Mencerdaskan dan Memartabatkan Bangsa

MODULE DESCRIPTION

Bachelor's of Mathematics Study Program

Faculty of Mathematics and Natural Science
Universitas Negeri Jakarta

2022

CONTENTS

ISLAMIC EDUCATION

Module name:	Islamic Education	
Module level, if applicable:	Undergraduate	
Code:	00000012	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:		
Lecturer(s):	Sari Nurulita, Lc, M.Si	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consists of 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS) structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to: CLO1. Understand philosophical and theological foundations of Islamic education in college CLO2. Understand the concept of monotheism and its applications insocials life CLO3. Understand the concept of humans as divine beings CLO4. Understand the role of religions in build civilization CLO5. Understand Quran as the inspiration of civilization CLO6. Understand Sunnah as the example and inspiration of culture CLO7. Understand ijtihad as mechanism of contextualization of	

<table>
<tr><td></td><td>Quran and Sunnah
CLO8. Understand the concept of Islamic ethics and aestethics in thedevelopment of science and technology
CLO9. Understand work ethics as a form of good deeds CLO10. Understand Islamic concept of fostering in family
CLO11. Understand implementation of Islam in multicultural society
CLO12. Understand Islamic concept of nation and government
CLO13. Understand Islamic concept of environment
CLO14. Understand The role of religions in facing contemporary issues: phenomenon of hijrah, jihad, radicals, Islamic moderation, information literacy, and anti corruption culture</td></tr>
<tr><td>Content:</td><td>1. Philosophical and theological foundations of Islamic education incollege
2. The concept of monotheism and its applications in socials life
3. The concept of humans as divine beings
4. The role of religions in life
5. Quran as a main source of Islamic teachings
6. Sunnah as basic professional mental
7. Ijtihad as an effort to maintain the relevance of Islamic teachings inlife
8. The concept of Islamic ethics and aestethics in the development ofculture and science and techlonoly
9. Work ethics as a form of good deeds
10. Islamic concept of fostering in family
11. Implementation of Islam in multicultural society
12. Islamic concept of nation and government
13. Islamic concept of environment
14. The role of religions in facing contemporary issues: phenomenon ofhijrah, jihad, radicals, Islamic moderation, information literacy, andanti corruption culture</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessmen Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. Assignment(1st)
b. A ssignment(2nd)
c. Case-based assignment (3rd)
d. Case-based assignment (4th)
e. UTS
f. UAS</td><td>Written test</td><td>10%
10%
15%
15%
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
</table>

Media	Power point presentation, Zoom, textbook, videos
Literatures	1. Hadiyanto, Andy dkk, *PAI untuk Perguruan Tinggi.* Jakarta: Fikra Publika, 2020 2. Abdullah, M. Amin. *Islamic Studies di Perguruan Tinggi:* Pendekatan Integratif-Interkonektif. Yogyakarta: Pustaka Pelajar. 2006. 3. Ali, Mukti HA. *Metode Memahami Agama Islam.* Jakarta: PT Bulan Bintang. 1991. 4. Aman, Saifudin, *Tren Spiritualitas Milenium Ketiga*, Jakarta: Ruhama, 2013 5. Hossein, Nasr Seyyed, *Menjelajah Dunia Modern*: Bimbingan untuk Generasi Muda Muslim, Bandung: Mizan, 1994 6. Mubarok, Achmad, *Pendakian Menuju Allah*, Jakarta: Khazanah Baru, 2002 7. Sauq, Achmad, *Meraih Kedamaian Hidup Kisah Spiritualitas Orang Modern,* Yogyakarta: Sukses Offset, 2010 8. Kailah, Salaamah, *Al-Islaam fi Siyaaqihi at-Taariikhy*, Beirut: Daar at-tanwiir, 2013 9. Kuntowijoyo, Paradigma Islam, Bandung: Mizan, 1990 10. Setiawan, M. Nurkholis, *Pribumisasi al-Qur'an,* Yogyakarta: Kaukab Dipantara, 2012 11. Kartanegara, Mulyadhi, *Reaktualisasi Tradisi Ilmiah Islam*, Jakarta: Baitul Ihsan, 2006 12. Madjid, Nurcholish, *Islam Agama Peradaban*, Jakarta: Paramadina,2008 13. Purnama, Tata Septayuda, *Khazanah Peradaban Islam*, Solo: TintaMedina, 2011

PROTESTANT CHRISTIANITY EDUCATION

Module name:	Protestant Christianity Education	
Module level, if applicable:	Undergraduate	
Code:		
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:		
Lecturer(s):	Prof. Dr. Ir. Amos Neolaka, M.Pd	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to: CLO1. Belief in God, uphold human values, and contribute to the improvement of life based off Pancasila CLO2. Act as citizens who love the nation, have nationalism, responsible to the country, respect diversities (Bhinneka Tunggal Ika)	

<table>
<tr><td></td><td>CLO3. Have social sensitivity, cared to the community and environment, abide the laws, honest, just, and discipline in hope for harmony in life
CLO4. Internallize norms, values, ethics, and responsibilities of profession, have a will to be independent, and entrepreneurship</td></tr>
<tr><td>Content:</td><td>1. Humans are sinner and deserve to get punished
2. Punishment for sins is death
3. Human efforts to be clean from sins/saved
4. Humans salvation is an initiative from Allah</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. 1st assignment
b. 2nd assignment
c. 3rd assignment (Case based)
d. 4th assignment (Case based)
e. UTS
f. UAS</td><td>Written test</td><td>10%
10%
15%
15%
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, bible</td></tr>
<tr><td>Literatures</td><td>1. Alkitab (sumber utama)
2. Silakan membaca buku referensi lain tentang iman Kristen danpenyelesaian tugas</td></tr>
</table>

HINDUISM EDUCATION

Module name:	Hinduism Education	
Module level, if applicable:	Undergraduate	
Code:	00051043	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:		
Lecturer(s):	Untung Suhardi, S.Pd.H, M.Fil.H	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to:CLO1. Explain the purpose of Hinduism CLO2. Understand the history of Hinduism CLO3. Understand the dynamics of education of HinduismCLO4. Understand moral teachings of Hinduism	

<table>
<tr><td></td><td>CLO5. Understand philosophical and theological concept of HinduismCLO6. Understand the Vedas
CLO7. Understand yajna in Hindu
CLO8. Understand harmony in diversity</td></tr>
<tr><td>Content:</td><td>1. The purpose of Hinduism
2. Understand the history of Hinduism
3. Understand the history of Hinduism
4. Understand moral teachings of Hinduism
5. Understand philosophical and theological concept of Hinduism
6. Understand the Vedas
7. Understand yajna in Hindu
8. Understand harmony</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. 1st assignment
b. 2nd assignment
c. 3rd assignment (case based)
d. 4 th assignment (case based)
e. UTS
f. UAS</td><td>Written test</td><td>10%
10%
15%
15%
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, Google Meet, textbook, videos</td></tr>
<tr><td>Literatures</td><td>1. Abdullah, Irwan. 2009. Konstruksi dan Reproduksi Kebudayaan cet. III. Yogyakarta : Pustaka Pelajar
2. Adi Suripto. 2006. Nilai-nilai Hindu dalam Budaya Jawa. Jakarta.Media Hindu
3. Adiputra, I Gd Rudia. 2003. Pengetahuan Dasar Agama Hindu.Jakarta : STAH Dharma Nusantara.
4. Bagus, I Putu Suamba. 2007. Siva-Budha Di Indonesia (Ajaran danperkembangannya). Denpasar : Widhya Dharma.
5. Donder. I Ketut. 2006. Brahmavidya Theologi Kasih Semesta. Surabaya : Paramita
6. Effendi Djohan. 2001. Agama-Agama Manusia. Obor</td></tr>
</table>

	Indonesia.Jakarta 7. Griffith, R.T.H. 2006. *Atharva Veda Samhita (Sukla Yajur Veda).* Surabaya : Paramitha 8. Mantra, IB. 1997. *Tata Susila Hindu Dharma*. Denpasar : upadasastra, Surabaya : Paramitha. 9. Mas Putra, Ny.IGA. 2000. *Panca Yadnya*. Denpasar : pemda Tk 1Bali 10. Durkheim, Emile.1965. *The Elementary Forms of the Religious Life*. (terjemahan bahasa Inggris oleh J.W.Swain. Glecoe, Illinois : The Free Press 11. Hadikusuma, Hilman. 1993. *Antropologi Agama*. Bandung. Citra Aditya Bakti 12. Hendro,Puspito. 1983. Sosiologi Agama. Kanisius. Jogjakarta 13. Koenjaraningrat. 1997. *Antropologi Budaya*. Jakarta : Dian Rakyat

BUDHISM EDUCATION

Module name:	Budhism Education	
Module level, if applicable:	Undergraduate	
Code:		
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st & 2nd	
Module coordinator:		
Lecturer(s):	Ir. Soelijono, M.M	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to:CLO1. Understand the purpose of Buddhism CLO2. Understand history of Buddhism CLO3. Understand dynamics development of moden Buddhism CLO4. Understand the concept of God and the laws of truth (kesunyataan) CLO5. Understand the concept of humans CLO6. Understand history and contents of Tripitaka CLO7. Understand social dimension of Buddhism	

<table>
<tr><td>Content:</td><td></td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests (45%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessmen Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. Individual assignments
b. Presentation
c. Group assignments
d. UTS
e. UAS
f. Attendance</td><td></td><td>15%
15%
15%
25%
25%
5%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, videos</td></tr>
<tr><td>Literatures</td><td>
1. AWS, Sudhamek. (2020). Mindfulness Based Business. Jakarta: PTGramedia Pustaka Utama.
2. Chandra, Ariya, Soelijono. (2018). Buku Ajar & Rancangan Pengajaran MPK Agama Buddha. Depok: Universitas Indonesia.
3. Endro, Herman S, (1997). Hari Raya Umat Buddha dan KalenderBuddhis. Jakarta: Yayasan Dhammadiepa Arama.
4. Farrer-Halls, Gill. (2000). Buddhist Wisdom. Wheaton, II: Godsfieldpress.
5. Harris, Ian (ed). (2011). The Illustrated Encyclopedia of Buddhism.Wigston: Anness Publishing Ltd.
6. Keown, Damien (ed). (2000). Contemporary Buddhist Ethics.Richmond: Curzon Press.
7. Van Voorst, Robert E. (2017). Anthology of World Scriptures (9thedition). Boston, USA: Cengage Learning.
8. Widyadharma, MP Sumedha. (2006). Dhamma-Sari. Jakarta:Penerbit Cetiya Vatthu Daya.
9. Widyadharma, MP Sumedha, (1979). Riwayat Hidup Buddha Gotama. Jakarta: Penerbit Cetiya Vatthu Daya.
10. Wowor, Carnelis, (2004). Pandangan Sosial Agama Buddha. Jakarta: CV. Nitra Kencana Buana.
11. Wright, Robert. (2017). Why Buddhism is True. New York, NY:Simon & Schuster.
</td></tr>
</table>

CATHOLIC EDUCATION

Module name:	Catholic Education	
Module level, if applicable:	Undergraduate	
Code:		
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:		
Lecturer(s):	Viana Meilani Prasetio, S.S., M.Pd	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to: CLO1. Understand oneself's descent and their life purpose as a religioushuman being who whorship God (Jesus Christ) and as a churchmember to continue God's redemption in the society CLO2. Understand and fathom the life of Jesus Christ and His redemption	

<table>
<tr><td></td><td>CLO3. Have self-realization as church members and actively involvedin the society
CLO4. Become a kind Catholic student who is sensitive to the surroundings</td></tr>
<tr><td>Content:</td><td>1. Understand oneself's descent and their life purpose as a religious human being who whorship God (Jesus Christ)
2. Understand oneself's descent and their life purpose as a religious human being who whorship God (Jesus Christ) and as a church member to continue God's redemption in the society Fathom the life of Jesus Christ and His redemption
3. Fathom the life of Jesus Christ and His redemption
4. Realizing oneself as church members and actively involved in the society
5. Realizing oneself as church members and actively involved in the society</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(70%) and structured tasks (30%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. 1st assignment (Case based)
b. 2nd assignment (Case based)
c. UTS
d. UAS</td><td>Written test</td><td>15%
10%
20%
50%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, Google Meet, bible, videos</td></tr>
<tr><td>Literatures</td><td>1. Kitab Suci
2. Katolisitas
3. Buku Ajar Mata Kuliah Wajib Umum Pendidikan Agama Katolik
4. Pengajaran Katekase KAJ</td></tr>
</table>

CONFUCIANISM EDUCATION

Module name:	Confucianism Education	
Module level, if applicable:	Undergraduate	
Code:	00051043	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:		
Lecturer(s):	Kristan, S.E, M.Ag	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to:CLO1. Explain the concept of God in ConfucianismCLO2. Explain the purpose of life and afterlife CLO3. Make essences and urgency of religious values CLO4. Explain humans foundation, dignity, and responsibility CLO5. Explain the development of Confucianism in response to challenges of era changes CLO6. Explain the concept of education, socioculture, and law and politics CLO7. Explain the concept of science and technology, echonomics, and environment	

<table>
<tr><td></td><td>CLO8. Explain the concept of religions as the source of morals and theconcept of diversity and its contribution in the history of world civilization</td></tr>
<tr><td>Content:</td><td>1. The concept of God in Confucianism
2. Understand the purpose of life and afterlife
3. Understand the essences and urgency of religious values
4. Understand humans foundation, dignity, and responsibility
5. Understand the development of Confucianism in response to challenges of era changes
6. The concept of education, socioculture, and law and politics
7. Understand the concept of science and technology, echonomics, andenvironment
8. Understand the concept of religions as the source of morals and theconcept of diversity and its contribution in the history of world civilization</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. 1st assignment
b. 2nd assignment
c. 3rd assignment (case based)
d. 4 th assignment (case based)
e. UTS
f. UAS</td><td>Written test</td><td>10%
10%
15%
15%
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, Google Meet, textbook, videos</td></tr>
<tr><td>Literatures</td><td>1. Si Shu Kitab Yang Empat, Matakin Solo. 2012
2. Tata Laksana Upacara Agama Khonghucu, Matakin Solo. 1984
3. Wu Jing Kitab Yang Lima, Matakin Solo. 1984
4. Xiao Jing Kitab Bakti - Matakin Solo. 1984
5. Nio Joe Lan 'Peradaban Tionghoa Selayang Pandang' PT. Gramedia Pustaka Jakarta 2013
6. Tjhie Tjay Ing Xs., Panduan Pengajaran Dasar Agama Khonghucu. Matakin. Solo. 2010
7. Materi Terbuka Kesadaran Pajak untuk Perguruan Tinggi. Tim Edukasi Perpajakan Direktorat Jendral Pajak Kementerian Keuangan Republik Indonesia. Tahun 2016.</td></tr>
</table>

CIVIC EDUCATION

Module name:	Civic Education	
Module level, if applicable:	Undergraduate	
Code:	00031062	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:		
Module coordinator:		
Lecturer(s):	Tim Dosen Pendidikan Kewarganegaraan MKU	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):	Pancasila	
Course outcomes:	After taking this course the students have ability to:CLO1. Understand basic concept of PKn CLO2. Analyze national identity CLO3. Analyze national integrity CLO4. Analyze nation and constitution CLO5. Apply the rights and obligations of citizens CLO6. Analyze democracy and democracy education CLO7. Analyze law country and human rights CLO8. Analyze Indonesia's geopolitics CLO9. Analyze regional autonomy CLO10. Analyze Indonesia's geostrategy	

<table>
<tr><td>Content:</td><td>1. Basic concept of PKn
2. National identity
3. National integrity
4. Nation and constitution
5. Rights and obligations of citizens
6. Democracy and democracy education
7. Law country and human rights
8. Indonesia's geopolitics
9. Regional autonomy
10. National defence and Indonesia's geostrategy</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. Assignments
b. Unit Test 1
c. Unit Test 2</td><td>Written test</td><td>50%
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, textbook, videos</td></tr>
<tr><td>Literatures</td><td>1. Tim Dosen. (2012). Pendidikan Kewarganegaraan, Jakarta: UPT MKU UNJ.
2. Dirjen Belmawa Kemenristekdikti. (2016). Pendidikan Kewarganegaraan untuk Perguruan Tinggi. Direktorat Jenderal Pembelajaran dan Kemahasiswaan, Kementerian Riset dan Pendidikan Tinggi.</td></tr>
</table>

INDONESIAN

Module name:	Indonesian	
Module level, if applicable:	Undergraduate	
Code:	00051142	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st & 2nd	
Module coordinator:		
Lecturer(s):	Venus Khasanah, S.S., M.Pd	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to: CLO1. Understand the nature of language, standing, and function of Bahasa Indonesia CLO2. Make texts in macro-genre CLO3. Proficient in Bahasa Indonesia	

<table>
<tr><td>Content:</td><td>1. Introduction
2. Explores academic texts in macro-genre
3. Explores the world of books
4. Designs research proposal and activity proposal
5. Reports research results and activity results
6. Self actualization through science articles</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests,
each covers 4-5 chapters. The final marks are derived from unit tests
(50%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. Assignments
b. Project based assignments
d. UTS
e. UAS</td><td>Written test</td><td>20%
30%

20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, textbook, videos</td></tr>
<tr><td>Literatures</td><td>1. Tim Penyusun. 2016. Bahasa Indonesia untuk Perguruan Tinggi. Cet. I. Jakarta: Kementerian Riset, Teknologi dan Pendidikan Tinggi Republik Indonesia.
2. Tim Pengajar MKU Bahasa Indonesia. 2015. Bahasa Indonesia: Bahan Ajar MPK Bahasa Indonesia. Jakarta: UPT MKU UNJ.
3. Amran Tasai. 2000. Cermat Berbahasa Indonesia di Perguruan Tinggi. Jakarta: MSP.
4. Dendy Sugono. 1989. Berbahasa Indonesia dengan Benar. Jakarta:PT Priastu.
5. Depdiknas. Dirjen Pendidikan Tinggi, Direktorat Ketenagaan. 2006. Diktat. "Acuan Pembelajaran Mata Kuliah Pengembangan Kepribadian Bahasa Indonesia". Jakarta.
6. Kemendikbud. 2015. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 50 Tahun 2015 tentang PUEBI. Jakarta.
7. Lamudin Finoza. 2003. Komposisi Bahasa Indonesia untuk Mahasiswa Nonjurusan Bahasa. Jakarta: Diksi Insan Mulia.
8. Widjono Hs. 2007. Bahasa Indonesia: Mata Kuliah Pengembangan Kepribadian di Perguruan Tinggi. Cet. Ke-2. Edisi Revisi. Jakarta: Grasindo.
9. Maidar, dkk. 1999. Pembinaan Keterampilan Menulis Bahasa Indonesia. Jakarta: Erlangga.
10. Mustakim. 2016. Seri Penyuluhan Bahasa Indonesia: Bentuk danPilihan Kata. Jakarta: Pusbinbangsa.</td></tr>
</table>

PANCASILA

Module name:	Pancasila	
Module level, if applicable:	Undergraduate	
Code:	00051122	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:		
Lecturer(s):	Yuyus Kardiman, M.Pd and team	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to: CLO1. Understand the introduction to Pendidikan Pancasila CLO2. Understand Pancasila in the history of Indonesia CLO3. Understand Pancasila as national principles of Indonesia CLO4. Understand Pancasila as national ideology CLO5. Understand Pancasila as philosophical system CLO6. Understand Pancasila as ethical system CLO7. Understand Pancasila as the fundamental of science development CLO8. Understand Pancasila and anti corruption values	

