here to Stay*. USA: Corwin Press. 9. Herron, J.D. (1996) *The Chemistry Classroom: Formulas for Succesful Teaching*. Washington, DC. 10. Winarti, A., & Sunarti. (2017). *Strategi Belajar Mengajar Kimia*. Program Studi Pendidikan Kimia Fakultas Keguruan dan Ilmu Pendidikan Universitas Lambung Mangkurat.
Date of last amendment	August 12, 2024

Module designation	**SEDC6069** Mineralogy
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Ibnu Khaldun, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain the fundamental concepts of mineralogy, including mineral classification and crystallographic systems. 2. Students are able to identify and analyze the physical and chemical properties of minerals through direct observation and laboratory experiments. 3. Students are able to apply basic and instrumental techniques to characterize minerals and interpret their chemical compositions. 4. Students are able to evaluate the roles of minerals in environmental, technological, and educational contexts. 5. Students are able to design and develop learning activities or teaching materials that integrate mineralogy concepts into chemistry education.

Content	This course content includes: • Definition and classification of minerals • Crystallography and crystal systems • Physical and chemical properties of minerals • Mineral identification methods (macroscopic, chemical, XRD, FTIR) • Environmental and technological applications of minerals • Role of minerals in daily life • Integration of mineralogy in chemistry education (laboratory work, contextual learning, STEM approach, and local mineral resources)
Exams and assessment formats	written examinations, assignment, and team based project
Study and examination requirements	1. Quiz: 15% 2. Assignment: 20% 3. Midterm: 20% 4. Project: 25% 5. Final exam: 20%
Recommended literature	1. Klein, C., & Dutrow, B. (2022). *Manual of mineral science* (24th ed.). Hoboken, NJ: Wiley. 2. Nesse, W. D. (2016). *Introduction to mineralogy* (2nd ed.). New York, NY: Oxford University Press. 3. Deer, W. A., Howie, R. A., & Zussman, J. (2013). *An introduction to the rock-forming minerals* (3rd ed.). London: Mineralogical Society of Great Britain and Ireland. 4. Putnis, A. (2021). *Introduction to mineral sciences* (2nd ed.). Cambridge: Cambridge University Press. 5. Klein, C. (2020). *Earth materials: Introduction to mineralogy and petrology* (2nd ed.). Cambridge: Cambridge University Press. 6. *Wiloso, D. A. (2024). Pelatihan deskripsi mineral secara megaskopis bagi siswa Praktek Kerja Lapangan SMKN 1 Karanggayam di Laboratorium Mineralogi dan Petrologi, Universitas AKPRIND Indonesia. Jurnal Abdi Masyarakat Indonesia, 4(3), 611-618*. 7. *Kartiwa, & Sugandi, D. (2023). Pengaruh pemanfaatan Museum Geologi sebagai sumber belajar terhadap tingkat pemahaman materi litosfer. Jurnal Pendidikan Geografi Undiksha, 11(2), 159-167.* 8. *Afriani, N., et al. (2024). Pengenalan sumber daya mineral dan batu bara sebagai bagian dari kegiatan pengabdian kepada masyarakat di SMA Negeri 1 Merangin. Community Development Journal, 5(4), 6396-6402*.
Date of last amendment	August 12, 2024

Module designation	**SEDC6071** Microbial Chemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Rahmad Rizki Fazli, S.Pd., M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, Case methods.
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Students are able to analyze microbial development, microbial habitats, microbial utilization, and understand the secondary metabolites produced by microbes through discussions supported by well-established references. 2. Students are able to recognize several forms of microbial intercellular communication, quorum sensing, and microbiological techniques for harvesting microbes and the secondary metabolites they produced through discussions supported by well-established references.
Content	This course content includes: • Microbial growth and development • Microbial habitats and ecology • Utilization of microbes • Secondary metabolites produced by microorganisms • Microbial cell communication and quorum sensing • Microbiological techniques for harvesting microbes and their secondary metabolites
Exams and assessment formats	case methods and task

Study and examination requirements	1. Case methods: 80% 2. Task: 20%
Recommended literature	1. Cohen, G. N. (2004). *Microbial Biochemistry*. Springer Dordrecht. 2. Fill, T. P. (Ed.). (2023). *Microbial Natural Products Chemistry: A Metabolomics Approach*. In *Advances in Experimental Medicine and Biology* (Vol. 1439). Springer. 3. Birkett, J., & Lester, J. (1999). *Microbiology and Chemistry for Environmental Scientists and Engineers*. CRC Press. 4. Li, J., Lu, X., Zou, X., & Ye, B.-C. (2024). Recent advances in microbial metabolic engineering for production of natural phenolic acids. *Journal of Agricultural and Food Chemistry, 72*(9), 4538–4551. 5. Du, B., Sun, M., Hui, W., Xie, C., & Xu, X. (2023). Recent advances on key enzymes of microbial origin in the lycopene biosynthesis pathway. *Journal of Agricultural and Food Chemistry, 71*(35), 12927–12942. 6. ang, K., Zhang, Z., Guo, X., Zhang, G., Jin, Y., & Wang, Z. (2025, August 13). Recent advances in organic molecule fluorescent probes for microbial imaging. *Journal of Materials Chemistry B*. Advance Article. 7. Biswas, S., Mahato, S., & Dhar, J. (2025, April 9). Bioconvection and bloom in porous environment and its assisted technologies: A review. 8. Alvionita M, Andriyani A, Rahmadina LP, Fazli RR, Idris I (2023) Isolation of biosurfactant producing bacteria from Mangrove area. In: AIP conference proceedings, vol 2569, No. 1. AIP Publishing.
Date of last amendment	August 12, 2024

