Faculty Mathematics and Natural Sciences
HASANUDDIN UNIVERSITY

MODULE HANDBOOK

Bachelor Program in Mathematics

2025

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Module Description of University Compulsory Courses

1. Module Description of Islamic Religious Education

Module Name	:	Islamic Religious Education
Module Level	:	Bachelor
Code, if applicable	:	23U01110102
Subtitle, if applicable	:	-
Courses, if applicable	:	Islamic Religious Education
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Haeriyyah, S.Ag., M.Pd.I.
Lecturer(s)	:	Religious Education Lecturer Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching		Self-Directed Learning, Cooperative learning Lecture, Small Group Discussion
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO-1: Students are able to internalize the values of Islamic teachings contained in the basic framework of Islamic teachings; CLO-2: Students are able to analyze religious values and diversity to achieve independent individuals with character with a spirit of social sensitivity;

		CLO-3: Students are able to integrate Islamic teaching values with science and technology based on scientific disciplines both independently and in teams.
Content	:	Students will learn about: 1. Internalization of Islamic religious values 2. Proof of the existence of Allah and the Oneness of God (Tawhid) 3. Actualization of moral values (akhlaq) in daily life 4. Law and Human Rights in Islam 5. The concept of civil society and the welfare of the ummah 6. Religious, cultural, and political diversity in religious, national, and state life 7. Integration of science and technology in accordance with scientific disciplines and Islamic values
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Form of examination: Written exam: Essay Assessment techniques: observation, participation, written test, presentation. Assessment weight: 25% for Assignment, 10% for Presentation, and 65% for Report. Assignments assess students' ability to apply concepts independently, while Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Pendidikan Agama Islam. 2014. Tim Pengajar Universitas Hasanuddin. UPT MKU Universitas Hasanuddin. 2. Direktorat Jenderal Pendidikan Tinggi. 2016. Pendidikan Agama Islam untuk Perguruan Tinggi. Dirjen Pembelajaran dan Kemahasiswaan Kemenristek Dikti Additional: 1. Mukti Ali. 2020. Metode Memahami Agama Islam. Jakarta: Bulan Bintang.

		2. M. Amin Abdullah. 2006. Islamic studies di Perguruan Tinggi: Pendekatan Integratif-Interkonektif. Yogyakarta: Pustaka Pelajar. 3. Maman. 2012. Pola Berpikir Sains: Membangkitkan Kembali Tradisi Keilmuan Islam. Bogor: QMM Publishing. 4. Ismail R. Al-Faruqi & Lois Lamya Al-Faruqi. 1986. The Cultural Atlas of Islam. New York: Macmillan Publishing Company. 5. Seyyed Hossein Nasr. 1994. Menjelajah Dunia Modern: Bimbingan untuk Generasi Muda Muslim. Bandung: Mizan. 6. Saifudin Aman. 2013. Tren Spiritualitas Milenium Ketiga. Jakarta: Ruhama. 7. Nurcholish Madjid. 2008. Islam: Kemodernan dan keindonesiaan. Bandung: Mizan. 8. Hakim, L. (2012). Islam, Pluralitas Agama, dan Pembentukan Masyarakat Madani di Indonesia. Harmoni, 11(1), 26-33. 9. Budhy Munawar-Rachman; Sukidi. (2001). Islam pluralisme: wacana kesetaraan kaum beriman. Jakarta: Paramadina. 10. Hisham Thalbah Syarif Hade Masyah. (2008.). Ensiklopedia mukjizat Al-qur'an dan Hadits. Jakarta: Sapta Sentosa. 11. Agus Pramono. 2021. Perkembangan Ilmu Pengetahuan & Teknologi Dalam Perspektif Islam. Sleman: Deepublish.
Last Updated	:	August 1st, 2024

2. Module Description of Catholic Religious Education

Module Name	:	Catholic Religious Education
Module Level	:	Bachelor
Code, if applicable	:	23U01110202
Subtitle, if applicable	:	-
Courses, if applicable	:	Catholic Religious Education
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Drs. Fredryk Welliam Mandey, M.Sc.
Lecturer(s)	:	Religious Education Lecturer Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching		Collaborative learning, Cooperative learning Lecture, Small Group Discussion, Self-Directed Learning
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO-1: Students are able to consistently integrate the unity between their Catholic faith and actions in daily life; CLO-2: Students are able to implement the concepts, values, teachings, and traditions of the Catholic faith in everyday life; CLO-3: Students are able to integrate the values, teachings, and traditions of the Catholic faith in contributing to

		the resolution of strategic issues in community and national life.
Content	:	Students will learn about: 1. The Nature, Foundation, Objectives, and Benefits of Catholic Religious Education in Higher Education 2. Basic Concepts of Religion and Faith 3. The Revelation–Faith Relationship between God and Humanity 4. Holy Scripture (the Bible): God's Work of Salvation Beginning with the People of Israel (Old Testament) and Reaching Its Fulfillment in Jesus (New Testament) 5. The Catholic Church 6. The Sacraments in the Catholic Church 7. Faith in Society: Interreligious Dialogue from the Perspective of Catholic Faith 8. Morality and Professional Ethics from the Perspective of Catholic Faith 9. Issues of Science, Technology, and the Environment in the View of the Catholic Church 10. Economic, Social, Political, and Societal Issues: Catholic Social Teaching
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Assessment techniques: observation, participation, presentation. Assessment weight: 65% for Report and 35% for Presentation. Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Kotan, D.B. 2021. Menjadi Saksi Keselamatan – Buku Ajar MK Pendidikan Agama Katolik PTU, Komisi Kateketik KWI, Penerbit OBOR Jakarta Additional: 1. Kahya, KB. 2007. Materi Pokok Pendidikan Agama Katolik, Komisi Kateketik Keuskupan Agung Makassar 1995. Katekismus Gereja Katolik, Penerbit Nusa Indah, Ende

		2. Hardawiryana, R (penerjemah). 2017 (cetakan.13). Dokumen Konsili Vatikan II, Penerbit OBOR Jakarta 3. Hardawiryana, R. 2014 (cetakan.3). Katekismus Gereja Katolik, Penerbit Nusa Indah, Ende. Kompendium Ajaran Sosial Gereja, Penerbit Kanisius, Yogyakarta
Last Updated	:	May 13rd, 2023

3. Module Description of Protestant Religious Education

Module Name	:	Protestant Religious Education
Module Level	:	Bachelor
Code, if applicable	:	23U01110302
Subtitle, if applicable	:	-
Courses, if applicable	:	Protestant Religious Education
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Ir. Insan Sosiawan Lepongbulan, M. Th, MM., M.Min
Lecturer(s)	:	Religious Education Lecturer Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching		Collaborative learning, Interactive Lecture, Group Discussion, Self-Directed Learning
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO-1: Students are able to internalize Protestant religious values as independent individuals of strong character; CLO-2: Students are able to articulate Protestant religious values in order to become independent individuals of strong character; CLO-3: Students are able to think critically, systematically, and innovatively, uphold integrity, communicate effectively,

		and work independently as well as collaboratively in a team.
Content	:	Students will learn about: 1. Religious Knowledge and Interreligious Harmony 2. Humanity and Sin 3. Salvation 4. New Life and the Growth of Faith 5. Morality and Ethics 6. Good Social Interaction 7. Guardians of God's Creation 8. The Relationship between Christian Faith and Science, Technology, and the Arts 9. Religion and Society 10. Religion and Culture 11. Religion and Politics 12. Religion and Law
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Assessment techniques: observation, participation, presentation. Exam format: Written test Assessment weight: 50% for Individual Assignment, 5% for Report, 5% for Presentation, 40% for Written Exam. Assignments assess students' ability to apply concepts independently, while Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Lembaga Alkitab Indonesia, 2008. ALKITAB. Jakarta: LAI. 2. Kementerian Riset, Teknologi dan Pendidikan Tinggi Republik Indonesia. 2016. Pendidikan Agama Kristen untuk Perguruan Tinggi. Cetakan I. Jakarta: Direktorat Jenderal Pembelajaran dqn Kemahasiswaan kementrian Riset, Teknologi, dan Pendidikan Tinggi Republik Indonesia.

		3. Harun Hadiwijono, 2001. Iman Kristen. Jakarta: PT. BPK GUNUNG MULIA. 4. Magnis Suseno, Frans., Etika Dasar, Kanisius, Yogyakarta 1987. 5. Universitas Terbuka, 2019., Pendidikan Agama Kristen Additional: 1. Niyoko, 2017. Pendidikan Agama Kristen Untuk Perguruan Tinggi. Cetakan 1. Yogyakarta: Taman Pustaka Kristen Indonesia. 2. Niftrik,G.C.Van& Boland, B.J.,1987. Dogmatika Masakini, Jakarta:BPK.Gunung Mulia. 3. Eriyani Mendrofa., "Iptek dan Teologia". Makalah 4. Khaza Savitra "Cara Mudah Bergaul", Makalah
Last Updated	:	May 13rd, 2023

4. Module Description of Hindu Religious Education

Module Name	:	Hindu Religious Education
Module Level	:	Bachelor
Code, if applicable	:	23U01110402
Subtitle, if applicable	:	-
Courses, if applicable	:	Hindu Religious Education
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	I Ketut Mundra,S.Ag
Lecturer(s)	:	Religious Education Lecturer Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching		Cooperative learning, Collaborative Learning, Small Group Discussion, Self-Directed Learning
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO-1: Students are able to internalize the values of the Vedic teachings contained in the fundamental framework of Hinduism; CLO-2: Students are able to analyze religious and diversity values to build a prosperous life; CLO-3: Students are able to integrate the values of Hindu teachings with a culture of critical thinking, transparency, hard work, and justice.

Content	:	Students will learn about: 1. Bhagavad Gita 2. Sarasamuccaya 3. Manawa Dharmasastra 4. Sawtikarana 5. Canakya Nitisastra 6. Veda Sabda suci Veda 7. Grhasta Asrama 8. Makna hari raya suci Hindu 9. Intisari Veda 10. Arthasastra 11. Kekawin Nitisastra 12. Guidelines for Interreligious Harmony in Hinduism 13. Panca Yajna
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Assessment techniques: observation, participation, presentation. Exam format: Written test Assessment weight: 45% for Presentation and 55% for Report Reports measure analytical and writing skills and presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Altogether, these components account for 100% of the final grade.
Reading list	:	Pendidikan Agama Hindu untuk Perguruan Tinggi
Last Updated	:	May 24th, 2023

5. Module Description of Buddhist Religious Education

Module Name	:	Buddhist Religious Education
Module Level	:	Bachelor
Code, if applicable	:	23U01110502
Subtitle, if applicable	:	-
Courses, if applicable	:	Buddhist Religious Education
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Hasdy, S.Si, M.Si.
Lecturer(s)	:	Religious Education Lecturer Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching		Cooperative learning, Group Discussion
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO-1: Students are able to demonstrate the ability to think critically, act rationally, and adapt dynamically; CLO-2: Students are able to have a broad perspective as a Buddhist and an intellectual; CLO-3: Students are able to guide students as intellectual models of Buddhists to become scientists with personalities that uphold humanity.
Content	:	The Buddhist Religious Education course covers core topics related to the study of Divinity, Humanity, Law, Morality,

		Religion and Science-Technology, Harmony, Society, Culture, and Politics.
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Assessment techniques: observation, participation, presentation. Exam format: Written test Assessment weight: 45% for Presentation, 10% for Report, 45% for Written Exam. Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Arya Tjahyadi. 1994. Buddha Dhamma dan Sains. Surabaya: Yayasan Dhammadlpa Arama. 2. Dhammika, Shravasti. 1996. Good guestion Good Answers. Diterjemahkan oleh Surja Handaka Vijjanan'da. Surabaya: Yayasan Dhammadipa Arama 3. Hasdy, S.Si., M.Si. 2012. Pendidikan Agama Buddha untuk Mahasiswa. Makassar: Dosen Pendidikan Agama Buddha Provinsi Sulawesi Selatan. 4. Kirthlsinghe, Buddhadasa P. (ed). 1994. Agama Buddha dan ilmu Pengetahuan. Diterjemahkan oleh R. Sugiarto. Jakarta: Aryasuryacandra. 5. Mukti, Krlshanda W. 2003. Wacana Buddha Dharma. 3akarta: Yayasan Dharma Pembangunan 6. Narada. 1996. Fiang Buddha dan Ajaran-ajaran-Nya 2. Jakarta: Yayasan Dhammadipa Arama. Additional: 1. P.A. Payutto. 2005. Ekonomi Buddhis: Jalan Tengah untuk Dunia Usaha. Diterjemahkan oleh R. Surya Widya. Jakarta: PP Nagabudhi 2. Piyadassl, Mahathera. 2003. Spektrum AJaran Buddha. Diterjemalikan oleh Hatih Rusll, Vlvl, dan Titin Negsi. 3akarta: Yayasan Pendldikan Buddhls Tri Ratna

		3. Rashid, Teja. 199 7. Sila dan 7iriaya. 3akarta: Penerbit Buddhis Bodhi. 4. Sri Dhammananda. 2002. Keyakinan Umat Buddha. Pustaka Karaniya. 5. Wowor, CorneJes. 1996. Ketuhanan Yang Maha Esa dalam Agama Buddha, Jakarta 6. Akademi Buddhis Nalanda. dkk. 200G. Acuan Pembelajaran Mata Kuliah Pendidikan Agama Buddha di Perguruan Tinggi Umum. Jakarta: Departemen Pendidikan Nasional Direktorat Jenderal Pendidikan Tinggi
Last Updated	:	August 1st, 2023

6. Module Description of Pancasila

Module Name	:	Pancasila
Module Level	:	Bachelor
Code, if applicable	:	23U01110702
Subtitle, if applicable	:	-
Courses, if applicable	:	Pancasila
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Dr. Safriadi, SIP., M.Si
Lecturer(s)	:	Pancasila Lecturer Team UPT-MKU
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching		Teaching methods: group discussion, problem-based learning, lecture Teaching forms: lecture
Contact Hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): After completing the Sampling Techniques course for one semester, Students will able to: ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objectives (CLO): CLO-1. Students are able to internalize the values of diversity as independent people with character. CLO-2. Students are able to describe the values of diversity to achieve independent people with character.
Content	:	Students will learn about:

		1. Pancasila Education in College 2. Pancasila in history Indonesian nation 3. Pancasila as a system Philosophy 4. Pancasila as a basis Country 5. Pancasila as State Ideology 6. Pancasila as the construction paradigm 7. Pancasila as a system Ethics
Study and examination requirements	:	Study and examination requirements: 1. Students must attend 15 minutes before the class starts 2. Students must inform the lecturer if they will not attend the class due to sickness, an urgent need, etc. 3. Students must submit all class assignments before the deadline 4. Students must switch off/silent all electronic devices 5. Students must the attend the exam to get final grade
Exams and assessment formats	:	Assessment techniques: observation, participation, presentation. Assessment weight: 20% for Assignment, 50% for Report and 30% for Presentation. Assignments assess students' ability to apply concepts independently, while Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: Directorate General of Higher Education, 2016. Teaching Materials for Pancasila Education Course. Jakarta: Directorate of Learning and Student Affairs. Support: 1. Notonagoro. 1994. Pancasila in Popular Science. Jakarta: Bumi Aksara. 2. Kaelan. 2000. Pancasila Education. Yogyakarta: Paradigma. 3. Yudi Latif. 2017. The Plenary State. Jakarta: Gramedia 4. Anwar Arifin. 2018. Pancasila The Middle Ideology without Opposition. Jakarta: Nufa Citra Mandiri.
Last Updated	:	August 6th, 2025

7. Module Description of Indonesian Language

Module Name	:	Indonesia Language
Module Level	:	Bachelor
Code, if applicable	:	23U01110902
Subtitle, if applicable	:	-
Courses, if applicable	:	Indonesia Language
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Dr. Hj. Indarwati, S.S., M.Hum.
Lecturer(s)	:	Indonesian Language Course Teaching Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching,		Teaching methods: group discussion, collaborative learning. Teaching forms: lecture
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO-1: Students are able to demonstrate pride in using the Indonesian language for national and international communication related to religious, national, diversity, and maritime values, with social sensitivity, perseverance, and entrepreneurial spirit. CLO-2: Students are able to identify and recognize religious, national, and diversity values.

		CLO-3: Students are able to think critically, systematically, and innovatively; demonstrate integrity; communicate effectively; and work independently or in teams in producing scientific papers.
Content	:	Students will learn about: 1. History, status, and functions of the Indonesian language 2. Varieties of the Indonesian language 3. Enhanced Spelling System (Ejaan Yang Disempurnakan – EYD) 5th Edition 4. Effective sentences 5. Paragraph development 6. Planning of scientific writing (topic, title, and outline) 7. Writing scientific papers (articles, papers, proposals) 8. Citation system and bibliography
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade. Form of examination: Written exam: Essay
Exams and assessment formats	:	Assessment techniques: observation, participation, written test. Assessment forms: assignment, written exam. Assignment = 75%, Written Exam= 25% CLO 1 => ILO 8: 25% (Written Exam: written test) CLO 2 => ILO 5: 25% (Assignment: participation) CLO 3 => ILO 5: 30% (Assignment: participation) CLO 4 => ILO 8: 20% (Assignment: observation) Assignments assess students' ability to apply concepts independently. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Anggaraini, Asih, dkk.2006. Mengasah Keterampilan Menulis Ilmiah di Perguruan Tinggi. Yogyakarta: Graha Ilmu. 2. Abidin, Yunus, dkk. 2017. Kemahiran Berbahasa Indonesia untuk Perguruan Tinggi. Bandung: PT Bumi Aksara.