<table>
<tr><td>Content:</td><td>1. Introduction to Pendidikan Pancasila
2. Pancasila in the history of Indonesia
3. Pancasila as national principles of Indonesia
4. Pancasila as national ideology
5. Pancasila as philosophical system
6. Pancasila as ethical system
7. Pancasila as the fundamental of science development
8. Pancasila and anti corruption values</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. 1st assignment
b. 2nd assignment
c. 3rd assignment (case based)
d. 4th assignment
e. 5th assignment (case based)
f. UTS
g. UAS</td><td>Written test</td><td>10%
5%
15%
5%
15%
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, textbook, videos</td></tr>
<tr><td>Literatures</td><td>1. Tim Penyusun, 2016. Pendidikan Pancasila. Kemsitekdikti, Jakarta
2. Tim Penyusun, 2016. Pendidikan Pancasila. UNJ, Jakarta
3. Latif, Y. (2014). Mata Air Keteladanan. Mizan
4. Kaelan. 2004. Pendidikan Pancasila. Paradigma, Yogyakarta
5. Budiardjo, Miriam. 2013. Dasar-Dasar Ilmu Politik. Jakarta: PTGramedia Pustaka Utama
6. Yuyun S, Suriasumantri. 1984. Filsafat ilmu, sebuah PengantarPopuler, Jakarta: Sinar Harapan
7. Pidato Bung Karno 1 Juni 1945</td></tr>
</table>

LINEAR ALGEBRA

Module designation	Linear Algebra
Semester(s) in which the module is taught	1
Person responsible for the module	Dr. Yudi Mahatma, M.Si.
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 680 minutes per week which consists of 200 minutes learning activity, 240 minutes structured task and 240 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **680 X 16 = 10880 minutes = 181, 33 hours**
Credit points	181,33 hours / 30 hours ≈ 6 ECTS
Required and recommended prerequisites for joining the module	-

Program intended learning outcomes	**PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics. **PLO 10**. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students master the method of solving the Linear Equation System CLO 2 : Students master the concept of matrix, properties of matrix, and its application CLO 3 : Students master the concept of vectors, vector operations, and their applications CLO 4 : Students are able to make line equations and plane equations in 3-dimensional space CLO 5 : Students master the concepts of vector spaces, subspaces, properties and examples CLO 6 : Students are able to determine the basis and dimensions of a vector space, row space and column space of a matrix CLO 7 : Students are able to explain about inner product spaces, orthonormal basis, coordinates, and solve basis change problems CLO 8 : Students master the concept of linear transformation, examples and properties of linear transformation, determine the kernel, range, rank, and nullity CLO 9 : Students are able to calculate the eigenvalues and eigenvectors of a matrix, and diagonalize the matrix The relationship between PLO and CLO in this course is described as follows:

CLO	PLO	
	7	10
1	√	
2	√	
3	√	
4		√

		5	√	
		6		√
		7		√
		8	√	
		9		√
Content	**Students will learn about:** Linear Equation System, Matrices, Vectors, Line and Plane Equations in 3-dimensional Space, Vector Spaces, Basis and Dimensions, Inner Product Spaces, Linear Transformations, Eigenvalues and Eigenvectors			
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams			
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.			
Reading list	**Main References:** Howard Anton, Aljabar Linear Elementer, Edisi Kelima, Penerbit Erlangga **Additional References:** Anton, H. dan Rorres, C.,(2014) Elementary Linear Algebra Applications Version, 11th edition, Wiley, USA			

REAL ANALYSIS I

Modul Name	Real Analysis I	
Modul level, if applicable	Undergraduate	
Code	31254013	
Sub-healing, If applicable		
Classes, if applicable		
Semester	4th Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Drs. Sudarwanto, M.Si, DEA Dr. Ellis Salsabila, M.Si Drs. Tri Murdiyanto, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 4th semester	
Type of Teaching	Face to face every week	Number of student
Lecture (expository, discussion, exercise), case based	150 minute	45
Workload	Total workload is 510 minutes (4,5 ECTS) per week which consists of 150 minutes (1.32 ECTS) learning activity, 180 minutes (1,59 ECTS) structured task and 180 minutes (1.59 ECTS) individual learning per week for 16 weeks.	
Credit Point	4.5 ECTS	
Prerequisite course(s)	-	
Course outcomes (CPMK)	*The Program Learning Outcome* (PLO) achieved by this course are:	

PLO 7	:	Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics.
PLO 10	:	Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.

The Course Learning Outcomes (CLO) achieved by this course are:

CLO 1	:	Identify the relationship of sets
CLO 2	:	Describe a real function
CLO 3	:	Able to apply mathematical induction to proof a mathematical statement
CLO 4	:	Able to prove the algebraic properties of real numbers

CLO 5	:	Able to analyze the properties of real numbers related to absolute values
CLO 6	:	Able to use axiom of completeness of real numbers to prove related theorems
CLO 7	:	Able to prove of supremum and infimum properties
CLO 8	:	Able to describe of nested interval properties
CLO 9	:	Able to describe of concepts of sequence and their limits
CLO10	:	Able to prove properties of convergence sequence of real numbers
CLO11	:	Able to describe monotone sequence and their properties
CLO12	:	Able to describe of subsequence and their properties
CLO13	:	Able to describe Cauchy sequences and their properties
CLO14	:	Able to describe divergence sequences and their properties
CLO15	:	Able to describe series and its convergence

The matrix of relation between CLO and PLO of this subject:

	PLO 7	PLO 10
CLO 1	V	V
CLO 2	V	V
CLO 3	V	V
CLO 4	V	V
CLO 5	V	V
CLO 6	V	V
CLO 7	V	V
CLO 8	V	V
CLO 9	V	V
CLO 10	V	V
CLO 11	V	V
CLO 12	V	V
CLO 13	V	V
CLO 14	V	V
CLO 15	V	V

Content (subjects)

1. Sets and Functions
   1.1 Sets and Functions
   1.2 Mathematical Inductions
   1.3 Finite and Infinite sets
2. Real Number System
   2.1 Algebraic Properties and Order Properties of Real Numbers
   2.2 Absolute Values and the real line
   2.3 The Completeness properties of real numbers

	2.4 Applications of the Supremum properties 2.5 Intervals 3. Sequence 3.1 Sequence and their limits 3.2 Limit Theorems 3.3 Montone sequences 4. Subsequence 4.1 Definition of sub sequence 4.2 Bolzano-Weierstrass Theorem 4.3 The Cauchy Criterion 4.4 Properly divergent sequences 5. Series 5.1 Infinite Series 5.2 Properties of Infinite Series 5.3 The Convergence of the infinite series
Study/exam achievements	Assessments of this course include: Task (30%), Midterm Exam (35%) and Final Exam (35%)
Media	LMS, Zoom
Literatures	**The Main Reference:** Robert G, Bartle and Donald R. Sherbert, Introduction To Real Analysis Fourth Edition, 2011, John Willey & Sons

REAL ANAYLSIS II

Module designation	Real Analysis II
Semester(s) in which the module is taught	5
Person responsible for the module	Dr. Yudi Mahatma, M.Si.
Language	Indonesia
Relation to curriculum	Compulsory
Teaching methods	Teaching methods used in this course are: ● Lecture (i.e., small group discussions and project-based learning) ● Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. TOTAL WORKLOAD PER SEMESTER 510 X 16 = 8160 minutes = 136 hours
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	Real Analysis 1 course
Module objectives/intended learning outcomes	CLO 1. Students master the concept of limits including definitions, properties, and theorems related to limits CLO 2. Students master the extensions of the limit concept including one-sided limits, infinite limits, and limit at infinity - Students master the concept of continuity of a function and are able to mention the properties of a continuous function - Students master the concept of the derivative of a function including definition, properties, and techniques for calculating derivatives - Students are familiar with the Mean Value Theorem, L'Hospital's Rule, and are able to apply it in solving problems - Students master the concept of Riemann integral, indefinite integral, and the Fundamental Theorem of Calculus

Content	Students will learn about: Limits, Continuous Functions, Monotone Functions, Inverse Functions, Derivatives, Mean Value Theorem, L'Hospital's Rule, Riemann Integral, and Fundamental Theorem of Calculus
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams
Study and examination requirements	Study and examination requirements: Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	Main References: Bartle, R. G. and Donald R. Sherbert, Introduction to Real Analysis, Fourth Edition, John Wiley & Sons Additional References: Purcell, R. J. and Dale Varberg, Calculus with Analytic Geometry, Fifth Edition, Prentice Hall, 1987

ECONOMICAL MATHEMATICS

Module designation	Economical Mathematics
Semester(s) in which the module is taught	6
Person responsible for the module	Dr. Yudi Mahatma, M.Si.
Language	Indonesia
Relation to curriculum	Elective
Teaching methods	Teaching methods used in this course are: ● Lecture (i.e., small group discussions and project-based learning) ● Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. TOTAL WORKLOAD PER SEMESTER 510 X 16 = 8160 minutes = 136 hours
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	Linear Algebra course
Module objectives/intended learning outcomes	- Students master the concept of market equilibrium - Students are familiar with several market models - Students are able to do comparative-static analysis - Students are able to calculate the optimum value with various techniques - Students are able to perform dynamic analysis
Content	Students will learn about: Equilibrium Point, Market Model, Comparative-Static Analysis, Optimization, Dynamic Analysis
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams

Study and examination requirements	Study and examination requirements: Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	Main References: Alpha. C, Kevin Wainwright, 2007, Fundamental Methods of Mathematical Economics, Four Edition, McGraw-Hill Additional References: 1. Mavron, Philips, 2007, Elements of mathematics for economics and finance, Springer 2. Akira Takayama, 1974, Mathematical Economics, McGraw-Hill

INSURANCE MATHEMATICS

Module designation	Insurance Mathematics
Semester(s) in which the module is taught	6
Person responsible for the module	Dr. Yudi Mahatma, M.Si.
Language	Indonesia
Relation to curriculum	Elective
Teaching methods	Teaching methods used in this course are: ● Lecture (i.e., small group discussions and project-based learning) ● Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. TOTAL WORKLOAD PER SEMESTER 510 X 16 = 8160 minutes = 136 hours
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	Stochastic Process course
Module objectives/intended learning outcomes	- Students master the concept of interest including simple interest, compound interest, nominal interest rate, and real interest rate - Students are able to calculate the final value and present value of various types of annuities - Students are able to explain about various types of insurance - Students are able to explain the components of the life table - Students are able to calculate the value of the probability of life/death, accelerated mortality, and life expectancy - Students are able to explain some mortality theories

Content	Students will learn about: Simple Interest, Compound Interest, Nominal Interest Rate, Real Interest Rate, Annuities, Insurance, Life Table, Accelerated Mortality, Life Expectancy, Mortality Theories
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams
Study and examination requirements	Study and examination requirements: Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	Main References: Futami, T., Matematika Asuransi Jiwa Bagian I, alih bahasa: Gatot Herliyanto; Kerja sama The Kyoei Life Insurance Co. Ltd., Tokyo Additional References: Tabel Mortalitas Indonesia IV, 2019, Asosiasi Asuransi Jiwa Indonesia

THE PHILOSOPHY OF SCIENCE

Module designation	The Philosophy of Science
Semester(s) in which the module is taught	2
Person responsible for the module	Dr. Lukman El Hakim, M.Pd. Dr. Yudi Mahatma, M.Si.
Language	Indonesia
Relation to curriculum	Faculty
Teaching methods	Teaching methods used in this course are: ● Lecture (i.e., small group discussions and project-based learning) ● Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. TOTAL WORKLOAD PER SEMESTER 340 X 16 = 5440 minutes = 90,67 hours
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- Students understand the philosophy of science - Students understand ethical problems in science - Students understand scientific reasoning
Content	Students will learn about: Philosophy of Science, Ethics, Deductive Inference, Inductive Inference
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams
Study and examination requirements	Study and examination requirements: Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.

Reading list	Main References: Jujun S. Sumantri, Filsafat Ilmu

FINANCIAL MATHEMATICS

Module designation	Financial Mathematics
Semester(s) in which the module is taught	3
Person responsible for the module	Drs. Sudarwanto, M.Si., DEA
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- Students master the concept of interest including simple interest, compound interest, and effective interest rate - Students are able to explain the concept of time value in money - Students master the concept of annuity - Students are able to explain the various types of options - Students are able to create asset price models and explain hedging - Students are able to derive the Black-Scholes Differential Equation and explain the solution - Students are able to explain risk neutrality - Students are able to explain implied volatility

Content	**Students will learn about:** Simple Interest, Compound Interest, Effective Interest Rate, Present Value, Discount, Annuity, Perpetuity, Call Option, Put Option, Short Sell, Arbitrage, Put-Call Parity, Discrete Asset Models, Continuous Asset Models, Hedging, Black-Scholes Partial Differential Equation, Expected Payoff, Risk Neutrality, Implied Volatility
Examination forms	Assessment for this course includes: 20% structured assignments, 15% individual assignments, 30% midterms and 35% final exams
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** 1. Kellison, Stephen G. (2009): *The Theory of Interest,* **3rd** ed., McGraw-Hill/Irwin, New York 2. Higham, Desmond J. (2004), Cambridge University Press, Cambridge **Additional References:** 3. Broverman, Samuel A. (2010): *Mathematics of Investment and Credit*, **5th** ed., ACTEX Publication Inc., Winsted 4. Vaaler, Leslie Jane Federer and James W. Daniel (2007): *Mathematical Interest Theory*, **2nd** ed., Pearson Education Inc., Washington

THEORY OF INVESTMENT AND ASSET

Module designation	Theory of Investment and Asset
Semester(s) in which the module is taught	5
Person responsible for the module	Drs. Sudarwanto, M.Si., DEA
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- Mahasiswa mampu menjelaskan tentang exchange, moneter, dan investasi - Mahasiswa mampu mendeskripsikan pembiayaan perusahaan - Mahasiswa mampu menganalisis keputusan bisnis
Content	**Students will learn about:** Exchange, Money Market, Monetary Aggregate, Investment Project, Invesment Balance, Financial Risk
Examination forms	Assessment for this course includes: 20% structured assignments, 15% individual assignments, 30% midterms and 35% final exams

Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** 3. Andrew T. Adam et. all, *Investment Mathematics*, John Wiley & Sons, Inc, New York: 2003 4. David Lovelock, Marilou Mendel, A. Larry Wright, *An Introduction to the Mathematics of Money*, Spriner, New York, 2007 **Additional References:** Sergio M. Focardi, Frank J. Fabozzi, The Mathematics of Financial Modeling and Investment Management, John Wiley & Sons, Inc, New York: 2004

INTRODUCTION TO GENERAL LINEAR MODEL

Module designation	Introduction to General Linear Model
Semester(s) in which the module is taught	7
Person responsible for the module	Drs. Sudarwanto, M.Si., DEA
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	Elementary Statistics course
Module objectives/intended learning outcomes	- Students are able to describe vector spaces - Students are able to explain the positive definite matrix - Students are able to explain about eigenvalue inequalities - Students are able to describe linear estimation - Students are able to analyze general linear models
Content	**Students will learn about:** Vektor Spaces, Matrices, Positive Definite Matrices, General Inverse, Moore-Penrose Inverse, Eigenvalue of Symmetric Matrices, Minimax Principle, Exponential Family of Distributions, Likelihood Maximum Estimators, Normal Linear Models, Multiple Linear Regression, General Linear Models

Examination forms	Assessment for this course includes: 20% structured assignments, 15% individual assignments, 30% midterms and 35% final exams
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** 5. R.B. Bapat, *Linear Algebra and Linear Models*, 3rd Edition, Springer-Verlag New York, 2012 6. Annette J. Dobson and Adrian G. Barnett, *An Introduction to Generalized Linear Models*, 4th Edition. Chapman & Hall, New York, 2018 **Additional References:** Raymond H. Myers et.al, *Generalized linear models: with applications in engineering and the sciences*, 2nd Edition, John Wiley & Sons Inc, New Jersey, 2010

PROBABILITY THEORY

Module designation	Probability Theory
Semester(s) in which the module is taught	6
Person responsible for the module	Drs. Sudarwanto, M.Si., DEA
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- Students are able to explain about probability space - Students are able to analyze conditional probabilities - Students are able to explain the characteristics of random variables - Students are able to describe distribution functions - Students are able to analyze the Limit Theorem
Content	**Students will learn about:** σ-Algebra, Probability Space, Conditional Probabilities, Bayes Theorem, Random Variables, Distribution Functions, Expectation, Moment Generating Functions, Joint Distribution Functions, Marginal Distribution Functions, Conditional Expectations, Law of Large Numbers, and Convergence of Random Variables

Examination forms	Assessment for this course includes: 20% structured assignments, 15% individual assignments, 30% midterms and 35% final exams
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** 7. Liliana Blanco Castaneda, Viswanathan Arunachalam, and Selvamuthu Dharmaraja, *Introduction to probability and stochastic processes with applications*, John Wiley & Sons, Inc, New York: 2012 8. Charles M. Grinstead, and J. Laurie Snell, *Introduction to Probability*, 2nd edition at http://www.dartmouth.edu/ **Additional References:** Capinski, M. dan Kopp, E., (2004). *Measure, Integral and Probability*, 2nd edition, Springer, London, 2004

MULTIVARIABLE CALCULUS

Modul name	Multivariable Calculus	
Modul level, if applicable	Sarjana	
Code	3125-939-4	
Sub-healing, If applicable		
Classes, if applicable		
Semester	3rd Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Dr. Lukita Ambarwati, S.Pd, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 3rd Semester	
Type of Teaching	Face to face every week	Number of Students
Lecture (expository, discussion, exercise) and project	200 minute	45
Workload	Total workload is 680 minutes (6 ECTS) per week which consists of 200 minutes (1,76 ECTS) learning activity, 240 minutes (2.12 ECTS) structured task and 240 minutes (2.12 ECTS) individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **680 X 16 = 10880 minutes = 181, 33 hours**	
Credit Point	6 ECTS	
Prerequisite course(s)	Differential Calculus dan Integral Calculus	
Course outcomes (CPMK)	*The Program Learning Outcome* (PLO) achieved by this course are:	

PLO 7	:	Master of theories of mathematical concepts, e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability and statistics.
PLO 10	:	Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.
PLO 11	:	Able to observe, recognize, formulate, and solve problems through a mathematical approach with or without software.