Module designation	**SEDCP616** Validation of Instrumental Analysis Methods
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Ibnu Khaldun, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. Students are able to explain the basic principles and importance of method validation in instrumental analysis within laboratory and industrial settings. 2. Students can identify and calculate validation parameters such as accuracy, precision, linearity, LOD, and LOQ. 3. Students are able to design and perform method validation procedures for various analytical techniques such as spectroscopy and chromatography. 4. Students can apply statistical analysis to evaluate the results of method validation. 5. Students are able to prepare validation documentation and reports in accordance with national and international regulatory standards.
Content	This course content includes: • Concepts and principles of analytical method validation • Validation parameters: accuracy, precision, linearity, LOD, LOQ, selectivity, and robustness • Validation of instrumental techniques: spectrophotometry, chromatography, and mass spectrometry • Preparation of validation documentation • Compliance with ISO/IEC 17025 and ICH Guidelines • Practical sessions and case studies in method design and evaluation

Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Case methods: 50,3% 2. Quiz: 8,5% 3. Midterm: 8,25% 4. Participatory Activities (Attitude, Discussion, and Presentation): 16,5% 5. Final exam: 16,5%
Recommended literature	1. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). *Principles of instrumental analysis* (7th ed.). Cengage Learning. 2. Miller, J. N., & Miller, J. C. (2018). *Statistics and chemometrics for analytical chemistry* (7th ed.). Pearson Education. 3. International Conference on Harmonisation. (2005). *ICH Q2(R1): Validation of analytical procedures: Text and methodology*. ICH Harmonised Tripartite Guideline. 4. Harris, D. C. (2020). *Quantitative chemical analysis* (10th ed.). W. H. Freeman. 5. EURACHEM. (2014). *The fitness for purpose of analytical methods: A laboratory guide to method validation and related topics* (2nd ed.). EURACHEM. 6. Snyder, L. R., Kirkland, J. J., & Dolan, J. W. (2011). *Introduction to modern liquid chromatography* (3rd ed.). Wiley. 7. Taylor, J. K. (1987). *Quality assurance of chemical measurements*. Lewis Publishers.
Date of last amendment	August 12, 2024

Module designation	**SEDC6075** School Chemistry Experiment
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Sri Winarni., S.Pd., M.Pd
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, Project,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Upon completing the learning process through discussion, exploration, and group work (C), students (A) are able to design experiments utilizing natural or locally available materials in the form of detailed and accurate laboratory manuals (B, C6; P2), aligned with senior high school chemistry content or its equivalent (D) 2. Upon completing the learning process through discussion, exploration, and group work (C), students (A) are able to carry out experiments using natural or locally available materials (B, C4; P4; A4) with precision and accuracy, in accordance with senior high school chemistry topics or their equivalents (D). 3. Upon completing the learning process through discussion, exploration, and group work (C), students (A) are able to perform experiments using natural or locally sourced materials (B, C4; P4; A4) in a detailed and accurate manner, relevant to senior high school chemistry content or its equivalent (D)**.**

Content	This course content includes: • Design and implementation of chemistry experiments to demonstrate and validate concepts • Development of effective and engaging school laboratory activities • Adaptation of experiments under limited laboratory facilities • Alternative experimental methods for senior high school level or equivalent
Exams and assessment formats	team-based project,
Study and examination requirements	1. Project 1: 33,33% 2. Project 2: 33,33% 3. Project 3: 33,33%
Recommended literature	1. Carin, A.A.,& Sund, R.B . 1975. *Teaching Science through Discovery*. Ohio: Charles E. Merrill Publishing Co. 2. Effendy. 2017. *Molekul, Struktur, dan Sifat-sifatnya: Seri Buku Ikatan Kimia dan Kimia Anorganik. Malang*: Indonesian Academic Publishing. 3. Pertiwi, N.K.A., Redhana, I. W., & Maryam, S. 2014. *Buku Pedoman Praktikum Kimia Ramah Lingkungan untuk Pembelajaran Kimia SMA*. e-Journal Kimia Visvitalis Universitas Pendidikan Ganesha Jurusan Pendidikan Kimia,. 2(1):66-75. 4. Thompson, R.B. 2008. Illustrated Guide to Home Chemistry Experiments. Sebastopol: Make Books 5. Walker, P & Wood, E. 2011. *Chemistry Experiments*. NewYork: Facts
Date of last amendment	August 12, 2024