		3. Chaer, Abdul. 2016. Tata Bahasa Praktis Bahasa Indonesia. Jakarta: Rineka Cipta. 4. Direktorat Jenderal Pendidikan Tinggi Kementerian Pendidikan dan Kebudayaan Republik Indonesia. 2013. Modul Mata Kuliah Bahasa Indonesia. Jakarta 5. Finoza, Lamuddin. 2001. Komposisi Bahasa Indonesia. Jakarta: Diksi Insan Mulia. 6. Kurniawan, Khaeruddin. 2012. Bahasa Indonesia Keilmuan untuk Perguruan Tinggi. Bandung: PT Refika Aditama. 7. Nurjamal, Daeng, Warta Sumirat, dan Riadi Darwis.2014. Terampil Berbahasa. Bandung: Alfabeta. 8. Sri Nugraheni, Aninditya dan Muhammad Rohmani. 2011. Belajar Bahasa Indonesia: Upaya Terampil Berbicara dan Menulis Karya Ilmiah. Surakarta: Cakra Media. 9. Wiyanto, Asul. 2004. Terampil Menerapkan Kaidah Ejaan Bahasa Indonesia. Jakarta. Grasindo. 10. Widjono H. S. 2005. Bahasa Indonesia. Jakarta: PT Grasindo. Support: 1. Alwi, Hasan, dkk. 2000. Tata Bahasa Baku Bahasa Indonesia: Edisi Ketiga. Jakarta: Departemen Pendidikan dan Kebudayaan. 2. Arifin, E. Zainal. 2006. Dasar-dasar Penulisan Karya Ilmiah. Jakarta: PT Grasindo. 3. Arifin, E. Zainal & S. AmranTasai. 2008. Cermat Berbahasa Indonesia: untuk Perguruan Tinggi. Jakarta: Akademika Pressindo. 4. Departemen Pendidikan Nasional. 2022. Pedoman Umum Ejaan Bahasa Indonesia edisi V dan Pedoman Umum Pembentukan Istilah. Jakarta: Pusat Bahasa
Last Updated	:	August 1st, 2025

8. Module Description of Civics

Module Name	:	Civics
Module Level	:	Bachelor
Code, if applicable	:	23U01110802
Subtitle, if applicable	:	-
Courses, if applicable	:	Civics
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Rahmatullah, SIP., M.Si., Dr. Safriadi, SIP., M.Si.
Lecturer(s)	:	Civic Course Teaching Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching		Group discussion, collaborative learning, lecture, tutorial
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO 1: Students are able to internalize national values as independent individuals with strong character. (ILO-8) CLO 2: Students are able to analyze national values in order to develop themselves as independent individuals with strong character. (ILO-8) CLO 3: Students are able to demonstrate citizenship skills in a critical, systematic, innovative, and ethical manner; communicate effectively; and work both independently

		and collaboratively by applying humane science and technology. (ILO-9)
Content	:	Students will learn about: 1. Civic Education in Higher Education 2. National Identity and Integration 3. Constitutional System 4. Rights and Obligations of Citizens 5. Rule of Law and Corruption Crimes 6. Indonesia's Geopolitics and Geostrategy 7. Democracy and Human Rights
Study and examination requirements	:	Study and examination requirements: 1. Students must attend 15 minutes before the class starts 2. Students must inform the lecturer if they will not attend the class due to sickness, an urgent need, etc. 3. Students must submit all class assignments before the deadline 4. Students must switch off/silent all electronic devices 5. Students must the attend the exam to get final grade
Exams and assessment formats	:	Assessment techniques: observation, participation, written test. Assessment forms: written exam, presentation, assignment. Assignments assess students' ability to apply concepts independently. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. The Written Exam assess comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Nurwardani, et al. (2016). Civic Education for Higher Education. Jakarta: Directorate General of Learning and Student Affairs, Ministry of Research, Technology, and Higher Education of the Republic of Indonesia. Support: 1. Civic Education Lecturer Team. (2014). Civic Education Learning Module. UPT MKU Unhas. 2. Sammy Ferrijayan, et al. (2014). National Insight and Basic Values of National Defense Module. Indonesian Institute of Public Administration.
Last Updated	:	August 6th, 2025

9. Module Description of English

Module Name	:	English
Module Level	:	Bachelor
Code, if applicable	:	23U01111102
Subtitle, if applicable	:	-
Courses, if applicable	:	English
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Andi Inayah Soraya, S.S., M.Hum
Lecturer(s)	:	Team teaching of English Course for General Courses
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 2nd semester
Type of teaching		Lecture, individual task, Cooperative and Collaborative Learning.
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO-1: Students are able to demonstrate an advanced understanding of basic pure and simple applied mathematics. ILO-8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO-9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO-1: Students are able to internalize academic values, norms, and ethics in improving the quality of life and contributing to the advancement of society, the nation, the state, and civilization. (ILO-8) CLO-2: Students are able to construct English sentences in accordance with proper grammatical rules. (ILO-9)

		CLO-3 Students are able to analyze information contained in English texts. (ILO-9) CLO-4: Students are able to communicate effectively in English, both in academic contexts and in everyday situations. (ILO-9)
Content	:	Students will learn about: 1. Concept and Importance of English Communication 2. Parts of Speech 3. English Tenses 4. Reading Strategies 5. Expressing Ideas in English 6. English Public Speaking Activities
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get a final grade.
Exams and assessment formats	:	Assessment techniques: observation, participation, performance, written test. Assessment forms: quiz, written exam, assignment. Assessment weight: 35% for Assignment, and 65% for Quiz, Written Exam Assignments assess students' ability to apply concepts independently. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	1. Team Teaching. 2022. Modul 1 English Language. Universitas Hasanuddin. 2. Team Teaching. 2022. Modul 2 English Language. Universitas Hasanuddin. 3. Team Teaching. 2022. Modul 3 English Language. Universitas Hasanuddin. 4. Team Teaching. 2022. Modul 4 English Language. Universitas Hasanuddin. 5. Team Teaching. 2022. Modul 5 English Language. Universitas Hasanuddin. 6. Team Teaching. 2022. Modul 6 English Language. Universitas Hasanuddin. 7. Team Teaching. 2022. Semester Based Course Plan. Universitas Hasanuddin

8. Boukhatem, A., 2019. Teaching Vocabulary Through Non-Verbal Communication. Abdalhamid Ibn Badis University of Mostaganem Faculty of Foreign languages Department of English
9. Rao, PS., 2019. The Role of Engslih as Global Language. King Faisal Univeristy. https://www.researchgate.net/publication/334282978_THE_ROLE_OF_ENGLISH_AS_A_GLOBAL_LANGUAGE
10. Pandarangga, S., 2015. The transformation of English as Global Language in The World. https://ejournal.uin-malang.ac.id/index.php/humbud/article/view/3132
11. Ahmad, Imtiaz. 2022. *Concise Guide English Grammar Parts of Speech*. Dera Ghazi Khan: Ghazi University Press.
12. Idaryani. 2015. *Bahasa Inggris untuk Perguruan Tinggi*. 1st Ed., Aceh Utara: Unimal Press.
13. Sarbunan, Thobias. 2020. *16 Tenses dalam Bahasa Inggris*. Ambon: Institut Agama Kristen Ambon (https://www.researchgate.net/publication/343218802_16-tenses-dalam-bahasa-inggris)
14. Mikulecky, Beatrice S. & Jeffries, Linda. 2007. Advanced Reading Power. Pearson Education: New York.
15. Mikulecky, Beatrice S. & Jeffries, Linda. 1996. More Reading Power. Longman: USA.
16. Chivers, Barbara & Shoolbred, Michael. 2007. *A Student's Guide to Presentations*. Sage Publications: London
17. Grussendorf, Marion. 2011. *English for Presentations.* Oxford University Press: Oxford.
18. Powell, Mark. 2002. *Presenting in English: How to Give Successful Presentations*. Thomson Heinle: Croatia.
19. Sullivan, Richard L. & Wircenski, Jerry L. 2010. *Technical Presentation Workbook Winning Strategies for Effective Public Speaking*. Asme Press: New York.
20. University of Birmingham Library Services. A Short Guide to Presentation Skills. www.intranet.birmingham.ac.ud/asc
21. Carnegie, D. and Esenwein, J.B., 2017. *The art of public speaking*. Courier Dover Publications.
22. Nikitina, A., 2011. *Successful public speaking*. Bookboon.
23. Beebe, S.A. and Beebe, S.J., 2010. *Public speaking handbook*. Allyn & Bacon.

Last Updated	:	Juni 5th, 2023

10. Module Description of Maritime Social Culture Insight

Module Name	:	Maritime Social Culture Insights
Module Level	:	Bachelor
Code, if applicable	:	23U02130101
Subtitle, if applicable	:	Indonesian Language (Bahasa Indonesia)
Courses, if applicable	:	-
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Dr. Nur Umriani Permatasari, S.Si.,M.Si.
Lecturer(s)	:	Maritime Social Culture Insights Lecturer Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in 1st semester
Type of teaching	:	Teaching methods: group discussion, collaborative learning, problem-based learning. Teaching forms: lecture, tutorial
Contact hours		100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO 8: Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO 9: Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): Ability to explain the geographical condition of an archipelagic country including islands, waters, potential of marine biological and nonbiological resources utilized for public welfare, jurisdictional boundaries in national and international contexts, maritime history, and explain patterns of socio-economic relations of maritime communities in local and ethnic, cross island and ethnic, national and global contexts, the living

		conditions of residents of coastal villages and islands with the main types of maritime economy, analyze the social function of maritime cultural elements as a glue for people from various regions of origin, across ethnic groups, and across nations to live together, and Upholding the values of coexistence and openness maintained by maritime communities in various parts of the world. Sub CLO ILO 9 → CLO 1: Understanding maritime socio-cultural knowledge. ILO 8 → CLO 2: Working together as social beings. ILO 9 → CLO 3: Promote the fulfillment of maritime cultural values. ILO 8 → CLO 4: Utilizing maritime resources and environment.
Content	:	Students will learn about: 1. Introduction, learning contract, and explanation of the scope of the Maritime Socio-cultural Insight Court 5. Vision and Conception of Indonesian Maritime Development 6. Geographical condition of the Archipelago/Kep. Indonesia, including climate and seasonal patterns, and potential of biological and non-biological resources 7. Maritime history from the days of the Maritime Kingdom of the Archipelago to the time of Indonesia's independence 8. Demographic potential and Indonesia's maritime economic sector 9. Maritime society and its categorization 10. Maritime culture, its elements, and social functions 11. Maritime socio-cultural values that are cored in the order of living together
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Assessment techniques: observation, participation, written test Assessment forms: written exam, assignment, presentation Assesment weight: ILO 9 → CLO 1: 10% (Assignment: participation) CLO 3: 30% (Presentation: observation) ILO 8 → CLO 2: 35% (Report) CLO 4: 25% (Assignment: observation)

		Form of examination: Written and Quiz exam: Essay Assignments assess students' ability to apply concepts independently. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Lampe, M. 2022. Maritime Textbook: Indonesian Maritime Socio-Cultural Insights. ISBN. 9789795304487. Publisher: Unhas Press. 2. Hankamnas-BPP Technology Council. 1996. BMI (Indonesian Maritime Continent). Jakarta: Directorate of Natural Resource Inventory Technology. 3. Benardie, Hakim SP. 2003. History of Indonesian Maritime Affairs. Marine Policy Assessment Project, Secretary General of the Indonesian Ministry of Marine Affairs and Fisheries. 4. Kasim, S. 2017. Philosophy of Science and Technology Insight (Unhas Textbook). ISBN: 978-602-6332-12-7. Pustaka Pena Press. Makassar. 5. Unhas Science and Technology Outlook Lecturer Team, 2013, Unhas MKU Science and Technology Outlook Textbook, 6th Edition. Unhas, Makassar. 6. Usman, H., et al. 2014. Science and Technology Insight Textbook (Using the Learning Approach). UPT MKU UNHAS. ISBN:978-602-99757-8-9. CV. Gelora Offset Printing. Makassar. Supporting: 1. DKP. 2007. United Nations Convention On The Law of The Sea (UNCLOS, DMI, Jakarta. 2. Gani, Radi A. et al (Compilation Team). 1999. Framework for the Development of Key Scientific Patterns. Hasanuddin University, Makassar. 3. Joko, Pramono. 2005. Maritime Culture. Publisher PT Gramedia Pustaka Utama Jakarta. 4. Lampe, Munsi. 2021. Shipping and the Reproduction of the Maritime Geo-Social-Cultural Unity of the Archipelago/Indonesia: A Focus on Maritime Anthropology Studies. Presented at the Inauguration Ceremony for the Position of Professor in the Field of Maritime Anthropology at the Faculty of Social and Political Sciences, Hasanuddin University, in front of

		the Extraordinary Open Senate Meeting of Hasanuddin University, Tuesday, November 30, 2021, in Makassar. 5. Hamid, Abd. Rahman. 2020. History and Maritime Culture of Indonesia. Yogyakarta: Ombak 6. Paeni, Mukhlis. 1995. Efforts to Understand Maritime Culture. Paper contributed to the Workshop on General Basic Subjects B, Faculty of Literature, Hasanuddin University. 7. Sallatang, Arifin. 1982. Pinggawa-Sawi: A Small Group Study (Dissertation) Hasanuddin University 8. Simangunsong, Bonar. 2015. Indonesia's Future Sea. Jakarta: Gramedia Publisher. 9. Unhas Identity Compilation Team. 2009. Actualization of Identity (Identity) of Hasanuddin University. Makassar. 10. Dadang Ahmad S., 2009. Workshop Material for the UPT MKU Unhas Science and Technology Insight Course (Combined Science and Technology Learning Material), Makassar. 11. Kartono, H. 2003. Environmental Pollution. Directorate General of Higher Education, Ministry of Education and Culture, Jakarta. 12. Kosela, S. 2003. Science and Technology for Human Life. Directorate General of Higher Education, Ministry of Education and Culture, Jakarta. 13. Mappadjantji Amien, 2009. Science and Technology Insight (Philosophy and Conceptual Framework), Workshop Material for the Wastek Course at UPT MKU Unhas, Makassar. 14. Masnur Muchlis, 2011. Character Education, Responding to Multidimensional Crisis Challenges. PT. Bumi Aksara, Second Edition. Jakarta. 15. Stock, Paul and Rob J.F. Burton, Journal of Sustainability, 2011. ISSN 2071-1050, 3, 1090-1113; doi;10.3390/su3081090 16. Suriasumantri, Jujun. 2003. Philosophy of Science: A Popular Introduction. Pustaka Sinar Harapan, Jakarta.
Last Updated	:	June 5th, 2023

11. Module Description of Student Community Service

Module Name	:	Student Community Service
Module Level	:	Bachelor
Code, if applicable	:	23H01132004
Subtitle, if applicable	:	-
Courses, if applicable	:	Student Community Service
Semester(s) in which the module is taught	:	6 (Sixth Semester)
Module coordinator(s)	:	Head of the Study Program
Lecturer(s)	:	1. Student Supervisor 2. Examiners
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Working in the site
Contact hours	:	180 hours per semester
Workload	:	8 weeks of working in the site
Credit points	:	4 (6.4 ECTS)
Requirements according to the examination regulations	:	Participants must be on the location for the specified time (8 weeks) with a presence of more than 80%
Recommended prerequisites	:	Completing at least 110 SKS (176 ECTS)
Module objectives/intended learning outcomes	:	After the completion of this module, participants will gain knowledge, skill and competence as follows: Knowledge: Participants will be able to: 1. Understand of the ways of thinking and how to works interdisciplinary so that participants understand the relation of interdependency and cooperation between sectors; 2. Understand of the application of knowledge, technology and arts that have been learned for the implementation of development; 3. Understand of the difficulty that is faced by society in theimplementation of development. Skill: Participants will be able to act as dynamist and problem solver and increase the reasoning power in study, formulation, and problem solving and work together in team works. Competence:

<table>
<tr><td></td><td></td><td>Participants will be able to doing a directly problem solving that will growing up the professionalism and social care of the participants for the increasing of the expertise, responsibility, and sense of service</td></tr>
<tr><td>Content</td><td>:</td><td>This module covers the process of work learning process, research, professional, local government, participation, and partnership. Work learning process: student community service acts as a media for appliance of theories/concept/ideas from all of knowledge/theory that have been gained by participants in the colleges. Research: learning process in the location of student community service can become an inspiration to do the research. Professional: work interdisciplinary and interdependently of mathematics and natural sciences. Local government: integration program with local government activity. Participation: increasing the independence of society so they can achieve their increasing health and wealth. Partnership: teamwork with all of another field of study.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>General and special debriefing (8%), meeting with supervisor (2%), observation preparation (5%), field observation (10%), preparation of work programs (20%), implementation of work programs (30%), seminar (15%), activities after leaving location (15%).

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Presentation and Report</td></tr>
<tr><td>Reading list</td><td>:</td><td>Rector’s Regulation Number 6/UN4.1/2019.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

Module Description of Basic Science Courses (Compulsory)

1. Module Description of Basic Mathematics I

Module Name	:	Basic Mathematics I
Module Level	:	Bachelor
Code, if applicable	:	23H01110103
Subtitle, if applicable	:	-
Courses, if applicable	:	Basic Mathematics I
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Jusmawati Masalesse, S.Si, M.Math
Lecturer(s)	:	Naimah Aris, S.Si, M.Math & Dr. Andi Muh Anwar, S.Si,
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in first year for Bachelor degree in Mathematics
Type of teaching		Lecture, collaborative learning, group discussion
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours for Learning and Teaching, 47.5 hours for Self Study, and 47.5 hours for Structured Works.
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Students are able to determine solutions to problems related to the concepts of single-variable calculus. CLO 2. Students are able to apply the concepts of calculus and matrices appropriately, effectively, and systematically in various contextual problems relevant to their field of study. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 3
CLO 1	X	
CLO 2		X

<table>
<tr><td>Content</td><td>:</td><td>This course equips students with the fundamentals of single-variable calculus and systems of linear equations through both analytical and visual approaches. The material covers the real number system, functions and graphs, limits and continuity, derivatives and their applications, indefinite and definite integrals, as well as systems of linear equations based on matrices. The learning process emphasizes logical, deductive, and systematic reasoning, while strengthening conceptual understanding through interactive lectures, group discussions, and case studies. Several enrichment topics, such as graph transformations, advanced integration techniques, and solving systems of linear equations using determinants and inverses, may be adjusted according to the needs and depth of the learning outcomes.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are assessed based on the following components: Written Exam (40%) and Assignment and quizzes (60%).

Assignments assess students' ability to apply concepts independently. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Thomas G.B., Weir, M. D. , Hass, J.R.2013. "Thomas Calculus early transcendentals", 13th edition, Pearson.</td></tr>
</table>

		2. James Stewart. 2015. "Single Variable Calculus: Early Transcendentals", Thomson Brooks/Cole. 3. Howard Anton, " Elementary Linear Algebra, Aplications Version," 11th edition, Wiley.
Last Updated	:	August 10th, 2023

2. Module Description of Basic Physics

Module Name	:	Basic Physics
Module Level	:	Bachelor of Mathematics
Code, if applicable	:	23H02110702
Subtitle, if applicable	:	-
Courses, if applicable	:	Basic Physics
Semester(s) in which the module is taught	:	I (First Semester)
Module coordinator(s)	:	Prof. Dr. Paulus Lobo Gareso, M.Sc
Lecturer(s)	:	Team teaching of Basic Physics
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in first semester
Type of teaching		Lecture and Small Group Discussion (SGD)
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works.
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO-1. Students are able to demonstrate an advanced understanding of basic pure and simple applied mathematics. ILO-5. Students are able to construct mathematical modelling with relatively new ideas and present the results orally and in writing. ILO-8. Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO-9. Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objectives (CLO): CLO-1. Students are able to analyze the laws of classical and modern physics using mathematical equations to obtain solutions to physics problems related to the

		concepts of quantities and units, kinematics and dynamics, work and energy, momentum, elasticity, oscillatory motion, fluids and heat (Knowledge) CLO-2. Students are able to demonstrate experiments to obtain data on physical phenomena in accordance with the procedures in the practicum diktat and relate the conclusions of observations to the application (Generic Skill 1) CLO-3. Students are able to describe the application of the concepts of mechanics, work and energy, momentum, elasticity, oscillation, fluid and heat in daily life, industry or technology utilization (Generic Skill 2)
Content	:	Students will learn about: 1. Magnitude, Unit and Dimension 2. Particle Kinematics 3. Particle dynamics 4. Work and energy 5. Linear momentum and collisions 6. Angular momentum and inertia 7. Elasticity 8. Harmonic Oscillator 9. Static Fluid 10. Dynamic Fluid 11. Temperature and Heat 12. Thermodynamics
Study and examination requirements	:	Study and examination requirements: 1. Students must attend 15 minutes before the class starts 2. Students must inform the lecturer if they will not attend the class due to sickness, an urgent need, etc. 3. Students must submit all class assignments before the deadline 4. Students must switch off/silent all electronic devices 5. Students must the attend the exam to get final grade
Exams and assessment formats	:	Assesment weight: Assignment (50%), Written Exam (50%) Assignments assess student's ability to apply concepts independently. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: Halliday & Resnick, Fisika Jilid 1, Terjemahan (Erwin Sucippto & Pantur Silaban), Jakarta, Erlangga 1994 Support: Physics-FMIPA Lecturer Team, Basic Physics 1, First Edition, Makassar 2010
Last Updated	:	June 5th, 2023

3. Module Description of Basic Chemistry

Module Name	:	Basic Chemistry
Module Level	:	Bachelor of Mathematics
Code, if applicable	:	23H03112702
Subtitle, if applicable	:	-
Courses, if applicable	:	Basic Chemistry
Semester(s) in which the module is taught	:	I (First Semester)
Module coordinator(s)	:	Dr. Rugaiyah A., M.Si
Lecturer(s)	:	MKU Chemistry Lecturer Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in first semester
Type of teaching		Small Group Discussion (SGD), Cooperative and Collaborative Learning (CBL), Problem Based Learning (PBL)
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO-1. Students are able to demonstrate an advanced understanding of basic pure and simple applied mathematics. ILO-5. Students are able to construct mathematical modelling with relatively new ideas and present the results orally and in writing. ILO-8. Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO-9. Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO 1. Ability to comprehensively describe the material of atomic structure, periodic system of elements, chemical

		bonding, chemical equilibrium, hydrocarbon compounds, functional groups of organic compounds, and basic biomolecules. [ILO 1] CLO 2. Ability to critically analyze problems or cases related to stoichiometry, solutions, acid-base equilibrium, chemical thermodynamics, chemical kinetics, and electrochemistry. [ILO 2]
Content	:	Students will learn about: 1. Atomic Structure 2. Periodic System of elements 3. Chemical Bonding 4. Stoichiometry 5. Solutions 6. Chemical Equilibrium 7. acid-base equilibrium 8. Chemical Thermodynamics 9. Chemical Kinetics 10. Electrochemistry 11. Hydrocarbon Compounds 12. Functional Groups of Organic Compounds 13. Biomolecular Basis
Study and examination requirements	:	Study and examination requirements: 1. Students must attend 15 minutes before the class starts 2. Students must inform the lecturer if they will not attend the class due to sickness, an urgent need, etc. 3. Students must submit all class assignments before the deadline 4. Students must switch off/silent all electronic devices 5. Students must the attend the exam to get final grade
Exams and assessment formats	:	40% for Presentation, 30% for Written Exam, and 30% for Assignment Assignments assess student's ability to apply concepts independently. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Hasanuddin University Chemistry Lecturer Team, 2011, Basic Chemistry, Technical Implementation Unit-MKU, Hasanuddin University, Makassar. 2. Chemistry Lecturer Team, 2013, Organic Chemistry, Technical Implementation Unit-MKU, Hasanuddin

		University, Makassar Teaching Materials for Sampling Techniques, Anisa, 2012. Support: 1. David L. Nelson, Michael M.Cox, 2005, Lehninger; Principles of Biochemistry, W.H. Freeman Company 2. David L. Nelson, Michael M.Cox, 2005, Lehninger; *Principles of Biochemistry*, W.H. Freeman Company.
Last Updated	:	June 5th, 2023

4. Module Description of Basic Biology

Module Name	:	Basic Biology
Module Level	:	Bachelor of Mathematics
Code, if applicable	:	23H04110102
Subtitle, if applicable	:	-
Courses, if applicable	:	Basic Biology
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Drs. Ambeng, M.Si
Lecturer(s)	:	BIology Lecturer Team
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	This course is a compulsory course and offered in first semester
Type of teaching		Group discussion, problem-based learning
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26 hours for Learning and Teaching, 32 hours for Self-Study, and 32 hours for Structured Works
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	Intended Learning Outcomes (ILO): ILO-1. Students are able to demonstrate an advanced understanding of basic pure and simple applied mathematics. ILO-5. Students are able to construct mathematical modelling with relatively new ideas and present the results orally and in writing. ILO-8. Students have integrity and highly value supreme divinity, social responsibility, and professional ethics. ILO-9. Students are able to adapt and develop their capabilities in mathematics and other relevant disciplines to support their professional lives in alignment with a culture of lifelong learning. Course Learning Objective (CLO): CLO 1: Students are able to analyze basic concepts in organisms and interactions with their environment.

