MODULE HANDBOOK
BACHELOR OF PHYSICS PROGRAMME

Faculty of Mathematics and Natural Sciences Education
Universitas Pendidikan Indonesia
2021

Table of Content

KU100 Islamic Education

Module name:	**Islamic Education**	
Module level, if applicable:	Bachelor	
Code:	KU100	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Lecturer team of Islamic Education	
Lecturer(s):	Lecturer team of Islamic Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository and discussion) 2. Structured activities (assignments based on conceptual and contextual approach) 3. Self-study (reading literature)	100 minutes	35
Workload:	Total workload is 90 hours 3.2 ECTS (5440 minutes) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.98 ECTS) structured activities, 1680 minutes (0.98 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: ● CLO1. Compare various methods of understanding Islam and develop their understanding of Islamic teachings with the proper methodology. ● CLO2. Analyze the history of the emergence of religion and the function of religion in human life. ● CLO3. Describe the position of the Qur'an and the Sunnah as a source of Islamic teachings. ● CLO4. Explain ijtihad as a process of developing Islamic law and various issues of the Khilafiyah in Islam. ● CLO5. Describe the concept of faith (belief system in Islam) as a core value and its implementation in daily life. ● CLO6. Describe the concept of worship and piety in Islam and its implementation in daily life correctly and appropriately. ● CLO7. Describe the concept of marriage and inheritance management in Islam. ● CLO8. Describe the idea of managing and using assets in Islam and various problems of Islamic economics in the modern era. ● CLO9. Compare various schools of thought and schools of	

<table>
<tr><td></td><td>thought in Islam.
● CLO10. Describe the concept of morality and its application in behavior
● CLO11. Analyze the concept of da'wah and amar ma'ruf nahi munkar in Islam and its implementation in daily life
● CLO12. Analyze the concept of jihad in Islam and its manifestation in everyday life.
● CLO13. Analyze the concept of people's leadership in the personal, family, nation, and state of life</td></tr>
<tr><td>Content:</td><td>Religion, the Qur'an and the Sunnah, ijtihad, the Khilafiyah in Islam, the concept of faith (belief system in Islam), the concept of marriage and inheritance management in Islam, Islamic economics, the concept of da'wah and amar ma'ruf nahi munkar, the idea of jihad in Islam.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO 1 - 13</td><td>Social Competences:
a. Individual assignments
b. Mid-test
c. Final Test</td><td>

Written
Written test
Written test</td><td>

20
40
40</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Stenberg, L., & Wood, P. (Eds.). (2022). What is Islamic studies?: European and North American approaches to a contested field. Edinburgh University Press.
2. Rüstem, Ü., Çakmak, G., Auji, H., Neumeier, E., Milwright, M., Gerschultz, et.al. (2022). Making Modernity in the Islamic Mediterranean. Indiana University Press.
3. Munawati, S. (2022). Monograf Aplikasi Pembelajaran Pendidikan Agama Islam Melalui Metode Mind Mapping. Penerbit Insania.
4. Mukhtarom, A. (2021). Studi Komprehensif Pendidikan Islam. Bintang Visitama.
5. Ulinnuha, L., Suradi, A., & Anwari, A. M. (2021). Pembaharuan Pendidikan Islam di Indonesia. Edu Publisher.
6. Indrianto, N. (2020). Pendidikan Agama Islam Interdisipliner Untuk Perguruan Tinggi. Deepublish.
7. Rustam, R., & Haris, Z. A. (2018). Buku Ajar Pendidikan Agama Islam di Perguruan Tinggi. Deepublish.
8. Husaini, A. (2016). 10 Kuliah Agama Islam. Pro-U Media
9. Shihab, Q.M. (2014). Mujjizat Alquran. Bandung: Mizan.
10. Shihab, Q.M. (2014). Wawasan Alquran. Bandung: Mizan.
11. Shihab, Q.S. (2013). Kaidah Tafsir. Tangerang: Lentera Hati
12. Syu’aib. S.A. (2012). Menjiwai Alquran. Terjemahan Muh. Alif. Yogyakarta: Mumtaz</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√
CLO5											√	√
CLO6											√	√
CLO7											√	√
CLO8											√	√
CLO9											√	√
CLO10											√	√
CLO11											√	√
CLO12											√	√
CLO13											√	√

KU101 Protestant Christianity Education

<table>
<tr><td>Module name:</td><td colspan="2">Protestant Christianity Education</td></tr>
<tr><td>Module level, if applicable:</td><td colspan="2">Bachelor</td></tr>
<tr><td>Code:</td><td colspan="2">KU101</td></tr>
<tr><td>Subheading, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Classes, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Semester:</td><td colspan="2">1st</td></tr>
<tr><td>Module coordinator:</td><td colspan="2">Lecturer team of Protestant Christianity Education</td></tr>
<tr><td>Lecturer(s):</td><td colspan="2">Lecturer team of Protestant Christianity Education</td></tr>
<tr><td>Language:</td><td colspan="2">Bahasa Indonesia</td></tr>
<tr><td>Classification within the curriculum:</td><td colspan="2">Compulsory course / General Courses (MKU)</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>1. Lecture (expository and discussion)
2. Structured activities (assignments based on conceptual and contextual approach)
3. Self-study (reading literature and religion activity)</td><td>100 minutes</td><td>35</td></tr>
<tr><td>Workload:</td><td colspan="2">Total workload is 90 hours 3.2 ECTS (5440 minutes) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.98 ECTS) structured activities, 1680 minutes (0.98 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.</td></tr>
<tr><td>Credit points:</td><td colspan="2">3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS</td></tr>
<tr><td>Prerequisites course(s):</td><td colspan="2">None</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td colspan="2">After taking this course, the students have the ability to:
● CLO1. Know Allah and His Attributes
● CLO2. Understand the basics of Christianity
● CLO3 See the value of humans in front of Allah
● CLO4 See the value of humans in front of Allah</td></tr>
<tr><td>Content:</td><td colspan="2">Knowing Allah, basics Christianity, the character of human leading, transfer of life, integrity, bible, science, and technology.</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1 - 4</td><td>Social Competences:
a. Individual assignments
b. Mid-test
c. Final Test</td><td>