Module designation	**SEDC6077** Environmental Chemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Prof. Dr. Drs. Abdul Gani, M.Si.
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Case methods and Team based project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After actively participating in the lectures (C), students (A) are able to analyze environmental issues, the presence of chemicals, the water cycle and biogeochemical cycles, as well as environmental sanitation (B, C4), thereby being able to manage them sustainably (P2) and utilize them appropriately (D, A3). 2. After actively participating in the lectures (C), students (A) are able to analyze air, water, and soil pollution, as well as global environmental issues, including the ozone layer, acid rain, and hazardous and toxic waste (B3) (B, C4), thereby being able to manage them sustainably (P2) and utilize them appropriately (D, A3).
Content	This course content includes: • Introduction to environmental chemistry • The environment and environmental issues • Chemistry and its relationship with the environment • Chemicals in the environment • Chemical transformation processes in the environment • The water cycle and biogeochemical cycles • Environmental sanitation • Air, water, and soil pollution • Global environmental issues: greenhouse effect, ozone layer depletion, acid rain, and hazardous and toxic waste (B3)

Exams and assessment formats	case methods and task
Study and examination requirements	1. Task: 60% 2. Midterm Examination: 20% 3. Final Semester Examination 20%
Recommended literature	1. A.K. Prodjosantoso, & Regina Tutik P. 2011. Kimia Lingkungan (Teori, eksperimen, dan aplikasi). Yogyakarta: Kanisius 2. Wasilah Abu Sudja. 1986. Kimia Lingkungan. Modul: 1-6. Jakarta: Karunika 3. Rukaesih Achmad. 2004. Kimia Lingkungan. Yogyakarta: Andi. 4. Des W. Connell & Gregory J. Miller. 1995. Kimia & Ekotoksikologi Pencemaran. Jakarta: UI-Press. 5. Wisnu Arya Wardhana. 1995. Dampak Pencemaran Lingkungan. Edisi Revisi. Yogyakarta: Andi. 6. Stanley E. Manahan. 2006. Green Chemistry, 2nd edition. Columbia, Missouri USA: ChemChar Research, Inc. 7. Stanley E. Manahan. 2000. Enveronmental Science, Technology, and Chemistry. Boca Raton: CRC press. 8. Internet
Date of last amendment	August 12, 2024

Module designation	**SEDC6079** Biotechnology
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Rahmad Rizki Fazli, S.Pd., M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case methods
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Students are able to understand the history of the development of biotechnology (classical and modern), the meaning and importance of biotechnology, the basic principles underlying the development of biotechnology, the role of biotechnology in human life, the risks that arise in biotechnology, and ethics in developing and implementing biotechnology. 2. Students are able to apply knowledge about DNA, molecular biology in biotechnology in the fields of food, health, agriculture and other related fields.
Content	This course content includes: • Development of biotechnology • Principles of applied biotechnology • Applications in the food industry • Applications in cosmetics • Applications in agriculture and forestry • Applications in energy • Applications in the medical field
Exams and assessment formats	case methods and task

Study and examination requirements	1. Case methods: 80% 2. Task: 20%
Recommended literature	1. Godbey, W. T. (2015). *An Introduction to Biotechnology: The Science, Technology and Medical Applications*. Academic Press. 2. Ratledge, C., & Kristiansen, B. (2013). *Basic Biotechnology* (3rd ed.). Cambridge University Press. 3. Budisa, N. (—). *Engineering the Genetic Code: Expanding the Amino Acid Repertoire for the Design of Novel Proteins*. Wiley. 4. Madigan MT; Martinko JM (2006). *Brock Biology of Microorganisms.* Edisi 112. 5. Singh, S., Ravikumar, B., & Singh, K. (2025). Biotechnology and technological advancements in agriculture: A review. *International Journal of Research in Agronomy, 8*(5), 328–338. 6. Chen, R., Ren, S., Li, S., Zhou, H., Jia, X., Han, D., & Gao, Z. (2024). Synthetic biology for the food industry: Advances and challenges. *Critical Reviews in Biotechnology, 45*(1), 23–47. 7. Shahab, M. A., Destro, F., & Braatz, R. D. (2025). Digital twins in biopharmaceutical manufacturing: Review and perspective on human-machine collaborative intelligence. *arXiv preprint*. 8. RR Fazli, R Hertadi, (2018). Optimization of rhamnolipid production from bioconversion of palm oil mill effluent (POME) waste by Pseudomonas stutzeri BK-AB12 using response surface methodology. IOP Conference Series: Earth and Environmental Science.
Date of last amendment	August 12, 2024