		CLO 2: Students are able to analyze the concepts of metabolism, reproduction, coordination of organisms and the application of biotechnology in the development of science in their respective fields.
Content	:	Students will learn about: 1. Basic Biology Courses Cover The Basic Concepts Biology 2. Basic Units of Life 3. Metabolism 4. Cell Division 5. Inheritance of Traits 6. Reproduction in Organisms 7. Coordination Systems in Organisms 8. Homeostatis as Well as Knowledge of Ecology 9. Classification and Basics in Biotechnology
Study and examination requirements	:	Study and examination requirements: 1. Students must attend 15 minutes before the class starts 2. Students must inform the lecturer if they will not attend the class due to sickness, an urgent need, etc. 3. Students must submit all class assignments before the deadline 4. Students must switch off/silent all electronic devices 5. Students must the attend the exam to get final grade
Exams and assessment formats	:	Assesment weight: Report 50%, Written Exam = 50% Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Reading list	:	Main: 1. Teaching materials / basic biology materials on the LMS. 2. Campbell, et al. 2003. Biology Volume 1: Erlangga 3. Campbell, et al. 2003. Biology volume 2. Jakarta: Erlangga 4. Campbell, et al. 2003. Biology jillid 3. Jakarta: Erlangga 5. Odum, E, P., 1998. Fundamentals of Ecology, third edition. UGM Press: Yogyakarta Support: 1. Barrett, J,M., 1986. Biology. Prentice-Hall, Englewood Cliffs, New Jersey 2. Odum, E, P., 1998. Dasar-Dasar Ekologiedisi ketiga. UGM Press: Yogyakarta. 3. Rompas, Y., Rampe, H.L., dan Rumondor, M.J. 2011. Struktur Sel Epidermis dan Stomata Daun Beberapa Tumbuhan Suku Orchidaceae. Jurnal Bioslogos. 1(1): 13-19.

		4. Novitasari, R. 2017. Proses Respirasi Seluler pada Tumbuhan. Prosiding Seminar Nasional Pendidikan Biologi dan Biologi. UNY: FMIPA Biologi. 5. Wolf, J.B., Smith, A. C.F., dan Lorenz, A. 2022. Mendel's laws of heredity on his 200th birthday: What have we learned by considering exceptions?Heredity. 129: 1-3. 6. Pereira, A. M., dan Coimbra, S. 2019.Advances in plant reproduction: from gametes to seeds. Journal of Experimental Botany. 70(11): 2933-2936. 7. Moore, S.G. dan Hasier, J.F., 2017. A 100-Year Review: Reproductive Technologies in Dairy Science. Journal of Diary Science. 100(12): 10314-10331. 8. Afrilianti, C., Sataral, M., Eljonnahdi, dan Fahri, F. 2019. Deskripsi Dan Habitat Mycalesis Perseus Fabricius, 1775 (Rhopalocera: Nymphalidae) Spesies Kosmopolitan Di Gunung Tompotika, Sulawesi. Journal of Dcience and Technology. 8(2): 134-137. 9. Kusmana, C., dan Hikmat, A. 2015. Keanekaragaman Hayati Flora di Indonesia. Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan. 5(2): 187-198. 10. Mauerhofer, L.M., Pappenreiter, P.,Paulik, C., Selfert, A. H., Bernacchi, S., dan Rittmann, S.K.M.R. 2019. Methods for quantification of growth and productivity in anaerobic Microbiology and Biotechnology. Folla Microbiol. 64: 321-260.
Last Updated	:	June 5th, 2023

Module Description of Program Competency Courses (Compulsory)

1. Module Description of Mathematical Logic and Set Theory

Module Name	:	Mathematical Logic and Set Theory
Module Level	:	Bachelor
Code, if applicable	:	23H01110203
Subtitle, if applicable	:	-
Courses, if applicable	:	Mathematical Logic and Set Theory
Semester(s) in which the module is taught	:	1 (First Semester)
Module coordinator(s)	:	Prof. Dr. Amir Kamal Amir, M.Sc.
Lecturer(s)	:	Prof. Dr. Budi Nurwahyu, MS. Prof. Dr. Amir Kamal Amir, M.Sc. Prof. Dr. Hasmawati, M.Si. Dr. Firman, S.Si.,M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in the first year for Bachelor Degree
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Collaborative Learning
Contact hours	:	150 minutes Lectures per week, 180 minutes Structured Assignments per week, and 180 minutes Independent Study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Lectures, 47.5 hours per semester for Independent Study, and 47.5 hours per semester for Structured Assignments
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Module objectives/intended learning outcomes	:	After completion of this module, CLO 1. students have a relatively deep understanding on the determination of the truth values of a statement including statements with quantifiers, understand logic rules and some inferential methods; CLO 2. students are able to understand the process for proving a statement logically, analytically and systematically; CLO 3. students are able to understand how to apply logic rules, inferential methods, proving methods to develop mathematics and its applications in other areas. The following is the mapping of the ILO and the CLO of this course:

		<table><tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 3</th></tr><tr><td>CLO 1</td><td>X</td><td></td><td></td></tr><tr><td>CLO 2</td><td></td><td></td><td>X</td></tr><tr><td>CLO 3</td><td></td><td>X</td><td></td></tr></table>
Content	:	This course is structured to develop the ability to think logically and think critically. This course does not emphasize the use or mastery of mathematical formulas, but rather trains and strengthens aspects of student mathematical logic. It is hoped that students understand the importance of mathematical knowledge not because they have to be proficient with numbers and just a number of quantitative formulas. The subject matter includes: Statement of Sentences, Sentence Truth Values, Logic Laws, some special forms of Statement, valid and invalid argument, Statement with quantifiers, Use of Logic in Some basic concepts of Mathematics, Methods of Proof, Boolean Algebra, and Algebra Set.
Study and examination requirements		Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. Students must attend the exam to get final grade.
Exams and assessment formats		The weight of each assessment component is 25% for Assignments; 15% for Report; 15% for Quizzes; 45% for Written Exam Assignments assess students' ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale: <table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr><tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr><tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr><tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr><tr><td>< 40</td><td>E</td><td>0.00</td></tr></table>
Reading list		Main:

		1. A. Weinstein, Logic, Set, and Number, second Edition, Wosworth Publishing Company, California, 1976. 2. P.J. Hurley, A Concise Introduction to Logic, Edisi-3, Wadsworth Pub, 1988. 3. A.K. Amir, Struktur Berpikir Logis dan Sistematis. Depublish, 2018. 4. Charles C Pinter, "Set Theory", Dover Publication, Inc.2014 5. Seymour Lipschutz, "Set Theory and Related Topics" Schaum Outline Series, 1998 6. K.H. Rosen, Discrete Mathematics and Its Application, Edisi 4, McGraw-Hill, 1995.
Last revision date		July 28th, 2025

2. Module Description of Basic Mathematics II

Module Name	:	Basic Mathematics II
Module Level	:	Bachelor
Code, if applicable	:	23H01110303
Subtitle, if applicable	:	-
Courses, if applicable	:	Basic Mathematics II
Semester(s) in which the module is taught	:	2 (Second Semester)
Module coordinator(s)	:	Jusmawati Masalesse, S.Si., M.Si.
Lecturer(s)	:	Naimah Aris, S.Si, M.Math & Dr. Andi Muh Anwar, S.Si,
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Collaborative Learning
Contact hours	:	150 minutes Lectures per week, 180 minutes Structured Assignments per week, and 180 minutes Independent Study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Lectures, 47.5 hours per semester for Independent Study, and 47.5 hours per semester for Structured Assignments
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Basic Mathematics I
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. determine solutions to problems related to the concepts of single-variable calculus. CLO 2. apply the concepts of calculus and matrices appropriately, effectively, and systematically in various contextual problems relevant to their field of study. The following is the mapping of the ILO and the CLO of this course:
Content	:	In this course, students study the fundamental concepts of multivariable calculus. Topics include functions of two or more variables, limits and continuity of multivariable functions,

	ILO 2	ILO 3
CLO 1	X	
CLO 2		X

<table>
<tr><td></td><td></td><td>partial derivatives and directional derivatives, extrema of multivariable functions, multiple integrals, as well as first-order differential equations. The learning methods applied in this course consist of lectures, discussions, and the case method, all of which are designed to support the achievement of the intended Course Learning Outcomes.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Written Exam (40%) and Report (60%)

Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Thomas G.B., Weir, M. D., Hass, J.R.2013. “Thomas Calculus early transcendentals”, 13th edition, Pearson.
2. James Stewart. 2015. “Single Variable Calculus: Early Transcendentals”, Thomson Brooks/Cole.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

3. Module Description of Linear Algebra I

Module Name	:	Linear Algebra I
Module Level	:	Bachelor
Code, if applicable	:	23H01110403
Subtitle, if applicable	:	-
Courses, if applicable	:	Linier Algebra I
Semester(s) in which the module is taught	:	2 (Second Semester)
Module coordinator(s)	:	Amir Kamal Amir
Lecturer(s)	:	Amir Kamal Amir, Andi Muhammad Anwar, Nur Erawati, Jusmawati Massalesse.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in first year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Collaborative Learning
Contact hours	:	150 minutes Lectures per week, 180 minutes Structured Assignments per week, and 180 minutes Independent Study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Lectures, 47.5 hours per semester for Independent Study, and 47.5 hours per semester for Structured Assignments
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Basic Mathematics 1
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Have good abilities in calculating linear algebra problems; CLO 2. Have good abilities in calculating linear algebra problems; CLO 3. Apply linear algebra concepts. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 2	ILO 3	ILO 7
CLO 1	X			
CLO 2		X		
CLO 3			X	X

<table>
<tr><td>Content</td><td>:</td><td>The Linear Algebra course introduces the fundamental concepts and methods essential for understanding linear structures in mathematics. The course begins with matrices and systems of linear equations, providing tools for solving and analyzing linear systems. It continues with the study of determinants and their properties, followed by Euclidean spaces and linear transformations, which form the basis for understanding mappings between vector spaces. Students also explore vector spaces, bases, and dimensions, which are central to abstract linear algebra. Furthermore, the course covers eigenvalues and eigenvectors, fundamental in both theoretical and applied mathematics, and concludes with the study of inner product spaces, where notions of length, angle, and orthogonality are rigorously defined. By the end of the course, students are expected to develop theoretical understanding necessary for further study in mathematics, engineering, and related fields.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are assessed based on the following components: Written Exam (35%) Quizzes (15%), Assignments (45%), and Presentation (5%)

Assignments assess student's ability to apply concepts independently. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:

<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table>
</td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Horward Anton, Chris Rorres, 2005. Elementary Linear Algebra, Applications Version, Edition 12, John Wiley & Sons.
2. Nur Erawaty, 2023. Sifat Dasar Ruang Vektor. Unhas Press.
3. Seymour Lipschutz, Marc L. Lipson, 2004. Schaum’s Outline of Linear Algebra, Edisi 3, McGraw-Hill.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

4. Module Description of Discrete Mathematics

Module Name	:	Discrete Mathematics
Module Level	:	Bachelor
Code, if applicable	:	23H01110503
Subtitle, if applicable	:	-
Courses, if applicable	:	Discrete Mathematics
Semester(s) in which the module is taught	:	2 (Second Semester)
Module coordinator(s)	:	Prof. Dr. Nurdin, S.Si., M.Si.
Lecturer(s)	:	Prof. Dr. Hasmawati, M.Si., Prof. Dr. Nurdin, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in first year for Bachelor degree in Mathematics
Type of teaching/teaching method		Lecturing, Small Group Discussion, Collaborative Learning, Self-Directed Learning
Contact hours	:	150 minutes Lectures per week, 180 minutes Structured Assignments per week, and 180 minutes Independent Study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Lectures, 47.5 hours per semester for Independent Study, and 47.5 hours per semester for Structured Assignments
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the final exams for Basic Mathematics I and Basic Mathematics II
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Students have a relatively deep understanding of the basics of counting, enumeration, and an introduction to graph theory; CLO 2. Able to identify objects, techniques, and basic theorems of counting, enumeration, and graph theory, and make connections to solve problems; CLO 3. Able to analyze discrete mathematical problems logically, analytically, and systematically structured. The following is the mapping of the ILO and the CLO of this course:

		<table><tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 3</th></tr><tr><td>CLO 1</td><td>X</td><td></td><td></td></tr><tr><td>CLO 2</td><td></td><td>X</td><td></td></tr><tr><td>CLO 3</td><td></td><td></td><td>X</td></tr></table>
Content	:	This course introduces and discusses several fundamental and essential concepts in discrete mathematics. It also provides students with opportunities to practice creative thinking in solving discrete problems. Referring to these objectives, the course is conducted by emphasizing sufficient time for students to engage in problem-solving activities, ranging from simple to more complex problems. Although the presentation of this course does not necessarily require a proof-oriented approach, one or two theorems are presented and proven in detail to provide examples of verbal reasoning. The course materials include: Fundamentals of Counting, Relations, Generating Functions, Recurrence Relations, and Introduction to Graph Theory
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Participants are marked based on their performance in theory: Quizzes (25%), Report (55%), Written Exam (20%). Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale:

Percentage of Achievement	Grade	Conversion Value
85 – 100	A	4.00
80 - <85	A-	3.75
75 - < 80	B+	3.5
70 - < 75	B	3.0
65 - < 70	B-	2.75
60 - < 65	C+	2.5
50 - < 60	C	2.00
40 - < 50	D	1.00
< 40	E	0.00

Reading list	:	1. Discrete Mathematics and Its Applications Seventh Edition, Kenneth H. Rosen, Published by McGraw-Hill, 2012. 2. Discrete and Combinatorial Mathematics an applied introduction fifth edition, Ralph P. Grimaldi, Pearson Addision Wesley, 2004 3. Discrete Mathematics, W W W Chen, 2003 4. A Short Course in Discrete Mathematics, for students of computer and computational science, Edward A. Bender and S. Gill Williamson, 2004 5. Hasmawati, Teori Graf,2023 6. Hasmawati, Hinding, N., Nurwahyu, B., Syukur Daming, A, Kamal Amir, A.The partition dimension of the vertex amalgamation of some cycles, Heliyon, 2022, 8(6), e09596
Last revision date	:	February 5th, 2025

5. Module Description of Algorithms and Programming

Module Name	:	Algorithms and Programming
Module Level	:	Bachelor
Code, if applicable	:	23H01110604
Subtitle, if applicable	:	-
Courses, if applicable	:	Algorithms and Programming
Semester(s) in which the module is taught	:	2 (Second Semester)
Module coordinator(s)	:	Dr. Khaeruddin, M.Sc.
Lecturer(s)	:	Dr. Khaeruddin, M.Sc.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in first year for Bachelor degree in Mathematics
Type of teaching/ teaching method		Lecturing, Small Group Discussion, Collaborative Learning, Self-Directed Learning
Contact hours	:	150 minutes Lectures per week, 180 minutes Structured Assignments per week, 180 minutes Independent Study per week, and 170 minutes Practicum
Workload	:	Total workload is 180 hours per semester which consists of 40 hours per semester for Lectures, 46.6 hours per semester for Independent Study, 46.6 hours per semester for Structured Assignments, and 46,6 hours per semester for Practicum
Credit points	:	4 (6.4 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. explain algorithms; CLO 2. apply algorithms to programming languages; CLO 3. analyze algorithms to solve programming problems; CLO 4. communicate ideas in appropriate contexts, both verbally and in writing, with groups. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 5	ILO 6	ILO 7	ILO 9
CLO 1	X	X			
CLO 2		X	X	X	
CLO 3				X	
CLO 4				X	X

<table>
<tr><td>Content</td><td>:</td><td>The Algorithms and Programming course discusses designing algorithms that serve as the basis for analyzing logic-related problems. Most of this course consists of intensive exercises to improve students' logic skills in solving logic problems, transforming them into algorithms and implementing them in a programming language.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Quizzes (20%), Report (50%), and Assignments (30%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Schaum’s Outline of Programming with Pascal, Byron S. Gottfried, McGraw Hill
2. Head First Java 2nd Edition, Kathy Sierra, Bert Bates, Oriel
3. Buku Penuntun Praktikum dengan Pascal tahun 2016
4. Buku Penuntun Praktikum dengan Java tahun 2016</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

6. Module Description of Statistical Methods

Module Name	:	Statistical Methods
Module Level	:	Bachelor
Code, if applicable	:	23H01110703
Subtitle, if applicable	:	-
Courses, if applicable	:	Statistical Methods
Semester(s) in which the module is taught	:	2 (Second Semester)
Module coordinator(s)	:	Nur Rohmah Oktaviani Putri, S.Si., M.Si
Lecturer(s)	:	Nur Rohmah Oktaviani Putri, S.Si., M.Si Prof. Dr. Aidawayati Rangkuti
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in the first year for Bachelor Degree in Mathematics
Type of teaching/ teaching method		Lecturing, Small Group Discussion, Collaborative Learning, Self-Directed Learning, Project Base Learning
Contact hours	:	150 minutes Lectures per week, 180 minutes Structured Assignments per week, and 180 minutes Independent Study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Lectures, 47.5 hours per semester for Independent Study, and 47.5 hours per semester for Structured Assignments
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Calculus I and Calculus II
Module objectives/intended learning outcomes	:	After completion of this module, students will be able to: CLO 1. apply the basic statistical knowledge; CLO 2. collect, process, analyze and interpretation of data based on the basic statistical knowledge; CLO 3. demonstrate their understanding of the basic statistical concept to solve a statistical related-problem through the use of technology; CLO 4. communicate statistical ideas in appropriate contexts both orally and in writing with group. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 6	ILO 7	ILO 9
CLO 1	X			
CLO 2	X	X		
CLO 3		X	X	
CLO 4			X	X

<table>
<tr><td>Content</td><td>:</td><td>This course introduces statistical concepts that used to collect, describe, analyze, and interpret data. It aims to develop students' analytical thinking by providing both theoretical understanding and practical applications of statistics in real-world problems. The course also covers data presentation, statistical measures, probability, and sampling distribution.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Quizzes (20%), Presentation (50%), and Assignments (30%).