The Course Learning Outcomes (CLO) achieved by this course are:

CLO 1	:	Mastering the concepts of Sequences and series, as well applying them to approximations.
CLO 2	:	Mastering the concept, operations and properties of

<table>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td>vector in R^2 and R^3</td></tr>
<tr><td>CLO 3</td><td>:</td><td>Determine the parameters of curves and surfaces in three dimensions.</td></tr>
<tr><td>CLO 4</td><td>:</td><td>Understand the concepts and properties of vector, divergence and curl fields.</td></tr>
<tr><td>CLO 5</td><td>:</td><td>Mastering the concepts and properties of limit and continuity of vector-valued functions</td></tr>
<tr><td>CLO 6</td><td>:</td><td>Mastering the concepts and properties of the derivative of vector valued functions</td></tr>
<tr><td>CLO 7</td><td>:</td><td>Mastering concepts, properties, applications and determining scalar, fields, gradients and directed derivatives</td></tr>
<tr><td>CLO 8</td><td>:</td><td>Mastering concepts and calculating line integrals directly or applying Green's Theorem</td></tr>
<tr><td>CLO 9</td><td>:</td><td>Mastering concepts, properties and determining Surface Integrals directly or applying the Divergence Theorem and Gauss Theorem</td></tr>
</table>

The matrix of relation between CLO and PLO of this subject:

<table>
<tr><th></th><th>PLO 7</th><th>PLO 10</th><th>PLO 11</th></tr>
<tr><td>CLO 1</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO 2</td><td>V</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td>V</td><td></td><td></td></tr>
<tr><td>CLO 4</td><td>V</td><td></td><td></td></tr>
<tr><td>CLO 5</td><td>V</td><td></td><td></td></tr>
<tr><td>CLO 6</td><td>V</td><td></td><td></td></tr>
<tr><td>CLO 7</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO 8</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO 9</td><td>V</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
<tr><td>Content (Pokok Bahasan)</td><td>1. Sequences and Series
2. Vectors in R2 and R3
3. Parameterization of curves and surfaces
4. Vector Field, Divergence and Curl
5. Limit dan Kekontinuan Fungsi Bernilai Vektor.
6. Limits and Continuity of Vector Valued Functions.
7. Scalar Fields, gradients and directional derivatives.
8. Line Integrals and Green Theorem.
9. Surface Integral, Gauss Divergence Theorem and Stokes Theorem</td></tr>
<tr><td>Study/exam achievements</td><td>Assessments of this course include:
Task (25%), Midterm Exam(25%), Projects(25%) and Final Exam(25%)</td></tr>
<tr><td>Media</td><td>LMS, Zoom</td></tr>
<tr><td>Literatures</td><td>The Main Reference</td></tr>
</table>

	Varberg, Purcell, Rigdom., 2009, Calclulus Nineth Edition, *Kalkulus dan Geometri Analitis*, Ed.9. Pearson **Supporting Reference:** 1. Larson, R. Dan Edwards, B.H,(2006) Multivariable Calculus, ninth edition, Brooke/Cole, Belmont, USA 2. Schurman, J. Multivariable Calculus, Reed College. 3. Kreyzsig, Erwin., *Matematika Teknik Lanjutan*. (Terj.). Penerbit Erlangga, Jakarta. 4. Spiegel, Murray R. *Kalkulus Lanjutan*. (Terj). Edisi ke-3 Penerbit Erlangga, Jakarta. 5. Rahayu, Widyanti dan Ambarwati, 2007, Lukita, *Buku Ajar Kalkulus Lanjut*, UNJ.

DIFFERENTIAL CALCULUS

Modul Name	Differential Calculus	
Modul level, if applicable	Undergraduate	
Code	31259394	
Sub-healing, If applicable		
Classes, if applicable		
Semester	1st Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Dr. Lukita Ambarwati, S.Pd, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 1st semester	
Type of Teaching	Face to face every week	Number of Students
Lecture (expository, discussion, exercise), case based	200 menit	45
Workload	Total workload is 680 minutes (6 ECTS) per minggu which consists of 200 minutes (1,76 ECTS) learning activity, 240 minutes (2.12 ECTS) structured task and 240 minutes (2.12 ECTS) individual learning per week for 16 weeks.	
Credit Point	6 ECTS	
Prerequisite course(s)	-	
Course outcomes (CPMK)	*he Program Learning Outcome* (PLO) achieved by this course are:	

PLO 7	:	Master the theories of mathematical concepts e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability and statistics.
PLO 8	:	Master of principles of mathematical modelling, linear programming, differential equations and numerical methods.
PLO 11	:	Able to observe, recognize, formulate and solve problems through a mathematical approach with or without software.

The Course Learning Outcomes (CLO) achieved by this course are:

CLO 1	:	Mastering the concept of the real number system
CLO 2	:	Determine the solution to the inequality
CLO 3	:	Determine solutions of inequalities that contain absolute values
CLO 4	:	Mastering the concept of function and operation of one variable function
CLO 5	:	Able to sketch a graph of the function of one variable
CLO 6	:	Mastering the concept and determining the limit of

		the function of one variable
CLO 7	:	Master the concept and identify a continuous function
CLO 8	:	Mastering the concept and determining the derivative function of one variable
CLO 9	:	Applying the concept of derivatives to determine the maximum and minimum values as well as drawing the graph of the function of one variable
CLO10	:	Mastering the concept of function of two or more variables
CLO11	:	Mastering the concept of the limit function of two or more variables
CLO12	:	Determine the continuity of the function of two or more variables
CLO13	:	Determine the partial derivative and the total derivative of a function of two or more variables
CLO14	:	Apply the concept of the derivative of a function of two variables
CLO15	:	Determine the extreme value of the function of two or more variables with the constrain function

The matrix of relation between CLO and PLO of this subject:

	PLO 7	PLO 8	PLO 11
CLO 1	v		
CLO 2	v		v
CLO 3	v		v
CLO 4	v		
CLO 5	v		
CLO 6	v		
CLO 7	v		
CLO 8		v	
CLO 9			v
CLO 10	v		
CLO 11	v		
CLO 12	v		
CLO 13		v	
CLO 14			v
CLO 15			v

Content (Pokok Bahasan)	1. Real Number System - Real Number - Interval - Inequality - Absolute Value 2. Function of one variable - Definition of Function

	- Domain, Codomain and Range - Operation of Function - Drawing of graph of a function 3. The Limit of function of one variable - Definition of Limit - Limit Theorem - Limits of trigonometric functions - Infinity limit and limit at infinity 4. Continuous Function 5. The derivative of a function of one variable - Definition of Function of one variable - Leibniz Notation - Chain Rule - High order derivation - Implicit function derivatives and parametric functions - L'Hospital Rule - Application of Derivative - Sketch of graph using derivative 6. Function of two or more variables - Definitions of function with two variables - Limit of function of two variables - Continuity of function of two variable - Partial Derivative - High order derivative - Chain Rule - Total Differential - Application of partial derivative to determine extreme values of functions - Derivative with Constrain
Study/exam achievements	Assessments of this course include: Task(30%), Midterm Exam(35%), Final Exam(35%)
Media	LMS, Zoom
Literatures	**The Main Reference:** Varberg, Purcell, Rigdom., 2009, Calclulus Nineth Edition, *Kalkulus dan Geometri Analitis*, Ed.9. Pearson **Supporting Reference::** *(ditulis dengan menggunakan gaya penulisan MLA)*

PARTIAL DIFFERENTIAL EQUATION

Modul Name	Partial Differential Equations	
Modul level, if applicable	Undergraduate	
Code	31259503	
Sub-healing, If applicable		
Classes, if applicable		
Semester	4th Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Dr. Lukita Ambarwati, S.Pd, M.Si Dr. Eti Dwi Wiraningsih, S.Pd, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 4th semester	
Type of Teaching	Face to face for every week	Number of Students
Lecture (expository, discussion, exercise), case based	150 menit	45
Workload	Total workload is 510 minutes (4,5 ECTS) per week which consists of 150 minutes (1.32 ECTS) learning activity, 180 minutes (1,59 ECTS) structured task and 180 minutes (1.59 ECTS) individual learning per week for 16 weeks.	
Credit Point	4.5 ECTS	
Prerequisite course(s)	-	
Course outcomes (CPMK)	*Program Learning Outcome* (PLO) yang dapat dicapai dengan matakuliah ini adalah:	

PLO 4	:	Able to conduct self-evaluation on the team under their responsibility and to manage teaching and learning independently.
PLO 8	:	Master the principles of mathematical modeling, linear programming, differential equations, dan numerical methods.
PLO 11	:	Able to observe, recognize, formulate, and solve problems through a mathematical approach with or without software.

The Course Learning Outcomes (CLO) achieved by this course are:

CLO 1	:	Understand the basic concepts of differential equations and their solutions
CLO 2	:	Understand the 1D Poisson Equation and be able to formulate its solution
CLO 3	:	Understand the Head Equation and be able to formulate a solution
CLO 4	:	Understand the Wave Equation and be able to

		formulate a solution
CLO 5	:	Understand the Maximum Principle and be able to apply it in solving related problems
CLO 6	:	Understand the 2D Poissons Equation and able to formulate a solution

The matrix of relation between CLO and PLO of this subject:

	PLO 4	PLO 8	PLO 11
CLO 1	v	v	
CLO 2	v	v	
CLO 3	v	v	
CLO 4	v	v	
CLO 5	v		v
CLO 6	v	v	

Content (Pokok Bahasan)

1. Basic Concepts of Differential Equations

a) Differential equations in the form of exact solution operators, stability of approximation solutions and convergence

b) PDE order 1, constant coefficient and homogen(transport equations), PDE orde1, non constant coefficients, homogen and non homogen

c) D'Alembert for solution of wave equation and solution of diffusi equation

2. Poisson Equation in One Dimension

a) Analitic solution, Green function, A Maximum Principle

b) Finite Difference Methode, Eigen Value Problems

3. The Heat Equation

a) Separation of Variables (Dirichlet and Newmann Boundary Conditions)

b) Finite difference method

c) Von Neumann stability analysis

d) Energy Arguments

4. Persamaan Gelombang

a) Separation of Variables

b) Uniqueness and Energy Arguments

c) Finite Difference Method

5. Maximum Principle

Maximum principle on Boundary Value Problems, Heat Equations, and Harmonic functions

6. Poisson Equations in Two Space Dimensions

a) Rectangular Domains

b) Polar Coordinaes

Study/exam achievements

Assessments of this course include:
Task(20%), Project(20%), Midterm Exam(30%), Final Exam(30%)

Media	LMS, Zoom
Literatures	**The Main Reference:** Aslak, Tveito, Ragnar Winther, Introduction to Partial Differential Equations, A Computational Approach,TAM, Spriger Verlag. **Supporting Reference:** Mark S. Gockenbach, Partial Differential Equations, Analytical and Numerical Methods, SIAM

CALCULUS OF VARIATION

Modul Name	Calculus of Variations	
Modul level, if applicable	Undergraduate	
Code	31254013	
Sub-healing, If applicable		
Classes, if applicable		
Semester	4th Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Dr. Lukita Ambarwati, S.Pd, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is an elective course and offered in the 4th semester	
Type of Teaching	Face to face in a week	Number of Students
Lecture (expository, discussion, exercise), case based	150 menit	45
Workload	Total workload is 510 minutes (4,5 ECTS) per week which consists of 150 minutes (1.32 ECTS) learning activity, 180 minutes (1,59 ECTS) structured task and 180 minutes (1.59 ECTS) individual learning per week for 16 weeks.	
Credit Point	4.5 ECTS	
Prerequisite course(s)	-	

Course outcomes (CPMK)

The Program Learning Outcome (PLO) achieved by this course are:

PLO 7	:	Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics.
PLO 10	:	Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.
PLO 11	:	Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software.

The Course Learning Outcomes (CLO) achieved by this course are:

CLO 1	:	Students are able to solve the standard optimal problems
CLO 2	:	Students are able to understand the concept and theorem of linear space and variation Gateaux
CLO 3	:	Students master concepts, theorems and how to solve the minimizing problems of convex functions.
CLO 4	:	Students master concepts, theorems and application

<table>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td>of Euler Lagrange equations.</td></tr>
<tr><td>CLO 5</td><td>:</td><td>Students are able to understand concepts, theorems and applications of the principle of variation in mechanics</td></tr>
</table>

The matrix of relation between CLO and PLO of this subject:
<table>
<tr><th></th><th>PLO 7</th><th>PLO 10</th><th>PLO 11</th></tr>
<tr><td>CLO 1</td><td>V</td><td></td><td>V</td></tr>
<tr><td>CLO 2</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO 3</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO 4</td><td>V</td><td>V</td><td>V</td></tr>
<tr><td>CLO 5</td><td>V</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>1. Standard Optimization Problems
1.1 Geodesic problems
1.2 Transit time problems
1.3 Isoperimetric problems
1.4 Surface are problems
2. Linear Space and the variation of Gateaux
2.1 Linear Space of Real Numbers
2.2 Functions in Linear Spaces
2.3 Fundamental of Optimizations
2.4 Variation's Gateaux
3. Minimization of convex functions
3.1 Convex Functions
3.2 Integral of convex functions
3.3 Strong convex functions
3.4 Applications
3.5 Minimizations with convex constrain
4. Euler Lagrange Equations
4.1 First equation: Stationer function
4.2 Special case of the first equation
4.3 Second equation
4.4 Variable End Point Problems
4.5 Integral Constraints: Lagrangian Multipliers
4.6 Integral Involving Higher Derivatives
4.7 Vector Value Stationary Functions
4.8 Invariant of Stationarity
4.9 Multidimensional Integrals
5. Variational Principle in Mechanics
5.1 The Action Integral
5.2 Hamilton Principle
5.3 The Total Energy
5.4 The Canonical Equations.
5.5 Integral and parametric equationof Motion</td></tr>
<tr><td>Study/exam achievements</td><td>Assessments of this course include:
Task (30%), Midterm Exam (35%) and Final Exam (35%)</td></tr>
<tr><td>Media</td><td>LMS, Zoom</td></tr>
</table>

Literatures	**The Main Reference:** Troutman, J.L, (1996), Variational Calculus and Optimal Control: Optimitation with elementary convexity (second edition), Springer. **Supporting Reference** 1. Dacorogna, B, (2004), Introduction to The Calculus of Variation, Imperial College Press 2. Fonseca, I dan Leoni G, (2007), Modern Methods In Calculus Of Variation: L^p space, Springer Monograph in Mathematics, Springer

INTRODUCTION TO FUCTIONAL ANALYSIS

Modul Name	Introduction to Functional Analysis	
Modul level, if applicable	Undergraduate	
Code	31250003	
Sub-healing, If applicable		
Classes, if applicable		
Semester	7th Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Dr. Lukita Ambarwati, S.Pd, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 7th semester	
Type of Teaching	Face to face every Week	Number of Students
Lecture (expository, discussion, exercise), case based	150 menit	45
Workload	Total workload is 510 minutes (4,5 ECTS) per week which consists of 150 minutes (1.32 ECTS) learning activity, 180 minutes (1,59 ECTS) structured task and 180 minutes (1.59 ECTS) individual learning per week for 16 weeks.	
Credit Point	4.5 ECTS	
Prerequisite course(s)	-	
Course outcomes (CPMK)	*The Program Learning Outcome* (PLO) achieved by this course are:	

PLO 7	:	Master the theories of mathematical concepts, e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability, and statistics.
PLO 10	:	Able to develop mathematical thinking, from procedural/computational understanding to advanced understanding, including exploration, logical reasoning, generalization, abstraction, and formal proving

The Course Learning Outcomes (CLO) achieved by this course are:

CLO 1	:	Formulate the concept and theory of Metric Space
CLO 2	:	Formulate the concept and they of Norm Space and Banach Space
CLO 3	:	Formulate the concept of Linear Operator
CLO 4	:	Formulate the Concept of Inner Product Space and Hilbert Space

The matrix of relation between CLO and PLO of this subject:

	PLO 7	PLO 10

<table>
<tr><td></td><td>
<table>
<tr><td>CLO 1</td><td>V</td><td>V</td></tr>
<tr><td>CLO 2</td><td>V</td><td>V</td></tr>
<tr><td>CLO 3</td><td>V</td><td>V</td></tr>
<tr><td>CLO 4</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
<tr><td>Content (Pokok Bahasan)</td><td>1. Metric Space
a) Metric and Metric Space
b) Open Ball in Metric Space
c) Open and Closed Set in Metric Space
d) Complete Metric Space
2. Norm Space and Banach Space
a) Vector Space
b) Norm Space and Banach Space
c) Properties of Norm Space
d) Finite Dimension of Norm Space and Subspace
e) Compactness on finite dimension space
3. Linear Operator
a) Linear Operator
b) Continu and bounded linear Operator
c) Linear Functional
d) Linear Operator and functional on finite dimensio spaces
e) Norm Space of operator, Dual Space
4. Inner Product Space and Hilbert Space
a) Inner Product Space, Hilbert Space
b) Properties of Inner Product Space
c) Direct Sum
d) Orthonormal Set and Sequance
e) Example of Orthonormal Set</td></tr>
<tr><td>Study/exam achievements</td><td>Assessments of this course include:
Task(30%), Midterm Exam(35%), Final Exam(35%)</td></tr>
<tr><td>Media</td><td>LMS, Zoom</td></tr>
<tr><td>Literatures</td><td>The Main Reference:
Erwin Kreyszig, 1978, Introductory Functional Analysis with Applications, John Wiley and Sons, New York

Referensi Pendukung: (ditulis dengan menggunakan gaya penulisan MLA)</td></tr>
</table>

INTRODUCTION TO TOPOLOGY

Modul Name	Introduction to Topology	
Modul level, if applicable	Undergraduate	
Code	31254043	
Sub-healing, If applicable		
Classes, if applicable		
Semester	6th Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Dr. Lukita Ambarwati, S.Pd, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 6th semester	
Type of Teaching	Face to face every week	Number of Students
Lecture (expository, discussion, exercise), case based	150 minute	45
Workload	Total workload is 510 minutes (4,5 ECTS) per week which consists of 150 minutes (1.32 ECTS) learning activity, 180 minutes (1,59 ECTS) structured task and 180 minutes (1.59 ECTS) individual learning per week for 16 weeks.	
Credit Point	4.5 ECTS	
Prerequisite course(s)	-	
Course outcomes (CPMK)	*The Program Learning Outcome* (PLO) achieved by this course are:	

PLO 7	:	Master of theories of mathematical concepts, e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability and statistics.
PLO 10	:	Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.

The Course Learning Outcomes (CLO) achieved by this course are:

CLO 1	:	Formulate concepts and theory of metric Space
CLO 2	:	Formulate concepts and theory of topology space
CLO 3	:	Classify a space according to certain properties

The matrix of relation between CLO and PLO of this subject:

	PLO 7	PLO 10
CLO 1	V	V
CLO 2	V	V

	CLO 3 | V | V
Content (Pokok Bahasan)	1. Metric Space a) Definition of Metric Space b) Open and Closed Set on Metric Space c) Complete Metric Space and Its Associate Properties 2. Topology Space in R dan R^2 a) Definition open and closed set in R b) Topology in R c) Definition open and closed set in R^2 d) Topology in R^2 3. Topology Space a) Definition of topology space b) Elementary Properties of topology space c) Basis of Topology Space d) Metric topology 4. Compact Space a) Definition and example of compact spac b) Properties of compact space 5. Separable Space a) Definition and example of separable space b) Properties of Separable Space 6. Connected Space a) Definition and example of connected, disconnected and path connected space b) Properties of connected space
Study/exam achievements	Assessments of this course include: Task(30%), Midterm Exam(35%), Final Exam(35%)
Media	LMS, Zoom
Literatures	**The Main Reference:** [1] G.F Simmons, 1963, Introduction to Topology and Modern Analysis, Mc Graw-Hill, Tokyo [2] Schaum Series, General Topology [3] L. Ambarwati, 2009, Pengantar *Topology*, Universitas Negeri Jakarta. **Referensi Pendukung:** *(ditulis dengan menggunakan gaya penulisan MLA)*

MEASURE THEORY

Modul Name	Measure Theory	
Modul level, if applicable	Undergraduate	
Code	31254053	
Sub-healing, If applicable		
Classes, if applicable		
Semester	7th Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Drs. Sudarwanto, M.Si, DEA	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 7th semester	
Type of Teaching	Face to face every week	Number of Students
Lecture (expository, discussion, exercise), case based	150 menit	45
Workload	Total workload is 510 minutes (4,5 ECTS) per week which consists of 150 minutes (1.32 ECTS) learning activity, 180 minutes (1,59 ECTS) structured task and 180 minutes (1.59 ECTS) individual learning per week for 16 weeks.	
Credit Point	4.5 ECTS	
Prerequisite course(s)	-	

Course outcomes (CPMK)

The Program Learning Outcome (PLO) achieved by this course are:

PLO 9	:	Capable to conduct research independently or in groups that can be used to guide stakeholders in choosing diverse alternative solutions to problems in mathematics.
PLO 11	:	Able to observe, recognize, formulate, and solve problems through a mathematical approach with or without software.