Module designation	**SEDC6081** Solids And Surface Chemistry
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Drs. Rusman, M. Si.
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Lecture, Collaborative Learning, Case Study Method
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-.
Module objectives/intended learning outcomes	1. Understand the scope of the Surface and Solid Chemistry course. 2. Be able to determine crystal planes and crystal forms. 3. Be able to analyze the differences between solid surfaces and liquid surfaces. 4. Be able to understand the principles of adsorption isotherms on the surface of a catalyst or adsorbent. 5. Be able to calculate the lattice energy of a crystal.
Content	This course content includes: • Properties of liquids and solids • Crystal forms, crystal lattices, and solid structure models • Relationship between solid structure and material properties • Material modification and applications (ceramics, alloys, semiconductors) • Surface tension of liquids • Kelvin's law and Gibbs adsorption • Adsorption isotherms and applications in heterogeneous catalysis
Exams and assessment formats	Case Method and Team-Based Project

Study and examination requirements	Task 20% Quiz 20% Midterm 30% Final Exam 30%
Recommended literature	R. Ropp, 2003, Solid State Chemistry, Elsivier Paul C. Hiemenz, Raj Rajagopalan, 1997, Principles of colloid and surface chemistry, 3rd ed. Marcel Dekker
Date of last amendment	August 12, 2024

Module designation	**SEDC6083 Structure Elucidation of Organic Compounds**
Semester(s) in which the module is taught	5th Semester and 7th Semester
Person responsible for the module	Dr. Drs. Syahrial, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case methods, and team-based project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After completing the course and engaging in a series of exercises (C), students (A) are able to accurately (D) analyze (C4) and integrate (A4) theoretical foundations for the application (P2) of UV-Vis spectrophotometry, IR spectrophotometry, mass spectrometry, and NMR spectroscopy in determining organic molecular structures. 2. After completing the course and engaging in a series of exercises (C), students (A) are able to accurately (D) construct (C6) molecular formulas and structural formulas of organic compounds through the ability to manage (P5) and organize (A4) spectral data from UV-Vis, IR, mass, and NMR spectroscopy.

Content	This course is designed to equip students with the foundational knowledge and practical skills required to pursue advanced studies in chemistry, and to contribute as mentors in chemistry olympiads and school-based mini-research projects at the high school level. The course covers key spectroscopic techniques used in the determination of molecular structure, including: ● **UV-Visible Spectrophotometry**: basic concepts, absorption spectra, and the ability to interpret UV-Vis spectra to identify structural features of organic molecules; ● **Infrared (IR) Spectrophotometry**: fundamental principles, IR spectral patterns, frequency absorption, fingerprint regions, and skills in spectral interpretation; ● **Mass Spectrometry (MS)**: core concepts, mass spectra analysis, molecular ions, fragmentation patterns, and proficiency in using mass spectra to distinguish between compounds; ● **Nuclear Magnetic Resonance (NMR) Spectroscopy**: basic principles, chemical shifts of ^{1}H and ^{13}C nuclei, and the ability to analyze and interpret NMR spectra for structure elucidation. The course emphasizes the integration of theoretical understanding with analytical interpretation skills, preparing students to competently deduce structural information from various types of spectral data.
Exams and assessment formats	case studies, project, and written examinations,
Study and examination requirements	1. Case methods: 15% 2. Quiz: 10% 3. Assignments:10 % 4. Midterm: 30% 5. Final exam: 35%

Recommended literature	1. Silverstein, R. M., Webster, F. X., Kiemle, D. J. 2005. *Spectrometric Identification of Organic Compounds*. 7th Ed., New York: John Wiley & Sons, Inc. 2. Breitmaier, E. 2002. *Structure Elucidation by NMR in Organic Chemistry, A Practical Guide*. 3rd Ed., England: John Wiley & Sons, Ltd. 3. Dachriyanus. 2004. Analisa Struktur Senyawa Organik Secara Spektroskopi. Padang: LPTIK Unand. 4. Field, L. D., Sternhell, S., Kalman, J. R. 2008. Organic Structures from Spectra. 4th Ed., England: John Wiley and Sons, Ltd. 5. Richards, S. A., Hollerton, J. C. 2011. Essential Practical NMR for Organic Chemistry. United Kingdom: John Wiley & Sons, Ltd. 6. Glagovich, N.M., and Timothy D.s. 2005. "Organic Spectroscopy Laboratory: Utilizing IR and NMR in the Identification of an Unknown. 7. Substance." Journal of Chemical Education 82(9):1382–84. doi: 10.1021/ed082p1382. 8. Nandiyanto, A. B. D., Oktiani, R and Ragadhita, R. 2019. "How to Read and Interpret Ftir Spectroscope of Organic Material." Indonesian Journal of Science and Technology 4(1):97–118. doi: 10.17509/ijost.v4i1.15806. 9. Silva, P.J., and Kimberly A. P. 2000. "Interpretation of Mass Spectra from Organic 10. Compounds in Aerosol Time-of-Flight Mass Spectrometry." Analytical Chemistry 72(15):3553–62. doi: 10.1021/ac9910132
Date of last amendment	August 12, 2024