Written (Report paper)
Written test
Written test</td><td>

20
40
40</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table>
The final mark will be weight as follow:
</td></tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS
Literature:	1. Vickers, J. E., & Tait, J. W. (Eds.). (2022). *The Cambridge Companion to American Protestantism*. Cambridge University Press. 2. Gerber, L., Hill, S., & Manigault-Bryant, L. (Eds.). (2021). *Fat Religion: Protestant Christianity and the Construction of the Fat Body*. Routledge. 3. Ross, K. R. (Ed.). (2020). *Christianity in East and Southeast Asia*. Edinburgh University Press. 4. Gary E. Roberts. 2015. *Developing Christian Servant Leadership_ Faith-based Character Growth at Work*. Palgrave Macmillan US 5. Noll, M. A. (2011*). Protestantism: A very short introduction*. OUP Oxford. 6. Maxwell C. John. (2010). *Becoming a Person of Influence: Talent is Never Enough*. Yates & Yates

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√

KU102 Catholic Christianity Education

Module name:	**Catholic Education**	
Module level, if applicable:	Bachelor	
Code:	KU102	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Lecturer team of Catholic Education	
Lecturer(s):	Lecturer team of Catholic Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository and discussion) 2. Structured activities (assignments based on conceptual and contextual approach) 3. Self-study (reading literature and religion activity)	100 minutes	35
Workload:	Total workload is 90 hours 3.2 ECTS (5440 minutes) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.98 ECTS) structured activities, 1680 minutes (0.98 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Understand the origin, nature, and purpose of human life so that they can build a more dignified life. ● CLO2. Explain the meaning of religious life and can work together with other religious people to respond to actual problems today. ● CLO3. Recognize and understand the life and work of Jesus Christ written in the Holy Scriptures and proclaimed by the Church so that they can live the life pattern of Jesus in real life. ● CLO4. Describen of the Universal Church and the Indonesian Church (local) so that students are expected to have empathy and are willing to be involved in it by taking part in the Church's mission during society/the world.	
Content:	Humanity, spirituality, religion, Jesus Christ and his relief work, Church and the faith.	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1 - 4</td><td>Social Competences:
a. Individual assignment
b. Mid-test
c. Final Test</td><td>
Written (Report paper)
Written test
Written test</td><td>
20
40
40</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Taylor, L. F. (2020). Catholic Cosmopolitanism and Human Rights. Cambridge University Press.
2. Suyanto, I. J., Taruno, B. S., Harum, H., Prasetianto, A. Y., & Vinsensius Felisianus Kama, O. (2021). Katolisitas Pendidikan Agama Katolik. Penerbit Universitas Katolik Indonesia Atma Jaya.
3. Hutahaean, W. S., & SE, M. T. (2021). Sejarah Gereja Indonesia. Ahli Media Book.
4. Magnis-Suseno, F. (2020). Menggereja di Indonesia. Percikan Kekatolikan Sekarang. Penerbit PT Kanisius.
5. Lili Tjahjadi, S. P. (2018). Surviving The" Dai Nippon". Gereja Katolik Indonesia Masa Pendudukan Jepang (1942-1945). Penerbit Obor.
6. Nurwardani, P. (2016). Pendidikan Agama Katolik (untuk Perguruan Tinggi), Jakarta, Direktorat Jendral Pembelajaran dan Kemahasiswaan. Lembaga Alkitab Indonesia, 1996, Alkitab, Jakarta, LBI.</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√

KU103 Hinduism Education

Module name:	**Hinduism Education**	
Module-level, if applicable:	Bachelor	
Code:	KU103	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Lecturers team of Hinduism education courses	
Lecturer(s):	Lecturers team of Hinduism education courses	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussion) 2. Structured activities (individual tasks) 3. Self-study (religion activity)	100 minutes	35
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.99 ECTS) structured activities, 1680 minutes (0.99 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for each exam, and 480 (0.28 ECTS) minutes for each exam preparation.	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes (CLO):	After taking this course the students have the ability to: ● CLO1. Appreciate the principles and patterns of development of Hinduism according to the discipline of science ● CLO2. Believe in Hyang Widhi through Sradha and Bhakti through efforts and means of worshiping him ● CLO3. Live the yajna and the implementation of religious holy days based on the teachings of Hinduism ● CLO4. Appreciate the concept of humans, human nature, avatars and saints according to Hindu teachings ● CLO5. Obeying God's Law according to the basics of Hinduism ● CLO6 Live the ethics (morality) concerning the mission to improve oneself in the teachings of dharma ● CLO7. Experiencing science and technology from a Hindu perspective ● CLO8. Live the Tri Harmony of religious people ● CLO9. Understand the concept of Hindu society based on religious literature ● CLO10. Understand the purpose of Satsangga and Dursangga ● CLO11. Appreciate culture as an expression of the practice of Hinduism ● CLO12. Appreciate politics from a Hindu perspective	