Assignments assess student's ability to apply concepts independently. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Quizzes are used to test continuous understanding of weekly content. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>Walpole, R. E., Myers, R. H., Myers, S. L., and Ye, K. 2002. Probability & Statistics for Engineers & Scientist. 7th-Ed, Pearson Education International
Sudjana, 2005. Metoda Statistika. Edisi 6. Tarsito. Bandung</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

7. Module Description of Linear Algebra II

Module Name	:	Linear Algebra II
Module Level	:	Bachelor
Code, if applicable	:	23H01120103
Subtitle, if applicable	:	-
Courses, if applicable	:	Linier Algebra II
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Dra. Nur Erawati, M.Si
Lecturer(s)	:	Prof. Dr. Amir Kamal Amir, M.Sc., Dra. Nur Erawati, M.Si., Prof. Dr. Nurdin, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in Second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Collaborative Learning, Self-Directed Learning
Contact hours	:	150 minutes Lectures per week, 180 minutes Structured Assignments per week, and 180 minutes Independent Study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Lectures, 47.5 hours per semester for Independent Study, and 47.5 hours per semester for Structured Assignments
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Linear Algebra I
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO-1. use concepts that can be diagonalized and linear transformations in solving linear algebra problems; CLO-2. apply theorems to prove statements in linear algebra; CLO-3. communicate linear algebra ideas both orally and in writing in groups. The following is the mapping of the ILO and the CLO of this course:

	ILO 2	ILO 3	ILO 6	ILO 9
CLO 1	X	X		
CLO 2			X	
CLO 3				X

<table>
<tr><td>Content</td><td>:</td><td>The Linear Algebra II course deepens students' understanding of linear algebra by focusing on advanced concepts and applications. The course begins with inner product spaces and orthogonal complements, which extend the study of vector spaces to include notions of orthogonality and projection. Students will learn the Gram–Schmidt process and its application to constructing orthonormal bases, as well as the least squares method for approximating solutions to overdetermined systems. The course also covers change of basis, orthogonal diagonalization, and the concepts of geometric and algebraic multiplicity of eigenvalues. Further topics include linear transformations, their kernels and ranges, inverse transformations, and the use of matrices to represent linear transformations. The course concludes with advanced concepts such as similarity and isomorphism, which highlight structural properties of vector spaces and transformations.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are assessed based on the following components: Assignments (22,5%), Quizzes (30%), Report (7,5%), and Written Exam (40%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Quizzes are used to test continuous understanding of weekly content. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:

<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
</table>
</td></tr>
</table>

		50 - < 60 | C | 2.00 40 - < 50 | D | 1.00 < 40 | E | 0.00
Reading list	:	1. Karim M. Abadir, Jan R. Magnus, 2005. Matrix Algebra, Cambridge University Press. 2. Horward Anton, Chris Rorres, 2005. Elementary Linear Algebra, Applications Version, Edition 12, John Wiley & Sons. 3. Seymour Lipschutz, Marc L. Lipson, 2004. Schaum's Outline of Linear Algebra, Edisi 3, McGraw-Hill.
Last revision date	:	July 28th, 2025

8. Module Description of Numerical Methods

Module Name	:	Numerical methods
Module Level	:	Bachelor
Code, if applicable	:	23H01120503
Subtitle, if applicable	:	-
Courses, if applicable	:	Numerical method
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Agustinus Ribal, S.Si., M.Sc., Ph. D
Lecturer(s)	:	Prof. Dr. Syamsuddin Toaha, M.Sc. Agustinus Ribal, S.Si., M.Sc., Ph. D
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Collaborative Learning
Contact hours	:	150 minutes Lectures per week, 180 minutes Structured Assignments per week, and 180 minutes Independent Study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Lectures, 47.5 hours per semester for Independent Study, and 47.5 hours per semester for Structured Assignments
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the final exams for Basic Mathematics I, Basic Mathematics II, Algorithms and Programming
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. identifying techniques and methods in numerical methods and establishing connections to solve numerical problems; CLO 2. applying concepts effectively to solve numerical method problems in mathematics, science, and engineering; CLO 3. demonstrating an understanding of numerical methods concepts through the use of appropriate technology; CLO 4. communicating mathematical ideas in appropriate contexts, both orally and in writing, particularly with numerical methods.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 2</th><th>ILO 3</th><th>ILO 6</th><th>ILO 7</th><th>ILO 9</th></tr>
<tr><td>CLO 1</td><td>X</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td>X</td><td></td><td></td><td>X</td></tr>
<tr><td>CLO 3</td><td>X</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 4</td><td>X</td><td></td><td></td><td>X</td><td></td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>Numerical Methods is a compulsory subject that provides fundamental and essential concepts in numerical computation. This course offers students the opportunity to develop creative thinking skills in solving numerical problems, with an emphasis on extensive problem-solving practice ranging from simple to complex cases. In addition, students will gain expertise in using computer tools to create simple simulations for better understanding of mathematics through numerical methods. The learning materials include error transmission, roots of nonlinear equations, systems of linear equations, interpolation, numerical derivatives, numerical integration, and numerical differential equations.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Report (50%), Written Exam (50%)

Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
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<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
</table></td></tr>
</table>

		< 40 | E | 0.00
Reading list	:	1. Abdelwahab Kharab and Ronald B. Guenther, 2002, An Introduction to Numerical Methods: A MATLAB Approach, Chapman and Hall/CRC. 2. Michael D. Greenberg, 1998, Advanced Engineering Mathematics (2nd Edition), Prentice Hall. 3. Abbaszadeh, M., Azis, M. I., & Dehghan, M. (2024). A mesh-free method using Pascal polynomials for analyzing space-fractional PDEs in irregular biological geometries. *Engineering Analysis with Boundary Elements, 169*, 105932. https://doi.org/10.1016/j.enganabound.2024.105932
Last revision date	:	July 28th, 2025

9. Module Description of Advanced Mathematics

Module Name	:	Advanced Mathematics
Module Level	:	Bachelor
Code, if applicable	:	23H01120204
Subtitle, if applicable	:	-
Courses, if applicable	:	Advanced Mathematics
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Naimah Aris, S.Si., M.Math.
Lecturer(s)	:	Jusmawati Massalesse, S.Si., M.Si., Naimah Aris, S.Si., M.Math., Dr. Muhammad Zakir, M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Collaborative Learning, Self-Directed Learning
Contact hours	:	200 minutes lectures per week, 240 minutes structured activities per week, and 240 minutes independent study per week
Workload	:	Total workload is 180 hours per semester which consists of 53,3 hours per semester for Learning and Teaching, 63,3 hours per semester for Self-Study, and 63,3 hours per semester for Structured Works
Credit points	:	4 (6.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Basic Mathematics I, and Basic Mathematics II
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understand the basic concepts of multivariable calculus, including vectors, vector calculus, several techniques and tools needed in mathematics; CLO 2. having geometric intuition and the underlying visualization will enable students to understand problems; CLO 3. understand how to use multivariable calculus concepts and several mathematical tools effectively to solve simple mathematics, science and engineering problems.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 3</th></tr>
<tr><td>CLO 1</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 3</td><td></td><td>X</td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>The focus of this course will be on vector functions, using calculus to analyze the geometry of curves and surfaces in three-dimensional space and some necessary mathematical techniques/toolkit. Topics will be covered are: vectors and vector functions in 3-dimensional Euclidean spaces, vector calculus including vector fields, line integrals, Green’s theorem, curl and divergence, surface integrals, Stokes's theorem; Series Convergent Test; improper integral; gamma and beta functions.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Report (60%), Written Exam (40%)

Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. James Stewart, Daniel Clegg, Saleem Watson, "Calculus Early Transcendentals" Ninth Edition, Thomson Brooks/Cole, 2021.</td></tr>
</table>

		2. James Stewan, "Calculus Early Transcendentals, Sixth edition", Thomson Brooks/Cole, 2008. 3. George B Thomas, Advanced Calculus, Twelfth Edition", Addison Wesley, 2004. 4. Robert Wrede, Spiegel Murray, "Theory and Problems of Advanced Calculus", Schaum series, 1997. 5. Lecture Multivariable Calculus MIT: https://www.youtube.com/playlist?list=PL4C4C8A7D06566F38 6. www.khanacademy.org
Last revision date	:	February 5th, 2025

10. Module Description of Probability Theory

Module Name	:	Probability theory
Module Level	:	Bachelor
Code, if applicable	:	23H01120303
Subtitle, if applicable	:	-
Courses, if applicable	:	Probability theory
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Nur Rohmah Oktaviani Putri, S.Si.,M.Si.
Lecturer(s)	:	Dr. Firman, S.Si., M.Si. Nur Rohmah Oktaviani Putri, S.Si.,M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Collaborative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Calculus I, Calculus II, and Statistical Methods
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understand the Probability as a stabilize relative frequency of random experiments and Its property based on the concept of sets and functions of sets; CLO 2. understand the characteristics and distribution functions of univariate random variable and multivariate random variables; CLO 3. determine mean, variance, probability distribution function and distribution function of univariate and multivariate random variables; CLO 4. determine distribution function and its expectations of univariate and multivariate random variables using transformation variables;

<table>
<tr><td></td><td></td><td>CLO 5. communicate mathematical ideas in appropriate contexts both orally and in writing with a group.
The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 5</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td>X</td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 4</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 5</td><td></td><td></td><td>X</td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>Probability theory is a compulsory subject that provides understanding and development of expertise in the form of probability theory, which has become the main reference to develop statistical theory based on mathematical concepts. This course provides an opportunity for students to understand the basics of probability theory and to solve probability problems. The learning material includes an introduction to probability theory, multivariate distributions, some special distributions, distribution of function of random variables, and limiting distributions. Some methods to develop probability theory according to random variables will also be discussed including transformation function of random variable and convergence that can be used to determine distribution function. Topics covered may include: Introduction to Probability Theory, Multivariate distributions, some special distributions, Distribution of function of random variables, and Limiting distribution.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
</table>

<table>
<tr><td>Exams and assessment formats</td><td></td><td>Participants are marked based on their performance in theory: Quizzes (15%), Written Exam (30%), Report (50%), and Assignments (5%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Robert V. Hogg dan Allen T. Craig, 1995, Introduction to Mathematical Statistics, Fifth Edition.
2. Wakerly, D., Mendenhall III, W. Scheaffer, R., 2008. Mathematical Statistics with Application, Ed. 7th, Thomson, Canada.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>July 28th, 2025</td></tr>
</table>

11. Module Description of Graph Theory

Module Name	:	Graph Theory
Module Level	:	Bachelor
Code, if applicable	:	23H01120403
Subtitle, if applicable	:	-
Courses, if applicable	:	Graph Theory
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Prof. Dr. Hasmawati, M.Si.
Lecturer(s)	:	Prof. Dr. Hasmawati, M.Si. Prof. Dr. Nurdin, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in the second year for Bachelor Degree
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have taken Discrete Mathematics, and have participated in the examination of the course.
Module objectives/intended learning outcomes	:	After completion of this module, students will be able to: CLO 1. understand the basic concepts of graphs and several operations in graphs and can construct a graph through an operation; CLO 2. enumerate tree graphs using matrix cofactors and determine the center and centroid.; CLO 3. develop basic knowledge of graph theory to understand graph coloring, location coloring and fuzzy coloring; CLO 4. determine decomposition and factorization of a graph; CLO 5. determine the connectivity of the vertices and edges of a connected graph The following is the mapping of the ILO and the CLO of this course:

		<table><tr><th></th><th>ILO 3</th><th>ILO 5</th><th>ILO 7</th><th>ILO 9</th></tr><tr><td>CLO 1</td><td></td><td>X</td><td></td><td></td></tr><tr><td>CLO 2</td><td>X</td><td>X</td><td></td><td></td></tr><tr><td>CLO 3</td><td></td><td></td><td>X</td><td>X</td></tr><tr><td>CLO 4</td><td>X</td><td></td><td></td><td></td></tr><tr><td>CLO 5</td><td></td><td></td><td>X</td><td></td></tr></table>
Content	:	This course teaches about isomorphism, matrix in graphs, and using matrix graphs to do enumeration, the definition and properties of Euler graphs, Hamiltonian graphs, planar graphs, and directed graphs. This course also learns about special types of some subgraphs. In addition, the students study the connectivity graph, matching, factorization, graph coloring, and the basic concept of Ramsey's theory or labeling.
Study and examination requirements		Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats		The weight of each assessment component is 5% for quizzes, 25% for assignments, 15% for presentation, 40% for report, and 15% for Written Exam. Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale: <table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr><tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr><tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr><tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr><tr><td>< 40</td><td>E</td><td>0.00</td></tr></table>

Reading list		1. J.A.Bondy and U.S.R. Murty (1982), Graph Theory with Applications, The Macmilan Press Ltd. 2. Gary Chartrand dan Ping Zhang (2005), Introduction to Graph Theory, Mc-GRAW-HILL INTERNATIONAL EDITION. 3. Reinhard Diestel (2000), Graph Theory: Graduste Texts In Mathematics, Springer. 4. Gary Chartrand, Ortrud R. Oellermann, (1993), Applied and algorithmic Graph Theory, McGRAW-HILL 5. Prof. Dr. Hasmawati, M.Si (2023), PENGANTAR TEORI DAN JENIS-JENIS GRAF, UPT Unhas Press. 6. Lase, Dermawan, Nurdin Hinding, and Amir Kamal Amir. "Modular Irregular Labeling on Firecrackers Graphs." Proximal: Jurnal Penelitian Matematika dan Pendidikan Matematika 6.1 (2023): 94- 102.
Last revision date	:	July 28th, 2025

12. Module Description of Ordinary Differential Equations

Module Name	:	Ordinary Differential Equations
Module Level	:	Bachelor
Code, if applicable	:	23H01120603
Subtitle, if applicable	:	-
Courses, if applicable	:	Ordinary Differential Equations
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Prof. Dr. Jeffry Kusuma
Lecturer(s)	:	Prof. Dr. Jeffry Kusuma
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Basic Mathematics I and Basic Mathematics II
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. classify and solve ordinary differential equations; CLO 2. identify techniques and methods and make connections to solve problems involving ordinary differential equations; CLO 3. apply concepts effectively to solve differential equation problems in mathematics, science, and engineering; CLO 4. apply mathematical methods to solve differential equations through the use of appropriate technology; CLO 6. to communicate mathematical ideas appropriately, both orally and in writing, within a group context.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 5</th><th>ILO 6</th></tr>
<tr><td>CLO 1</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 4</td><td>X</td><td></td><td></td><td>X</td></tr>
<tr><td>CLO 5</td><td></td><td>X</td><td>X</td><td></td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>Differential Equations is a compulsory course that provides an understanding and development of skills in solving continuous mathematical models in the form of ordinary differential equations, which are easily found and applied in various fields of applied mathematics. This course gives students the opportunity to practice recognizing and solving a given ordinary differential equation or system of differential equations. The learning materials for this course include the identification and solution of first-order differential equations with variable coefficients, second-order differential equations, higher-order differential equations, and systems of differential equations. Several methods for solving differential equations will also be discussed, including the series method, Laplace transform, a method using infinite series, and numerical methods that can be used to solve initial value and boundary value problems of various types.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Assignments (15%), Written Exam (30%), Quizzes (5%), and Report (50%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:</td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table>
</td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Jeffry Kusuma, Persamaan Differensial Elementer, Diktat Kuliah, Unhas
2. Boyce dan Di Prima, 1992, Elementary Differential Equations and Boundary Value Problems
3. Michael D. Greenberg, 1998, Advanced Engineering Mathematics, 2nd Ed
4. Kreyzig, Erwin, Advanced Engineering Mathematics
5. https://bookboon.com/en/statistics-and-mathematics-ebooks</td></tr>
<tr><td>Last revision date</td><td>:</td><td>July 28th, 2025</td></tr>
</table>

13. Module Description of Introduction to Real Analysis

Module Name	:	Introduction to Real Analysis
Module Level	:	Bachelor
Code, if applicable	:	23H01110103
Subtitle, if applicable	:	-
Courses, if applicable	:	Introduction to Real Analysis
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Prof. Budi Nurwahyu, M.Si.
Lecturer(s)	:	Prof. Budi Nurwahyu, M.Si; Jusmawati Massalesse, S.Si, M.Si; Dr. M. Nur S.Si, M.Si; Dr. Muh Zakir, M.Si
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year (semester III) for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours for Learning and Teaching, 47.5 hours for Self-Study, and 47.5 hours for Structured Works.
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Basic Mathematics I; Basic Mathematis II; Mathematical Logic and Set Theory
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Students are able to apply basic concepts related to completely ordered fields, topology, sequences of real numbers, limits, and continuous functions CLO 2. Students are able to demonstrate logically and systematically the concepts and properties of completely ordered fields, topology, sequences of real numbers, limits, and continuous functions CLO 3. Students are able to use and relate concepts to each other to identify and solve problems

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 3</th></tr>
<tr><td>CLO 1</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 3</td><td></td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>This course covers the complete ordered field, topology, sequences of real numbers, and limits and continuity of real functions. The discussion on the complete ordered field includes the algebraic properties of real numbers, order properties derived from the set of positive numbers, bounded sets, supremum–infimum, and their applications. In topology, the focus is on open and closed sets and their relation to interior and limit points. The study of sequences of real numbers addresses convergence and divergence criteria, the Monotone Convergence Theorem, the Bolzano–Weierstrass Theorem, and Cauchy sequences. Finally, the topic of limits and continuity emphasizes the epsilon–delta definition, the Bolzano Intermediate Value Theorem, the Maximum–Minimum Theorem, uniform continuity, and the distinction between ordinary continuity and uniform continuity.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>The assessment of this course consists of assignments (20%), quizzes (30%), a written exam (40%), and report (10%).

Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
</table></td></tr>
</table>

			65 - < 70	B-	2.75	
			60 - < 65	C+	2.5	
			50 - < 60	C	2.00	
			40 - < 50	D	1.00	
			< 40	E	0.00	
Reading list	:	1. Robert G. Bartle and Sherbert and Donald R., 2000, Introduction to Real Analysis, John Wiley and Sons. 3rd ed. 2. William F. Trench, 2003, Intoduction to Real Analysis, Pearson Education. 3. Manfred Stoll, 1997,"An Introduction to Real Analysis", Addison-Wesley Educational Publishers Inc.				
Last revision date	:	July 28th, 2025				

14. Module Description of Entrepreneurship

Module Name	:	Entrepreneurship
Module Level	:	Bachelor
Code, if applicable	:	23H01120802
Subtitle, if applicable	:	-
Courses, if applicable	:	Entrepreneurship
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Prof. Dr. Hasmawati, M.Si.
Lecturer(s)	:	Prof. Dr. Hasmawati, M.Si., Dr.Khaeruddin, M.Sc.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	100 minutes lectures per week, 120 minutes structured activities per week, and 120 minutes independent study per week
Workload	:	Total workload is 90 hours per semester which consists of 26.7 hours per semester for Learning and Teaching, 31.7 hours per semester for Self-Study, and 31.7 hours per semester for Structured Works
Credit points	:	2 (3.2 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Students have integrity that upholds the highest divinity, social responsibility, and professional ethics; CLO 2. Students are able to develop their skills or talents, and communicate individually and in teamwork; CLO 3. Students are able to adapt and develop integrity in communicating, socializing, and collaborating with many people. The following is the mapping of the ILO and the CLO of this course:

	ILO 7	ILO 8	ILO 9
CLO 1		X	
CLO 2	X		
CLO 3			X

<table>
<tr><td>Content</td><td>:</td><td>The Entrepreneurship course introduces students to the fundamental concepts and principles of entrepreneurship, including its definition, basic principles, motivation to start a business, entrepreneurial concepts and characteristics, and the relationship between entrepreneurship as a field of study and real entrepreneurial practice. The course also covers business opportunities, financial management, and marketing strategies. Assessments include quizzes in weeks four and twelve, a written exam in week eight, and week sixteen. The main goal of the course is to foster students' awareness, willingness, and ability to become entrepreneurs by utilizing their personal potential and local natural resources with an entrepreneurial spirit.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Quizzes (10%), Report (55%), and Presentation (35%).

Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Quizzes are used to test continuous understanding of weekly content. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
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<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Abdullah, T dan Tantri F. 2012. Manajemen Pemasaran Cetakan Pertama. Raja Grafindo
2. Fahmi. 2013. Manajemen Strategis. Bandung: Alfabeta
3. Hasan, A. 2013. Marketing dan Kasus-Kasus Pilihan. CAPS. Yogyakarta.</td></tr>
</table>

		4. Osterwalders A, Pigneur Y, Bernarda G, Smith A (2015) Value proposition design. Journal of business models 3 (1): 81-92 5. Richard L. Daft. Edward Tanujaya (Penterjemah). 2010. Era Baru Manajemen. Edisi 9, Salemba Empat Irham. 6. Dr. Drs. H. Yadiman, SH., MH. Hukum Bisnis, LEKKAS bandung September 2019 7. Rukka, R.M., N. Busthanul dan N. Fatonny, 2018. Strategi Pengembangan Bisnis Keripik Bayam. Jurnal Sosial Ekonomi Pertanian, Vol.14 (1), halaman 41-54. http://journal.unhas.ac.id/index.php/jsep/article/view/3622
Last revision date	:	February 5th, 2025

15. Module Description of Real Analysis

Module Name	:	Real Analysis
Module Level	:	Bachelor
Code, if applicable	:	23H01120903
Subtitle, if applicable	:	-
Courses, if applicable	:	Real Analysis
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Naimah Aris, S.Si., M.Math
Lecturer(s)	:	Prof. Dr. Budi Nurwahyu, MS., Jusmawati Massalesse, S.Si.,M.Si., Naimah Aris, S.Si.,M.Math., Dr. Muh. Nur, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Classification within the curriculum	:	Compulsory course in semester IV for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning, Case Method
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Advanced Mathematics and Introduction to Real Analysis
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. describe, explain, interpret, and apply the concept and theorem of the derivative of function, integral, sequence of function, infinite series and topology in metric space; CLO 2. Interpret the concept in proving theorems and other related concepts concerning derivatives, integrals, sequences of functions, and the topology of metric spaces; CLO 3. communicate concepts of derivatives, integrals, sequences of functions, and the topology of metric

<table>
<tr><td></td><td></td><td>spaces orally and in writing, both independently and in groups.