The Course Learning Outcomes (CLO) achieved by this course are:

CLO 1	:	Be able to explain about the null set, properies and characteristics
CLO 2	:	Able to explain about measure space
CLO 3	:	Able to explain Lebesque measure
CLO 4	:	Able to explain Borel Set
CLO 5	:	Able to explain σ-field and propertes
CLO 6	:	Able to explain monotone space
CLO 7	:	Able to explain concept of Lebesque integral
CLO 8	:	Be able to explain the relationship between the lebesque integral and the Riemann Integral

CLO 9	:	Be able to explain the meaning of integral function space L^1 and its properties
CLO10	:	Be able to explain the meaning of Hilbert space and its properties
CLO11	:	Be able to explain the definition of space of L^p, p ≥3 and its properties
CLO12	:	Be able to explain the meaning of Lebesque-Stieltjes Measure and Its Properties
CLO13	:	Able to apply the Radon-Nikodym Theorem
CLO14	:	Be able to explain the meaning of the Lebesque-Stieltjes Integral

The matrix of relation between CLO and PLO of this subject:

	PLO 9	PLO 11
CLO 1	V	V
CLO 2	V	V
CLO 3	V	V
CLO 4	V	V
CLO 5	V	V
CLO 6	V	V
CLO 7	V	V
CLO 8	V	V
CLO 9	V	V
CLO 10	V	V
CLO 11	V	V
CLO 12	V	V
CLO 13	V	V
CLO 14	V	V

Content (Pokok Bahasan)

1. Set and Function
   a) Set, properties and type
   b) Functions, properties and types
   c) Null set, properties and its characteristic
2. Lebesque Measure
   a) Measure Space
   b) Lebesque Measure
   c) Borel Set
3. σ -field
   a) Properties of σ -field
   b) Monotone Class
3. Lebesque Integral
   a) Definition of Lebesque Integral
   b) Relation Between Lebesque and Riemann Integral
4. Space of integral function
   a) Space of integral function L^1
   b) Hilbert Space
   c) L^p, space for p ≥3
5. Lebesque-Stieltjes Measure

	a) Definition of Lebesque-Stieltjes Measure b) Radon-Nikodym Theorem c) Lebesque-Stieltjes Integral
Study/exam achievements	Assessments of this course include: Structure Task(25%), Independent Task(25%), Midterm Exam(25%) and Final Exam(25%)
Media	LMS, Zoom
Literatures	**The Main Reference:** 1. Capinski, M. dan Kopp, E, (2004). **Measure, Integral and Probability**, Edisi ke 2, Springer, London. 2. Frank Burk (1998), Lebesque Measure and Integration: An Introduction, John Wiley and Sons, New York. 3. Vladimir I. Bogachev (2007), Measure Theory volume I, Springer-Verlag Berlin Heidelberg. **Suplement Reference:** *(ditulis dengan menggunakan gaya penulisan MLA)*

DISCRETE MATHEMATICS

Module designation	Discrete Mathematics
Semester(s) in which the module is taught	2
Person responsible for the module	Devi Eka Wardani Meganingtyas, S.Pd., M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (individual task)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	*Number Theory*

Program intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. **PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics. **PLO 10**. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof. **PLO 11**. Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Understand the definition of sets, mathematical induction, inclusion and exclusion principles, multiple sets and statements. CLO 2 : Understand the rules of addition and multiplication, combinations, permutations, generation of combinations and permutations. CLO 3 : Comprehend the relational model for databases, binary relations, equality and partition relations, partial and lattice ordering relations, chaining and chain reciprocation, task scheduling problems. CLO 4 : Understanding of numeric functions, asymptotic behavior of a numeric function, generating functions and combinatorial problems. CLO 5 : Understand recurrence relations, homogeneous solutions, special solutions, total solutions and solutions using generating function methods. CLO 6 : Understanding Groups, Subgroups, Permutation Groups, group codes and codes, isomorphism, automorphism, homomorphism, ring, integral area and ring homomorphism field, polynomial ring and cyclic code. CLO 7 : Understand lattice and algebraic systems, the principle of duality, spreading lattice and complementary lattice, boolean lattice and boolean algebra, uniqueness of Boolean algebra,

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and statement calculus.
CLO 8 : Understand graphs, multiple graphs and weighted graphs, paths and series, shortest paths in weighted graphs, euler paths and series, Hamilton paths and series, salesman problems, factors of a graph and planar graphs.
CLO 9 : Understand trees, rooted trees, path lengths in rooted trees, prefix codes, binary search trees, spanning trees and cut sets, minimum spanning trees, transport networks.

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><th rowspan="2">CLO</th><th colspan="4">PLO</th></tr>
<tr><th>5</th><th>7</th><th>10</th><th>11</th></tr>
<tr><td>1</td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>3</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td><td>√</td><td></td></tr>
<tr><td>6</td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>7</td><td></td><td></td><td>√</td><td></td></tr>
<tr><td>8</td><td></td><td></td><td></td><td>√</td></tr>
<tr><td>9</td><td></td><td></td><td></td><td>√</td></tr>
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</tr>
<tr>
<td>Content</td>
<td>Students will learn about:
sets and expressions, permutations and combinations, relations and functions, discrete numeric functions and generating functions, recursive relations and gruf and ring recursive algorithms, boolean algebra, graphs and planar graphs, trees, and cut sets.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:
20% structured assignments, 30% midterms and 50% final exams</td>
</tr>
<tr>
<td>Study and examination requirements</td>
<td>Study and examination requirements:
Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td>
</tr>
</table>

Reading list	**Main References:** Rosen, Kenneth. H., *Discrete Mathematics And Its Applications*, Seventh Edition, McGraw-Hill, 2012. **Additional References:** Liu, C.L., *Dasar-Dasar matematika Diskret,* Gramedia Pustaka Utama, 1995. Wijaya, Belawati., *Pengantar Matematika Diskret,* Pusat Antar Universitas Ilmu Komputer UI, 1987 Daliyo dan Wardoyo,Retantyo. *Matematika Diskrit,* Proyek Pembinaan Tenaga Kependidikan, Persiapan Perkuliahan Program Lanjutan MIPA LPTK (Program B), FMIPA UGM, 1990. Budayasa, I Ketut, *Matematika Diskrit 1,* Program Pascasarjana Pendidikan Matematika IKIP.

PROGRAMMING ALGORITHM

Module designation	Programming Algorithm
Semester(s) in which the module is taught	2
Person responsible for the module	Dr. Makmuri, M.Si / Devi Eka Wardani Meganingtyas, S.Pd., M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and case-based learning) • Structured assignments (project development)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	-

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 5. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis.
PLO 8. Mastering the principles of mathematical modeling, linear programming, differential equations, and numerical methods.
PLO 10. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.
PLO 11. Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Mastering the concept of programming algorithms.
CLO 2 : Mastering the flow of making flowcharts.
CLO 3 : Mastering the concepts of branching and repetition in flowcharts.
CLO 4 : Mastered the creation of simple programs by using Python software.

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><td rowspan="2">CLO</td><td colspan="4">PLO</td></tr>
<tr><td>5</td><td>8</td><td>10</td><td>11</td></tr>
<tr><td>1</td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>2</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td>√</td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td><td>√</td></tr>
</table>
</td>
</tr>
<tr>
<td>Content</td>
<td>Students will learn about:
introduction to algorithms, flowcharts, branching, repetition, the Python programming language, lists, and subroutines.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:
25% structured assignments, 35% midterms and 40% final exams.</td>
</tr>
</table>

Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** Zarman, Wendi & Wicaksono, Mochamad Fajar. 2020. *Implementasi Algoritma dalam Bahasa Python.* Bandung: Informatika Bandung. **Additional References:** Munir, Rinaldi. 2007. *Algoritma dan Pemrograman Bahasa Pascal dan C Edisi Revisi.* Bandung: Informatika Bandung.

NUMERICAL METHODS

Module designation	Numerical Methods
Semester(s) in which the module is taught	3
Person responsible for the module	Tian Abdul Aziz, Ph.D / Devi Eka Wardani Meganingtyas, S.Pd., M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (project development and presentation)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	*Programming Algorithm*

Program intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. **PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics. **PLO 8**. Mastering the principles of mathematical modeling, linear programming, differential equations, and numerical methods. **PLO 9**. Able to conduct research independently or in groups that can be used to provide guidance to stakeholders in choosing various alternative solutions to problems in mathematics. **PLO 10**. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof. **PLO 11**. Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Be able to match data points with a curve approximation of a numerically linear and non-linear function. CLO 2 : Mastering to calculate the roots of a non-linear equation numerically. CLO 3 : Understand how to solve integration problems numerically. CLO 4 : Understand how to solve differential equations numerically. CLO 5 : Understand how to solve systems of linear equations numerically. The relationship between PLO and CLO in this course is described as follows:

CLO	PLO					
	5	7	8	9	10	11
1	√		√			
2		√	√			
3					√	√

	4					√	√	
	5				√		√	

Content	**Students will learn about:** error analysis in numerical calculations, explaining floating point numbers, binary numbers and base k numbers. In addition, students are able to determine the roots of non-linear equations using closed and open methods, solve systems of linear equations using elementary row operations and iterations, explain linear and non-linear interpolation, curve fitting, numerical integration and determine initial value problems.
Examination forms	Assessment for this course includes: 30% structured assignments, 35% midterms and 35% final exams.
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** Chapra, Steven C., Caynale, Raymond P., Numerical Methods for Engineers, Fifth Edition, 2006, Mc.Graw Hill International. **Additional References:** Kreyzig, Advanced Engineering Mathematics, John Willey Munir, Rinaldi, Metode Numerik, 2003, Informatika Bandung Sahid, Pengantar Komputasi Numerik dengan Matlab, 2005, Andi Yogyakarta Susila, I Nyoman, Dasar-dasar Metode Numerik, 1992, Depdikbud.

ENTERPRENEURSHIP

Module designation	Enterpreneurship
Semester(s) in which the module is taught	4
Person responsible for the module	Devi Eka Wardani Meganingtyas, S.Pd., M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (project development)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	-

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 2. Internalize the spirit of independence, struggle and entrepreneurship.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Understand the concept and theory of entrepreneurship.
CLO 2 : Able to innovate in entrepreneurship.
CLO 3 : Able to carry out the entrepreneurial process.

The relationship between PLO and CLO in this course is described as follows:

<table>
<tr><td rowspan="2">CLO</td><td>PLO</td></tr>
<tr><td>2</td></tr>
<tr><td>1</td><td>√</td></tr>
<tr><td>2</td><td>√</td></tr>
<tr><td>3</td><td>√</td></tr>
</table>
</td>
</tr>
<tr>
<td>Content</td>
<td>Students will learn about:
entrepreneurial concepts and theories, innovation in entrepreneurship, and the entrepreneurial process.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:
60% project and 40% midterm exam.</td>
</tr>
<tr>
<td>Study and examination requirements</td>
<td>Study and examination requirements:
Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td>
</tr>
<tr>
<td>Reading list</td>
<td>Main References:
Wiratmo,Masykur. Pengantar Kewirawastaan, Kerangka Dasar memasuki Dunia Bisnis. Edisi ke 2 BPFE, Yogyakarta, 2001.

Additional References:
Seng, Ang Wan. Rahasia Bisnis Orang Cina. Hikmah, Bandung. 2007.

Danandjaja James. Antropologi Psikologi: Teori, Metode dan Sejarah Perkembanganya . Rajawali Press. Jakarta. 2002</td>
</tr>
</table>

DESIGN AND ANALYTICAL ALGORITHM

Module designation	Design and Analytical Algorithm
Semester(s) in which the module is taught	4
Person responsible for the module	Drs. Mulyono, M.Kom / Faroh Ladayya, M.Si.
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (individual task)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	*Programming Algorithm*

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 5. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis.
PLO 8. Mastering the principles of mathematical modeling, linear programming, differential equations, and numerical methods.
PLO 10. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Able to define algorithms and their complexity.
CLO 2 : Able to solve graphs problemming.
CLO 3 : Able to design algorithms with various approaches.
CLO 4 : Understand the Backtracking and Branch and Bound paradigms to find optimal solutions.
CLO 5 : Understand the problems in NP-Complete class.

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><td rowspan="2">CLO</td><td colspan="3">PLO</td></tr>
<tr><td>5</td><td>8</td><td>10</td></tr>
<tr><td>1</td><td>√</td><td></td><td></td></tr>
<tr><td>2</td><td>√</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td>√</td><td></td></tr>
<tr><td>4</td><td></td><td></td><td>√</td></tr>
<tr><td>5</td><td></td><td></td><td>√</td></tr>
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</tr>
<tr>
<td>Content</td>
<td>Students will learn about:

criteria for evaluating the goodness of sorting algorithms (Bubble sort, Bose-Nelson Sort, Merge-sort, Insertion sort, Selection sort, Heap sort, Quick Sort, Radix sort) , searching, graph problems (MST, Shorts Path, DFS, BFS, Connectivity), Designing algorithms with approaches: Iterative, divide and conquer, Greedy, dynamic programming, branch and bound, backtracking, Matrix multiplication: Optimal cost and Parenthesization, NP-Complete: Tractable/Intractable Problem.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:

30% structured assignments, 30% midterms and 40% final exams</td>
</tr>
</table>

Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** Aho, Hopcroft and Ullman, " *The Design and Analysis of Computer Algorithms",* Addison-Wesley, 1974. Goodman, S. E. *Introduction to The Design and Analysis of Algorithm*.New York:McGraw-Hill, 1987. **Additional References:** Cormen, Leiserson, Rivest, " *Introductions to Algorithms",* Mc. Graw Hill, 1989 Alagic, Suad dan Michael A. Arbib. *The Design Well-Stuctured and CorrectProgram.* New York: Springer-Verlag, 1978. Brassard, G., dan P. Bratley. *Algorithmics, Theory and Practice.* New Jersey:Prentice-Hall, 1988.

MATHEMATICS SEMINAR

Module designation	Mathematics Seminar
Semester(s) in which the module is taught	6
Person responsible for the module	Team of lecturers
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (project development, presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **340 X 16 = 5440 minutes = 90,67 hour**
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	-

Program intended learning outcomes

PLO 3. Able to maintain and develop a network with mentors, colleagues, peers both inside and outside the institution.

PLO 4. Able to carry out the process of self-evaluation of work groups under their responsibility, and able to manage learning independently.

PLO 5. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis.

PLO 6. Able to document, store, secure, and retrieve data to ensure validity and prevent plagiarism.

PLO 7. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics.

PLO 9. Able to conduct research independently or in groups that can be used to provide guidance to stakeholders in choosing various alternative solutions to problems in mathematics.

PLO 10. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.

PLO 11. Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Able to analyze the essence of mathematical scientific articles.
CLO 2 : Able to compile the state of the art of a topic.
CLO 3 : Able to compile mathematical scientific papers.
CLO 4 : Able to present scientific papers compiled.

The relationship between PLO and CLO in this course is described as follows:

CLO	PLO							
	3	4	5	6	7	9	10	11
1	√	√						
2	√		√			√		
3	√			√	√	√		
4	√				√	√	√	√

Content	**Students will learn about:** independent studies of national and international journals, discussions, project based and presentations.
Examination forms	Assessment for this course includes: 10% individual assignments, 25% student activities, 30% project presentation and 35% project paper.
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** Any article whose topics are related to mathematics.

STOCHASTIC PROCESS

Module designation	Stochastic Process
Semester(s) in which the module is taught	6
Person responsible for the module	Drs. Sudarwanto, M.Si., DEA
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (individual task)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	*Mathematical Statistics I*
Program intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. **PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics. **PLO 10**. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof. **PLO 11**. Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software.

<table>
<tr>
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<td>
Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Be able to describe discrete Markov chains.
CLO 2 : Able to analyze the Poisson Process.
CLO 3 : Be able to explain continuous Markov chains.
CLO 4 : Able to describe the renewal process.
CLO 5 : Able to analyze the Wiener process.

The relationship between PLO and CLO in this course is described as follows:

<table>
<tr><td rowspan="2">CLO</td><td colspan="4">PLO</td></tr>
<tr><td>5</td><td>7</td><td>10</td><td>11</td></tr>
<tr><td>1</td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>2</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td><td>√</td><td></td></tr>
<tr><td>5</td><td></td><td></td><td></td><td>√</td></tr>
</table>
</td>
</tr>
<tr>
<td>Content</td>
<td>Students will learn about:
entrepreneurial concepts and theories, innovation in entrepreneurship, and the entrepreneurial process.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:
15% assignment I, 15% assignment II, 20% final assignment, and 25% midterm exam, and 25% final exam.</td>
</tr>
<tr>
<td>Study and examination requirements</td>
<td>Study and examination requirements:
Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td>
</tr>
<tr>
<td>Reading list</td>
<td>Main References:
Ross, Sheldon. M., Introduction to Probability Models. 12th Edition, Academic Press, London UK, 2019.

Taylor, H.M. dan Karlin, S., An Introduction to Stochastic Modeling. 3th edition, Academic Press, San Diego,1998.

Additional References:

Grimmett, G.R. dan Stirzaker, D.R., Probability and Random Processes. 3th edition, Oxford University Press Inc., New York, 2001.</td>
</tr>
</table>

RISK THEORY

Module designation	Risk Theory
Semester(s) in which the module is taught	7
Person responsible for the module	Drs. Sudarwanto, M.Si., DEA
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (individual task)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **340 X 16 = 5440 minutes = 90,67 hours**
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	-
Program intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. **PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Be able to describe Risk Measurement. CLO 2 : Able to determine the Actuarial Model. CLO 3 : Able to explain the claims distribution model. CLO 4 : Able to describe the loss model. CLO 5 : Able to analyze the credibility model.

<table>
<tr><td></td><td>The relationship between PLO and CLO in this course is described as follows:

<table>
<tr><td rowspan="2">CLO</td><td colspan="2">PLO</td></tr>
<tr><td>5</td><td>7</td></tr>
<tr><td>1</td><td></td><td>√</td></tr>
<tr><td>2</td><td></td><td>√</td></tr>
<tr><td>3</td><td>√</td><td></td></tr>
<tr><td>4</td><td>√</td><td></td></tr>
<tr><td>5</td><td>√</td><td></td></tr>
</table></td></tr>
<tr><td>Content</td><td>Students will learn about:

concepts and theories about risk measurement, actuarial models and risk models, probability models in the risk process, loss models, claim distribution, risk distribution estimation, bankruptcy theory and credibility theory.</td></tr>
<tr><td>Examination forms</td><td>Assessment for this course includes:

10% assignment I, 10% assignment II, 15% student activity, and 30% midterm exam, and 35% final exam.</td></tr>
<tr><td>Study and examination requirements</td><td>Study and examination requirements:

Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td></tr>
<tr><td>Reading list</td><td>Main References:

http://irmapa.org/artikel/ (Indonesia Risk management)
https://law.uii.ac.id/wp-content/uploads/2017/01/BLC-v1-no2-th2017-fh-uii-perlindungan-bagi-pemegang-polis-jika-perusahaan-asuransi-pailit-dien.pdf

Additional References:
shttps://www.cermati.com/artikel/jenis-dan-macam-macam-risiko-asuransi-yang-wajib-diketahui
https://www.allianz.co.id/explore/apa-sih-risiko-dalam-asuransi-dan-bagaimana-mengelolanya.html</td></tr>
</table>

GRAPH THEORY

Module designation	Graph Theory
Semester(s) in which the module is taught	3
Person responsible for the module	Drs. Swida Purwanto, M.Pd / Devi Eka Wardani Meganingtyas, S.Pd., M.Si
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (project development, presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **340 X 16 = 5440 minutes = 90,67 hour**
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	*Discrete Mathematics*

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 7. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics.
PLO 10. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Understand the basic concepts of graph theory.
CLO 2 : Understand the concept of graph coloring.
CLO 3 : Understand the definition of circuits and Euler cycles on graphs and their applications.
CLO 4 : Understand extreme problems in graph theory.
CLO 5 : Understand how to calculate the number of 1-factors and spanning tree of a graph.
CLO 6 : Understanding the concept of graph labeling.
CLO 7 : Understanding the algorithm of spanning tree and its application.