<table>
<tr><td></td><td>

- CLO13 Appreciate Hindu Leadership Science related to the concepts of Astabrata and Astadasa Paramiteng Prabhu

</td></tr>
<tr><td>Content:</td><td>The principle of developing Hinduism according to the disciplines studied, the pattern of developing Hinduism according to the disciplines of knowledge learned, Sraddha and Bhakti, Brahma Vidya/Hindu Theology, Efforts and Means of Worshiping Him, Yajna, Naimitika Karma and Nitya Karma, Hari Raya, Meaning of the Day religious sacred, Hindu Human Concept, Hindu Human Nature, Hindu Human Dignity, Hindu Human Responsibility, Awatara and Hndu Saints, Raising Awareness to Obey God's Law according to Hinduism, Hindu Religion's Prophetic Function in Law, Mission to Improve Self, Implementation of Truth, Virtue, Compassion, Peace, Non-Violence in Daily Life Together, Obligation to Study and Practice Knowledge, Tri Hita Karana and Responsibility to Nature and the Environment, Religion is a Grace for All, The Nature of Togetherness in Religious Pluralism, Family Krama (Banjar Community), Village Krama (Regional Community), Citizen, Color Chess, Dormitory Chess, Purusa Artha Chess, Satsangga, Dursangg, Religious Attachment as the Core of Culture and its various Aspects, Responsibilities of Hindus in Realizing Critical Thinking (Academic), Fair Work Hard Work, Understanding and Sources of Hindu Teachings About Politics (Nitisastra), Sri Rama's Message to Bharata on State, Sri Rama's Mandate to Wibisana me, Gajah Mada's Leadership, Excerpts of Hindu Literature Containing the teachings of Nitisastra (Politics)</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weigh t (%)</th></tr>
<tr><td>1</td><td>CLO1 - 13</td><td>Social competence:
a. Individual task

b. Mid-test
c. Final Test</td><td>Performance (rubric of individual task)
Test
Test</td><td>40

30
30</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>

1. Pitriani, N. R. V. (2022). *Buku Ajar Metode Pengajaran Agama Hindu*. Nilacakra.
2. Shattuck, C. (2002). *Hinduism*. Routledge.
3. Purnomo, I. M. B. A. (2021). *Buku Ajar Pendidikan Agama Hindu di Perguruan Tinggi*. Mertajati Widya Mandala Publisher.
4. Buck, W. (2021). *Ramayana*. Univ of California Press.
5. Williams, R. B. (2018). *Introduction to Swaminarayan Hinduism*. Cambridge University Press.
6. Olivelle, P., & Davis, D. R. (Eds.). (2018). *Hindu Law: A New History of Dharmaśāstra*. Oxford University Press.
7. Siswadi, G. A. (2019). *Integrasi Pendidikan Agama Hindu dalam Pembelajaran Bahasa Sanskerta*. Nilacakra.
8. Parisada Hindu Dharma Indonesia. (2013). *Buku Swatikarana Pedoman ajaran Hindu Dharma Indonesia.*

</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√
CLO5											√	√
CLO6											√	√
CLO7											√	√
CLO8											√	√
CLO9											√	√
CLO10											√	√
CLO11											√	√
CLO12											√	√
CLO13											√	√

KU104 Buddhism Education

Module name:	**Buddhism Education**	
Module-level, if applicable:	Bachelor	
Code:	KU104	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Lecturers team of Buddhism education courses	
Lecturer(s):	Lecturers team of Buddhism education courses	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussion) 2. Structured activities (individual tasks) 3. Self-study (religion activity)	100 minutes	35
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.99 ECTS) structured activities, 1680 minutes (0.99 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for each exam, and 480 (0.28 ECTS) minutes for each exam preparation.	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Explain the position of mind and mind in the the relationship between science and religion by showing the classification and characteristics of science in the Buddha Dhamma, realizing the importance, benefits, development, and impact of science and technology ● CLO2. Explain the Supreme Godhead in Buddhism ● CLO3. Explain the historical background of the writing of the Tripitaka / Tipitaka which is then used as a guide for Buddhists in carrying out their daily lives ● CLO4. Explain Brahmavihara/noble qualities and get used to living in harmony on campus, at home, and in society in daily life ● CLO5. Explain the Bodhisattva and imitate the qualities of the Bodhisattva ● CLO6. Explain the Law of Kamma/Karma as a cosmic law about cause and effect which is also an impersonal moral law ● CLO7. Explain and have a broad understanding of the Buddha Dharma by well explaining the relationship of the sources of Buddhist teachings with the basic framework of teachings ● CLO8. Explained that Tilakkhana is the universal nature of	