The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 2</th><th>ILO 4</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 2</td><td></td><td>X</td><td>X</td></tr>
<tr><td>CLO 3</td><td>X</td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>The course Introduction to Real Analysis covers fundamental concepts of mathematical analysis that serve as a foundation for further studies in pure and applied mathematics. The main topics include: Derivatives, Riemann Integral, Sequences of Functions, Series of Functions, and Metric Spaces. Through this course, students are expected to understand, apply, and communicate the key concepts of real analysis both orally and in writing, individually as well as collaboratively. This course also provides the necessary background for advanced courses such as Advanced Real Analysis and Complex Analysis.</td></tr>
<tr><td>Study and examination requirements</td><td></td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td></td><td>Participants are marked based on their performance in theory: Assignment (20%), Report (15%), Written Exam (40%), and Quiz (25%).

Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
</table></td></tr>
</table>

			50 - < 60	C	2.00	
			40 - < 50	D	1.00	
			< 40	E	0.00	
Reading list		1. Bartle, Robert.G and Sherbert, Donald R., 2000, Introduction to Real Analysis, John Wiley and Sons. 3rd ed. 2. Budi Nurwahyu. 2019. Common fixed-point theorems on generalized ratio contraction mapping in extended rectangular B-metric spaces, International Journal of Mathematics and Mathematical Sciences, pp 1-14 3. Trench, William F., 2003, Intoduction to Real Analysis, Pearson Education. 4. Rudin, Walter. Principles of Mathematical Analysis. 3rd ed. McGraw-Hill, 1976. 5. Charles C. Pugh, 2015, "Real Mathematical Analysis", Springer International Publishing Switzerland. 2nd ed.			
Last revision date		February 5th, 2025				

16. Module Description of Partial Differential Equations

Module Name	:	Partial Differential Equations
Module Level	:	Bachelor
Code, if applicable	:	23H01121003
Subtitle, if applicable	:	-
Courses, if applicable	:	Partial Differential Equations
Semester(s) in which the module is taught	:	4 (second year)
Module coordinator(s)	:	Prof. Jeffry Kusuma, Ph.D.
Lecturer(s)	:	Prof. Dr. Jeffry Kusuma, Prof. Agustinus Ribal, S.Si.,M.Sc., Ph. D, Naimah Aris, S.Si.,M.Math.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning, Case Method
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 SKS (4.8 ECTS)
Requirements according to the examination regulations		Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Ordinary Differential Equations and Advanced Mathematics
Module objectives/intended learning outcomes	:	After completion of this module, students will be able to: CLO-1. demonstrate their understanding of periodical function and its approximation; CLO-2. demonstrate their understanding of classifying and solving partial differential equation; CLO-3. students are able to use the concepts effectively to solve partial differential equation problems in mathematics, sciences and engineering; CLO-4. demonstrate their understanding of the concepts through the use of technology when appropriate; CLO-5. identify techniques and methods in solving partial differential equations; CLO-6. communicate mathematical ideas in appropriate contexts both orally and in writing with a group.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 3</th><th>ILO 4</th><th>ILO 5</th><th>ILO 6</th></tr>
<tr><td>CO 1</td><td>X</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO 2</td><td>X</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO 3</td><td></td><td></td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>CO 4</td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CO 5</td><td></td><td>X</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CO 6</td><td></td><td></td><td></td><td></td><td>X</td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>This course contains classification of partial differential equation (PDE), periodic function, Fourier series, trichotomy of partial differential equation, initial and boundary value problems, method of separation variables for one dimension heat equation, transformation into the others variables, several others methods for solving one dimension heat equation, transformation into canonical form of PDE, solution of one dimension wave equations, D' Alembert solution for one dimension wave equation, two dimension of Laplace equation in Cartesian coordinate, two dimension of Laplace equation in polar coordinate, Poisson solution for Laplace equation in the annulus, two dimension of heat equation, two dimension of wave equation and introduction to the numerical solution for partial differential equation.</td></tr>
<tr><td>Study and examination requirements</td><td></td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td></td><td>The weight of each assessment component is 30% for assignments, 50% for reports, and 20% for written exams.

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td><table>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td></td><td>1. Partial Differential Equations for Scientists and Engineers, Farlow, Stanley J., John Wiley & Sons.
2. Advanced Engineering Mathematics, O'Neil, Peter V., Thomson.
3. Advanced Engineering Mathematics, Kreyszig, Erwin, John Wiley & Sons.
4. Other sources on the Internet.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

17. Module Description of Operation Research

Module Name	:	Operation research
Module Level	:	Bachelor
Code, if applicable	:	23H01121103
Subtitle, if applicable	:	-
Courses, if applicable	:	Operation research
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Prof. Dr. Aidawayati Rangkuti, MS.
Lecturer(s)	:	Prof. Dr. Aidawayati Rangkuti, MS. Agustinus Ribal, S.Si.,M.Sc., Ph.D
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Basic Mathematics II, Linear Algebra I
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understanding various mathematical methods and concepts, and applying these methods in related fields such as industry, economics, and agriculture; CLO 2. analyzing and implementing various operations research models in other fields of study; CLO 3. constructing mathematical models, explaining procedures, and solving linear programming problems using appropriate optimization techniques, and interpreting the results in related fields; CLO 4. Communicating ideas, developing self - competence based on local wisdom, and adaptingeffectively in a society with diverse backgrounds.

		The following is the mapping of the ILO and the CLO of this course: ILO 3 / ILO 4 / ILO 6 / ILO 7 CLO 1: X CLO 2: X X X CLO 3: X X X X CLO 4: X X X
Content	:	Operations Research is a compulsory subject in the mathematics study program that equips students with the ability to formulate linear programming problems and solve them using optimization methods, both manually and with the aid of software. The course also introduces the concept of duality in linear programming problems along with its properties, as well as sensitivity analysis. The second part of the course focuses on transportation problems and their solutions using Vogel's Approximation Method (VAM), the Stepping Stone method, and the Modified Distribution Method (MODI). In the final part, the course discusses project network problems and their solutions, including project management and the Program Evaluation and Review Technique (PERT). Topics covered may include: convex sets and formulation of linear programming problems, graphical and simplex methods, special cases of solutions, duality and its properties, transportation problem and its solution methods (VAM, Stepping Stone, MODI), and project management including PERT.
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Participants are marked based on their performance in theory: Quizzes (15%), Written Exam (30%), Report (50%), and Assignments (5%). Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

<table>
<tr><td></td><td></td><td>Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Frederick, S. H, Gerald, 2001.” Introduction to Operation Research”. seven edition, Mc Graw- Hill, New York.
2. Gass, Saul L, 1984. “Linear Programming: Method and Application”. Fifth edition, Mc Graw- Hill, New York.
3. Ronal. E. Miller, 2000. “Optimization” Foundation and Application. Prentice Hall, Inc USA.
4. Hiller, Liebermen.2005. Introduction to Operation Research. Eighth edition, Mc Graw- Hill, Companies, one book, New York.
5. Taha, Hamdy, 2007. “Operation Research”. Eighth edition Mc Graw- Hill, New York.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

18. Module Description of Mathematical Modeling

Module Name	:	Mathematical Modelling
Module Level	:	Bachelor
Code, if applicable	:	23H01121203
Subtitle, if applicable	:	-
Courses, if applicable	:	Mathematical Modelling
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Prof. Dr. Kasbawati, S.Si., M.Si.
Lecturer(s)	:	Prof. Dr. Syamsuddin Toaha, M.Sc., Prof. Dr. Kasbawati, S.Si., M.Si., Dr. Khaeruddin, M.Sc.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory Course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning, Project Base Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Completion of modules Advanced Mathematics and Differential Equation
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. identify simple problems in natural phenomena that can be studied and solved mathematically, either independently or collaboratively, through discussion, exchanging ideas, and respecting each other's opinions; CLO 2. construct mathematical models of simple problems in natural phenomena by applying mathematical tools that are relevant and up to date with current developments; CLO 3. apply appropriate fundamental mathematical concepts in solving mathematical models, with or

<table>
<tr><td></td><td></td><td>without the aid of computational tools, interpret the solutions, and validate them using the available data.
The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 5</th><th>ILO 6</th><th>ILO 7</th><th>ILO 8</th><th>ILO 9</th></tr>
<tr><td>CLO 1</td><td></td><td></td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td>CLO 3</td><td></td><td>X</td><td></td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>The course focuses on the application of mathematical theory to various real-world problems, including spring/pendulum systems, interaction dynamics (such as population dynamics, kinetic reactions, metabolic systems, and the spread of diseases), traffic flow problems, as well as other complex issues that can be mathematically analyzed and solved. This course serves as a core subject in the Mathematics Program and functions as a prerequisite for subsequent courses, such as Special Topics in Applied Mathematics.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in Assignments (15%), Report (50%), and Presentation (35%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
</table></td></tr>
</table>

		60 - < 65 | C+ | 2.5 50 - < 60 | C | 2.00 40 - < 50 | D | 1.00 < 40 | E | 0.00
Reading list	:	1. Haberman, R. 1998. Mathematical Models: Mechanical Vibrations, Population Dynamics, and Traffic Flow. SIAM. Philadelphia. 2. Edward, B. 1987. Mathematics for Dynamic Modeling. Academic Press, Inc. San Diego, California. 3. Toaha, S. 2013. Pemodelan Matematika dalam Dinamika Populasi. Dua Satu Press, Makassar. 4. Scientific Journals that related to the topic of the Project
Last revision date	:	February 5th, 2025

19. Module Description of Mathematical Statistics

Module Name	:	Mathematical statistics
Module Level	:	Bachelor
Code, if applicable	:	23H01121303
Subtitle, if applicable	:	-
Courses, if applicable	:	Mathematical statistics
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Dr. Firman, S.Si, M.Si.
Lecturer(s)	:	Dr. Firman, S.Si, M.Si, Jusmawati Massalesse, M.Si
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in the fourth semester for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Probability Theory
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understand the basic principles of inferential statistics (estimation and hypothesis testing); CLO 2. analyze mathematical problems in a logical, analytical and systematically structured way. CLO 3. demonstrate knowledge of estimation and testing for large sample sizes. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 3	ILO 4	ILO 7
CLO 1	X		X	
CLO 2		X		X
CLO 3		X	X	

<table>
<tr><td>Content</td><td>:</td><td>Mathematical statistics course introduces students to the fundamental concepts of mathematical statistics, focusing on statistical inference and its theoretical foundations. It begins with an overview of inference statistics, explaining how data can be used to draw conclusions about populations. The course covers sufficient statistics, which are essential for summarizing data without losing relevant information. Students will also learn about point estimation and confidence intervals, including methods for estimating population parameters and assessing their accuracy. Finally, the course delves into hypothesis testing theory, providing tools for making decisions based on statistical evidence.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in: Quizzes (15%), Report (55%), Written Exam (30%)

Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Final grades are determined based on the scale shown in the table below:

<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
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<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Robert V. Hogg dan Allen T. Craig, 1995, Introduction to Matemathical Statistics, Fifth Edition.
2. George Casella dan Roger L Berger, 2001. Statistical Inference, Duxbury & Thomas Learning</td></tr>
</table>

		3. Wakerly, D., Mendenhall III, W. Scheaffer, R., 2008. Mathematical Statistics with Application, Ed. 7th, Thomson, Canada.
Last revision date	:	February 5th, 2025

20. Module Description of Algebraic Structures

Module Name	:	Algebraic Structures
Module Level	:	Bachelor
Code, if applicable	:	23H01121403
Subtitle, if applicable	:	-
Courses, if applicable	:	Algebraic Structures
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Prof. Dr. Amir Kamal Amir, M.Sc.
Lecturer(s)	:	Dra. Nur Erawati, M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning, Case Method
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Linear Algebra II
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. using group and ring concepts to prove theorems in algebra; CLO 2. apply theorems to prove other results in Algebra; CLO 3. communicate mathematical ideas both orally and in writing with the group. The following is the mapping of the ILO and the CLO of this course:

	ILO 2	ILO 3	ILO 4
CLO 1	X	X	
CLO 2	X	X	
CLO 3	X		X

<table>
<tr><td>Content</td><td>:</td><td>Algebraic structures cover abstract algebra with a focus on non-empty sets with one or two binary operators, as well as the application of logic and algebraic concepts in problem solving. Topics covered include basic concepts of functions and binary operators, groups and subgroups, cyclic groups, permutation groups, cosets and Lagrange's Theorem, abelian groups, factor groups, homomorphisms, kernels, and images. Additionally, the course covers simple groups, group centers, normal subgroups, ring structures, and homomorphisms between rings, including an introduction to fields.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Quiz (25%), Report (15%), Written Exam (40%), and Assignments (20%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
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<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Fraleigh, John B.; A First Course In Abstract Algebra, Edisi Ke 5, Addison Wesley, 1994.
2. Dummit, David S.; Foote, Richard M.; Abstract Algebra, Prentice Hall, 1991.</td></tr>
</table>

		3. Manuscript of abstract algebra textbook 4. Textbook 'Basic Concepts of Inner Product Space'
Last revision date	:	February 5th, 2025

21. Module Description of Geometry

Module Name	:	Geometry
Module Level	:	Bachelor
Code, if applicable	:	23H01130103
Subtitle, if applicable	:	-
Courses, if applicable	:	Geometry
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Amir Kamal Amir, M.Sc.
Lecturer(s)	:	Dra. Nur Erawati, M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Real Analysis
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. identify the properties of real numbers, generalize to higher dimensions, and establish relationships to solve problems; CLO 2. analyzing the differences between vectors, bivectors, and multivectors; CLO 3. analyzing the generalization of real numbers to quaternion numbers The following is the mapping of the ILO and the CLO of this course:

	ILO 2	ILO 3	ILO 4
CLO 1	X		
CLO 2		X	
CLO 3			X

<table>
<tr><td>Content</td><td>:</td><td>Geometry introduces the basic concepts of algebraic geometry with a focus on developing students' critical thinking skills in extending the properties of real numbers to higher dimensions. Learning emphasizes problem-solving, ranging from simple to complex problems, and involves discussions and presentations of theorem proofs to train logical and systematic thinking. The material covers vector spaces, bivectors, multivectors, geometric operations such as translation and rotation, as well as quaternion algebra and its applications in Euclidean and rotational fields.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Report (60%), Written Exam (40%).

Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Suter, J. (2003), Geometric Algebra Primer, http://www.jaapsuter.com/geometric-algebra/
2. Doran, C, and Lasenby , A. (2007), Geometric Algebra for Physics, Cambridge University Press.
3. Nur, M., & Idris, M. . (2023). A New Notion of Inner Product in A Subspace of n-Normed Spaces. Journal of the</td></tr>
</table>

		Indonesian Mathematical Society, 29(3), 372–381. https://doi.org/10.22342/jims.29.3.1412.372-381
Last revision date	:	July 28th, 2025

22. Module Description of Stochastic Processes

Module Name	:	Stochastic Processes
Module Level	:	Bachelor
Code, if applicable	:	23H01130203
Subtitle, if applicable	:	-
Courses, if applicable	:	Stochastic Processes
Semester(s) in which the module is taught	:	6 (Sixth Semester)
Module coordinator(s)	:	Jusmawati Massalesse, M.Si.
Lecturer(s)	:	Jusmawati Massalesse, M.Si., Dr. Firman, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning, Project Base Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Advanced mathematics, Probability Theory
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Students are able to explain the terminology related to various types of stochastic processes and the characteristics that differentiate the types of stochastic processes from each other.; CLO 2. Students are able to apply the concept of probability distribution to determine the properties associated with a stochastic process; CLO 3. Student are able to model the dynamics of random events in various fields of science, as well as interpret the long-run behavior of random events using different types of stochastic processes.

		The following is the mapping of the ILO and the CLO of this course: ILO 4 | ILO 5 | ILO 7 | ILO 8 | ILO 9 CLO 1: X | | | X | CLO 2: X | X | X | | CLO 3: | X | X | | X
Content	:	The Stochastic Processes course introduces students to the fundamental concepts and techniques for analyzing random phenomena that evolve over time. The course begins with the basic definition of stochastic processes and their relationship with random variables and probability distributions. It then explores joint probabilities and distributions, conditional probabilities and moments, and advances to classical stochastic models such as Markov chains, Poisson processes, and Markov processes. Further topics include the birth and death processes and renewal processes, which are widely applied in modeling real-world systems. By the end of this course, students are expected to understand the theoretical foundations of stochastic processes, develop skills to model and analyze random systems, and apply these concepts in various fields such as mathematics, computer science, engineering, and economics.
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. Students must attend the exam to get final grade.
Exams and assessment formats	:	Participants are marked based on their performance in theory: Assignments (5%), Quizzes (25%), Written Exam (20%), Report (50%). Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale:

<table>
<tr><td></td><td></td><td>
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table>
</td></tr>
<tr><td>Reading list</td><td>:</td><td>
1. Karlin, S & Amp; H. M. Taylor, 1994. An Introduction to Stochastic Modeling, 3rd Edition. Academic Press. New York.
2. Allen, S. 2003. Introduction to Stochastic Process with Biology Application.
3. Ross, Sheldon M. 2007. Introduction to Probability Models, 9th Edition. Elsevier Inc. London
</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

23. Module Description of Complex Functions

Module Name	:	Complex Functions
Module Level	:	Bachelor
Code, if applicable	:	23H01130303
Subtitle, if applicable	:	-
Courses, if applicable	:	Complex Functions
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Amir Kamal Amir, M.Sc.
Lecturer(s)	:	Dra. Nur Erawati, M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Compulsory course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Introduction to Real Analysis
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. have a relatively deep understanding of the concept of complex variable functions.; CLO 2. identify objects, and master the techniques for proving complex variable function theorems; CLO 3. reconstruct, modify, analyze, the fundamentals of complex function theory and other fields, and be able to assess accuracy, interpret it, and communicate it both verbally and in writing. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 2
CLO 1	X	X
CLO 2		X
CLO 3	X	

<table>
<tr><td>Content</td><td>:</td><td>Complex Functions covers fundamental and important concepts in complex functions and encourages students to think creatively in solving various problems, ranging from simple to complex. The main focus is on the problem-solving process, with several theorems presented and proven to train students' logical reasoning skills. The material covers complex numbers and their operations, complex functions, limits and continuity, differentials and analytic functions, Cauchy-Riemann equations, harmonic functions, complex function integrals, Cauchy's integral theorem, Taylor and Laurent series, and residue theorems and their applications.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Quizzes (10%), Report (50%), Written Exam (40%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Ruel V Churchill and James Ward Brown, (2010), Complex Variables and Applications, McGRAW-HILL.</td></tr>
</table>

		2. Murray Spigel (1964), Theory and Problem of Complex Variables, McGRAW-HILL. 3. John Erik Fornaess (1993), Several Complex Variables, Princeton University Press 4. Stephen D. Fisher (1990), Complex Variables, Dover Publications, INC.
Last revision date	:	July 28th, 2025

24. Module Description of Research and Thesis Result Seminar

Module Name	:	Research and Thesis Result Seminar
Module Level	:	Bachelor
Code, if applicable	:	23H01140404
Subtitle, if applicable	:	-
Courses, if applicable	:	Research and Thesis Result Seminar
Semester(s) in which the module is taught	:	7th or 8th (Seventh or Eight semester)
Module coordinator(s)	:	Head of Bachelor Program in Mathematics
Lecturer(s)	:	Thesis Supervisors
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	Compulsory course in the final stage of the curriculum
Type of teaching/teaching method	:	Supervision with Lecturer Independent Research and Preparation Presentation and Evaluation
Contact hours	:	11.25 hours activities per week during the semester, including meetings with the supervisors, independent research, presentation, evaluation, and revision.
Workload	:	Total workload is 180 hours per semester which consists of 36 hours per semester for Meetings/Supervision with Lecturer, 126 hours per semester for Independent Research and Preparation, and 18 hours per semester for Presentation, Evaluation, and Revision
Credit points	:	4 (6.4 ECTS)
Requirements according to the examination regulations	:	Students must have completed all prerequisite compulsory courses and obtained approval of the thesis proposal from the supervisor.
Recommended prerequisites	:	Sufficient mastery of mathematical subjects relevant to the chosen topic.
Module objectives/intended learning outcomes	:	After completion of this module, students will be able to: CLO 1. conduct independent study of a particular topic; CLO 2. using mathematical power that has been studied in previous courses; CLO 3. understand, analyze, and provide solution from mathematical point of view; CLO 4. have self-confidence, good ethics, and good performance in communication; CLO 5. write a scientific report and scientific presentation using different presentation media. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 2	ILO 5	ILO 6	ILO 7	ILO 9
CLO 1				X		
CLO 2	X					
CLO 3		X				