Module designation	**SEDC6085** Organic Chemistry Natural Resource
Semester(s) in whch the module is taught	5th Semester and 7th Semester
Person responsible for the module	Prof. Dr. Drs. Abdul Gani, M. Si.
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Case methods and Team based project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After actively participating in the lectures (C), students (A) are able to conclude the basic grouping of secondary metabolites based on their structure, classification, nomenclature, uses, and sources (B, C5), thereby being able to apply this knowledge (P4) to classify them accurately (D, A4). 2. After actively participating in the lectures (C), students (A) are able to conclude secondary metabolites based on their biosynthetic pathways, identification and isolation methods, as well as bioassay tests (B, C6), thereby being able to apply this knowledge (P4) to verify them accurately (D, A5).
Content	This course content includes: • Overview of secondary metabolites • Terpenoids, steroids, polyketides, phenylpropanoids, flavonoids, and alkaloids • Structure, classification, and nomenclature • Sources and uses • Biosynthetic pathways • Identification and isolation methods • Bioassay testing
Exams and assessment formats	Team based project and examination

Study and examination requirements	1. Team based project : 50% 2. Midterm Examination: 25% 3. Final Semester Examination 25%
Recommended literature	1. Musman, M. 2017. Kimia Organik Bahan Alam. Edisi 1. Banda Aceh: Syiah Kuala University Press. 2. Robinson, T. 1995. Kandungan Organik Tumbuhan Tinggi. Edisi 6. (Terjemahan Kosasih Padmawinata). Bandung: ITB Press 3. Harborne, J. B. 1987. Metode Fitokimia, penuntun cara modern menganalisis tumbuhan. Terbitan kedua. (Terjemahan Kosasih Padmawinata dan Iwang Soediro). Bandung: ITB Press 4. Manito, P. 1992. Biosintesis Produk Alami. Cetakan Pertama.(Terjemahan Koensoemardiyah). Semarang: Semarang Press 5. Cooper, R. & Nicola, G. 2015. Natural Product Chemistry. New York: CRS Press 6. Gani, A., Adlim, M., Rahmayani, R.F.I., Hanum, L., & Nabila, R. 2024. Preparation and characterization of coconut shell liquid smoke and the properties of preserving tofu. Kuwait Journal of Science, 51: 100289. https://doi.org/10.1016/j.kjs.2024.100289 7. N Saidi, K Awang, M Yahya, 2019, Isolation of Oxoaphorpine Alkaloid from Bark of Cryptocarya Ferrea, Pharmacognosy Journal, 11(4), :782-786, 09753575. 8. Abdul Gani, Erlidawati, Nurmalasari, 2022, Ethnochemistry Study Of The Use Of Plants As Traditional Medicine In The Community Of Samadua District, South Aceh Regency, JKPK (Jurnal Kimia dan Pendidikan Kimia), 7(2), 208-222, 2503-4154. https://jurnal.uns.ac.id/jkpk/article/view/61521 9. Internet
Date of last amendment	August 12, 2024

Module designation	**SEDC6046** Electroanalysis Chemistry
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Ibnu Khaldun, M.Si
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	1. Students are able to explain the fundamental principles of electrochemical reactions used in chemical analysis. 2. Students can identify and distinguish between various electroanalytical techniques such as conductometry, potentiometry, and voltammetry. 3. Students are able to conduct basic electroanalytical experiments in the laboratory and scientifically interpret the results. 4. Students can apply electroanalytical methods in the qualitative and quantitative determination of chemical substances. 5. Students are able to analyze the advantages, limitations, and applications of electroanalytical techniques in environmental, industrial, and biomedical chemistry.

Content	This course content includes: • Fundamental principles of electroanalysis and electrochemical processes • Electroanalytical techniques: conductometry, potentiometry, voltammetry, amperometry, and coulometry • Ion-selective electrodes • Experimental design, data processing, and result interpretation • Applications in environmental, industrial, pharmaceutical, and biomedical fields • Laboratory practice for qualitative and quantitative electrochemical analysis
Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Case methods: 50,3% 2. Quiz: 8,5% 3. Midterm: 8,25% 4. Participatory Activities (Attitude, Discussion, and Presentation): 16,5% 5. Final exam: 16,5%
Recommended literature	1. Bard, A. J., & Faulkner, L. R. (2001). *Electrochemical methods: Fundamentals and applications* (2nd ed.). Wiley. 2. Wang, J. (2006). *Analytical electrochemistry* (3rd ed.). Wiley-VCH. 3. Kissinger, P. T., & Heineman, W. R. (1996). *Laboratory techniques in electroanalytical chemistry* (2nd ed.). CRC Press. 4. Scholz, F. (2010). *Electroanalytical methods: Guide to experiments and applications* (2nd ed.). Springer. 5. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). *Principles of instrumental analysis* (7th ed.). Cengage Learning. 6. Compton, R. G., & Banks, C. E. (2011). *Understanding voltammetry* (2nd ed.). Imperial College Press. 7. Brett, C. M. A., & Brett, A. M. O. (1998). *Electrochemistry: Principles, methods, and applications*. Oxford University Press. 8. Bard, A. J., Parsons, R., & Jordan, J. (Eds.). (1985). *Standard potentials in aqueous solution*. CRC Press. 9. Bond, A. M. (1994). *Modern polarographic methods in analytical chemistry*. CRC Press. 10. Koryta, J., Dvorak, J., & Kavan, L. (1993). *Principles of electrochemistry* (2nd ed.). Wiley.
Date of last amendment	January 13, 2025