<table>
<tr><td></td><td>all that exists, this is the basis of the Buddha's teaching
● CLO9. Explains Cattari Arya Saccani are the four truths that exist in the universe, which are not affected by time and are therefore eternal truths
● CLO10. Explain, obey and practice precepts as a way of life and be able to cooperate with other groups and be tolerant in social life
● CLO11. Explain Meditation and the meaning of self-meditation, relationships with other people, the universe, and God Almighty
● CLO12. Describes the 31 planes of existence that can be reborn based on the good or bad kamma of the creature concerned
● CLO13. Explain Tri Ratna / Tiratana shows the meaning of the people Buddha takes refuge in Buddha, Dhamma, and Sangha as Soko Guru
● CLO14. Explain the working process of the Paticcasamuppada Law</td></tr>
<tr><td>Content:</td><td>Buddha Dhamma/Dharma with Science and Technology, The Supreme Godhead in Buddhism, The Tipitaka Scriptures/Tripitaka, Brahmavihara, Bodhisattva, Law of Kamma/Karma, Basic Shell of Buddhism, Tilakkhana, Cattari Arya Saccani, Sila, Meditation, 31 realms of existence, Triratna/Tiratana, Paticcasamuppada Law</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1 –14</td><td>Social competence:
a. Individual task

b. Mid test
c. Final Test</td><td>
Performance (rubric of individual task)
Written Test
Written Test</td><td>
40

30
30</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Wright, D. S. (2020). Buddhism: What Everyone Needs to Know. Oxford University Press, USA.
2. Saputro, R. A., Idris, M., & Suryani, I. (2021). Tipologi Peninggalan Sejarah Masa Klasik Hindu-Buddha sampai Masa Kemerdekaan di Palembang Barat. Penerbit Lakeisha.
3. McMahan, D., & Braun, E. (Eds.). (2017). Meditation, Buddhism, and Science. Oxford University Press.
4. Kemenag Bimas Buddha Jabar. (2011). Dhammapada Sabda-Sabda Buddha Gotama.
5. Tim penyusun. (2010). Riwayat Buddha Gotama. Lembaga Pengkajian Dan Pengembangan Keagamaan Buddha Indonesia.</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√
CLO5											√	√
CLO6											√	√
CLO7											√	√
CLO8											√	√
CLO9											√	√
CLO10											√	√
CLO11											√	√
CLO12											√	√
CLO13											√	√
CLO14											√	√

KU105 Civic Education

Module name:	**Civic Education**	
Module-level, if applicable:	Bachelor	
Code:	KU105	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Lecturer team of Civic Education	
Lecturer(s):	Lecturer team of Civic Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (expository, group discussion, and presentation) 2. Structured activities (working on problem set practice from the textbook) 3. Self-study (reading literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes of lecture in just the first meeting, and a seminar in a group of students (0.82 ECTS), 120 minutes of structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Have conceptual knowledge about Introduction of Understanding Personality Development Courses in Pancasila Education and Citizenship in Higher Education ● CLO2. Have conceptual knowledge about Pancasila as a philosophy, the basis of the State and National Ideology. ● CLO3. Have conceptual knowledge about National Identity ● CLO4. Have conceptual knowledge about the State and the Constitution ● CLO5. Have conceptual knowledge about Human Rights and Citizens' Rights and Duties ● CLO6. Have conceptual knowledge about Democracy and the rule of law ● CLO7. Have conceptual knowledge about Indonesian Geopolitics in the form of Archipelago Insight. ● CLO8. Have conceptual knowledge about the State Organisation System ● CLO9. Have conceptual knowledge about Indonesian Geostrategy in the form of National Resilience.	

<table>
<tr><td>Content:</td><td>Introduction of Understanding Personality Development Courses in Pancasila Education and Citizenship in Higher Education; Pancasila as a philosophy, Fundamentals of the State and National Ideology; National Identity; State and Constitution; Human Rights and Citizens' Rights and Duties; Democracy and the rule of law; Indonesian Geopolitics in the form of Archipelago Insights; State Organization System; and Indonesian Geostrategy in the form of National Resilience.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1–9</td><td>Social competences:
a. Individual and Group assignments (presentation)
b. Exam:
- Mid exam
- Final exam</td><td>
Written & Performance

Writing test
Writing test</td><td>
30

35
35</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Saragih, H., Manullang, S. O., Soetijono, I. K., Hamidah, S., Triono, T., Bintarawati, F., ... & Meganingratna, A. (2022). Pendidikan Kewarganegaraan. Yayasan Kita Menulis.
2. Zulfikar Putra, S. H., & Wajdi, H. F. (2021). Buku Ajar Pendidikan Pancasila Dan Kewarganegaraan Panduan Kuliah Di Perguruan Tinggi. Ahlimedia Book.
3. Iswardhana, M. R. (2020). Pendidikan Pancasila dan Kewarganegaraan: Merajut Kebhinekaan dalam Menghadapi Tantangan Revolusi Industri. PT Kanisius.
4. Damri, M. P., Putra, F. E., & Kom, M. I. (2020). Pendidikan kewarganegaraan. Prenada Media.
5. Banks, J. A. (2020). Diversity, transformative knowledge, and civic education: Selected essays. Routledge.
6. Tomalili, R. (2019). Pendidikan Pancasila dan Kewarganegaraan. Deepublish.
7. Marijan, K. (2019). Sistem politik Indonesia: Konsolidasi demokrasi pasca orde baru. Kencana.
8. Ramadlan, M. F. S., Wahid, A., Rakhmawati, F. Y., Destrity, N. A., Hair, A., Harjo, I. W. W., & Utaminingsih, A. (2019). Media, Kebudayaan, dan Demokrasi: Dinamika dan Tantangannya di Indonesia Kontemporer. Universitas Brawijaya Press.</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√
CLO5											√	√
CLO6											√	√
CLO7											√	√
CLO8											√	√
CLO9											√	√