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><td rowspan="2">CLO</td><td colspan="2">PLO</td></tr>
<tr><td>7</td><td>10</td></tr>
<tr><td>1</td><td>√</td><td></td></tr>
<tr><td>2</td><td>√</td><td></td></tr>
<tr><td>3</td><td>√</td><td></td></tr>
<tr><td>4</td><td></td><td>√</td></tr>
<tr><td>5</td><td></td><td>√</td></tr>
<tr><td>6</td><td>√</td><td></td></tr>
<tr><td>7</td><td></td><td>√</td></tr>
</table>
</td>
</tr>
<tr>
<td>Content</td>
<td>Students will learn about:

basic concepts of graph theory, graph coloring, circuits and cycles, extreme problems, arithmetic on graphs, graph labeling, and graph algorithms and applications.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:

15% structured assignments, 35% projects, 25% midterms and 25% final exams</td>
</tr>
</table>

Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** N. Hartsfield and G. Ringel, 1994, **Pearls in Graph Theory**, Academic Press. **Additional References:** R. Diestel, 2000, **Graph Theory**, Electronic Edition, Springer-Verlag, New York

BUSINESS COMMUNICATION

Module designation	Business Communication
Semester(s) in which the module is taught	6
Person responsible for the module	Dr. Makmuri, M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **340 X 16 = 5440 minutes = 90,67 hours**
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	

Program intended learning outcomes	**PLO 3**. Able to maintain and develop a network with mentors, colleagues, peers both inside and outside the institution. **PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students are able to understand the concept of softskill and hardskill and improve individual softskill. CLO 2 : Students are able to understand counting techniques, the concept of Pigeonhole Principle, also the concept of permutations and combinations in the theory of change. CLO 3 : Students understand the philosophy, history and basic concepts of change. CLO 4 : able to see and trust change and understand the concept of initiating change. CLO 5 : Able to change corporate culture as well as understand concepts in creating change parties and managing expectations. CLO 6 : Understand the concept of diffusion, innovation, and able to carry out the diffusion of innovation. CLO 7 : Able to analyze the concept of soft skills, change, diffusion of innovation and organizational learning in business organizations by visiting a company and then seeing, observing directly and conducting interviews The relationship between PLO and CLO in this course is described as follows:

CLO	PLO	
	3	5
1		√
2		√
3		√
4	√	√
5	√	√
6		√
7	√	√

Content	**Students will learn about:** Business communication which includes the understanding of soft skills, about The Theory Of Change, model Learning Organization, diffusion of innovation, and the application of soft skills, theory of change, learning organization and diffusion of innovation in business organizations.
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams (project)
Study and examination requirements	**Study and examination requirements:** - Students must attend 15 minutes before the class starts. - Students must inform the lecturer if they cannot attend the class due to sickness, etc. - Students must submit all class assignments before the deadline. **Form of examination:** Individual and group projects
Reading list	**Main References:** 1. S. Vasanthakumari, 2019, Soft skills and its application in work place, World Journal of Advanced Research and Reviews, 2019, 03(02), 066–072 2. Kasali R. Rosen, Kenneth. H., Change! Tak Peduli Jalan Salah yang Anda Jalani Putar Arah Sekarang Juga, PT Gramedia Pustaka Utama, 2005. 3. Peter M. Senge, The Fifth Discipline THE ART AND PRACTICE OF THE LEARNING ORGANIZATION, Currency Doubleday, a division of Bantam Doubleday Dell Publishing Group, Inc., in 1990. 4. Rogers E.M., Singhal A., Quinlan Margaret M, Diffusion of Innovations, An Integrated Approach to Communication Theory and Research Publisher: Mahway, MJ: Lawrence Erlbaum Associates, March 2019, DOI: 10.4324/9780203710753-35 5. Dewi Ariningrum Rusmiarti, ANALISIS DIFUSI INOVASI DAN PENGEMBANGAN BUDAYA KERJA PADA ORGANISASI BIROKRASI, Jurnal Masyarakat Telematika dan Informasi Vol. 6 No. 2 November 2015 Hal.: 85 - 100

RESEARCH METODOLOGY

Module designation	Research Metodology
Semester(s) in which the module is taught	5
Person responsible for the module	Dr. Eti Dwi Wiraningsih
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **340 X 16 = 5440 minutes = 90,67 hours**
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	-

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 6. Able to document, store, secure, and retrieve data to ensure validity and to prevent plagiarism.
PLO 9. Capable to conduct research independently or in groups that can be used to guide stakeholders in choosing diverse alternative solutions to problems in mathematics.
PLO 11. Able to observe, recognize, formulate, and solve problems through a mathematical approach with or without software.

Course Learning Outcomes (CLO) to be achieved in this course are:

CL O1 : Students understand about research, scientific research, elements of science and scientific science.
CLO 2 : Students know about research methodology.
CLO 3 : Students master in writing scientific research.

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><td rowspan="2">CLO</td><td colspan="3">PLO</td></tr>
<tr><td>6</td><td>9</td><td>11</td></tr>
<tr><td>1</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2</td><td></td><td>√</td><td>√</td></tr>
<tr><td>3</td><td>√</td><td>√</td><td>√</td></tr>
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</td>
</tr>
<tr>
<td>Content</td>
<td>Students will learn about:
Scientific research, various types of researches, methods that can be used, finding the right method to solve real world problems.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:
50% structured assignments, 20% midterms and 30% final exams</td>
</tr>
<tr>
<td>Study and examination requirements</td>
<td>Study and examination requirements:
- Students must attend 15 minutes before the class starts.
- Students must inform the lecturer if they cannot attend the class due to sickness, etc.
- Students must submit all class assignments before the deadline.

Form of examination:
Individual assignments and projects</td>
</tr>
</table>

Reading list	**Main References:** Shraddha Bhome et al ,(2013), Research Methodology, Himalaya publishing House, Mumbai, India. **Additional References:** Louis Cohen, Lawrence Manion and Keith Morrison, Research Methods in Education,(2007), the Taylor & Francis.

MATHEMATICAL MODELING

Module designation	Mathematical Modeling
Semester(s) in which the module is taught	6
Person responsible for the module	Dr. Eti Dwi Wiraningsih
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	Elementary Differential Equations

Program intended learning outcomes	**PLO 8**. Master the principles of mathematical modeling, linear programming, differential equations, dan numerical methods. **PLO 9**. Capable to conduct research independently or in groups that can be used to guide stakeholders in choosing diverse alternative solutions to problems in mathematics. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students are able to understand the meaning of modeling and examples of modeling CLO 2 : Students are able to understand the definitions and terms of modeling methodology CLO 3 : Students are able to understand methodology as well as flow chart modeling and methodology in practice formulating background problems CLO 4 : Students are able to understand differential equations, random numbers, Data, mechanical vibration problems, population dynamics problems, and traffic flow problems in the application of mathematical concepts CLO 5 : Students are able to understand mechanical vibrations, population dynamics, traffic flows in the selection of topics or cases CLO 6 : Students are able to understand literature, consult in designing models CLO 7 : Students are able to literature, conceptualize, and apply mathematical concepts in analysis and model solutions CLO 8 : Students master the concept of understand literature studies, design modeling solutions, and consult in model Analysis for development The relationship between PLO and CLO in this course is described as follows:

CLO	PLO	
	8	9
1	√	
2	√	
3	√	
4	√	
5	√	

		6		√
		7		√
		8		√
		9		√
Content	**Students will learn about:** Mathematical modeling which includes introduction to modeling concepts and theories, modeling methodology, application of mathematical concepts in mathematical modeling, selection of topics or cases of mathematical modeling, model design, model Analysis and model solutions, and model Analysis for model development.			
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams (project)			
Study and examination requirements	**Study and examination requirements:** - Students must attend 15 minutes before the class starts. - Students must inform the lecturer if they cannot attend the class due to sickness, etc. - Students must submit all class assignments before the deadline. **Form of examination:** Individual and group projects			

Reading list	**Main References:** 1. V. Capasso, "Lecture Notes in Biomathematics: Mathematical Structures of Epidemic Systems," New York : Springer-Verlag , 2008 2. E. A. Bender, "An Introduction to Mathematical Modelling," New York : John Wiley & Sons, Inc., 1978. 3. C. L. Dym, "Principles of Mathematical Modelling" Second Edition, Elsevier Academic Press, 2004. 4. Haberman, Richard. 1998. Mathematical Models. SIAM, Pentice Hall, Inc, New Jersey. 5. Edward, Diwlyn. 2001. Guide to Mathematical Modelling. 2nd Ed. Palgrave **Additional References:** - MZ Ndii, Z Amarti, ED Wiraningsih, AK Supriatna. Rabies Epidemic Model with Uncertainty in Parameters: Crisp and Fuzzy Approaches. 2018. IOP Conference Series: Materials Science and Engineering 332 (1), 012031. - Wiraningsih E.D., Amarti Z., Supriatna A.K. Herd Vaccination Threshold for Rabies Disease with Fuzzy Initial Condition and Fuzzy Transmission Coefficient. 2018. Proceeding International Conference on Engineering, Technologies, and Applied Sciences (ICETsAS 2018). - Wiraningsih E.D., Agusto F., Lenhart S., Widodo, Aryati L., Toaha S., and Govaerts W. Stability analysis of rabies model with vaccination effect and culling in dogs. 2015. International journal of applied mathematics and statistics. CESER publication. - Wiraningsih E.D., Widodo, Aryati L., and Toaha S. Optimal control for SEIR rabises model between Dogs and Human with Vaccination Effect both in dogs and Human. 2010. Proceeding the Third International Conference on Mathematics and Natural Sciences (ICMNS), Bandung Institute of Technology, Indonesia.

SEMINAR OF PRE UNDERGRADUATE THESIS

Module designation	Seminar of Pre Undergraduate Thesis
Semester(s) in which the module is taught	2
Person responsible for the module	Dr. Eti Dwi Wiraningsih
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **340 X 16 = 5440 minutes = 90,67 hours**
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 2. Internalize the spirit of independence, struggle and entrepreneurship
PLO 3. Able to maintain and develop a network with mentors, colleagues, peers both inside and outside the institution.
PLO 5. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis.
PLO 6. Able to document, store, secure, and retrieve data to ensure validity and prevent plagiarism.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Students Choose and master research topics from various fields of Mathematical Sciences
CLO 2 : Students develop research themes and define research problems
CLO 3 : Students prepare a thesis proposal
CLO 4 : Student are guided on making proposals and prepared thesis proposal exam

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><td rowspan="2">CLO</td><td colspan="4">PLO</td></tr>
<tr><td>2</td><td>3</td><td>5</td><td>6</td></tr>
<tr><td>1</td><td>√</td><td>√</td><td>√</td><td></td></tr>
<tr><td>2</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>3</td><td>√</td><td></td><td>√</td><td></td></tr>
<tr><td>4</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
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</td>
</tr>
<tr>
<td>Content</td>
<td>Students will learn about:
various research topics, research theme development, proposal making guidance and thesis proposal exams.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment of the honors thesis research is carried out by the defense commite using rubric developed by program study based on students' presentation</td>
</tr>
<tr>
<td>Study and examination requirements</td>
<td>Study and examination requirements:
Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td>
</tr>
</table>

Reading list	**Main References:** Linda Childers Hon, Guidelines for writing a thesis or dissertation Mark Stephan Felix and Ian Smith,2019, A Practical Guide to Dissertation and Thesis Writing, Cambridge Scholars Publishing.

DINAMICAL SYSTEM

Module designation	Dinamical System
Semester(s) in which the module is taught	4
Person responsible for the module	Dr. Eti Dwi Wiraningsih
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	

Program intended learning outcomes	**PLO 8**. Mastering the principles of mathematical modeling, linear programming, differential equations, and numerical methods. **PLO 10**. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof. **PLO 11**. Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students are able to understand introduction of dynamical systems in general, linear differential equations, nonlinear differential equations, autonomous differential equations, Equilibrium points, eigenvalues and eigenvectors, stability properties, linearity and Jacobian matrices, and Face fields or directional fields. CLO 2 : Students are able to understand the stability of a system, the definition of Linear and Fixed-Point Systems, Analysis of Fixed-Point stability, types of stability based on eigenvalues, and can work some exercises. CLO 3 : Students are able to understand the material about linearity system techniques, examples of stability analysis questions, and can do exercises related to stability analysis material. CLO 4 : Students are able to understand the definition and examples of Conditionalization. CLO 5 : Students are able to understand the criteria of Routh and Routh-Hurwitz. CLO 6 : Students understands about local sensitivity analysis and Global sensitivity analysis . CLO7 : Understand basic reproduction number concepts and examples in SEIR models The relationship between PLO and CLO in this course is described as follows: CLO | PLO

			8	10	11
		1	√	√	√
		2	√	√	√
		3			√
		4	√		√
		5		√	√
		6		√	√
		7		√	√
Content	**Students will learn about:** Dynamical Systems which includes, introduction to dynamical systems, stability analysis of Linear systems, stability analysis of nonlinear systems, dimensional, Routh-Hurwitz stability criteria, Sensitivity Analysis, and basic reproduction numbers				
Examination forms	Assessment for this course includes: 20% structured assignments, 15% individual assignments, 30% midterms and 35% final exams				
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.				

Reading list	**Main References:** 1. R. Kuhn, "Introduction to Dynamical Systems", London: Department of Mathematics King's Collage, 2005. 2. J. Hale and H. Kocak, Dynamics and Bifurcations," New York: Springer-Verlag. 1991. 3. W. Boyce and R.C. DiPrima, "Elementary Differential Equations and Boundary Value Problems", New York: John Wiley & Sons, Inc, 1997. Some Journals: - MZ Ndii, Z Amarti, ED Wiraningsih, AK Supriatna. Rabies Epidemic Model with Uncertainty in Parameters: Crisp and Fuzzy Approaches. 2018. IOP Conference Series: Materials Science and Engineering 332 (1), 012031. - Wiraningsih E.D., Amarti Z., Supriatna A.K. Herd Vaccination Threshold for Rabies Disease with Fuzzy Initial Condition and Fuzzy Transmission Coefficient. 2018. Proceeding International Conference on Engineering, Technologies, and Applied Sciences (ICETsAS 2018). - Wiraningsih E.D., Agusto F., Lenhart S., Widodo, Aryati L., Toaha S., and Govaerts W. Stability analysis of rabies model with vaccination effect and culling in dogs. 2015. International journal of applied mathematics and statistics. CESER publication. - Wiraningsih E.D., Widodo, Aryati L., and Toaha S. Optimal control for SEIR rabises model between Dogs and Human with Vaccination Effect both in dogs and Human. 2010. Proceeding the Third International Conference on Mathematics and Natural Sciences (ICMNS), Bandung Institute of Technology, Indonesia. **Additional References:** Resmawan. 2019. Pengantar Sistem Dinamik, Jurusan Matematika, UNG

OPERATIONAL RESEARCH

Module designation	Operational Research
Semester(s) in which the module is taught	6
Person responsible for the module	Dr. Eti Dwi Wiraningsih/Tian Abdul Azis, PhD.
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 680 minutes per week which consists of 200 minutes learning activity, 240 minutes structured task and 240 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **680 X 16 = 10880 minutes = 181, 33 hours**
Credit points	136 hours / 30 hours 4,5 ECTS
Required and recommended prerequisites for joining the module	*Linear Programming*

Program intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. **PLO10**. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.. **PLO11.** Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students are able to determine general mathematical models with constraints and model solutions and analyze the sensitivity to changes in variables and optimal solutions. CLO 2 : Students understand the types and models of queuing systems on single and multiple services. CLO 3 : Students master in modeling model of stock items in inventory management, control systems, EOQ models, stock management settlement methods, and nador methods. CLO 4 : Students are able to understand the model in the forecasting system on the time series method with computer-based solutions and forecasting settlement methods. CLO 5 : Students are able to understand the optimization Model with multiple constraints both on the types of constraints and the types of controlled optimization. CLO 6 : Students are able to understand the forms and models of decision theory on non-Linear programs and their solutions, decision-making models, and multilevel analysis programs. CLO 7 : Students are able to understand the transportation network model both in transportation problems and shipping and Assignment Problems. CLO 8 : Students are able to understand materials related to network flow models, shortest route problems, minimal spanning trees, and maximum flows. CLO 9 : Able to understand materials related to project network models in the form of Project Management,

<table>
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<td></td>
<td>
Project networks, CPM/PERT models, activity Time probability, and time-cost balance.
CLO10 : Understand monte carlo method related materials both in solving methods and algorithms.

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><td rowspan="2">CLO</td><td colspan="3">PLO</td></tr>
<tr><td>5</td><td>10</td><td>11</td></tr>
<tr><td>1</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4</td><td></td><td>√</td><td>√</td></tr>
<tr><td>5</td><td>√</td><td></td><td></td></tr>
<tr><td>6</td><td></td><td>√</td><td>√</td></tr>
<tr><td>7</td><td></td><td>√</td><td>√</td></tr>
<tr><td>8</td><td>√</td><td></td><td></td></tr>
<tr><td>9</td><td></td><td>√</td><td></td></tr>
<tr><td>10</td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td>
</tr>
<tr>
<td>Content</td>
<td>Students will learn about:
general mathematical models with constraints and solution models, sensitivity analysis of variable changes and optimal solutions, types and models of queue Systems, stock models, stock models, forecasting models and systems, optimization models with multiple constraints, forms and models of decision theory, transportation network models, distribution models of goods, project management models, and monte carlo models.</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:
50% structured assignments, 20% midterms and 30% final exams</td>
</tr>
<tr>
<td>Study and examination requirements</td>
<td>Study and examination requirements:
Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td>
</tr>
<tr>
<td>Reading list</td>
<td>Main References:
1. MCL web: http://fmipa.unj.ac.id/elearning/mcl/
2. Bernard W. Taylor III, Introduction to Management Science, 8th edition, Prentice Hall, New Jersey, 2004
3. Frederick S. Hillier , Gerald J. Lieberman, Introduction To Operation Research, 7th edition, Mc Graw Hill, Boston, 2001
4. Levent Kandiller, Principles of Mathematics in Operation research, Springer, 2001</td>
</tr>
</table>

OPTIMUM CONTROL THEORY

Module designation	Optimum Control Theory
Semester(s) in which the module is taught	5
Person responsible for the module	Dr. Eti Dwi Wiraningsih
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	Multivariable Calculus, Elementary Differential Equations.