Module designation	**SEDC6048** Bioinorganic Chemistry
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Prof. Dr. Adlim, M.Sc
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes of lecture and discussion per week ✔ 120 minutes of structured tasks per week ✔ 120 minutes of independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	Passed basic chemistry courses I and basic chemistry II
Module objectives/intended learning outcomes	1. Students can explain the general classification of biomolecules and porphyrin complexes and their biological functions through independent/group assignments in the context of disease/deficiency/poisoning. 2. Students can explain Hemoglobin, myoglobin, and cytochrome and their biological functions through independent/group assignments in the context of disease/deficiency/poisoning. 3. Students can explain metalloenzymes, nitrogen fixation, and metal/non-metal elements that change biological systems that are harmful to health through independent/group assignments.

Content	This course content includes: • Roles and interactions of inorganic elements in biological systems • Biological functions of metals in the body • Mechanisms of metal interactions with enzymes and proteins • Roles of metals in metabolic processes • Basic concepts of metal biochemistry and molecular mechanisms • Applications of bioinorganic chemistry in health, environment, and technology • Recent developments: metal-based drugs, cancer therapy, and biosensor technology
Exams and assessment formats	written examinations, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Case Assignment: 30% 2. Quiz: 20 % 3. Midterm: 20% 4. Participatory Activities (Attitude, Discussion, and Presentation): 10% 5. Final exam: 20%
Recommended literature	1. Adlim (2009). Kimia Anorganik, Syiah Kuala Press 2. Rosette M. Roat-Malone (2007). Bioinorganic Chemistry, short course, 2nd edition, Wiley-Interscience 3. Ivano Bertini, Harry B. Gray, Stephen J. Lippard, and Joan Selverstone Valentine (2024), Bioinorganic Chemistry, Libretex 4. Robert R. Crichton (2008). Biological Inorganic Chemistry An Introduction, Amsterdam, Elsevier
Date of last amendment	January 13, 2025

Module designation	**SEDC6050** STEAMC in Chemistry
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Prof. Dr. Adlim, M.Sc
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, case methods,
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes of lecture and discussion per week ✔ 120 minutes of structured tasks per week ✔ 120 minutes of independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	Passed basic chemistry courses I and basic chemistry II
Module objectives/intended learning outcomes	1. Students can explain the core concepts of STEAMC and its role in multidisciplinary innovation through independent/group assignments in the context of community needs and school learning. 2. Students can integrate character values such as integrity, responsibility, and cooperation in every learning process and develop critical, analytical, and creative thinking skills to produce innovative and ethical work through independent/group assignments in the context of community needs and learning at school. 3. Students apply creative approaches based on science, technology/art to solve STEAMC-based problems through group assignments in the context of community needs and learning at school.
Content	This course content include: • Multidisciplinary integration of Science, Technology, Engineering, Art, Mathematics, and Character (STEAMC) • Critical, creative, and ethical thinking skills • Problem-solving for complex real-world issues • Development of innovative, data-driven, and technology-based solutions • Integration of aesthetic aspects, cultural values, and moral considerations

Exams and assessment formats	Project assignment, case studies, student presentations, and guided class discussions
Study and examination requirements	1. Regular assignment: 25 % 2. Case assignment : 25 % 3. Project Assignment : 50%
Recommended literature	1. Introduction to STEAMC (Definition and philosophy of STEAMC, The importance of an interdisciplinary approach in education, Implementation of STEAMC in formal and non-formal education curricula). (1-2) 2. Character in STEAMC (Ethical values in science, technology, and art; 21st-century competencies: critical thinking, communication, collaboration, and creativity; Character building: social and environmental responsibility) (3-4) 3. Art (Creativity in STEAMC: visual arts, music, design, and media, Collaboration between art and science and technology (e.g., data visualization or digital art), Project examples: creating art based on scientific or technological concepts) (5) 4. Science in STEAMC (Basic principles of science: exploration and experimentation, Examples of science applications in everyday life, Examples of science-based projects (e.g., simple technology experiments related to chemistry as much as possible) (6-7) 5. Technology in STEAMC (The role of technology in modern life Introduction to the latest technologies (e.g., AI, IoT, or VR), Use of technological devices in STEAMC learning (8) 6. Engineering (Basic principles of engineering: design, prototyping, and innovation, Engineering-based problem-solving, Projects: creating simple tools based on physics or engineering concepts) (9) 7. Mathematics in STEAMC (Mathematics as the universal language of science and technology, Applications of mathematics in data analysis and problem solving, Case studies: mathematical simulation or modeling in real projects (10) 8. Integrated STEAMC Projects (Solving real-world problems using a STEAMC approach, Multidisciplinary team collaboration, Project presentations: developing communication and critical thinking skills (11-15) 9. Evaluation and Reflection (Reflection on the learning process, Project evaluation and competency mastery, STEAMC-based self-development planning
Date of last amendment	January 13, 2025