KU106 Indonesia Language Education

Module name:	**Indonesian Language**	
Module-level, if applicable:	Bachelor	
Code:	KU106	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Lecturer team of Indonesian Language	
Lecturer(s):	Lecturer team of Indonesian Language	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (expository, group discussion, presentation) 2. Structured activities (working on problem set practice from the textbook) 3. Self-study (reading literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes of lecture in just the first meeting, and a seminar in a group of students (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Fear God Almighty. ● CLO2. Have good and right morals, ethics, and language personality. ● CLO3. Have a role as a citizen who is proud of the language and uses the language. ● CLO4. Have a cooperative role and have high social sensitivity and concern for language. ● CLO5. Appreciate the diversity of languages, cultures, and personalities as well as the original opinions/findings of others. ● CLO6. Appreciate the sense of language and have the spirit of prioritising the interests of the nation and the wider community. ● CLO7. Apply science and technology to obtain, collect, and process various existing facts related to language ● CLO8. Know material about MKWU Indonesian Language Education including the Nature of Language, Indonesian Language Development, Today's Indonesian Language, Variety of Languages and Its Characteristics, Diction or Word Choice, Enhanced Indonesian Spelling, Effective Sentences, Paragraphs, Scientific Writings, Papers, Research Reports, Journal Articles, Reasoning, and Scientific Presentations. ● CLO9. Has a critical, sensitive, and wise nature and is	

<table>
<tr><td></td><td>responsible for the process and learning of individuals and or groups.
● CLO10. Apply good and correct use of Indonesian both orally and in writing in daily life.</td></tr>
<tr><td>Content:</td><td>The Nature of Language, Indonesian Language Development, Today's Indonesian Language, Variety of Languages and Their Characteristics, Diction or Word Choice, Enhanced Indonesian Spelling, Effective Sentences, Paragraphs, Scientific Writings, Papers, Research Reports, Journal Articles, Reasoning, and Scientific Presentations.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weighted as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1–3</td><td>Generic competences:
- Individual and Group assignments</td><td>Performance</td><td>20</td></tr>
<tr><td>2</td><td>CLO4 - 10</td><td>- Exam:
Quiz
Mid test
Final test</td><td>
Written test
Written test
Written test</td><td>
10
35
35</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Yahya, H. I. (2022). Bahasa Indonesia Untuk Perguruan Tinggi. Nas Media Pustaka.
2. Yulianti, N., & Kom, S. (2022). Bahasa Indonesia Untuk Perguruan Tinggi. CV. Mitra Cendekia Media.
3. Nugraheni, A. S. (2019). Bahasa Indonesia di Perguruan Tinggi Berbasis Pembelajaran Aktif. Prenada Media.
4. Perdana, I., & Misnawati, M. P. (2019). Cinta dan Bangga Berbahasa Indonesia di Perguruan Tinggi. SPASI MEDIA.
5. Tantawi, I. (2019). Terampil berbahasa Indonesia: Untuk Perguruan Tinggi. Prenada Media.
6. Rokhmansyah, A., & Rijal, S. (2018). Bahasa Indonesia Untuk Perguruan Tinggi. Unnes Press.
7. Aziz, Firman, dkk. (2016). Bahasa Indonesia Untuk Perguruan Tinggi. Bandung: CV Maulana Media Grafika.
8. BPPB KEMENDIKBUD. (2011). Politik Bahasa. Jakarta: Badan Pengembangan dan Pembinaan Bahasa.
9. Hasnah (2011). Menulis Karangan Ilmiah. Pekanbaru: Cendikia Insani.
10. Abidin, Yunus, dkk. (2010). Kemampuan Berbahasa Indonesia</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	
CLO2									√		√	
CLO3									√		√	
CLO4									√		√	
CLO5									√		√	
CLO6									√		√	
CLO7									√		√	
CLO8									√		√	
CLO9									√		√	
CLO10									√		√	

KU108 Sport Education

Module name:	**Sport Education**	
Module-level, if applicable:	Bachelor	
Code:	KU108	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2nd	
Module coordinator:	Lecturers team of Sport Education	
Lecturer(s):	Lecturers team of Sport Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussions, and practical methods). 2. Structured activities (Record physical fitness and physical activity) 3. Self-study (review the literature on physical fitness and physical activity)	100 minutes	35
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 1400 minutes (0.82 ECTS) lectures, 840 minutes (0.49 ECTS) exercise, 840 minutes (0.49 ECTS) structured activities, 1680 minutes (0.99 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for two exams, and 480 minutes (0.28 ECTS) for two exam preparations.	
Credit points:	3.2 ECTS (3 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Analyse theoretical and practical concepts of physical fitness related to health and skills ● CLO2. Understand the importance of a healthy and active lifestyle and apply it in daily life ● CLO3. Apply lifestyle and healthy food consumption ● CLO4. Utilise technology to help implement a healthy and active lifestyle ● CLO5. Interact positively, and tolerantly, and respect others in completing various learning activities ● CLO6. Work together in completing learning activities during lectures and outside class hours ● CLO7. Evaluate physical fitness and daily physical activity ● CLO8. Practice one style of swimming ● CLO9. Design, interpret and perform physical activities to maintain daily health ● CLO10. Show a responsible attitude, mutual respect, and hard work through physical activities	
Content:	Healthy and Active Lifestyle, Physical Fitness and Physical	