		CLO 4 X X CLO 5 X
Content	:	1. Consulting the progress result with the supervisors; 2. Presenting of the research result; 3. Clarifying the suggestions/comments of the examiners during the proposal seminar; 4. Students present their research results in a results seminar; 5. Students answer the questions raised by the examiners regarding the results of their research.
Study and examination requirements	:	Participants are marked based on their performance in theory: Project or Case Study (100%), prepare and present a research and thesis or progress report following the university's thesis guidelines, the seminar is evaluated by at least 80% examiner and supervisor.
Exams and assessment formats	:	Scoring the grade of the Result is based on the following assessment components:
Reading list	:	1. Hasanuddin University regulations regarding final projects. 2. Guidelines and formats for writing and compiling final projects at the department, faculty, and university levels. 3. Teaching materials for courses related to the final project topic. 4. Primary and supporting literature for courses related to the final project topic. 5. Relevant reputable international journals published within the last 5 years.
Last revision date	:	February 5th, 2025

No.	Main Criteria	Weight
A. Written Thesis Assessment		**60**
1	Introduction	10
2	Research Methodology	5
3	Writing Technique and Language Use	5
4	Results	15
5	Discussion	15
6	Conclusion and Recommendation	5
7	References	5
B. Presentation Assessment		**40**
1	Presentation Structure	5
2	Use of Audio-Visual Aids	5
3	Time Management	5
4	Mastery of Material and Accuracy of Responses	20
5	Attitude and Appearance	5
Total Overall		**100**

25. Module Description of Thesis Writing and Final Examination

Module Name	:	Thesis Writing and Final Examination
Module Level	:	Bachelor
Code, if applicable	:	23H01140504
Subtitle, if applicable	:	-
Courses, if applicable	:	Thesis Writing and Final Examination
Semester(s) in which the module is taught	:	7 or 8 (Seventh or Eight)
Module coordinator(s)	:	Head of Bachelor Program in Mathematics
Lecturer(s)	:	Thesis Supervisors
Language	:	Indonesian Language (Bahasa Indonesia)
Relation to curriculum	:	Compulsory course in the final stage of the curriculum
Type of teaching/teaching method	:	Supervision with Lecturer Independent Research and Preparation Presentation, Evaluation, and Final Revision
Contact hours	:	11.25 hours activities per week during the semester, including consultation with the supervisors, individual study, writing the thesis draft, and the defence examination.
Workload	:	Total workload is 180 hours per semester which consists of 20 hours per semester for consultation with the supervisors, 60 hours per semester for Individual Study, 80 hours per semester for Writing the Thesis Draft and 20 hours per semester for Defence Examination
Credit points	:	4 (6.4 ECTS)
Requirements according to the examination regulations	:	• Have passed the Research and Thesis Result Seminar • Have obtained approval for their draft/manuscript from the supervisor(s) • Have received an approval letter from the Head of Study Program and the Dean • Have obtained a thesis permission letter from the Directorate of Education, Hasanuddin University
Recommended prerequisites	:	Research and Thesis Result Seminar
Module objectives/intended learning outcomes	:	After completion of this module, students will be able to: CLO 1. communicate the results of their work to the campus community; CLO 2. use their mathematical power that has been studied in previous courses; CLO 3. have self-confidence, good ethics, and good performance in communication; CLO 4. write scientific thesis report and scientific presentation. The following is the mapping of the ILO and the CLO of this course:

		<table><tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 5</th><th>ILO 6</th><th>ILO 7</th><th>ILO 9</th></tr><tr><td>CLO 1</td><td></td><td></td><td></td><td></td><td>X</td><td></td></tr><tr><td>CLO 2</td><td>X</td><td>X</td><td></td><td>X</td><td></td><td></td></tr><tr><td>CLO 3</td><td></td><td></td><td></td><td></td><td></td><td>X</td></tr><tr><td>CLO 4</td><td></td><td></td><td>X</td><td></td><td>X</td><td></td></tr></table>
Content	:	1. This module serves as a continuation of the Research and Thesis Result Seminar. 2. Students prepare a comprehensive research report in the form of a final thesis. 3. Students present and defend their research results before a panel of supervisors and examiners in a formal defense session.
Study and examination requirements	:	Participants are marked based on their performance in theory: Project or Case Study (100%), thesis must follow the official writing format and academic standards set by the university, present and defend their research before a panel of supervisors and examiners.
Exams and assessment formats	:	Scoring the grade of the Result is based on the following assessment components:

No.	Main Criteria	Weight
A. Written Thesis Assessment		**60**
1	Introduction	10
2	Research Methodology	5
3	Writing Technique and Language Use	5
4	Results	15
5	Discussion	15
6	Conclusion and Recommendation	5
7	References	5
B. Presentation Assessment		**40**
1	Presentation Structure	5
2	Use of Audio-Visual Aids	5
3	Time Management	5
4	Mastery of Material and Accuracy of Responses	20
5	Attitude and Appearance	5
Total Overall		**100**

Reading list	:	1. Hasanuddin University regulations regarding final projects. 2. Guidelines and formats for writing and compiling final projects at the department, faculty, and university levels. 3. Teaching materials for courses related to the final project topic. 4. Primary and supporting literature for courses related to the final project topic. 5. Relevant reputable international journals published within the last 5 years.
Last revision date	:	February 5th, 2025

Module Description of University Elective Courses

1. Module Description of Finite Difference Methods

Module Name	:	Finite Difference Methods
Module Level	:	Bachelor
Code, if applicable	:	23H01121503
Subtitle, if applicable	:	-
Courses, if applicable	:	Finite Difference Methods
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Agustinus Ribal, S.Si., M.Sc., Ph. D
Lecturer(s)	:	Agustinus Ribal, S.Si., M.Sc., Ph. D, Dr. Khaeruddin, M.Sc.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Differential equation and partial differential equation
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Understand several mathematical methods and concepts and apply these methods in several related fields such as industry, economics, and agriculture; CLO 2. Analyze and implement several optimization methods into other fields of study; CLO 3. Construct several mathematical models, explain procedures, and solve optimization problems using appropriate techniques and interpret the results obtained in other related fields;

<table>
<tr><td></td><td></td><td>CLO 4. Able to communicate ideas, develop personal skills based on local wisdom, and easily adapt to communities with diverse backgrounds.
The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 3</th><th>ILO 4</th><th>ILO 6</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 4</td><td></td><td></td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>The Finite Difference Method course equips students with knowledge and skills to apply numerical approaches in solving partial differential equations (PDEs). Students learn the fundamental concepts of finite difference approximations through Taylor series expansion (forward, backward, and central differences). These methods are then applied to solve elliptic, parabolic, and hyperbolic PDEs under various boundary conditions—both regular and irregular—and in different coordinate systems (Cartesian, polar, and cylindrical). Ultimately, students are able to implement finite difference methods to solve real-world problems, including the two-dimensional heat equation and the convection-diffusion equation.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Quizzes (16%), Written Exam (40%), Report (35%), and Assignments (9%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:</td></tr>
</table>

			Percentage of Achievement	**Grade**	**Conversion Value**
			85 – 100	A	4.00
			80 - <85	A-	3.75
			75 - < 80	B+	3.5
			70 - < 75	B	3.0
			65 - < 70	B-	2.75
			60 - < 65	C+	2.5
			50 - < 60	C	2.00
			40 - < 50	D	1.00
			< 40	E	0.00
Reading list	:	1. Hoffmann, K.A., Chiang, S.T., "Computational Fluid Dynamics for Engineers Volume1, 3rd edition"Engineering Education System,1995 2. Noye, J., "Computational Techniques for Differential Equations", Elsevier Science Publisher B.V, 1984 3. Leon, L., Pinder, G.F., "Numerical Solution of Partial Defferential Equation in Science and Engineering", John Wiley & Sons, 1982 4. Strauss, W. A., 2007: Partial Differential Equations: An Introduction. John Wiley & Sons.			
Last revision date	:	February 5th, 2025			

2. Module Description of Dynamical Systems

Module Name	:	Dynamical System
Module Level	:	Bachelor
Code, if applicable	:	23H01121603
Subtitle, if applicable	:	-
Courses, if applicable	:	Dynamical System
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Prof. Dr. Syamsuddin Toaha, M.Sc.
Lecturer(s)	:	Prof. Dr. Syamsuddin Toaha, M.Sc. Prof. Dr. Jeffry Kusuma, Prof. Dr. Kasbawati, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in the second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students must have a good understanding about the basic concepts of the Differential Equations.
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. investigate the stability of a system; CLO 2. understand the importance of initial conditions and understand the meaning of the terms attractor and repeller; CLO 3. understand the importance of parameter values in a model; CLO 4. describe qualitatively the longterm behavior of a system; CLO 5. understand the sensitivity of chaotic systems to initial conditions. The following is the mapping of the ILO and the CLO of this course:

	ILO 4	ILO 5	ILO 6
CLO 1	X		X
CLO 2	X		X

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>CLO 3</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>CLO 4</td><td></td><td>X</td><td>X</td></tr>
<tr><td>CLO 5</td><td></td><td>X</td><td>X</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>:</td><td>In dynamical systems, the model—usually represented by a set of differential or difference equations—determines the evolution of the system solely based on its initial state, that is, its long-term behavior once the initial conditions are given. The objective of this module is to study how to use such models to analytically and qualitatively predict the long-term behavior of a system.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Written Exam (20%), Report (60%), and Assignments (20%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table>
</td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Arrowsmith, D.K., Place, C.M. 1982. Ordinary Differenitial Equations. Chapman and Hall. London.
2. J.D. Murray, Mathematical Biolgy I, Springer, New York.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

3. Module Description of Number Theory

Module Name	:	Number Theory
Module Level	:	Bachelor
Code, if applicable	:	23H01122003
Subtitle, if applicable	:	-
Courses, if applicable	:	Number Theory
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Dr. Muhammad Zakir, M.Si.
Lecturer(s)	:	Dra. Nur Erawati, M.Si., Dr. Muhammad Zakir, M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Mathematical Logic and Set Theory
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Obeying the agreed-upon rules, being disciplined in completing tasks, and respecting the opinions of others; CLO 2. Demonstrating an awareness of their role as a learner in the classroom by engaging actively in the learning process; CLO 3. Internalizing the spirit of independence in completing assignments and examinations; CLO 4. Able to organize the stages of task completion and select appropriate methods for accomplishing the task; CLO 5. Able to collaborate and communicate within a team while taking responsibility for the work.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 3</th></tr>
<tr><td>CLO 1</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 3</td><td></td><td></td><td>X</td></tr>
<tr><td>CLO 4</td><td></td><td></td><td>X</td></tr>
<tr><td>CLO 5</td><td></td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>In number theory, important topics include division and the Euclidean Algorithm for finding the greatest common divisor, as well as the ideas of common divisors, common multiples, and prime numbers. The concept of congruence leads to the study of complete and reduced residue systems, along with linear congruences and Diophantine equations. Further topics are Euler’s generalization and its applications, the Chinese Remainder Theorem, Euler’s totient function, and properties of numbers under prime power modulo.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Assignments (20%), Report (40%), Written Exam (40%)

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
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<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
</table>

Reading list	:	1. I. Niven, H.S. Zuckerman, H.L. Montgomery, An Intruduction to the Theory of Number, John Wiley & Sons, 5-th Edition, 2006. 2. Nur Erawaty, Loecky Haryanto, Syamsuddin Toaha, Modul Pembelajaran Mata Kuliah Teori Bilangan, Unhas, 2009.
Last revision date	:	February 5th, 2025

4. Module Description of Coding Theory

Module Name	:	Coding theory
Module Level	:	Bachelor
Code, if applicable	:	23H01121703
Subtitle, if applicable	:	-
Courses, if applicable	:	Coding theory
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Dr. Muhammad Zakir, M.Si
Lecturer(s)	:	Dr. Muhammad Zakir, M.Si., Prof. Dr. Nurdin, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Collaborative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Mathematical Logic and Set, Linear Algebra I, Discrete Mathematics, Algebra Structure
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. decode, detect, and correct errors; CLO 2. perform decoding of linear codes; CLO 3. decode perfect codes; CLO 4. construct polynomials from a cyclic code, The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 2	ILO 3
CLO 1	X		
CLO 2		X	
CLO 3			X
CLO 4			X

<table>
<tr><td>Content</td><td>:</td><td>Coding Theory is an application of Linear Algebra. Several fundamental concepts that must be mastered in this course are related to Linear Algebra, particularly the concept of vector spaces and their properties. Specifically, the vector spaces that are extensively discussed in this course are matrix spaces. The topics covered in this course include linear codes, perfect codes, and other related types of codes, as well as cyclic codes.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Assignment and Quizzes (60%), Written Exam (40%)

Assignments assess student's ability to apply concepts independently. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
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<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>Main:
3. Coding Theory A First Course; SAN LING CHAOPINGXING; National University of Singapore; 2004
4. Coding Theory and Cripthography: The Essential, second edition, D.R. Hankerson, D.G. Hoffman, D.A. Leonard, C.C. Lindner, K.T. Phelps, C.A. Rodger, J.R. Wall, Marsel Dekker Ink, New York, 2000
5. Introduction to Coding Theory, J.H. Van Lint, Springer-Verlag, 1982.</td></tr>
</table>

		Additional: 1. Coding Theory and Cripthography: The Essential, second edition, D.R. Hankerson, D.G. Hoffman, D.A. Leonard, C.C. Lindner, K.T. Phelps, C.A. Rodger, J.R. Wall, Marsel Dekker Ink, New York, 2000 2. Theory of Error-Correcting Codes, F.J. Mac Williams, J.J. Sloane, North-Holland, 1977. 3. Introduction to The Theory of Error-Correcting Codes, V. Pless, Wiley, 1982. 4. A Mathematical Theory of Communication, C.E. Shannon, Bell System Technical Journal, 27:379-423, and 623-56, 1948.
Last revision date	:	February 5th, 2025

5. Module Description of Calculus of Variations

Module Name	:	Calculus of Variations
Module Level	:	Bachelor
Code, if applicable	:	23H01121803
Subtitle, if applicable	:	-
Courses, if applicable	:	Calculus of Variations
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Prof. Dr. Eng. Mawardi, S.Si., M.Si.
Lecturer(s)	:	Dr. Firman, S.Si.,M.Si., Prof. Dr. Eng. Mawardi, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in second year for Bachelor degree in Mathematics and Set Theory
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Basic Mathematics I and Basic Mathematics II
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Obtain extreme values in functional calculus; CLO 2. derive the Euler–Lagrange equation and determine its relationship with the extremal function in elementary calculus; CLO 3. determine the canonical form of the Euler equation and quadratic functions. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 2	ILO 3
CLO 1	X		
CLO 2		X	
CLO 3			X

<table>
<tr><td>Content</td><td>:</td><td>Calculus of Variations is a course that introduces the study of functional and variational problems, including the first variation and the search for optimal paths. The topics also cover endpoint and derivative problems, functionals with higher-order derivatives, and the canonical form of Euler’s equation. In addition, the course explores quadratic functionals and other topics related to functionals with applications in mathematics and applied sciences.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Assignments (20%), Report (60%), Written Exam (20%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.
Students are marked based on their percentage of points obtained and based on the following grade scale:
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<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>I. M. Gelfand, S. V. Fomin, Calculus of Variations, Prentice-Hall, New Jersey, 1963.
Lewis, F.L. dan Symros, V.L. Optimal Control. Canada: John Wiley and Sons, Inc., 1995.
Chiang, A.C. Elements of Dynamics Optimization. USA: Waveland Press, Inc., 1992.</td></tr>
<tr><td>Last revision date</td><td>:</td><td>February 5th, 2025</td></tr>
</table>

6. Module Description of Economic and Financial Mathematics

Module Name	:	Economics and Financial Mathematics
Module Level	:	Bachelor
Code, if applicable	:	23H01121903
Subtitle, if applicable	:	-
Courses, if applicable	:	Economics and Financial Mathematics
Semester(s) in which the module is taught	:	4 (Fourth Semester)
Module coordinator(s)	:	Prof. Dr. Aidawayati Rangkuti, MS.
Lecturer(s)	:	Dr. Amran, S.Si.,M.Si., Prof. Dr. Aidawayati Rangkuti, MS., Jusmawati Massalesse, S.Si.,M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	-
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understand interest rates, present value analysis, probability theory, the probability of normal random variables, and their properties; CLO 2. identify techniques and theorems related to interest rates, present value, and Brownian motion, and establish their relationship in deriving the Black–Scholes formula; CLO 3. apply the Black–Scholes concept effectively to solve option pricing problems in economics. The following is the mapping of the ILO and the CLO of this course:

		<table><tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 4</th><th>ILO 5</th><th>ILO 7</th></tr><tr><td>CLO 1</td><td>X</td><td></td><td></td><td></td><td></td></tr><tr><td>CLO 2</td><td></td><td>X</td><td>X</td><td></td><td></td></tr><tr><td>CLO 3</td><td></td><td>X</td><td></td><td>X</td><td>X</td></tr></table>
Content	:	This course introduces the Black-Scholes formula for option pricing based on the Brownian Motion approach. To understand the formulation, students are required to have sufficient knowledge of probability theory, particularly the properties of normally distributed random variables. The course also covers key financial concepts such as interest rate, present value, and arbitrage, which are fundamental in determining option prices in both single and multi-period settings. Main topics include probability theory, normal random variables, Brownian Motion and Geometric Brownian Motion, interest rate and present value analysis, arbitrage theory, and the Black-Scholes formula.
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Participants are marked based on their performance in theory: Written Exam (20%), Report (50%), and Assignments (30%) Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale: <table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr><tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr><tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr><tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr><tr><td>< 40</td><td>E</td><td>0.00</td></tr></table>
Reading list	:	An Elementary Introduction to Mathematical Finance (Third Edition). Cambridge University Press, Sheldon M. Ross. 2011.
Last revision date	:	February 5th, 2025

7. Module Description of Machine Learning

Module Name	:	Machine Learning
Module Level	:	Bachelor
Code, if applicable	:	23H01130403
Subtitle, if applicable	:	-
Courses, if applicable	:	Machine Learning
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Dr. Khaeruddin, M.Sc.
Lecturer(s)	:	Dr. Khaeruddin, M.Sc. Edy Saputra Rusdy , S.Si., M.Si. A. Muh. Amil Siddik, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Linear Algebra I, Algorithms and Programming, Mathematical Statistics
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. apply appropriate fundamental mathematical concepts to solve problems using Machine Learning; CLO 2. identify simple problems in real-world phenomena through data that can be analyzed and solved mathematically; CLO 3. develop machine-learning models with computational tools, interpret the solutions, and validate them using the available data; The following is the mapping of the ILO and the CLO of this course:

		<table><tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 4</th><th>ILO 6</th><th>ILO 8</th></tr><tr><td>CLO 1</td><td>X</td><td></td><td></td><td></td><td>X</td></tr><tr><td>CLO 2</td><td></td><td>X</td><td>X</td><td></td><td></td></tr><tr><td>CLO 3</td><td></td><td></td><td></td><td>X</td><td></td></tr></table>
Content	:	Machine Learning is an elective subject that provides understanding and development of expertise in the form of the fundamental ideas, intuitions, concepts, algorithms, and techniques that enable computers to become smarter through learning from data. The material covered includes supervised learning, unsupervised learning, reinforcement learning, and ensemble methods.
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Participants are marked based on their performance in theory: Quizzes (15%), Report (55%), and Assignments (30%). Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale: <table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr><tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr><tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr><tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr><tr><td>< 40</td><td>E</td><td>0.00</td></tr></table>
Reading list	:	1. https://scikit-learn.org/stable/user_guide.html 2. https://alex.smola.org/drafts/thebook.pdf 3. Géron, A. (2019). *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems* (2nd ed.). O'Reilly Media.