Program intended learning outcomes	**PLO 8**. Mastering the principles of mathematical modeling, linear programming, differential equations, and numerical methods. **PLO 11.** Able to observe, recognize, formulate, and solve problems through a mathematical approach with or without software. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students are able to understand the introduction of basic optimal control problems, necessary conditions, and the principle of maximum Pontryagin, and able to do some exercises. CLO 2 : Students are able to understand the existence and uniqueness of optimal solution, the adjoint interpretation, the optimality principle, hamiltonian and autonomous problems, and able to do some exercises. CLO 3 : Students are able to understand some cases using the forward-Backward Sweep method CLO 4 : Students are able to understand required conditions, numerical solutions, and examples of some finite control cases. CLO 5 : Students are able to understand necessary Terms, linear quadratic regulator problems, higher order differential equations, Isoperimetric constraints, numerical solutions, and able to do some exercises. CLO 6 : Able to understand materials about Bang-Bang Control and single control, and able to do some exercises. CLO 7 : Able to understand the necessary conditions and examples of some discrete time models cases. The relationship between PLO and CLO in this course is described as follows:

CLO	PLO	
	8	11
1	√	√
2	√	√
3	√	√
4	√	√

		5	√	√	
		6	√	√	
		7	√	√	
Content	**Students will learn about:** basic optimum Control problems, existence and terms of solutions, forward-Backward Sweep Method, limited Control, optimal control of several variables, Linear dependence on control, and discrete time models.				
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams				
Study and examination requirements	**Study and examination requirements:** - Students must attend 15 minutes before the class starts. - Students must inform the lecturer if they cannot attend the class due to sickness, etc. - Students must submit all class assignments before the deadline. **Form of examination:** Individual assignments and group projects				

Reading list	**Main References:** 1. R. Kuhn, "Introduction to Dynamical Systems", London: Department of Mathematics King's Collage, 2005. 2. J. Hale and H. Kocak, Dynamics and Bifurcations," New York: Springer-Verlag. 1991. 3. W. Boyce and R.C. DiPrima, "Elementary Differential Equations and Boundary Value Problems", New York: John Wiley & Sons, Inc, 1997. **Some Journals:** - MZ Ndii, Z Amarti, ED Wiraningsih, AK Supriatna. Rabies Epidemic Model with Uncertainty in Parameters: Crisp and Fuzzy Approaches. 2018. IOP Conference Series: Materials Science and Engineering 332 (1), 012031. - Wiraningsih E.D., Amarti Z., Supriatna A.K. Herd Vaccination Threshold for Rabies Disease with Fuzzy Initial Condition and Fuzzy Transmission Coefficient. 2018. Proceeding International Conference on Engineering, Technologies, and Applied Sciences (ICETsAS 2018). - Wiraningsih E.D., Agusto F., Lenhart S., Widodo, Aryati L., Toaha S., and Govaerts W. Stability analysis of rabies model with vaccination effect and culling in dogs. 2015. International journal of applied mathematics and statistics. CESER publication. - Wiraningsih E.D., Widodo, Aryati L., and Toaha S. Optimal control for SEIR rabises model between Dogs and Human with Vaccination Effect both in dogs and Human. 2010. Proceeding the Third International Conference on Mathematics and Natural Sciences (ICMNS), Bandung Institute of Technology, Indonesia. **Additional References:** Resmawan. 2019. Pengantar Sistem Dinamik, Jurusan Matematika, UNG.

SAMPLING THEORY

Module designation	Sampling Theory
Semester(s) in which the module is taught	5
Person responsible for the module	
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	

Program intended learning outcomes	**PLO 6.** Able to document, store, secure, and retrieve data to ensure validity and prevent plagiarism. **PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics. **PLO 9.** Able to conduct research independently or in groups that can be used to provide guidance to stakeholders in choosing various alternative solutions to problems in mathematics. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students are able to understand the meaning of the survey, the stages of the main activities of the survey design and probability sampling and non probability sampling. CLO 2 : Students are able to Understand the meaning and understanding of simple random sampling and binary population characteristics and sampling distributions for parameter estimator. CLO 3 : Students are able to estimate population characteristics based on systematic sampling, estimate variety and estimate procedures. CLO 4 : Students are able to understand the definition of random sampling, calculate the estimated average and total population. CLO 5 : Students are able to distinguish PPS with replacement, PPS without repalecement dan PPS systematic random. CLO 6 : Students understands cluster random sampling and simple one-stage cluster sampling. CLO 7 : Students are able to perform ratio estimations based on SRS, estimations for subdomains based on SRS The relationship between PLO and CLO in this course is described as follows:

CLO	PLO		
	6	7	9
1	√	√	√

		2		√	√
		3		√	√
		4		√	√
		5		√	√
		6		√	√
		7		√	√
Content	**Students will learn about:** Sampling theory which includes simple random sampling, probability proportional to size, cluster random sampling, multistage random sampling dan ratio estimation.				
Examination forms	Assessment for this course includes: 20% structured assignments, 15% individual assignments, 30% midterms and 35% final exams				
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.				
Reading list	**Main References:** 1. Earl Babbie. (1998). **Survey Research Methods**. 2. Wadswords. Belmont. 2. Masri Singarimbun dan Sofian Effendi. (1989). **Metode Penelitian Survai**. 1.LP3ES. Jakarta. 3. Murthy, M.N.. (1977). Sampling Theory Methods. Statistical PublishingSociety. 4. W.G.Cochran. (2007). **Sampling Techniques**. Third Editon. John Wiley &Sons. India. Thompson,S.K., (2002). Sampling 2nd edition. John Wiley & Sons.				

TIME SERIES ANALYSIS

Module designation	Time Series Analysis
Semester(s) in which the module is taught	4
Person responsible for the module	Widyanti Rahayu, M.Si.
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	Elementary Statistics

Module objectives/intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solvin their area of expertise, based on the results of informat analysis. **PLO 7**. Mastering mathematical theoretical concepts including logic, discrete mathematics, algebra, analysis and geomet theory of probability and statistics. **PLO 11**. Able to observe, recognize, formulate and solve proble mathematical approach with or without the help of software Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Students are able to understand basic concert on stochastic processes, autocovariance functions, autocorrelation functions and partial autocorrelation, white noise, mean estimation, autocovariance estimation, and autocorrelation estimation, representation of AR and MA processes. CLO 2 : Students understand the models AR, MA, ARMA, ARIMA, nonstationary in mean, nonstationary in variance and autocovarians. CLO 3 : Students *Able to understand MSE minimizing forecasting, forecasting computing, and forecasting updates.* CLO 4 : Students are *Able to identify steps in modeling, inverse autocorrelation function, and extended sample autocorrelation function.* CLO 5 : Students *Able to estimate the parameters and oemiliban model in the method of moment, maximum likelihood, nonlinear estimation, OLS estimation, and selection of the best model.* CLO 6 : *Able to determine the model of regression methods, MA, and seasonal ARIMA.* The relationship between PLO and CLO in this course is described as f

CLO	PLO		
	5	7	11
1	√	√	√
2	√	√	√
3		√	√
4	√	√	√
5	√	√	√

		6		√	√	
Content	**Students will learn about:** Basic concepts of Time Series Analysis, stationary and nonstationary Time Series models, forecasting methods, Model identification, Parameter estimation and model selection, and seasonal time series models.					
Examination forms	Assessment for this course includes: 50% structured assignments, 20% midterms and 30% final exams					
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.					
Reading list	**Main References:** 1. Wei, William W. S. , Time Series Analysis: Univariate and Multivariate Method, Pearson Education, 2006 2. Soejoti, Zanzawi, Materi Pokok Analisis Runtun Waktu, penerbit Karunika, Jakarta. 2. Cryer, Jonathan D. and Chan, Kung-Sik, Time Series Analysis With Applications in R , Springer					

NONPARAMETRIC STATISTIC

Module name	Course Module
Module level	Undergraduate Programme
Code, if applicable	3125-704-2
Sub-title, if applicable	-
Courses, if applicable	Nonparametric Statistics
Semester(s) in which the module is taught	6
Person responsible for the module	Lecturer of course
Lecturer(s)	1. Dr. Flavia Aurelia, M.Pd. 2. Dra. Widyanti Rahayu, M.Si.
Language	Bahasa Indonesia
Relation to curriculum	This course is a elective course and offered in the 5rd Semester
Type of teaching, contact hours	Teaching methods used in this course are: - Lecture (i.e. presentation of lecture material, group discussion, case-based learning) - Structured assignments (case studies) The class size for the lecture is 40 students. Contact hours for lecture is 26.67 hours.
Workload	Students are required to fulfill a minimum of 90.67 hours in one semester, which consists of: - 26.67 hours for lecture, - 32 hours for structued assignments, - 32 hours for self-study
Credit points	3.0 ECTS
Requirements according to the examination Regulations	Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.

Recommended prerequisites	- Linear Algebra - Basic Statistics
Program intended learning outcomes	Programmes Learning Outcome (PLO) that can be achieved with this course are: PLO 7 : Able to conduct, analyze, and apply research outcomes to improve the mathematics learning process. PLO 11 : Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software. The Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Mastering basic statistical concepts that have an important role in nonparametric statistical analysis. CLO 2 : Able to understand the concept of various tests for one sample cases and apply them in various fields. CLO 3 : Able to understand the concept of various tests for the case of two independent samples and apply them in various fields. CLO 4 : Able to understand the concept of various tests for the case of two related samples and apply them in various fields. CLO 5 : Able to understand the concept of various tests for the case of k independent samples (k>2) and apply them in various fields. CLO 6 : Able to understand the concept of various tests for the case of k related samples (k>2) and apply them in various fields. CLO 7 : Mastering concepts and procedures in obtaining nonparametric correlation values so as to be able to express their meaning based on real problems. The relationship between PLO and CLO in this course is described as follows. **CLO** | PLO: 7, 11 **1** √ √ **2** √ √ **3** √ √ **4** √ √

	5	√	√
	6	√	√
	7	√	√
Content	Students will learn about: 1. The Use of Statistical Test in Research 2. Statistical Tests for the case of: - One-Sample - Two Independent Samples - Two Related Samples - *k* independent samples - *k* related samples 3. Measures of Correlation and Their Tests of Significance		
Forms of Assessment	The components of assessment in learning consist of assignments (30%), mid-exams (35%), and final exams (35%).		
Study and examination requirements and forms of examination	• Study and examination requirements: 1. Students must be present 15 minutes before the lecture begins. 2. Students who do not attend more than 20% of the total meeting are considered failed in this course. 3. Students are not allowed to use communication tools for purposes that are not related to learning. 4. Students must submit all assignments before the deadline. 5. Students must take the exam to get the final grade. • Form of examination: written examination		
Media employed	Computer/ personal laptop, internet, LCD, whiteboard, online learning platforms (Microsoft Teams/ Zoom, LMS), Microsoft Excel, and Microsoft Power Point.		
Reading list	References: 1. Conover, W.J. 1999. *Practical Nonparametric Statistics*. New York: Wiley International Edition. 2. Siegel, Sidney.1956. *Nonparametric Statistics for the Behavioral Sciences*. New York: Mc Graw Hill. 3. Kvam, Paul H. & Vidakovic, Brani. 2007. Nonparametric Statistics with Application to Science and Engineering. New Jersey: John Wiley & Sons, Inc. 4. Sheskin, David J. 2000. Handbook of Parametric and Nonparametric Statistical Procedures. Second Edition. Chapman & Hall/ CRC. 5. Sprent, P. & Smeeton, N.C. 2001. Applied Nonparametric Statistical Methods. Third Edition. Chapman & Hall/ CRC.		

MATHEMATICAL STATISTIC II

Module name	Course Module
Module level	Undergraduate Programme
Code, if applicable	3125-504-3
Sub-title, if applicable	-
Courses, if applicable	Mathematical Statistics II
Semester(s) in which the module is taught	Semester 5
Person responsible for the module	Lecturer of course
Lecturer(s)	Vera Maya Santi, M.Si.
Language	Bahasa Indonesia
Relation to curriculum	This course is a compulsory subject of the study program in semester 5.
Type of teaching, contact hours	Teaching methods used in this course are: - Lecture (i.e. presentation of lecture material, group discussion, case-based learning) - Structured assignments (case studies) The class size for the lecture is 40 students. Contact hours for lecture is 40 hours.
Workload	Students are required to fulfill a minimum of 136 hours in one semester, which consists of: - 40 hours for lecture, - 48 hours for structued assignments, - 48 hours for self-study
Credit points	4.5 ECTS
Requirements according to the examination Regulations	Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Recommended prerequisites	Mathematical Statistics I

Program intended learning outcomes

Programmes Learning Outcome (PLO) that can be achieved with this course are:

PLO 7 : Master the theories of mathematical concepts, e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability, and statistics.

PLO 11 : Able to observe, recognize, formulate, and solve problems through a mathematical approach with or without software.

The Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Able to understand the concepts and statistical theories of sample distribution.

CLO 2 : Able to master the concepts, theories, and basic principles of parameter point estimators.

CLO 3 : Able to master the concepts, theories, and basic principles in evaluating parameter estimators.

CLO 4 : Able to understand the concepts, theories, and basic principles of the adequacy of estimators as well as completeness and exponential families.

CLO 5 : Able to master the concepts, theories, and basic principles of parameter interval estimators.

CLO 6 : Able to master the concepts, theories, and principles in hypothesis testing.

The relationship between PLO and CLO in this course is described as follows.

CLO	PLO	
	7	11
1	√	√
2	√	√
3	√	√
4	√	√
5	√	√
6	√	√

Content

Mahasiswa akan mempelajari tentang:

4. Statistics and Sampling Distributions
5. Point Estimation
6. Criteria for Evaluating Parameter Estimators
7. Sufficiency and Completeness
8. Interval Estimation

	9. Tests of Hypothesis
Forms of Assessment	The components of assessment in learning consist of assignments (30%), mid-exams (35%), and final exams (35%).
Study and examination requirements and forms of examination	• Study and examination requirements: 6. Students must be present 15 minutes before the lecture begins. 7. Students who do not attend more than 20% of the total meeting are considered failed in this course. 8. Students are not allowed to use communication tools for purposes that are not related to learning. 9. Students must submit all assignments before the deadline. 10. Students must take the exam to get the final grade. • Form of examination: written examination
Media employed	Computer/ personal laptop, internet, LCD, whiteboard, online learning platforms (Microsoft Teams/ Zoom, LMS), Microsoft Excel, and Microsoft Power Point.
Reading list	References: 6. Bain, L. J. & Engelhart, M. (1992). *Introduction to Probability and Mathematical Statistics* (2nd ed.). Duxbury. 7. Hogg, R. V., McKean, J. W., & Craig, A. T. (2019). *Introduction to Mathematical Statistics* (8th ed.). Pearson. 8. Hogg, R. V. & Craig, A.T. (1978). *Introduction to Mathematical Statistics* (4th ed.). Macmillan Publishing Co., Inc.

MATHEMATICAL STATISTICS I

Module name	Course Module
Module level	Undergraduate Programme
Code, if applicable	3125-503-3
Sub-title, if applicable	-
Courses, if applicable	Mathematical Statistics I
Semester(s) in which the module is taught	Semester 4
Person responsible for the module	Lecturer of course
Lecturer(s)	3. Dra. Widyanti Rahayu, M.Si 4. Vera Maya Santi, M.Si.
Language	Bahasa Indonesia
Relation to curriculum	This course is a compulsory subject of the study program in semester 4.
Type of teaching, contact hours	Teaching methods used in this course are: - Lecture (i.e. presentation of lecture material, group discussion, case-based learning) - Structured assignments (case studies) The class size for the lecture is 40 students. Contact hours for lecture is 40 hours.
Workload	Students are required to fulfill a minimum of 136 hours in one semester, which consists of: - 40 hours for lecture, - 48 hours for structued assignments, - 48 hours for self-study
Credit points	4.5 ECTS
Requirements according to the examination Regulations	Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Recommended prerequisites	Basic Statistics

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
Programmes Learning Outcome (PLO) that can be achieved with this course are:

PLO 7 : Master the theories of mathematical concepts, e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability, and statistics.
PLO 10 : Able to develop mathematical thinking, from procedural/computational understanding to advanced understanding, including exploration, logical reasoning, generalization, abstraction, and formal proving.

The Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Able to understand the concepts and principles of probability.
CLO 2 : Able to understand the concept of random variables and probability distribution functions.
CLO 3 : Able to understand the procedure for determining the expected value and variance of random variables with special or common probability distributions.
CLO 4 : Able to understand the concept of probability distribution of combined random variables.
CLO 5 : Able to understand concepts and theories in determining the function distribution of a random variable.
CLO 6 : Able to understand concepts and theories regarding the convergence of distributions.

The relationship between PLO and CLO in this course is described as follows.

<table>
<tr><th rowspan="2">CLO</th><th colspan="2">PLO</th></tr>
<tr><th>7</th><th>10</th></tr>
<tr><td>1</td><td>√</td><td>√</td></tr>
<tr><td>2</td><td>√</td><td>√</td></tr>
<tr><td>3</td><td>√</td><td>√</td></tr>
<tr><td>4</td><td>√</td><td>√</td></tr>
<tr><td>5</td><td>√</td><td>√</td></tr>
<tr><td>6</td><td>√</td><td>√</td></tr>
</table>
</td>
</tr>
<tr>
<td>Content</td>
<td>Mahasiswa akan mempelajari tentang:
10. Probability
11. Random Variables and Their Distributions
12. Special Probability Distributions</td>
</tr>
</table>

	13. Joint Distributions 14. Functions of Random Variables 15. Limiting Distributions
Forms of Assessment	The components of assessment in learning consist of assignments (30%), mid-exams (35%), and final exams (35%).
Study and examination requirements and forms of examination	• Study and examination requirements: 11. Students must be present 15 minutes before the lecture begins. 12. Students who do not attend more than 20% of the total meeting are considered failed in this course. 13. Students are not allowed to use communication tools for purposes that are not related to learning. 14. Students must submit all assignments before the deadline. 15. Students must take the exam to get the final grade. • Form of examination: written examination
Media employed	Computer/ personal laptop, internet, LCD, whiteboard, online learning platforms (Microsoft Teams/ Zoom, LMS), Microsoft Excel, and Microsoft Power Point.
Reading list	References: 9. Bain, L. J. & Engelhart, M. (1992). *Introduction to Probability and Mathematical Statistics* (2nd ed.). Duxbury. 10. Hogg, R. V., McKean, J. W., & Craig, A. T. (2019). *Introduction to Mathematical Statistics* (8th ed.). Pearson. 11. Hogg, R. V. & Craig, A.T. (1978). *Introduction to Mathematical Statistics* (4th ed.). Macmillan Publishing Co., Inc.

BASIC STATISTICS

Module name	Course Module
Module level	Undergraduate Programme
Code, if applicable	3125-501-3
Sub-title, if applicable	-
Courses, if applicable	Elementary Statistics
Semester(s) in which the module is taught	Semester 1
Person responsible for the module	Lecturer of course
Lecturer(s)	5. Qorry Meidianingsih, M.Si. 6. Devi Eka Wardani, M.Si.
Language	Bahasa Indonesia
Relation to curriculum	This course is a compulsory subject of the study program in semester 1.
Type of teaching, contact hours	Teaching methods used in this course are: - Lecture (i.e. presentation of lecture material, group discussion, case-based learning) - Structured assignments (case studies) - Project-based Learning The class size for the lecture is 40 students. Contact hours for lecture is 40 hours.
Workload	Students are required to fulfill a minimum of 136 hours in one semester, which consists of: - 40 hours for lecture, - 48 hours for structued assignments, - 48 hours for self-study
Credit points	4.5 ECTS
Requirements according to the examination Regulations	Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Recommended prerequisites	-
Program	Programmes Learning Outcome (PLO) that can be achieved with this course are:

intended learning outcomes

PLO 5 : Able to make appropriate decisions to solve problems within their expertise, based on information and data analysis.

PLO 7 : Master the theories of mathematical concepts, e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability, and statistics.

The Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Able to understand the basic concepts of statistics, types of data and its benefits in various fields.

CLO 2 : Able to perform and interpret the results of descriptive statistical analysis.

CLO 3 : Able to understand the concepts in probability.

CLO 4 : Able to understand the definition of discrete random variables and the types of discrete probability distributions.

CLO 5 : Able to understand the definition of continuous random variable and its application.

CLO 6 : Able to understand the basic principles in parameter estimation.

CLO 7 : Able to understand the procedure in performing inferential statistical analysis for one sample case.

CLO 8 : Able to understand the procedure in performing inferential statistical analysis for the case of two samples.

CLO 9 : Able to understand the application of statistical methods in analyzing the relationship between two variables.

CLO 10 : Able to understand analytical procedures in comparing more than two population mean values.

The relationship between PLO and CLO in this course is described as follows.

CLO	PLO	
	7	11
1	√	√
2	√	√
3	√	√
4	√	√
5	√	√

	<table><tr><td>6</td><td>√</td><td>√</td></tr><tr><td>7</td><td>√</td><td>√</td></tr></table>
Content	Students will learn about: 16. Introduction to Statistics 17. Descriptive Statistics 18. Probability 19. Discrete Probability Distributions 20. Normal Probability Distributions 21. Parameter Estimations 22. Hypothesis Testing for One Sample Case 23. Hypothesis Testing for Two Sample Case 24. Correlation and Regression 25. Analysis of Variance (ANOVA)
Forms of Assessment	The components of assessment in learning consist of assignments (30%), mid-exams (35%), and final exams (35%).
Study and examination requirements and forms of examination	• Study and examination requirements: 16. Students must be present 15 minutes before the lecture begins. 17. Students who do not attend more than 20% of the total meeting are considered failed in this course. 18. Students are not allowed to use communication tools for purposes that are not related to learning. 19. Students must submit all assignments before the deadline. 20. Students must take the exam to get the final grade. • Form of examination: written examination
Media employed	Computer/ personal laptop, internet, LCD, whiteboard, online learning platforms (Microsoft Teams/ Zoom, LMS), Microsoft Excel, and Microsoft Power Point.
Reading list	References: 12. Triola MF. (2008). *Elementary Statistics 11th Ed*. Addison-Wesley: New-York. 13. Mendenhall W, Beaver RJ, Beaver. (2013). *Introduction Probability & Statistics 14th Edition*. BM. Brooks/Cole: Boston. 14. Walpole, Ronald E. (1995). *Pengantar Statistika Edisi ke-3*. PT. Gramedia Pustaka Utama: Jakarta.

OLYMPISM

Module designation	Olympism
Semester(s) in which the module is taught	1
Person responsible for the module	Ibnu Hadi, M.Si
Language	Indonesia
Relation to curriculum	Faculty
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (individual task)
Workload (incl. contact hours, self-study hours)	Total workload is 170 minutes per week which consists of 50 minutes learning activity, 60 minutes structured task and 60 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **170 X 16 = 2720 minutes = 45,33 hours**
Credit points	45,33 hours / 30 hours ≈ 1,5 ECTS
Required and recommended prerequisites for joining the module	

Program intended learning outcomes	**PLO 2**. Internalize the spirit of independence, struggle and entrepreneurship. **PLO 3**. Able to maintain and develop a network with mentors, colleagues, peers both inside and outside the institution. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Able to analyze Olympic History, Philosophy, and Olympic Values CLO 2 : Able to analyze the concept of the Olympics as a vehicle for understanding culture among nations CLO 3 : Able to apply the Olympic Concept in Building a Harmonious Society CLO 4 : Able to apply the inculcation of Olympic values to develop the souls of Indonesian youth winning characters CLO 5 : Able to apply the Cultivation of Olimpism to Produce Leaders with Character CLO 6 : Able to apply Facilitator Skills in Planting Olympics CLO 7 : Able to create learning using the concept of Olympiad in students at school CLO 8 : Able to explain the results of group performance related to instilling Olympic values in seminars The relationship between PLO and CLO in this course is described as follows:

CLO	PLO			
	2	3		
1	√			
2	√			
3	√			
4	√			
5	√			
6	√	√		
7		√		
8		√		

Content	**Students will learn about:** *Olympic History, Philosophy, and Olympic Values, The Olympics as a Means of Understanding Intercultural Cultures, The Application of Olympiads Builds a Harmonious Society, Planting Olympic Values to Develop the Spirit of Indonesian Youth Winner Character, Cultivating Oimpism to Produce Leaders with Character, Workshop on Facilitation Skills in Cultivating Olympiads*
Examination forms	Assessment for this course includes: 20% structured assignments, 30% midterms and 50% final exams
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** Olympism Module **Additional References:**

LINEAR PROGRAMMING

Module designation	Linear Programming
Semester(s) in which the module is taught	2
Person responsible for the module	Dr. Eti Dwi Wiraningsih/Ibnu Hadi, M. Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (individual task)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	*Linear Algebra*

Program intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. **PLO 8**. Mastering the principles of mathematical modeling, linear programming, differential equations, and numerical methods. **PLO 9**. Able to conduct research independently or in groups that can be used to provide guidance to stakeholders in choosing various alternative solutions to problems in mathematics. **PLO 11**. Able to observe, recognize, formulate and solve problems through a mathematical approach with or without the help of software. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Be able to formulate the concept of algebraic manipulation for solving linear programming problems CLO 2 : Be able to solve linear programming problems using graphical methods CLO 3 : Be able to formulate theories and concepts of the simplex method for solving mathematical problems CLO 4 : Be able to relate the relationship between the primal and dual cases CLO 5 : Be able to formulate a mathematical model formulation for integer problems CLO 6 : Able to analyze transportation problems CLO 7 : Able to analyze assignment issues CLO 8 : Able to implement theoretical concepts with the help of software The relationship between PLO and CLO in this course is described as follows:

CLO	PLO			
	5	8	9	11
1	√			
2		√		√
3				
4	√			√

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<tr><td>7</td><td></td><td></td><td>√</td><td></td></tr>
<tr><td>8</td><td>√</td><td></td><td>√</td><td></td></tr>
</table></td></tr>
<tr><td>Content</td><td>Students will learn about:
Mathematical Models, Linear Programming, Graphical Method, The Simplex Method, Primal Dual, Integer Programs, Transportation, Assignments</td></tr>
<tr><td>Examination forms</td><td>Assessment for this course includes:
20% structured assignments, 30% midterms and 50% final exams</td></tr>
<tr><td>Study and examination requirements</td><td>Study and examination requirements:
Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td></tr>
<tr><td>Reading list</td><td>Main References:
Bazaraa Mokhtar & Jarvis John J. (1977). Linear Programming and Network Flows. New York – London – Santa Barbara – Sydney – Toronto: John Willey & Sons.
Additional References:
1. Sitorus, Parlin, 1997, Program Linear, Universitas Trisakti, Jakarta.
2. Soemartojo, N., 1988, Program Linear, Universitas Terbuka.
3. Supranto, J., 1983, Linear Programming, Edisi Kedua, Fakultas Ekonomi Universitas Indonesia.
4. Taha, H.A., 2003, Operation Research: An Introduction, Seventh Edition, Prentice Hall.
5. Taylor, Bernard W., 2005, Introduction to Management Science, Eighth Edition, Prentice-Hall.</td></tr>
</table>

ABSTRACT ALGEBRA

Modul name	Abstract Algebra	
Modul level, if applicable	Sarjana	
Code	3125-939-4	
Sub-healing, If applicable		
Classes, if applicable		
Semester	5rd Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Dr. Yudi Mahatma, M.Si/Ibnu Hadi, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 5rd Semester	
Type of Teaching	Face to face every week	Number of Students
Lecture (expository, discussion, exercise) and project	200 minute	About 40
Workload	Total workload is 680 minutes (6 ECTS) per week which consists of 200 minutes (1,76 ECTS) learning activity, 240 minutes (2.12 ECTS) structured task and 240 minutes (2.12 ECTS) individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **680 X 16 = 10880 minutes = 181, 33 hours**	
Credit Point	6 ECTS	
Prerequisite course(s)	Number Theory, Linear Algebra, and Introduction to Fundamental Mathematics	
Course outcomes (CPMK)	*The Program Learning Outcome* (PLO) achieved by this course are: PLO 7 : Master of theories of mathematical concepts, e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability and statistics. PLO 10 : Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof. *The Course Learning Outcomes* (CLO) achieved by this course are: CLO 1 : Understand the definition of a group CLO 2 : Understand the concepts of subgroups and cosets CLO 3 : Understand the concept of homomorphism group CLO 4 : Identify permutation groups CLO 5 : Understand the definition of ring	

<table>
<tr><td></td><td>
CLO 6 : Understand the concept of ideal
CLO 7 : Understand the definition of Euclid ring

The matrix of relation between CLO and PLO of this subject:

<table>
<tr><th></th><th>PLO 7</th><th>PLO 10</th></tr>
<tr><td>CLO 1</td><td>V</td><td>V</td></tr>
<tr><td>CLO 2</td><td>V</td><td>V</td></tr>
<tr><td>CLO 3</td><td>V</td><td>V</td></tr>
<tr><td>CLO 4</td><td>V</td><td>V</td></tr>
<tr><td>CLO 5</td><td>V</td><td>V</td></tr>
<tr><td>CLO 6</td><td>V</td><td>V</td></tr>
<tr><td>CLO 7</td><td>V</td><td>V</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>10. Group
11. Subgroup and Coset
12. Mapping on Group
13. Permutation Group
14. Ring
15. Ideal
16. Mapping on Ring
17. Euclidean Ring.
18.</td></tr>
<tr><td>Study/exam achievements</td><td>Assessments of this course include:
Task (40%), Midterm Exam(30%), and Final Exam(30%)</td></tr>
<tr><td>Media</td><td>LMS, Zoom, Classical Meeting</td></tr>
<tr><td>Literatures</td><td>The Main Reference
1. Herstein, I. N., Topics in Algebra, Second Edition, John Wiley & Sons
2. Herstein, I. N., Abstract Algebra, Third Edition, Prentice Hall
Supporting Reference:</td></tr>
</table>

FUNCTION OF COMPLEX VARIABLE

Module designation	Function of Complex Variable
Semester(s) in which the module is taught	4
Person responsible for the module	Ibnu Hadi, M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (individual task)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	*Multivariable Calculus*

Program intended learning outcomes	**PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics. **PLO 10**. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Understand the definition of complex number and their basic algebraic properties CLO 2 : Understand of another form and further properties of complex numbers CLO 3 : Understand the function of complex variable, their limits, continuity of complex function. CLO 4 : Understanding of Caucy Riemann equation, and analytic function. CLO 5 : Understand elementary function of complex variable. CLO 6 : Understanding od integral of complex variable, countour integral, Cauchy Integral formula and their extended, and fundamental theorem of algebra CLO 7 : Understand the series of complex number, Taylor series, Laurents series, integration and differentiation of power series. CLO 8 : Understand residues and pole, Cauchy's rediue theorem, zero and poles. The relationship between PLO and CLO in this course is described as follows:

CLO	PLO	
	7	10
1	√	√
2	√	√
3	√	√
4	√	√
5	√	√
6	√	√
7	√	√

	8	√	√	

Content	**Students will learn about:** Complex number and their algebraic properties, vector and moduli, complex conjugate, exponential form, roots of complex, mapping on complex variable, limit, continuity, derivatives, Cauchy-Riemann equations, analytic function, harmonic function, elementary function, integral of complex, contour integral, Cauchy-Goursat theorem. Connected domain, Cauchy Integral, Lioville theore and the fundamental theorem of algebra, series on complex number, Taylor series, Laurent series, integration and differentiation of power series, residues, pole, zero
Examination forms	Assessment for this course includes: 40% structured assignments, 30% midterms and 30% final exams
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** 1. James W Brown, Ruel V. Churchil, 2003, Complex Variables and Aplication 8th edition, Mc Graw Hill, New York. 2. Donald W. Trim, 1995, Complex Variables and Aplication, PWS Publising Company, Boston. 3. Walter Rudin, 1987, Real and Complex Analysis, 3th edition, Mc Graw Hill, Singapore. **Additional References:** 1. Paliouras, John, 1987, Peubah Kompleks untuk Ilmuwan dan Insinyur, Erlangga.

ENGLISH

Module designation	English
Semester(s) in which the module is taught	3
Person responsible for the module	Dr. Pinta Deniyanti Sampoerno, M.Si / Ibnu Hadi, M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (project development, presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **340 X 16 = 5440 minutes = 90,67 hour**
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 3. Able to maintain and develop a network with mentors, colleagues, peers both inside and outside the institution
PLO 4. Able to conduct self-evaluation on the team under their responsibility and to manage teaching and learning independently.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Able to read according to the meaning of the sentence
CLO 2 : be able to guess the meaning of words according to the context
CLO 3 : Able to analyze word formation and guess the meaning of words from the affixes used
CLO 4 : Able to mention simple number operations according to mathematical algorithms
CLO 5 : Be able to identify reference words from pronouns
CLO 6 : Able to explain the function of the connector
CLO 7 : Be able to identify topics, subtopics, main thoughts, and main sentences
CLO 8 : Make an outline of an article / discourse
CLO 9 : Make conclusions from the available information

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><td rowspan="2">CLO</td><td colspan="2">PLO</td></tr>
<tr><td>3</td><td>4</td></tr>
<tr><td>1</td><td>√</td><td>√</td></tr>
<tr><td>2</td><td>√</td><td>√</td></tr>
<tr><td>3</td><td>√</td><td>√</td></tr>
<tr><td>4</td><td>√</td><td>√</td></tr>
<tr><td>5</td><td>√</td><td>√</td></tr>
<tr><td>6</td><td>√</td><td>√</td></tr>
<tr><td>7</td><td>√</td><td>√</td></tr>
</table>
</td>
</tr>
<tr>
<td>Content</td>
<td>
Students will learn about:

Meaningful Units, Guessing Meaning from Context, Word Formation, Basic Mathematical Formation and Operation, Reference, Sentence Connectors and Modifying Clauses and Phrases, Recognizing Topic and Subtopics, Recognizing Main Idea and Topic Sentence, Outlining, dan Drawing Inferences
</td>
</tr>
</table>

Examination forms	Assessment for this course includes: 20% structured assignments, 30% projects, 20% midterms and 30% final exams
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** 1. Anita Woolfolk (2007). ***Educational Psychology*** (*ninth edition, International edition*). Boston: Pearson education, Inc. 2. John W. Santrock (2001). ***Educational Psychology*** (international edition). Boston: Mc Graw Hill. 3. Paul Eggen and Don Kauchak (2004). ***Educational Psychology***: *Windows on lassrooms* (*sixth edition, international edition*). New Jersey: Pearson Prentice Hall. 4. Robert E. Slavin (2006). ***Educational psychology*** (edisi terjemahan). Jakarta: PT Indeks. **Additional References:** 5. Gerrig R.J. And Zimbardo, PG. (2005). ***Psychology and Life*** (7th). Boston: Pearson. 6. Carolle Wade, and Carol Tavris (2008). ***Psychology***. (edisi terjemahan). Jakarta: Penerbit Erlangga

DATA STRUCTURE

Module designation	Data Structure
Semester(s) in which the module is taught	3
Person responsible for the module	Drs. Mulyono, M.Kom
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (individual task)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	*Programming Algorithm, Discrete Mathematics*

Program intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. **PLO 6**. Able to document, store, secure, and retrieve data to ensure validity and prevent plagiarism. **PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics. Course Learning Outcomes (CLO) to be achieved in this course are: CLO 1 : Mastering the theory and concepts of algorithm complexity CLO 2 : Understand and be able to use data structures in making algorithms CLO 3 : Mastering the theory and concepts of Graphs and Trees CLO 4 : Can estimate the time needed to run an algorithm CLO 5 : Can distinguish various sorting algorithms and determine which algorithm is suitable in a case CLO 6 : Can create sets and use them in programming CLO 7 : Can create stacks, lists, and queues and use them in programming CLO 8 : Can apply graphs and algorithms related to graphs CLO 9 : Can apply trees and algorithms related to trees The relationship between PLO and CLO in this course is described as follows:

CLO	PLO		
	5	6	7
1	√	√	
2	√		
3	√		
4			√
5			√
6		√	√
7		√	√
8		√	√
9		√	√

Content	**Students will learn about:** abstract data type concept, linear data model (array and dynamic list, stack and queue), set, hierarchical data model (binary tree, heap, binary search tree, AVL-tree, B-Tree), graph model, hashtable, tracking algorithm
Examination forms	Assessment for this course includes: 20% structured assignments, 30% midterms and 50% final exams
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Reading list	**Main References:** 1. MCL: mcl.math-unj.org 2. Weiss, Mark A. (2012). **Data Structures and Algorithm Analysis in Java**. Pearson Education, Inc. **Additional References:**

ENGLISH FOR MATHEMATICS

Module designation	English for Mathematics
Semester(s) in which the module is taught	3
Person responsible for the module	Dr. Pinta Deniyanti Sampoerno, M.Si / Ibnu Hadi, M.Si
Language	Indonesia
Relation to curriculum	*Compulsory*
Teaching methods	Teaching methods used in this course are: • Lecture (small group discussions and project-based learning) • Structured assignments (project development, presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 340 minutes per week which consists of 100 minutes learning activity, 120 minutes structured task and 120 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **340 X 16 = 5440 minutes = 90,67 hour**
Credit points	90,67 hours / 30 hours ≈ 3 ECTS
Required and recommended prerequisites for joining the module	

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 3. Able to maintain and develop a network with mentors, colleagues, peers both inside and outside the institution

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : able to use English related to numbers and their operations.
CLO 2 : able to use English related to logic and set topics.
CLO 3 : Able to use English related to algebraic topics.
CLO 4 : able to use English related to the topic of geometry.
CLO 5 : able to use English related to calculus topics.
CLO 6 : able to use English related to the topic of probability and statistics.