<table>
<tr><td></td><td>Activity, Evaluation of Physical Fitness and Physical Activity Level Status, Physical fitness related to health and pulse rate, Body Mass Index and physical fitness related to health, Warming, cooling and related physical fitness Health-related, Flexibility and fitness related to health, Nutrition Food and Physical fitness related to skills, Components of physical fitness related to skills, and Calories, Physical fitness related to skills and Activities Invasion Games, Physical fitness related to skills and Field/Net Games, Aquatic Activities, Creating personal fitness activity programs</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1-3</td><td>Social competences
a. Individual assignments (physical fitness and physical activity)
b. Exam
a. Mid-exam
b. Final exam</td><td>Performance assessment Test</td><td>20

30
20</td></tr>
<tr><td>2</td><td>CLO4 - 9</td><td>Social competences (Physical fitness and physical activity)</td><td>Performance assessment</td><td>20</td></tr>
<tr><td>3</td><td>CLO10</td><td>Social competences (Responsible attitude, mutual respect, and hard work through physical activities)</td><td>Performance assessment</td><td>10</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Pratiwi, E. (2021). Buku Ajar Strategi Pembelajaran Pendidikan Jasmani: Pedoman Guru Dalam Mengajar Penjas. Bening Media Publishing.
2. Permana, R. (2020). Teori dan Praktik: Pendidikan Jasmani di Perguruan Tinggi. EDU PUBLISHER.
3. Hidayat, C., & Juniar, D. T. (2020). Strategi Pembelajaran Pendidikan Jasmani. Deepublish.
4. Hanafi, M., & Prastyana, B. R. (2020). Metodologi Kepelatihan Olahraga Tahapan & Penyusunan Program Latihan. Jakad Media Publishing.
5. Houston, Jennifer, and Pamela Kulinna. (2014). Health-Related Fitness Models in Physical Education. Strategies 27(2): 20–http://www.tandfonline.com/doi/abs/10.1080/08924562.2014.879026.</td></tr>
</table>

	6. Giriwijoyo, S., & Zafar, S. D. (2010). *Ilmu Faal Olahraga*. Bandung 7. Sidik, D. Z. (2010). *Mengajar dan melatih atletik*. Bandung: PT Remaja Rosdakarya

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√
CLO5											√	√
CLO6											√	√
CLO7											√	√
CLO8											√	√
CLO9											√	√
CLO10											√	√

KU109 Confucianism Education

Module name:	**Confucianism Education**	
Module-level, if applicable:	Bachelor	
Code:	KU109	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Lecturers team of Confucianism education courses	
Lecturer(s):	Lecturers team of Confucianism education courses	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussion) 2. Structured activities (individual tasks) 3. Self-study (religion activity)	100 minutes	35
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.99 ECTS) structured activities, 1680 minutes (0.99 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for each exam, and 480 (0.28 ECTS) minutes for each exam preparation.	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Explain the history of Confucius ● CLO2. Explain how the Confucian religion in Indonesia ● CLO3. Mentions several books of Confucianism ● CLO4. Explain the holy path brought by the great teachings (Thai Hak) ● CLO5. Understand the beginning and end of a matter ● CLO6. Explain the essence of each case ● CLO7. Explain the importance of the virtue of self-development as the main ● CLO8. Explain "examining the nature of each case" ● CLO9. Explain the importance of perfect knowledge ● CLO10. Explain the concept of straightening the heart ● CLO11. Explain the concept of self-development ● CLO12. Explain the relationship between self-development and household/state development ● CLO13. Explain the content of the preface Cu-Hi ● CLO14. Explain the concept of the all-perfect God as stated in chapter XXXII verses 1-6 ● CLO15. Explain and demonstrate the procedures for praying the Confucian religion	

<table>
<tr><td></td><td>

CLO16. Mentions the big days of the Confucian religion
CLO17. Explain the relationship between character/talent and social environment
CLO18. Explain the influence of relationships and the environment on a person's character/talent
CLO19. Explain the role of education in the development of one's character/talent
CLO20. Explain the meaning and purpose of religion
CLO21. Explain how to deal with religious differences
CLO22. Mention the levels of religious adherents
CLO23. Explain the causes of unhappiness/misery of rich people

</td></tr>
<tr><td>Content:</td><td>The history of Confucianism, Confucianism in Indonesia, Several books of Confucianism, The holy path, the beginning and end of a case, The essence of each case, The virtue of developing oneself as the subject, Examining the nature of each case, Straightening the heart as the base for self-development, Fostering self-tidying up the household, Cu Hi preface, the concept of the perfect God, Confucian religious prayer procedures, Confucian religious holidays, the concept of similar character/talent in association, association and environment, education, religious purposes and goals, Attitudes in dealing with religious differences, Levels of religious adherents, Rich people</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO 1 – 23</td><td>Social competence:
a. Individual task
b. Mid-test
c. Final Test</td><td>Performance (rubric of individual task)
Test
Test</td><td>40
30
30</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>

Kitab Sishu. (2012). Kitab Suci Agama Konghucu. Majelis Tinggi Agama Konghucu Indonesia.
Keputusan Bersama Menteri Agama, Jaksa Agung, dan Menteri dalam Negeri RI. (2011). Jakarta: Menteri Dalam Negeri.
Negoro, T.K Beng Setio. (2005). Rahasia Kehidupan Jilid I. Bandung: Karya Bengras.