Module designation	**SEDC6052** Innovative Learning Design
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Drs. Rusman, M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	1. After completing lectures with student-centred learning and appropriate strategies, students can integrate their knowledge of chemistry, pedagogy, and ICT into innovative chemistry learning in accordance with the characteristics of the students. 2. After completing the course through the Case Method and PjBL, students are able to produce plans and evaluate innovative and adaptive chemistry learning in accordance with the characteristics of the material (content knowledge) and the characteristics of the students, learning approaches, learning resources, learning media (pedagogical knowledge), and relevant information and communication technology (technological knowledge).
Content	This course content includes: • Characteristics and principles of innovative learning • Scope of content, learning indicators, and learning objectives • Development of innovative learning ideas • Selection and implementation of innovative learning models and strategies • Development of learning tools and simulation practice • Product evaluation, feedback, and revision of innovative learning designs

Exams and assessment formats	Case method, assignment, and team based project
Study and examination requirements	1. Case method: 20% 2. Assignment: 32% 3. Project: 48%
Recommended literature	1. Handayani, S. M., & Sri, U., Megasari, R. 2020. Strategi Pembelajaran Ekonomi Model-model Pembelajaran Inovatif di Era Revolusi Industri 4.0. Malang: Literindo Berkah Karya. 2. Ibnu B.T. 2014. Mendesain Model Pembelajaran Inovatif, Progresif dan Kontekstual. Jakarta: Prenadamedia Group. 3. Nurdyansyah. 2019. Media Pembelajaran Inovatif. Surabaya: UMSIDA Press. 4. Nurdyansyah & Fahyuni, E.F. 2016. Inovasi Model Pembelajaran. Sidoarjo: Nizamia Learning Center. 5. Pribadi, B. A. 2011. Model ASSURE untuk Mendesain Pembelajaran Sukses. Jakarta: PT Dian Rakyat. 6. Sharan, S. 2014. The Handbook of Cooperative Learning. Yogyakarta: Istana Media. 7. [Rosyid, A. & Mubin, F. 2024. Pembelajaran Abad 21: Melihat Lebih Dekat Inovasi dan Implementasinya dalam Konteks Pendidikan Indonesia. Tarbawi, 7(1): 1-12. 8. Saleh, M., Hasim, E., & Smith, M. 2024. Implementasi Model-Model Pembelajaran Inovatif Abad 21 di Sekolah Dasar. Jurnal Pendidikan Masyarakat dan Pengabdian. 4(1): 35-44.
Date of last amendment	January 13, 2025

Module designation	**SEDC6054** Chemistry Of Essential Oils
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Prof. Dr. Drs. Abdul Gani, M. Si.
Language	Indonesian
Relation to curriculum	Elective Course
Teaching methods	Case methods and Team based project
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After actively participating in the lectures (C), students (A) are able to analyze essential oils, including their definition, uses, economic value, isolation methods, analytical techniques of physicochemical properties, and identification of their chemical components (B, C5), thereby being able to apply them (P4) for proper development (D, A4). 2. After actively participating in the lectures (C), students (A) are able to draw conclusions about essential oils in terms of source plants, production, quality, chemical components, uses, isolation, and modification of the main components of patchouli, citronella, ylang-ylang, galangal, nutmeg, clove/lawang, vetiver, agarwood, and/or eucalyptus oils (B, C6), thereby being able to apply them (P4) to verify them accurately (D, A5).
Content	This course content includes: • Definition, uses, and economic value of essential oils • Isolation and analytical techniques • Physicochemical properties and chemical components • Source plants, production, and quality • Applications and modification of major components (patchouli, citronella, ylang-ylang, galangal, nutmeg, clove, vetiver, eucalyptus)

Exams and assessment formats	Team based project and examination
Study and examination requirements	1. Team based project : 50% 2. Midterm Examination: 25% 3. Final Semester Examination 25%
Recommended literature	1. Lawless, Julia. 2013. The encyclopediaof essential oils. Red Wheel 2. Baser, K.H.C, and Buchbauer, G. 2010. Handbook of Essential Oils: Sciences, Technology, and Application. Boca Raton: CRC Press 3. Sastrohamidjojo, H. 2004. Kimia Minyak Atsiri, Yogyakarta: Gadjah Mada University Press 4. Kubeczka, K.H.& Formacek, V. 2002. Essential Oils Analysis by Capillary Gas Chromatography & Carbon-13 NMR Spectroscopy. West Sussex: John Wiley & Son, Ltd. 5. De Silva, K, T. 1995. A Manual on The Essential Oil Industry. Austria: United Nations Industrial Development Organization Vienna 6. Parry, E.J. 1921. The Chemistry of Essential Oils and Artificial Perfumes, Volume I & II. London: Scott, Greenwood and Son Abdul Gani, Erlidawati, Nurmalasari, 2022, Ethnochemistry study of the use of plants as traditional medicine in the community of Samadua District, South Aceh Regency, JKPK (Jurnal Kimia dan Pendidikan Kimia), 7(2), 208-222, 2503-4154. https://jurnal.uns.ac.id/jkpk/article/view/61521 7. Internet
Date of last amendment	January 13, 2025