The relationship between PLO and CLO in this course is described as follows:
<table>
<tr><td rowspan="2">CLO</td><td>PLO</td></tr>
<tr><td>3</td></tr>
<tr><td>1</td><td>√</td></tr>
<tr><td>2</td><td>√</td></tr>
<tr><td>3</td><td>√</td></tr>
<tr><td>4</td><td>√</td></tr>
<tr><td>5</td><td>√</td></tr>
<tr><td>6</td><td>√</td></tr>
</table>
</td>
</tr>
<tr>
<td>Content</td>
<td>Students will learn about:

English terms related to numbers and their operations, logic and sets, algebra, geometry, calculus, probability and statistics,</td>
</tr>
<tr>
<td>Examination forms</td>
<td>Assessment for this course includes:

20% structured assignments, 30% projects, 20% midterms and 30% final exams</td>
</tr>
<tr>
<td>Study and examination requirements</td>
<td>Study and examination requirements:

Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.</td>
</tr>
</table>

Reading list	**Main References:** 5. Anita Woolfolk (2007). ***Educational Psychology*** (*ninth edition, International edition*). Boston: Pearson education, Inc. 6. John W. Santrock (2001). ***Educational Psychology*** (international edition). Boston: Mc Graw Hill. 7. Paul Eggen and Don Kauchak (2004). ***Educational Psychology****: Windows on lassrooms* (*sixth edition, international edition*). New Jersey: Pearson Prentice Hall. 8. Robert E. Slavin (2006). ***Educational psychology*** (edisi terjemahan). Jakarta: PT Indeks. **Additional References:** 6. Gerrig R.J. And Zimbardo, PG. (2005). ***Psychology and Life*** (7th). Boston: Pearson. 7. Carolle Wade, and Carol Tavris (2008). ***Psychology***. (edisi terjemahan). Jakarta: Penerbit Erlangga

TRANSFORMATION GEOMETRY

Module Name	Course Module
Module Level	Bachelor Degree of Mathematics
Code, if applicable	3125-301-3
Sub-title, if applicable	-
Courses, if applicable	Transformation Geometry
Semester(s) in which the module is taught	3rd semester
Person responsible for the Module	Lecturer
Lecturer (s)	Ibnu Hadi, M.Si
Language	Bahasa Indonesia
Relation to Curriculum	Study Program's Elective Course
Type of teaching, contact hours	The teaching methods used in this course are: - Learning activity (group discussion, case study, and video-based learning) - Structure task (essay dan case study) - Project based learning
Workload	Total workload is 136 hour (4,5 ECTS) per semester, which consists of 40 hours learning activity, 48 hours for structure task, and 48 hours individual learning
Credit Points	3 SKS (4,5 ECTS)
Requirements according to the examination regulations	Students must attend all lectures and submit all individual and group assignments scheduled before the final exam.
Recommended prerequisites	

<table>
<tr>
<td>Program intended learning outcomes</td>
<td>
PLO 5. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis.
PLO 7. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis, and geometry, as well as theory of probability and statistics.
PLO 10. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.
PLO 11. Able to observe, recognize, formulate, and solve problems through a mathematical approach with or without the help of software.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Mastering the concept of isometric transformation
CLO 2 : Mastering the concept of non-isometry transformation
CLO 3 : Mastering the concept of product of transformation

<table>
<tr><th rowspan="2">CLO</th><th colspan="4">PLO</th></tr>
<tr><th>5</th><th>7</th><th>10</th><th>11</th></tr>
<tr><td>1</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
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</tr>
</table>

Content	1. The concept of isometric transformation 2. The concept of transformation is not isometry 3. The concept of the product of transformations
Forms of Assessment	Assessment of the learning process according to the following components: Final Examination 40%, Middle Examination 30%, assignments 30%

Study and examination requirements and forms of examination	Study and examination requirements: - Students must be present 15 minutes before class starts. - Students must turn off all electronic devices. - Students are required to notify the lecturer if they are absent from class due to illness, etc. - Students must turn in all classwork before the deadline. - Students must take the exam to get the final grade. Form of examination: Written Exam
Media employed	laptop, Internet, LCD, Whiteboard, Zoom/GoogleTemui/Tim Microsoft, LMS.
Reading list	Main Reference
	Eccles (1985). Transformation Geometry. Springer Verlag, Inc. Susanto,B. (1990).Geometri Transformasi. Jogyakarta: FMIPA UGM

ANALYTICAL GEOMETRY

Module Name	Course Module
Module Level	Bachelor Degree of Mathematics
Code, if applicable	3125-604-3
Sub-title, if applicable	
Courses, if applicable	Analytical Geometry
Semester(s) in which the module is taught	2nd semester
Person responsible for the module	Lecturer of Courses
Lecturer (s)	Devi Eka Wardani Meganingtyas, S.Pd, M. Si
Language	Bahasa Indonesia
Relation to Curriculum	This course is a compulsory course and offered in the 2nd semester.
Type of teaching, contact hours	Teaching methods used in this course are: • Lecture (i.e., group investigation, small group discussion, dan video-based learning) • Structured assignments (i.e., essay and case study)
Workload	For this course, students required to meet a minimum of 135,99 hours in one semester, which consist of: 39,99 hours for lecture, 48 hours for structured assignments, 485 hours for independent study,
Credit Points	4.5 ECTS / 3 CP
Requirements according to the examination regulations	Students must attend all lectures and submit all individual and group assignments scheduled before the final exam.
Recommended prerequisites	-
Program intended learning outcomes	**PLO 5**. Able to make appropriate decisions in the context of solving problems in their area of expertise, based on the results of information and data analysis. **PLO 7**. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis, and geometry, as well as theory of probability and statistics. **PLO 11**. Able to observe, recognize, formulate, and

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<td>
solve problems through a mathematical approach with or without the help of software.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1 : Students can master the concept of lines in the field to solve math problems.
CLO 2: Students can master the concept of lines in space and planes and apply them in solving problems.
CLO 3 : Students can master the circle concept and apply it in solving mathematical problems.
CLO 4 : Students can master the parabola concept and apply it in solving mathematical problems.
CLO 5 : Students can master the ellipse concept and apply it in solving mathematical problems.
CLO 6 : Students can master the concept of hyperbole and apply it in solving mathematical problems.
CLO 7: Students can master the ball concept and apply it in solving mathematical problems.

<table>
<tr><th rowspan="2">CLO</th><th colspan="3">PLO</th></tr>
<tr><th>5</th><th>7</th><th>11</th></tr>
<tr><td>1</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>5</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>6</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>7</td><td>√</td><td>√</td><td>√</td></tr>
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</td>
</tr>
<tr>
<td>Content</td>
<td>
Students will learn about:
1. The concept of lines in the fields to solve math problems.
2. The concept of lines in space and planes and apply them in solving problems.
3. Circle concept and apply it in solving mathematical problems.
4. The concept of parabola and applying it in solving mathematical problems.
5. Ellipse concept and apply it in solving math problems.
</td>
</tr>
</table>

	6. The concept of hyperbole and applying it in solving mathematical problems. 7. Ball concept and apply it in solving math problems.
Forms of Assessment	Assessment of the learning process according to the following components: Assignment 30%, mid test 30 %, and final test 40%
Study and examination requirements and forms of examination	- Students must be present 15 minutes before class starts. - Students must turn off all electronic devices. - Students are required to notify the lecturer if they are absent from class due to illness, etc. - Students must turn in all classwork before the deadline. - Students must take the exam to get the final grade. **Form of examination:** Written Exam

Media employed	Laptop, Internet, LCD, Whiteboard, Zoom/GoogleTemui/Tim Microsoft, LMS.
Reading list	**Main Reference** • Anton, Howard. 2004. Aljabar Linear Elementer. Jakarta: Erlangga. • George B. Thomas Jr. Calculus and Analytic Geometry. 9th Edition. • http://www.ebook3000.com/Calculus-and-Analytic-Geometry--9th-Edition_125838.html (diakses Maret 2013) • K. Martono. 1987. Kalkulus Diferensial. Bandung: Alva Gracia. • _____. 1985. Kalkulus dan Ilmu Ukur Analitik. Bandung: Angkasa • Kreyszig, Erwin. 1993. Advanced Engineering Mathematics. New York: John Wiley & Sons, Inc. • Leithold, Louis. 1991. Kalkulus dan Ilmu Ukur Terjemahan Nababan. Jakarta: Erlangga • Purcell. 1986. Kalkulus dan Geometri Analitis. Diterjemahkan oleh Bana Kartasasmita dan Rawuh. Jakarta: Erlangga. • Wardani Rahayu, Suprakarti, Oktaviani. 2018. Geometri Analitik. Yogjakarta: Matematica

ELEMENTARY DIFFERENTIAL EQUATION

Module Name	Course Module
Module Levels	Bachelor Degree of Mathematics
Code, if applicable	3125-942-3
Sub-titles, if applicable	-
Courses, if applicable	Elementary Differential Equations
Semester(s) in which the module is taught	3rd semester
Person responsible for the modules	Lecturer
Lecturer(s)	Dr. Eti Dwi Wiraningsih, S.Pd, M.Si
language	Bahasa Indonesia
Relations to Curriculum	This course is a compulsory course provided in the second semester
Type of teaching, contact hours	The teaching methods used in this course are: - Studying (synchronous: material presentations, group discussions and class discussions) - Structured assignments (Asyncronous in LMS: discussion forums for individual assignments and questions) - Project Based Learning Class capacity for lectures is 40 students. The time for lectures is one meeting of 150 minutes
Workloads	For this course, students are required to fulfill a minimum of 136 hours in one semester, which consists of: - 40 hours for lectures - 48 hours for structured tasks - 48 hours for self study
Credit Points	4.5 ECTS
Requirements according to the examination regulations	Students must attend lectures at least 80%
Recommended prerequisites	Complete all individual tasks scheduled in the LMS

Program intended learning outcomes

PLO 7. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis, and geometry, as well as theory of probability and statistics.
PLO 8. Mastering the principles of mathematical modeling, linear programming, differential equations, and numerical methods.
PLO 9. Able to conduct research independently or in groups that can be used to provide guidance to stakeholders in choosing various alternative solutions to problems in mathematics.
PLO 10. Able to develop mathematical thinking, starting from procedural/computational understanding to a broad understanding including exploration, logical reasoning, generalization, abstraction, and formal proof.
PLO 11. Able to observe, recognize, formulate, and solve problems through a mathematical approach with or without the help of software.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1: First Order Differential Equations Degree One
CLO 2: First Order Differential Equations High Degree
CLO 3: n-th Order Linear Differential Equations
CLO 4: System of Linear Differential Equations
CLO 5: Applications of Differential Equations in other Field of Science

The relationship between PLO and CLO in this course is described as follows:

CLO	PLO				
	7	8	9	10	11
1	√	√		√	√
2	√	√		√	√
3	√	√		√	√

	4 √ √ √ √ **5** √ √

Content	**Students will learn about:** 1. First order Differential Equations of degree one whose variables can be separated. 2. Changing the first order Differential Equations of degree one into Differential Equations whose variables can be separated. 3. Exact Differential Equations. 4. Changing first order Differential Equations of degree one to exact. 5. First order linear Differential Equations. 6. Converting the first order Differential Equations of degree one into a linear Differential Equations. 7. First order Differential Equations of high degree. 8. The n-th order linear Differential Equations with constant coefficients. 9. The n-th order linear Differential Equations with variable coefficients (Cauchy and Legendre Differential Equations). 10. Second order linear Differential Equations with variable coefficients. 11. System of linear Differential Equations 12. Applications of Differential Equations.
Forms of Assessment	Components and assessment weights in learning include assignments (30%), midterm exams (35%), and final exams (35%).
Study and examination requirements and forms of examination	• **Study and examination requirements**: 21. Students must be present 15 minutes before class starts. 22. Students who are absent, either with notification or not, more than 20% of the total meeting are considered failed. 23. Students are not allowed to use communication tools for purposes that are not related to learning. 24. Students must submit all assignments before the allotted deadline. 25. Students must take an exam to get a final grade. • **Form of examination**: Presentation and written exam

media employed	**Computer/laptop, internet, LCD, whiteboard, online platform (Microsoft Teams/Zoom, LMS), Microsoft Excel, Microsoft Power Point (for materials).**
reading list	**Main Reference**
	1. Ayres, Frank. (1995). Differential Equations. Erlangga. **2. Williamson. (2001). Introduction To Differential Equations and Dynamical Systems. McGraw-Hill.** **3. Kent Nagle (1994), Fundamental of Differential Equations and Boundary Value Problems, Addison-Wesley Publishing Company Inc.** **4. Kreyzig, (1983), Advanced Engineering Mathematics, 5th Edition, Wiley International, 1983**

INTEGRAL CALCULUS

Modul Name	Integral Calculus	
Modul level, if applicable	Undergraduate	
Code	31259404	
Sub-healing, If applicable		
Classes, if applicable		
Semester	2st Semester	
Module coordinator	Dr. Lukita Ambarwati, S.Pd, M.Si	
Lecturer(s)	Ibnu Hadi, M.Si	
Language	Bahasa Indonesia	
Classification within the curriculum	This course is a compulsory course and offered in the 2st semester	
Type of Teaching	Face to face every week	Number of Students
Lecture (expository, discussion, exercise), case based	200 menit	45
Workload	Total workload is 680 minutes (6 ECTS) per minggu which consists of 200 minutes (1,76 ECTS) learning activity, 240 minutes (2.12 ECTS) structured task and 240 minutes (2.12 ECTS) individual learning per week for 16 weeks.	
Credit Point	6 ECTS	
Prerequisite course(s)	Differential Calculus	
Course outcomes (CPMK)	*The Program Learning Outcome* (PLO) achieved by this course are: PLO 7 : Master the theories of mathematical concepts e.g. mathematical logic, discrete mathematics, algebra, analysis and geometry, probability and statistics. PLO 11 : Able to observe, recognize, formulate and solve problems through a mathematical approach with or without software. *The Course Learning Outcomes* (CLO) achieved by this course are:	

CLO 1	:	Describe the meaning of an indefinite integral
CLO 2	:	Apply the basic indefinite integral formulas
CLO 3	:	Determine the integral of various functions
CLO 4	:	Determine the integral of the logarithmic function and its inverse
CLO 5	:	Determine the integral of trigonometric functions and their inverses
CLO 6	:	Describe hyperbolic functions
CLO 7	:	Determine the inverse of the hyperbolic function
CLO 8	:	Determine the integral of various functions by many techniques of integration

CLO 9	:	Describe the meaning of a certain integral (Riemann integral)
CLO10	:	Apply the fundamental theorem of calculus
CLO11	:	Compute the infinite limit integral and the integral of an infinite function
CLO12	:	Apply definite integrals to calculate area
CLO13	:	Applying certain integrals to calculate the volume of rotating objects using the disc method, the ring method, the shell method
CLO14	:	Apply definite integrals to calculate the length of a curve
CLO15	:	Apply the definite integral to calculate the surface area of a rotating object
CLO16		Apply definite integrals to determine mass and center of mass
CLO17		Apply integrals to probability theory and random variables
CLO18		Compute the double integral in Cartesian coordinates, in polar coordinates,
CLO19		Apply the double integral to calculate the volume of a solid, surface area, the mass and center of mass of the lamina
CLO20		Compute the triple integral in Cartesian coordinates, cylindrical coordinates, spherical coordinates,
CLO21		Applying the triple integral to calculating the volume of a solid object, the mass and center of mass of a solid body

The matrix of relation between CLO and PLO of this subject:

	PLO 7	PLO 11
CLO 1	v	
CLO 2	v	v
CLO 3	v	v
CLO 4	v	
CLO 5	v	
CLO 6	v	
CLO 7	v	
CLO 8		v
CLO 9		v
CLO 10	v	
CLO 11	v	
CLO 12	v	
CLO 13		v
CLO 14		v

CLO 15		v
CLO 16	v	
CLO 17	v	
CLO 18		v
CLO 19	v	
CLO 20		v
CLO 21	v	

Content (Pokok Bahasan)	1. Improper Integral - infinite limit of integration - Infinite integrand 2. Trancedental Function - the natural logarithm function - invers function - general exponential and logarithm function - the invers trigonometric function and their derivatives - the hyperbolic function and their inverses 3. Techniques of Integration - Basic integration rules - integration by parts - rationalizing subtitutions - integration of rational functions using partial fraction 4. The Definite Integral - the definite integral - the first fundamental theorem of calculus 5. Application of the integral - the area of a plane region - volumes of solids: slabs, disk, washer - volumes of solids of revolution: shells - length of curve - work and fluid force - moments and center of mass - probability and randoms variables 6. Multiple integral and the application - double integral over rectangles - iterated integrals - double integral over nonrectangular region - double integral in polar coordinates - surface integral - triple integrals in cartesian coordinat - triple integrals in cylindrical and spherical coodinates - change of variables in multiple integral
Study/exam achievements	Assessments of this course include: Task(30%), Midterm Exam(35%), Final Exam(35%)
Media	LMS, Zoom

Literatures	**The Main Reference:** Varberg, Purcell, Rigdom., 2009, Calclulus Nineth Edition, *Kalkulus dan Geometri Analitis*, Ed.9. Pearson **Supporting Reference::**

PARALEL COMPUTATION

Module designation	Parallel Computating
Semester(s) in which the module is taught	5
Person responsible for the module	
Language	Indonesia
Relation to curriculum	*Elective*
Teaching methods	Teaching methods used in this course are: • Lecture (i.e., small group discussions and project-based learning) • Structured assignments (i.e., project development and presentations)
Workload (incl. contact hours, self-study hours)	Total workload is 510 minutes per week which consists of 150 minutes learning activity, 180 minutes structured task and 180 minutes individual learning per week for 16 weeks. **TOTAL WORKLOAD PER SEMESTER** **510 X 16 = 8160 minutes = 136 hours**
Credit points	136 hours / 30 hours ≈ 4,5 ECTS
Required and recommended prerequisites for joining the module	Programming algorithm

Program intended learning outcomes

PLO 6. Able to document, store, secure, and retrieve data to ensure validity and prevent plagiarism.

PLO 7. Mastering mathematical theoretical concepts including mathematical logic, discrete mathematics, algebra, analysis and geometry, as well as theory of probability and statistics.

Course Learning Outcomes (CLO) to be achieved in this course are:

CLO 1	:	Understand the concepts and terminology in parallel computing
CLO 2	:	Understand the parallel computing model
CLO 3	:	Obtain an overview of several parallel computing paradigms
CLO 4	:	Knowing the notation used in parallel algorithms
CLO 5	:	Understand algorithm evaluation based on running time and number of processor criteria, processing theory using message passing
CLO 6	:	Understand the parallel computing of PRAM models, PRAM algorithms, and their complexity
CLO 7	:	Knowledge of MPI and PVM, as well as important routines
CLO 8		Understand how to measure parallel processing performance
CLO 9		Understand the use of dividend and conquer techniques
CLO 10		Understand the use of pipeline techniques
CLO 11		Understand the theory of synchronous computing
CLO 12		Understand the theory of load balancing and its types
CLO 13		Understand the theory of shared memory programming
CLO 14		Understand the types of parallel sorting algorithms
CLO 15		Understand the use of parallel numerical algorithms
CLO 16		Understand several image processing techniques in parallel

	CLO 17 — Understand several searching and optimization techniques in parallel The relationship between PLO and CLO in this course is described as follows: CLO 1: PLO 6 √, PLO 7 √ CLO 2: PLO 6 √, PLO 7 √ CLO 3: PLO 6 √, PLO 7 √ CLO 4: PLO 7 √ CLO 5: PLO 7 √ CLO 6: PLO 7 √ CLO 7: PLO 7 √ CLO 8: PLO 7 √ CLO 9: PLO 7 √ CLO 10: PLO 7 √ CLO 11: PLO 7 √ CLO 12: PLO 7 √ CLO 13: PLO 7 √ CLO 14: PLO 7 √ CLO 15: PLO 7 √ CLO 16: PLO 7 √ CLO 17: PLO 7 √
Content	**Students will learn about:** concepts and theories on processing theory, MPI, PVM, message passing, measuring parallel processing performance, dividend and conquer techniques, pipeline techniques, synchronous computing, load balancing and its types, shared memory, parallel sorting, parallel numerical algorithms, processing image in parallel, searching and optimization in parallel.
Examination forms	Assessment for this course includes: 40% structured and individual assignments, 30% midterms and 30% final exams
Study and examination requirements	**Study and examination requirements:** Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.

Reading list	**Main References:** 1. Ian Foster and Carl Kesselman (2004), The Grid: Blueprint for a New Computing Infrastructure, 2nd edition, Morgan Kaufmann Publishers, San Francisco, USA, ISBN: 1-55860-933-4 2. Tao Yang, Lecture Notes on Parallel Scientific Computing, Department of Computer Science University of California Santa Barbara, CA 93106 3. Parhami, B (2002). "Introduction do Parallel Processing. Algorithms and Architecture", Kluwer Academic Publisher, 2002 4. Wilkinson, B (2005). "Parallel Programming: Technques and Application Using Networked Workstations and parallel computers (2nd edition)", Precentice Hall, 2005 5. Trobec, R (2018). Introduction to Parallel Computing: From Algorithms to Programming on State-of-the-Art Platforms, Springer

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