</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√
CLO5											√	√
CLO6											√	√
CLO7											√	√

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO8											√	√
CLO9											√	√
CLO10											√	√
CLO11											√	√
CLO12											√	√
CLO13											√	√
CLO14											√	√
CLO15											√	√
CLO16											√	√
CLO17											√	√
CLO18											√	√
CLO19											√	√
CLO20											√	√
CLO21											√	√
CLO22											√	√
CLO23											√	√

KU110 Pancasila Education

Module name:	**Pancasila Education**	
Module-level, if applicable:	Bachelor	
Code:	KU110	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Lecturer team of Pancasila Education	
Lecturer(s):	Lecturer team of Pancasila Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (Flipped Classroom Model) 2. Structured activities: consist of three main activities, namely (1) Learning before class (Before Classroom), (2) Learning in Class (During Classroom), and Learning After Class (After Classroom). 3. Self-study activities: study literature	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lecture in just first meeting, and seminar in a group of students (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Implement scientific, educational, and religious attitudes. ● CLO2. Implement compassion, succession, and fostering in a work environment and social life that has global competitive and comparative advantages. ● CLO3. Adapt dynamic changing times ● CLO4. Insight and be a good citizen ● CLO5. Become a lifelong learner	
Content:	Introduction to Understand Pancasila Education, Historical Review of Pancasila, Pancasila as a View of Life and the Basics of the State, Pancasila as a Philosophical System, Pancasila as a State Ideology, Pancasila as an Ethical System, and Pancasila as a Basic Value in the Development of Science	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weighted as follow:

<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1 - 5</td><td>Social competences:
a. Individual assignments
b. Exam:
Mid exam
Final exam</td><td>

Performance

Written test
Written test</td><td>

30

35
35</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Kaelan (2002). Pendidikan Pancasila. Jakarta: Paradigma
2. Latif, Y. (2011). Negara Paripurna: Historisitas, Rasionalitas, Aktualitas Pancasila. Jakarta: Gramedia Pustaka Utama.
3. Naskah Undang Undang Dasar 1945
4. Nurwardani, P, Saksama, H.Y., Kuswanjono, A, Munir, M, Mustansyir, R, Nurdin, E.S., Mulyono, E., Prawatyani, S.J., Anwar,A.A., Evawany, Priyautama, F., Festanto, A. (2016). Pendidikan Pancasila: Untuk Perguruan Tinggi. Jakarta: Kemristekdikti Ditjen Belmawa.</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√
CLO5											√	√

KU119 Art Education

<table>
<tr><td>Module name:</td><td colspan="2">Art Education</td></tr>
<tr><td>Module-level, if applicable:</td><td colspan="2">Bachelor</td></tr>
<tr><td>Code:</td><td colspan="2">KU119</td></tr>
<tr><td>Subheading, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Classes, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Semester:</td><td colspan="2">2nd</td></tr>
<tr><td>Module coordinator:</td><td colspan="2">Lecturers team of Art Education</td></tr>
<tr><td>Lecturer(s):</td><td colspan="2">Lecturers team of Art Education</td></tr>
<tr><td>Language:</td><td colspan="2">Bahasa Indonesia</td></tr>
<tr><td>Classification within the curriculum:</td><td colspan="2">Compulsory course / General Courses (MKU)</td></tr>
<tr><td>Type of Teaching:</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>. Lecture (expository, discussions, questions and answers through an appreciation and analysis approach).
. Structured activities (art practice)
. Self-study (reviewing and searching for relevant material literature)</td><td>100 minutes</td><td>35</td></tr>
<tr><td>Workload:</td><td colspan="2">The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 1400 minutes (0.82 ECTS) lectures, 840 minutes (0.49 ECTS) exercise, 840 minutes (0.49 ECTS) structured activities, 1680 minutes (0.99 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for two exams, and 480 minutes (0.28 ECTS) for two exam preparations.</td></tr>
<tr><td>Credit points:</td><td colspan="2">3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS</td></tr>
<tr><td>Prerequisites course(s):</td><td colspan="2">None</td></tr>
<tr><td>Course Learning Outcomes:</td><td colspan="2">After taking this course the students have the ability to:
● CLO1. Knowledge of the concept of art in general
● CLO2. Experience in playing several art forms
● CLO3. Improve awareness of national culture
● CLO4. Practice an art performance</td></tr>
<tr><td>Content:</td><td colspan="2">Branch of Art, Basic music concepts, Basic elements of Music, Acoustics and organology, Types of music, Performing arts studies, Music psychology, Music and street musicians, Culture and the arts, Functions of art in society, Archipelago traditional arts, and art practice.</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO 1</td><td>Social competences
a. Individual assignment
b. Exam
a. Mid-exam
b. Final exam</td><td>Performance assessment