		4. Patterson, J., & Gibson, A. (2017). *Deep learning: A practitioner's approach*. Sebastopol, CA: O'Reilly Media.
Last revision date	:	July 28th, 2025

8. Module Description of Boundary Element Methods

Module Name	:	Boundary Element Methods
Module Level	:	Bachelor
Code, if applicable	:	23H01130503
Subtitle, if applicable	:	-
Courses, if applicable	:	Boundary Element Methods
Semester(s) in which the module is taught	:	3 (Third Semester)
Module coordinator(s)	:	Prof. Dr. Jeffry Kusuma
Lecturer(s)	:	Prof. Dr. Jeffry Kusuma
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in second year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	None
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. demonstrate their understanding of the transformation of partial differential equations into boundary integral equations; CLO 2. demonstrate their understanding of the discretization of boundary value problems for integral equations; CLO 3. demonstrating an understanding of using numerical integration to solve simultaneous linear systems of equations AX = B for boundary s; CLO 4. demonstrate their understanding in finding solutions at any interior point. The following is the mapping of the ILO and the CLO of this course:

		<table><tr><th></th><th>ILO 2</th><th>ILO 6</th><th>ILO 4</th><th>ILO 7</th></tr><tr><td>CLO 1</td><td>X</td><td></td><td></td><td></td></tr><tr><td>CLO 2</td><td>X</td><td>X</td><td></td><td></td></tr><tr><td>CLO 3</td><td></td><td>X</td><td>X</td><td>X</td></tr><tr><td>CLO 4</td><td></td><td>X</td><td>X</td><td>X</td></tr></table>
Content	:	The Boundary Element Method course discusses numerical approaches to solving partial differential equations (PDEs) such as Laplace, diffusion-convection, and wave equations, both in steady and unsteady conditions. The course begins with the transformation of PDEs into boundary integral equations using Green's functions, followed by the discretization of the boundary domain into elements, the formation of the linear equation system AX=B, the calculation of entries in matrices A and B, and the solution of the system to obtain solutions at the boundary and within the domain. This method focuses on solving boundary value problems with high efficiency, especially for complex geometries or unbounded domains, with Laplace's equation as the main case study.
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Participants are marked based on their performance in theory: Assignments (10%), Report (60%), Quizzes (10%), and Written Exam (20%). Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale: <table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr></table>

			60 - < 65	C+	2.5	
			50 - < 60	C	2.00	
			40 - < 50	D	1.00	
			< 40	E	0.00	
Reading list	:	1. Prof. Moh. Ivan Azis, M.Sc., Ph.D. Metode Elemen Batas untuk Media Anisotropik Homogen, Brilian Internasional Surabaya, 2012. 2. Brebbia, C. A., Dominguez, J. Boundary Elements An Introductory Course, WIT-Press Boston Southampton, 1992. 3. M. I. Azis, A numerical solution for unsteady anisotropic diffusion reaction equation of time–space variable coefficients , Math. Meth. Appl. Sci. 47 (2024), 1628–1642, DOI 10.1002/mma.9713. 4. Mohammad Ivan Azis, "A Mixed LT and BEM for Unsteady Harmonic Acoustic Problems of Anisotropic Trigonometrically Graded Materials," Engineering Letters, vol. 31, no.4, pp1457-1463, 2023			
Last revision date	:	July 28th, 2025				

9. Module Description of Learning and Teaching

Module Name	:	Learning and Teaching
Module Level	:	Bachelor
Code, if applicable	:	23H01130603
Subtitle, if applicable	:	-
Courses, if applicable	:	Learning and Teaching
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Budi Nurwahyu
Lecturer(s)	:	Budi Nurwahyu
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Principle of Mathematics understanding, Mathematically Thinking, Analysis of Mathematics objects, Argumentation and proving of mathematics, Mathematics Problem solving skill, Planning and executing teaching of mathematics, Evaluation principle of teaching of mathematics, Teaching practice of mathematics.
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. identify and increase to mathematics understanding and mathematically thinking of students; CLO 2. identify and utilize to mathematics objects for enhancing mathematics understanding and cognitive style of students; CLO 3. utilize to principles of mathematics proving and problem solving; CLO 4. plan and execute to teaching of mathematics effectively, innovative and creative.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 2</th><th>ILO 7</th><th>ILO 8</th><th>ILO 9</th></tr>
<tr><td>CLO 1</td><td></td><td>X</td><td></td><td>X</td></tr>
<tr><td>CLO 2</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 4</td><td></td><td></td><td>X</td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>In this module, the students will know, describe, explain and practice: Principle of Mathematics understanding, Mathematically Thinking, Analysis of Mathematics objects, Argumentation and proving of mathematics, Mathematics Problem solving skill, Planning and executing teaching of mathematics, Evaluation principle of teaching of mathematics, Teaching practice of mathematics.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Written Exam (55%), Assignments (15%), and Presentations (30%).

Assignments assess student's ability to apply concepts independently. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
</table>

Reading list	:	1. David Tall, Advanced Mathematical Thinking, ISBN 978-0-306-47203-9, Springer, 1991. 2. Alan H Schoenfeld, Mathematical Problem solving, ISBN 012-628870-4, Academic Press Inc Ltd, London, 1985. 3. Steven G. Krantz, How to Teach Mathematics, American Mathematical Society, 2 edition, 1999.
Last revision date	:	July 28th, 2025

10. Module Description of Computational Mathematics

Module Name	:	Computations Mathematics
Module Level	:	Bachelor
Code, if applicable	:	23H01130703
Subtitle, if applicable	:	-
Courses, if applicable	:	Computations Mathematics
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Agustinus Ribal, S.Si.,M.Sc., Ph. D
Lecturer(s)	:	Agustinus Ribal, S.Si.,M.Sc., Ph. D Dr.Khaeruddin, M.Sc.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Advanced Mathematics, Numerical Methods, Differential Equations
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understanding several mathematical methods and concepts and applying these methods in other related fields such as industry, economics, and agriculture; CLO 2. analyzing and implementing several numerical methods into other fields of study; CLO 3. create several mathematical models, explain procedures, and solve problems numerically using appropriate techniques and interpret the results obtained in other related fields; CLO 4. communicating ideas, developing personal skills based on local wisdom, and easily adapting to communities with different backgrounds.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 3</th><th>ILO 4</th><th>ILO 6</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 4</td><td></td><td></td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>Computational Mathematics is an elective course in the mathematics program that equips students with the ability to solve real-world problems numerically using computers, as well as analyze errors and convergence of numerical methods. The course covers numerical methods for initial value problems, such as Euler's method, Runge-Kutta methods, multi-step methods, and corrector-predictor methods, as well as their application to systems of ordinary differential equations of first and higher orders. Additionally, the course discusses two-point limits, vector and matrix norms, spectral radii, matrix series and their convergence, as well as iterative methods for large-scale linear systems and nonlinear systems.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Written Exam (40%), and Report (60%).

Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
</table></td></tr>
</table>

			< 40	E	0.00	
Reading list	:	1. Burden R.L. and Faires J.D., Numerical Analysis (9th edition) Brooks/Cole, Australia, UK, USA, 2011. 2. Smith G.D., Numerical Solution of Partial Differential Equations - Finite Difference Methods, Clarendon Press, Oxford, 1978.				
Last revision date	:	July 28th, 2025				

11. Module Description of Control Theory

Module Name	:	Control Theory
Module Level	:	Bachelor
Code, if applicable	:	23H01130803
Subtitle, if applicable	:	-
Courses, if applicable	:	Control Theory
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Dr. Firman, S.Si.,M.Si.
Lecturer(s)	:	Dr. Firman, S.Si.,M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Case Study, Cooperative Learning, Project-Based Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 SKS (4.8 ECTS)
Requirements according to the examination regulations		Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Basic Mathematics I, Linear Algebra I
Module objectives/intended learning outcomes	:	After completion of this module, students are able to: CLO 1. recognize various problems in control systems CLO 2. understand the basic principles of control theory CLO 3. understand the concept of feedback control design to analyze the stability of the control system CLO 4. apply methods in control theory to real problems The following is the mapping of the ILO and the CO of this course:
Content	:	The course provides eight main groups of study materials, state space representation of a scalar differential equation, transformation of state space equations into scalar differential equations, solution of the state space equation, control and observation of the linear control system, stability analysis of linear and nonlinear systems, input-

	ILO 1	ILO 2	ILO 3	ILO 6
CLO 1	X			
CLO 2	X	X	X	
CLO 3		X		X
CLO 4			X	X

<table>
<tr><td></td><td></td><td>output linearization in nonlinear control systems (input-output linearization in nonlinear control systems), optimal control based on the calculus of variations, and Pontryagin Principle (The Pontryagin Principle).</td></tr>
<tr><td>Study and examination requirements</td><td></td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td></td><td>Participants are marked based on their performance in theory: Presentation (5%), Assignments (10%), Written Exam (30%), and Report (55%).

Assignments assess student's ability to apply concepts independently. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td></td><td>State Space Analysis of Control Systems. Katsuhiko Ogata.
Introduction to Mathematical Control Theory, S. Barnett & R. G. Cameron,
3Nonlinear Systems. Hassan K. Khalil
Sugeng, K.A., Barack, Z.Z., Hinding, N., Simanjuntak, R, Modular Irregular Labeling on Double-Star and Friendship Graphs, Journal of Mathematics, 2021, 2021, 4746609.
Firman, et.al. 2022. Modification of the Trajectory Following Method for Asymptotic Stability in a System of Nonlinear</td></tr>
</table>

		Control.Nonlinear Dynamics and Systems Theory, 22 (2). p. 169–177
Last revision date		July 28th, 2025

12. Module Description of Introduction to Digital Processing

Module Name	:	Introduction to Digital Image Processing
Module Level	:	Bachelor
Code, if applicable	:	23H01130903
Subtitle, if applicable	:	-
Courses, if applicable	:	Introduction to Digital Image Processing
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Eng. Mawardi, S.Si., M.Si.
Lecturer(s)	:	Prof. Dr. Eng. Mawardi, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics and Set Theory
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Basic Mathematics II

<table>
<tr><td>Module objectives/intended learning outcomes</td><td>:</td><td>After the completion of this module, the student will be able to:
CLO 1. Understand the definition of metric spaces and determine their completeness;
CLO 2. Understand the definition of convolution and correlation and apply them in image processing;
CLO 3. Process or transform images using Fourier and discrete Wavelet transforms;
CLO 4. Demonstrate image restoration and provide simple examples;

The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 6</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 3</td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 4</td><td></td><td></td><td>X</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>:</td><td>This elective course is designed to provide students with additional skills in digital image processing, which are widely required in various applications such as healthcare, broadcasting, and other fields. The course covers the fundamentals of digital image processing, image transformation, spatial filtering, frequency domain processing, Fourier and Wavelet transforms, image restoration, color image processing, and image segmentation.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Report (60%), Assignments (20%), Presentation (20%).

Assignments assess student's ability to apply concepts independently, while control. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:</td></tr>
</table>

			Percentage of Achievement	**Grade**	**Conversion Value**
			85 – 100	A	4.00
			80 - <85	A-	3.75
			75 - < 80	B+	3.5
			70 - < 75	B	3.0
			65 - < 70	B-	2.75
			60 - < 65	C+	2.5
			50 - < 60	C	2.00
			40 - < 50	D	1.00
			< 40	E	0.00
Reading list	:	1. Gonzalez, R.C., and Woods, R.E., 1992, *Digital Image Processing*, Addison-Wesley. 2. Gerhard X. Ritter & Joseph N. Wilson, 1996, *Handbook of Computer Vision Algorithms in Image Algebra*, CRC Press. 3. Wijaya, M. Ch., & Prijono, Agus, 1997, *Digital Image Processing Using Matlab*, Informatika, Bandung.			
Last revision date	:	July 28th, 2025			

13. Module Description of Optimization

Module Name	:	Optimization
Module Level	:	Bachelor
Code, if applicable	:	23H01131003
Subtitle, if applicable	:	-
Courses, if applicable	:	Optimization
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Agustinus Ribal, S.Si.,M.Sc., Ph. D
Lecturer(s)	:	Prof. Dr. Aidawayati Rangkuti, MS., Prof. Agustinus Ribal, S.Si.,M.Sc., Ph.D
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics and Set Theory
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Operations Research
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. understand several mathematical methods and their underlying concepts, and apply these methods in other related fields such as industry, economics, and agriculture; CLO 2. analyze and implement several optimization methods in other areas of study; CLO 3. construct mathematical models, explain the procedures, and solve optimization problems using appropriate methods, as well as interpret the obtained results in relevant fields;

<table>
<tr><td></td><td></td><td>CLO 4. communicate ideas effectively, develop self-capabilities based on local wisdom, and adapt easily within communities of diverse backgrounds.

The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 2</th><th>ILO 4</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 4</td><td></td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>The Optimization course is an elective in the mathematics study program that equips students with the ability to apply several mathematical methods in optimization. The first part of this course focuses on dynamic programming and game theory. Dynamic programming includes both deterministic and probabilistic approaches, while game theory covers zero-sum games as well as pure and mixed strategies. The second part of the course discusses queuing theory and network analysis. Queuing theory covers both single-server and multi-server models, while network analysis introduces the concepts and applications of the max flow–min cut theorem and the maximum flow algorithm.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Report (55%), Written Exam (45%)

Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
</table></td></tr>
</table>

			65 - < 70	B-	2.75	
			60 - < 65	C+	2.5	
			50 - < 60	C	2.00	
			40 - < 50	D	1.00	
			< 40	E	0.00	
Reading list	:	1. Hiller, Liebermen, 2005. Introduction to Operation Research. Eighth edition, Mc Graw- Hill, Companies, one book, New York. 2. Caccetta, L., 2005. Network Optimisation Lecture Notes. Perth: Curtin Publication. 3. Frederick, S. H, Gerald, 2001." Introduction to Operation Research". seven edition, Mc Graw- Hill, New York. 4. Gass, Saul L, 1984. "Linear Programming : Method and Application". Fifth edition, Mc Graw- Hill, New York. 5. Ronal. E. Miller, 2000. "Optimization" Foundation and Application. Prentice Hall, Inc USA 6. Taha, Hamdy, 2007. "Operation Research". Eighth edition Mc Graw- Hill, New York 7. Hinding, Nurdin, Determination of the Grid-Shaped Transportation Network's Optimization Value via Graph Labelling (August 20, 2024). Available at SSRN: https://ssrn.com/abstract=5266765 or http://dx.doi.org/10.2139/ssrn.5266765			
Last revision date	:	July 28th, 2025				

14. Module Description of Insurance Mathematics

Module Name	:	Insurance Mathematics
Module Level	:	Bachelor
Code, if applicable	:	23H01131103
Subtitle, if applicable	:	-
Courses, if applicable	:	Insurance Mathematics
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Aidawayati Rangkuti, MS.
Lecturer(s)	:	Prof. Dr. Aidawayati Rangkuti, MS. Ainun Mawaddah Abdal, S.Si.,M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Statistical Methods
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. apply mathematical methods, data management, analysis, and interpretation based on mathematical and statistical concepts; CLO 2. apply statistics to build models, implement probability laws, and develop applications in business, industry, health, demography, and programming, as well as prepare reports and presentations; CLO 3. adapt to society and the workplace, communicate effectively, collaborate in teams, and take responsibility. The following is the mapping of the ILO and the CLO of this course:

<table>
<tr><td></td><td></td><td>
<table>
<tr><th></th><th>ILO 3</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td>X</td></tr>
<tr><td>CLO 2</td><td></td><td>X</td></tr>
<tr><td>CLO 3</td><td>X</td><td>X</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>:</td><td>Insurance Mathematics is an elective subject that provides understanding and development This elective course provides a comprehensive introduction to the mathematical foundations of insurance, focusing on the principles, models, and calculations used in life insurance, annuities, and premium determination. Students will develop the skills required to apply mathematical and statistical methods to real-world problems in the insurance industry.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Report (70%), and Assignments (30%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table>
</td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Bowers, Newton L., et al. 1997. Actuarial Mathematics. Second Edition. The Society of Actuaries. United States of America.</td></tr>
</table>

		2. Gupta, A.K. and Varga, T., 2013. An introduction to actuarial mathematics (Vol. 14). Springer Science & Business Media. 3. Gerber, H.U., 2013. Life insurance mathematics. Springer Science & Business Media. 4. Cunningham, R.J, et al. 2006. Model for Quantifying Risk (Second Edition). ACTEX Publication.Inc. United State of America. 5. Takashi Futami, 1993. "Actuarial Mathematics Part I" Co, LTD, Tokyo, Japan
Last revision date	:	July 28th, 2025

15. Module Description of Introduction to Functional Analysis

Module Name	:	Introduction to Functional Analysis
Module Level	:	Bachelor
Code, if applicable	:	23H01131203
Subtitle, if applicable	:	-
Courses, if applicable	:	Introduction to Functional Analysis
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Budi Nurwahyu, M.Si.
Lecturer(s)	:	Prof. Budi Nurwahyu, M.Si.; Jusmawati Massalesse, S.Si, M.Si; Dr. M. Nur S.Si, M.Si; Naimah Aris, S.Si, M. Math.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours for Learning and Teaching, 47.5 hours for Self Study, and 47.5 hours for Structured Works.
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Introduction to Real Analysis & Real Analysis.
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Students are able to understand the definition of metric space and determine its completeness.; CLO 2. Students are able to demonstrate the properties of linear normed spaces and Banach spaces; CLO 3. Students are able to prove basic theorems for normed spaces and Banach spaces as well as transformations between the them. CLO 3. Developing students' ability to find information through the world wide web, and present concepts in written and oral skills both independently and in groups The following is the mapping of the ILO and the CLO of this course:

		<table><tr><th></th><th>ILO 2</th><th>ILO 4</th><th>ILO 7</th></tr><tr><td>CLO 1</td><td>X</td><td></td><td></td></tr><tr><td>CLO 2</td><td>X</td><td></td><td></td></tr><tr><td>CLO 3</td><td></td><td>X</td><td></td></tr><tr><td>CLO 4</td><td></td><td></td><td>X</td></tr></table>
Content	:	The course gives an introduction to functional analysis, which is a branch of analysis in which one develops analysis in infinite dimensional vector spaces. The central concepts which are studied, are metric spaces, normed spaces with emphasis on Banach and continuous linear maps (operators and functional) between such spaces.
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Participants are marked based on their performance in: Report (50%), Assignments (25%), and Written Exam (25%). Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale: <table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr><tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr><tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr><tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr><tr><td>< 40</td><td>E</td><td>0.00</td></tr></table>
Reading list	:	1. Introductory Functional Analysis With Applications, Kreyszig. E, John Wiley & Sons. Inc. New York 1978. 2. Principles of Fungsional Analysis second edition, Martin Schechter.American Mathematical Society, 2002

		3. Sumanang. M, Pengantar Analisis Fungsional, UPI, Bandung 2010. 4. Principles of Fungsional Analysis second edition, Martin Schechter.American Mathematical Society, 2002 5. Nur, M., Bahri, M., & Islamiyati, A. (2024). A new 2-norm in normed spaces. In AIP Conference Proceedings (Vol. 3161, p. 060006). Proceedings Of 5th International Conference On Sustainable Innovation In Engineering And Technology 2023. Aip Publishing. https://doi.org/10.1063/5.0164441
Last revision date	:	July 28th, 2025

16. Module Description of Cryptography

Module Name	:	Cryptography
Module Level	:	Bachelor
Code, if applicable	:	23H01131303
Subtitle, if applicable	:	-
Courses, if applicable	:	Cryptography
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Amir Kamal Amir, M.Sc.
Lecturer(s)	:	Prof. Dr. Amir Kamal Amir, M.Sc. Dr. Andi Muhammad Anwar, S.Si., M.Si
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Calculus I, Calculus II, and Statistical Methods
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. describe cryptosystems and build cipher models from a given problem; CLO 2. explain several types of public key systems and apply them to solve several everyday problems; CLO 3. explaining and applying cryptanalysis to classical cryptography. The following is the mapping of the ILO and the CLO of this course:

	ILO 1	ILO 2	ILO 6
CLO 1	X	X	
CLO 2		X	X
CLO 3	X		X

<table>
<tr><td>Content</td><td>:</td><td>Cryptography is an elective course in the field of algebra that covers current topics in the application of mathematics, particularly in cryptography and data security. The material covered includes data communication security in computer networks, classical and modern cryptography (symmetric and public key), as well as basic algebraic concepts such as groups, rings, and fields. Additionally, the course covers cryptographic algorithms such as DES and AES, number theory in public-key cryptography, hashing functions, and digital signatures as part of cryptographic security systems.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Quizzes (20%), Written Exam (30%), and Report (50%).

Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Hoffstein, J., Pipher, J., Silverman, H.J., 2014, An Introduction to Mathematical Cryptography (Undergraduate Text in Mathematics), Springer Science-Bussines Media, New York
2. Johannes A. Buchmann, 2001, Introduction to Cryptografi, Springer-Verlag, New York, Berlin, Heidelberg.Calculus, 7th edition, James Stewart, 2000.</td></tr>
</table>

Last revision date	:	July 28th, 2025

17. Module Description of Mathematical Biology

Module Name	:	Mathematical biology
Module Level	:	Bachelor
Code, if applicable	:	23H01131403
Subtitle, if applicable	:	-
Courses, if applicable	:	Mathematical biology
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Kasbawati, S.Si., M.Si.
Lecturer(s)	:	Prof. Dr. Syamsuddin Toaha, M.Sc. Prof.Dr. Kasbawati, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Linear Algebra I, Linear Algebra II, Advanced Mathematics, Differential Equations
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. develop the ability to translate descriptions of biological scenarios into mathematical models; CLO 2. make assumptions more flexibly and evaluate the impact of these assumptions as an integral part of the modeling process; CLO 3. learn various types of mathematical models for biological systems and apply mathematical techniques to extract meaningful information from these models; CLO 4. improve their ability to communicate mathematical ideas, including mathematical results, clearly and effectively in written form;

<table>
<tr><td></td><td></td><td>CLO 5. collaborate effectively in teams and communicate mathematical ideas clearly to peers and instructors through the use of appropriate presentation tools or software.

The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 5</th><th>ILO 6</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 3</td><td>X</td><td>X</td><td></td></tr>
<tr><td>CLO 4</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>CLO 5</td><td>X</td><td>X</td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>Mathematical Biology is a fifth-semester module that introduces the applications of mathematics to problems in biology, ecology, physiology, and medicine, such as molecular or protein diffusion, drug transformation (issues in pharmacokinetics), disease outbreaks, and ecological systems. The modeling process challenges students to identify a sufficiently small set of variables or aspects that allow for a mathematical approach without losing the essence of the phenomena under study. The mathematics involved includes ordinary and partial differential equations, matrix theory, and optimization theory. By the end of this module, students are expected to be able to derive mathematical models from biological phenomena, solve mathematical problems, conduct simulations, and interpret the results.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Assignments (24%), Quizzes (24%), Reports (52%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Quizzes are used to test continuous understanding of weekly content. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:</td></tr>
</table>

		<table><tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr><tr><td>85 – 100</td><td>A</td><td>4.00</td></tr><tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr><tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr><tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr><tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr><tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr><tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr><tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr><tr><td>< 40</td><td>E</td><td>0.00</td></tr></table>
Reading list	:	1. Partial Differential Equations, Jeffry Kusuma, Hasanuddin University Study and Learning Resource Center, 2018. 2. Partial Differential Equations with Fourier Series and Boundary Problems, Asmar, Nakhle, Pearson Prentice Hall. 3. Persamaan Diferensial Parsial, Jeffry Kusuma, Depublish, 2023Partial Differential Equations, Jeffry Kusuma, Depublish, 2023. 4. Partial Differential Equations for Scientists and Engineers, Farlow, Stanley J., John Wiley & Sons. 5. Advanced Engineering Mathematics, O'Neil, Peter V., Thomson. 6. Advanced Engineering Mathematics, Kreyszig, Erwin, John Wiley & Sons. 7. Other sources on the Internet.
Last revision date	:	July 28th, 2025

18. Module Description of Measure Theory and Probability

Module Name	:	Measure Theory and Probability
Module Level	:	Bachelor
Code, if applicable	:	23H01131503
Subtitle, if applicable	:	-
Courses, if applicable	:	Measure Theory and Probability
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Dr. Muh. Nur, S.Si., M.Si.
Lecturer(s)	:	Prof. Dr. Eng. Mawardi, S.Si., M.Si., Dr.Muh. Nur, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Calculus I, Calculus II, and Statistical Methods
Module objectives/intended learning outcomes	:	After completion of this module, the student will be able to: CLO 1. understanding of set notation and operations on sets, set algebra, and sigma algebra; CLO 2. demonstrate an understanding of the properties, measure spaces, probability spaces, and outer measure; CLO 3. demonstrate an understanding of measurable functions, distribution functions, and the Lebesgue integral. The following is the mapping of the ILO and the CLO of this course:

	ILO 3	ILO 4	ILO 7
CLO 1	X	X	
CLO 2		X	X
CLO 3	X	X	X

<table>
<tr><td>Content</td><td>:</td><td>This course is a continuation of mathematical analysis and statistics, focusing on the development of measure theory and probability. Measure theory and probability play an important role in the advancement of integral theory, probability and statistical theory, Fourier analysis, functional analysis, topology, geometry, quantum physics, and other related fields. The course provides students with the foundation needed to understand these concepts and their applications in both pure and applied mathematics.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory:, Written Exam (40%), and Report (60%).

The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Reports measure analytical and writing skills. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>M. Brokate and G. Kersting, Measure and Integral, Springer, 2015.
J. Jacod and P. Protter, Probability Essentials, 2nd ed., Springer, 2004.
Ekasasmita, W.; Bahri, M.; Bachtiar, N.; Rahim, A.; Nur, M. One-Dimensional Quaternion Fourier Transform with Application to Probability Theory. Symmetry 2023, 15, 815. https://doi.org/10.3390/sym15040815</td></tr>
</table>

		4. Marek Capinski and Ekkehard Kopp, Measure, Integral and Probability, Springer-Verlag, 2004. 5. Billingsley, P. (1995). Probability and measure (3rd ed.). Wiley.
Last revision date	:	July 28th, 2025

19. Module Description of Special Topics in Algebra

Module Name	:	Special Topics in Algebra
Module Level	:	Bachelor
Code, if applicable	:	23H01131603
Subtitle, if applicable	:	-
Courses, if applicable	:	Special Topics in Algebra
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Amir Kamal Amir, M.Sc
Lecturer(s)	:	Prof. Dr. Budi Nurwahyu, MS., Prof. Dr. Amir Kamal Amir, M.Sc., Dra. Nur Erawati, M.Si., Andi Muhammad Anwar, S.Si., M.Si
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics and Set Theory
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Linear Algebra II, Algebraic Structures
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Recognize and understand the definitions and examples of the materials in Algebra Topic 1 and Algebra Topic 2; CLO 2. Interpret the definitions and properties contained in the materials of Algebra Topic 1 and Algebra Topic 2; CLO 3. Construct and prove the properties presented in the materials of Algebra Topic 1 and Algebra Topic 2.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 1</th><th>ILO 2</th><th>ILO 3</th></tr>
<tr><td>CLO 1</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td></td><td></td><td>X</td></tr>
<tr><td>CLO 3</td><td></td><td>X</td><td></td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>The topics of this course may vary each semester depending on the availability of topics and the readiness of the lecturers. However, within a single semester, the course will cover only two algebra topics, namely Algebra Topic 1 and Algebra Topic 2.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Assignments (30%), Report (50%), Written Exam (20%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Books / journals / learning modules related to Algebra Topic 1
2. Books / journals / learning modules related to Algebra Topic 2</td></tr>
<tr><td>Last revision date</td><td>:</td><td>July 28th, 2025</td></tr>
</table>

20. Module Description of Special Topics in Analysis

Module Name	:	Special Topics in Analysis
Module Level	:	Bachelor
Code, if applicable	:	23H01131703
Subtitle, if applicable	:	-
Courses, if applicable	:	Special Topics in Analysis
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Naimah Aris, S.Si.,M.Math.
Lecturer(s)	:	Prof. Dr. Budi Nurwahyu, MS., Naimah Aris, S.Si.,M.Math., Dr. Muh. Nur, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics and Set Theory
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Introduction to Real Analysis and Real Analysis
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Students are able to understand the fundamentals of science and their applications, as well as the fundamentals of mathematics and their applications; CLO 2. Students are able to master mathematical methods and communicate mathematical concepts in modeling real-world problems; CLO 3. Students are able to communicate and collaborate in reviewing discussed topics, while demonstrating discipline and self-development based on maritime character principles.

		The following is the mapping of the ILO and the CLO of this course: ILO 2 / ILO 4 / ILO 7 CLO 1: X CLO 2: X CLO 3: X
Content	:	Special Topics in Analysis is an elective course in the field of mathematical analysis that specifically discusses recent developments, particularly in Fourier analysis, functional analysis, operator theory, and dynamical systems. The course emphasizes reviewing and analyzing the latest research papers related to these areas, with the aim of providing insights, fostering analytical and systematic thinking, and exploring new models or theoretical developments in analysis. Furthermore, it highlights the applications of analysis in science and engineering, especially in applied mathematics. The learning activities include:studying and reading the most recent journal papers, summarizing selected papers from various journals, preparing a proposal, and presenting the work through class presentations.
Study and examination requirements	:	Study and examination requirements: ● Students must attend 15 minutes before the class starts. ● Students must switch off all electronic devices. ● Students must inform the lecturer if they will not attend the class due to sickness, etc. ● Students must submit all class assignments before the deadline. ● Students must attend the exam to get final grade.
Exams and assessment formats	:	Participants are marked based on their performance in theory: Quizzes (5%), and Presentation (95%). Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Quizzes are used to test continuous understanding of weekly content. Altogether, these components account for 100% of the final grade. Students are marked based on their percentage of points obtained and based on the following grade scale:

Percentage of Achievement	Grade	Conversion Value
85 – 100	A	4.00
80 - <85	A-	3.75
75 - < 80	B+	3.5
70 - < 75	B	3.0
65 - < 70	B-	2.75
60 - < 65	C+	2.5

			50 - < 60	C	2.00	
			40 - < 50	D	1.00	
			< 40	E	0.00	
Reading list	:	1. The most recent Paper in journal with topic in analysis of mathematics 2. Nur, M., Al Azhary Masta, M. B., & Firman, A. I. (2024). On the 2-normed Orlicz space. Computer Science, 19(4), 1377-1387.				
Last revision date	:	July 28th, 2025				

21. Module Description of Special Topics in Applied Mathematics

Module Name	:	Special Topics in Applied Mathematics
Module Level	:	Bachelor
Code, if applicable	:	23H01131903
Subtitle, if applicable	:	-
Courses, if applicable	:	Special Topics in Applied Mathematics
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Kasbawati, S.Si., M.Si.
Lecturer(s)	:	Prof. Dr. Syamsuddin Toaha, M.Sc., Prof. Dr. Kasbawati, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics and Set Theory
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Advanced Mathematics, Differential Equations, Real Analysis, and Mathematical Modeling
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Able to master the fundamentals of science and their applications, as well as the fundamentals of mathematics and their applications; CLO 2. Able to master mathematical methods and communicate mathematical concepts effectively in modeling real-world problems; CLO 3. Able to communicate and collaborate in reviewing discussed topics, while demonstrating discipline and self-development based on maritime character principles.

<table>
<tr><td></td><td></td><td>The following is the mapping of the ILO and the CLO of this course:
<table>
<tr><th></th><th>ILO 2</th><th>ILO 5</th><th>ILO 7</th></tr>
<tr><td>CLO 1</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 3</td><td></td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>This course is an elective in the field of applied mathematics that specifically discusses recent topics in the application of mathematics across various fields. The discussion of these topics is carried out by reviewing and analyzing recent papers related to applied mathematics in real-world contexts.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in theory: Presentation (38%), Quizzes (15%), and Report (47%).

Reports measure analytical and writing skills. Presentations evaluate oral communication, organization of ideas, and confidence in delivering academic material. Quizzes are used to test continuous understanding of weekly content. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:
<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
<tr><td>Reading list</td><td>:</td><td>1. The latest published papers originating from reputable international journals (papers published by reputable /indexed journals) as well as various reading sources relating to the topic of the paper's discussion.)</td></tr>
</table>

		2. Harvesting Strategies in the Migratory Prey-Predator Model with a Crowley-Martin Type Response Function and Constant Efforts 3. https://e-ndst.kiev.ua/v23n1.htm
Last revision date	:	July 28th, 2025

22. Module Description of Special Topics in Combinatorics

Module Name	:	Special Topics in Combinatorics
Module Level	:	Bachelor
Code, if applicable	:	23H01131803
Subtitle, if applicable	:	-
Courses, if applicable	:	Special Topics in Combinatorics
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Dr. Hasmawati, M.Si.
Lecturer(s)	:	Prof. Dr. Hasmawati, M.Si. Dr. Nurdin, S.Si., M.Si.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours per semester for Learning and Teaching, 47.5 hours per semester for Self-Study, and 47.5 hours per semester for Structured Works
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations		Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Students have completed and taken the exams for Discrete Mathematics and Graph Theory
Module objectives/intended learning outcomes	:	After completion of this module, students are able to: CLO 1. solve simple problems of a graph labeling problems, Ramsey problem, metric dimension, and partition problem CLO 2. construct a state of the art of a research topic in a structured and grammatically correct manner CLO 3. develop the fundamentals of one research topic in the area CLO 4. present the state of the art by internalizing academic values, norms, and ethics The following is the mapping of the ILO and the CO of this course:

	ILO 6	ILO 7	ILO 8	ILO 9
CLO 1	X	X		
CLO 2	X		X	
CLO 3		X	X	
CLO 4				X

<table>
<tr><td>Content</td><td>:</td><td>The course provides four main groups of study materials, namely graph labeling, Ramsey theory, metric dimension, and partition dimension. All of these topics are within the scope of graph theory and are designed to help students in identifying and developing their final project topics</td></tr>
<tr><td>Study and examination requirements</td><td></td><td>Study and examination requirements:
Students must attend 15 minutes before the class starts.
Students must switch off all electronic devices.
Students must inform the lecturer if they will not attend the class due to sickness, etc.
Students must submit all class assignments before the deadline.
Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td></td><td>Participants are marked based on their performance in theory: Report (95%), and Assignments (5%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. Altogether, these components account for 100% of the final grade.

In this course, there are four assessments component, i.e. individual work, team work, team presentation, and team discussion. The score is the all-assessments component is 5% for assignments and 95% for report. Students are marked based on their percentage of points obtained and based on the following grade scale:

<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table></td></tr>
</table>

Reading list		1. Lase, D., Hinding, N., & Amir, A. K. (2022). Modular Irregular Labeling on Firecrackers Graphs. Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika, 6(1), 94-102. https://doi.org/10.30605/proximal.v6i1.2188 2. Hinding, N., Sugeng, K.A., Nurlindah, Wahyudi, T.J., Simanjuntak, R., Two types irregular labelling on dodecahedral modified generalization graph, ***Heliyon***, 2022, 8(11), e11197. 3. Hasmawati, Hinding, N., Nurwahyu, B., Syukur Daming, A., Kamal Amir, A., The partition dimension of the vertex amalgamation of some cycles, ***Heliyon***, 2022, 8(6), e09596 Gary Chartrand, Ortrud R. Oellermann, (1993), Applied and algorithmic Graph Theory, McGRAW-HILL 4. Sugeng, K.A., Barack, Z.Z., Hinding, N., Simanjuntak, R, *Modular Irregular Labeling on Double-Star and Friendship Graphs*, ***Journal of Mathematics***, 2021, 2021, 4746609. 5. J.A. Gallian, *Graph Labeling*, Electron. J. Combin. Dyn. Surv. DS6 (2023). 6. Reinhard Diestel (2000), Graph Theory, Graduate Texts In Mathematics, Springer. 7. Prof. Dr. Hasmawati, M.Si (2020), PENGANTAR TEORI DAN JENIS-JENIS GRAF, UPT Unhas Press. 8. Ronald L. graham, Bruce H. Rothschild, Joel H. Spencer. Ramsey Theory, JOHN WILEY & SONS, New York. 9. Reinhard Diestel (2000), Graph Theory, Graduate Texts In Mathematics, Springer. 10. Peraturan Rektor nomor 29/UN4.1/2023 tentang Penyelenggaraan Program Sarjana Universitas Hasanuddin
Last revision date		July 28th, 2025

Module Description of Competency Support Courses (CSC)

Module Name	:	Competency Support Courses
Module Level	:	Bachelor
Code, if applicable	:	23U02130102 – 23U02133720
Subtitle, if applicable	:	-
Courses, if applicable	:	Communication and Collaboration (23U02130102) Activity Management (23U02130202) Negotiation Strategy (23U02130302) Active Learning (23U02130402) Digital Communication (23U02130502) Social Empathy (23U02130602) Cultural Diversity (23U02130702) Community Development (23U02130802) Startup Entrepreneurship (23U02130902/23U02131004) Innovation Leadership (23U02131102) Decision Making (23U02131202) Problem Solving (23U02131302) Professional Ethics (23U02131402) Critical and Creative Thinking (23U02131502) Solution-Oriented Creativity (23U02131602) Innovation and Design Thinking (23U02131702) Talent Development (23U02131801/23U02131902) Scientific Literacy and Presentation (23U02132002) Internship / Work Practice (23U02132102 – 23U02132509) Independent Study / Project (23U02132602 – 23U02132806) Independent Research (23U02133020) Creativity and Innovation Development (23U02133120) Leadership and National Defense Character (23U02133220) Welfare for Indonesian Maritime Continent (23U02133320) Entrepreneurship Development and Empowerment (23U02133420) Industry/Business Practice (23U02133520) Humanistic Character Development (23U02133620) Communication and Social Interaction (23U02133720)
Semester(s) in which the module is taught	:	6th Semester
Module coordinator(s)	:	Directorate of Student Affairs and Career Development
Lecturer(s)	:	Supervisor (Assigned by the study program)
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Competency Support Courses (CSC) for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Group Discussion, Collaborative Learning, Cooperative Learning, Case Study, Project Based Learning
Contact hours	:	Varies according to the activity (typically 2700 minutes per 1 credit hour)

<table>
<tr><td>Workload</td><td>:</td><td>Equivalent to 2–20 credits (3.2 – 32 ECTS).
Workload includes preparation, participation, mentoring, implementation, reporting, and reflection stages.
Refer to CSC rubric</td></tr>
<tr><td>Credit points</td><td>:</td><td>2-20 (3.2 - 32 ECTS)</td></tr>
<tr><td>Requirements according to the examination regulations</td><td></td><td>• Completion of verified and documented extracurricular or co-curricular activities.
• Submission of reports, logbooks, and certificates of participation or achievement.
• Approval and validation from the faculty and Directorate of Student Affairs.</td></tr>
<tr><td>Recommended prerequisites</td><td>:</td><td>Active enrollment as an undergraduate student at Hasanuddin University and participation in recognized academic or non-academic programs.</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td>:</td><td>After completion of this module, students are able to:
CLO 1. internalize the ethics of communication, collaboration, and social interaction;
CLO 2. develop networks and knowledge, appreciate cultural diversity, views, religions and beliefs, opinions or original findings of others, work together, have social sensitivity and concern for society and environtment;
CLO 3. have critical thinking skills in collaborating across scientific fields;
CLO 4. maintain and develop work networks, with mentors, colleagues, and peers.

The following is the mapping of the ILO and the CO of this course:
<table>
<tr><th></th><th>ILO 6</th><th>ILO 7</th><th>ILO 8</th><th>ILO 9</th></tr>
<tr><td>CLO 1</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 3</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>CLO 4</td><td></td><td></td><td></td><td>X</td></tr>
</table></td></tr>
<tr><td>Content</td><td>:</td><td>The MKPK encompasses diverse learning activities, including:
• Academic and scientific competitions (ONMIPA, PKM, GEMASTIK, etc.)
• Entrepreneurship programs (PMW, P2MW, Independent Startups)
• Leadership and organizational management (PPK Ormawa, Student Council)
• Community engagement and volunteerism (Community Empowerment, Social Services)
• Internships and independent studies (Industry/Institution-based programs)
• Research, publications, and scientific presentations
• Talent, creativity, and cultural development programs</td></tr>
</table>

Study and examination requirements	:	• Activity-based reports and documentation (logbook, certificates, or portfolio) • Reflective essays on learning outcomes and skill development • Assessment rubrics based on participation, output, and achievement level
Exams and assessment formats		• Performance-based assessment • Supervisor and mentor evaluation • Recognition of achievements based on national/international competition results or project outcomes • Conversion to SKS based on *activity hours* (1 SKS = 2,700 minutes)
Reading list		1. *Rubrik Mata Kuliah Penguatan Kompetensi (Edisi 2 Tahun 2024)*, Universitas Hasanuddin 2. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi RI (2020). *Panduan Merdeka Belajar–Kampus Merdeka*. 3. Hasanuddin University Rector's Regulation No. 4541/UN4.1/KEP/2022 on MBKM Implementation. 4. Relevant guides for specific activities (PKM Guidelines, ONMIPA Manual, MBKM Internship Modules, etc.).
Last revision date		February 5th, 2025