Module designation	**SEDC6056** Industrial Biochemistry
Semester(s) in which the module is taught	6th Semester
Person responsible for the module	Dr. Rahmad Rizki Fazli, S.Pd., M.Si.
Language	Indonesian, English (for lecture material)
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, Case methods.
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured tasks per week ✔ 120 minutes learn to be independent per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. After completing the lecture process which is carried out actively, students are able to accurately analyze (B, C4) the industrialization of biochemical products, the industrialization of biotechnology products, get to know Biofarma and the products produced by Biofarma, so that they are able to develop (P4) the skills to implement the bioindustrial knowledge obtained in everyday life (A4) independently, accurately and measurably. 2. After completing the lecture process which is carried out actively, students are able to accurately analyze (B, C4) about PT Paragon, PT Paragon derivative products, job opportunities at PT Paragon and PT Biofarma, so that they are able to develop (P4) skills in implementing the bioindustry knowledge obtained in daily life (A4) independently, accurately and measurably.
Content	This course is given to strengthen students' knowledge in understanding Introduction to Industrial Biochemistry, PT Biofarma, PT Paragon, PT Biogen Scientific, PT Bioplast, Career Opportunities at PT Paragon and PT Biofarma, Getting to Know the Beauty Industry, Drugs Industry, Plastic Industry, and Rubber Industry. Students are expected to think critically, be confident, and be disciplined in solving the questions and problems given.

Exams and assessment formats	case methods and task
Study and examination requirements	1. Case methods: 80% 2. Task: 20%
Recommended literature	1. Voet, D., Voet, J. G., & Pratt, C. W. (2016). Fundamentals of Biochemistry: Life at the Molecular Level (5th ed.). Hoboken, NJ: John Wiley & Sons. 2. Nelson, D. L., & Cox, M. M. (2017). Lehninger Principles of Biochemistry (7th ed.). New York: W. H. Freeman and Company. 3. Mathews, C. K., van Holde, K. E., Appling, D. R., & Anthony-Cahill, S. J. (2013). Biochemistry (4th ed.). Boston: Pearson. 4. Shuler, M. L., & Kargi, F. (2017). Bioprocess Engineering: Basic Concepts (3rd ed.). Upper Saddle River, NJ: Prentice Hall. 5. Bailey, J. E., & Ollis, D. F. (1986). Biochemical Engineering Fundamentals (2nd ed.). New York: McGraw-Hill. 6. Scragg, A. H. (2005). Biotechnology for Engineers: Biological Systems in Technological Processes. New York: Taylor & Francis. 7. Stanbury, P. F., Whitaker, A., & Hall, S. J. (2016). Principles of Fermentation Technology (3rd ed.). Oxford: Butterworth-Heinemannl. 8. SA Akbar, AN Lestari, RR Fazli, G Gunawan. (2025). Harnessing macroalgae for heavy metal phytoremediation: a sustainable approach to aquatic pollution control. BIO Web of Conferences.
Date of last amendment	January 13, 2025

Module designation	**SEDC6058** Virtual Chemistry
Semester(s) in which the module is taught	6th semester
Person responsible for the module	Dr. Muhammad Nazar, S.Pd., MSCST
Language	Indonesian, English
Relation to curriculum	Elective Course
Teaching methods	Lecture, small group discussion, recitation, project-based learning
Workload (incl. contact hours, self-study hours)	2 x 45 hours per semester, comprising: ✔ 100 minutes lecture and discussion per week ✔ 120 minutes structured task per week ✔ 120 minutes independent learning per week
Credit points	2 SKS = 3.34 ECTS (90 hours)
Required and recommended prerequisites for joining the module	no prerequisites
Module objectives/intended learning outcomes	1. Through project-based learning, students develop skills in using various virtual chemistry platforms accurately and responsibly. 2. Through project-based learning, students are able to produce virtual chemistry learning tools based on digital platforms appropriately and effectively.
Content	This course trains students to be able to use various virtual platforms and produce virtual chemistry learning tools based on digital platforms in a relevant manner.
Exams and assessment formats	Project assesment
Study and examination	Team based-project

Recommended literature	Anthony J. Duben (2024), Case Studies in the Virtual Physical Chemistry Laboratory, Springer International Publishing: Switzerland (Unduh Buku) Nazar, Muhammad, Zulfadli, Rahmatillah, Puspita, Kana, Setiawaty, Sri and Sulastri,. "Development of augmented reality as a learning tool to improve student ability in comprehending chemical properties of the elements" *Chemistry Teacher International*, vol. 6, no. 3, 2024, pp. 241-257. https://doi.org/10.1515/cti-2023-0070 https://www.labxchange.org/ https://phet.colorado.edu/ https://www.molinspiration.com
Date of last amendment	January 13, 2025