Written Test
Written Test</td><td>20

30
30</td></tr>
</table>
</td></tr>
</table>

	2	CLO 2	Social competences	Performance assessment	10
	3	CLO 3 CLO 4	Social competences	Performance assessment	10
	Total				**100**
Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS, music instrumentations,				
Literature:	1. Kholid, Dody (2003). *'komposisi musik*' 2. Mack, Dieter. (2001). *Ilmu Melodi*, PML, Yogyakarta 3. Sukahardjana (2004). *Musik antara Kritik dan Apresiasi*. Kompas, Jakarta				

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	
CLO2									√		√	
CLO3									√		√	
CLO4									√		√	

KU300 Islamic Education Seminar

Module name:	**Islamic Education Seminar**	
Module-level, if applicable:	Bachelor	
Code:	KU300	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Lecturer team of Islamic Education Seminar	
Lecturer(s):	Lecturer team of Islamic Education Seminar	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes of lecture in just the first meeting, and a seminar in a group of students (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	(KU100) Islamic Education	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Analyse problems in the fields of education, culture, da'wah, politics, economics, law, technology, and scientific disciplines from the point of view of Islamic teachings. ● CLO2. Solving the problems of life-based on Islamic teachings. ● CLO3. Contribute to the Islamic teaching that is full of compassion for the universe both on campus and off campus. ● CLO4. Demonstrate a level of religious maturity as a tolerant Muslim (tasamuh), harmonious and compatible (tawazun), moderate (tawasut), and consistent (istiqamah). ● CLO5. Demonstrate an increase in the quality and quantity of worship (mahdhah and ghair mahdhah). ● CLO6. Demonstrate awareness in developing scientific disciplines and professions that they are engaged in, as part of worship (ghairu mahdhah).	
Content:	Islam and Education, Islam and Culture, Islam and gospel endeavor, Islam and politics, Islam and economy, Islam and law, Islam and technology, Islam, and knowledge discipline	

<table>
<tr>
<td>Study/exam achievements:</td>
<td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1</td><td>Social competences
a. Group assignments

b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>20

30
30</td></tr>
<tr><td>2</td><td>CLO2</td><td>Social competences</td><td>Performance assessment</td><td>10</td></tr>
<tr><td>3</td><td>CLO3 - 6</td><td>Social competences</td><td>Performance assessment</td><td>10</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td>
</tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Azra, Azyumardi, (2000). Pendidikan Islam, Jakarta: Logos.
2. Hamzah Muchotob, et al. (2004). Al-Muntahâ, Tafsîr Maudhû'i (Jilid 1), Yogyakarta: Pustaka Pesantren.</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	√
CLO2									√		√	√
CLO3									√		√	√
CLO4									√		√	√
CLO5									√		√	√
CLO6									√		√	√

KU301 Protestant Christianity Education Seminar

Module name:	**Protestant Christianity Education Seminar**	
Module-level, if applicable:	Bachelor	
Code:	KU301	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Lecturer team of Christianity Education Seminar	
Lecturer(s):	Lecturer team of Christianity Education Seminar	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes of lectures and student group presentation in 4th meeting (0.82 ECTS), 120 minutes of structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	(KU101) Protestant Christianity Education	
Course Learning Outcomes:	After taking this course the students have the ability to: ● CLO1. Understand human duties according to the Bible ● CLO2. Understand the basics of Christianity ● CLO3. Learn leadership from Bible characters ● CLO4. Show the attitude and character of believers	
Content:	1. The reason God created humans 2. The character of the prophet Moses is exemplary 3. Seeing the values of a leader who pleases Allah 4. The types of gifts that Allah has given to people who believe 5. Definition and steps for implementing integrity in life 6. Things that should be seen from a believer 7. Respect and submit to the Government 8. The basic human need in terms of love 9. Learn the commitment and sincerity of the Apostle Paul 10. The link between Science and Theology The attitude of believers in science 11. Believers who study science, both exact and social, and have good character 12. A leader who is not selfish but puts others first 13. Be a role model in work and attitude/character	

<table>
<tr>
<td>Study/exam achievements:</td>
<td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO 1-4</td><td>Social competences:
a. Group assignment
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>20

40
40</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table>
</td>
</tr>
<tr>
<td>Forms of media:</td>
<td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td>
</tr>
<tr>
<td>Literature:</td>
<td>

Vickers, J. E., & Tait, J. W. (Eds.). (2022). The Cambridge Companion to American Protestantism. Cambridge University Press.
Gerber, L., Hill, S., & Manigault-Bryant, L. (Eds.). (2021). Fat Religion: Protestant Christianity and the Construction of the Fat Body. Routledge.
Ross, K. R. (Ed.). (2020). Christianity in East and Southeast Asia. Edinburgh University Press.
Gary E. Roberts. 2015. Developing Christian Servant Leadership_ Faith-based Character Growth at Work. Palgrave Macmillan US
Noll, M. A. (2011). Protestantism: A very short introduction. OUP Oxford.

</td>
</tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	√
CLO2									√		√	√
CLO3									√		√	√
CLO4									√		√	√

KU302 Catholic Education Seminar

Module name:	**Catholic Education Seminar**	
Module-level, if applicable:	Bachelor	
Code:	KU302	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Lecturer team of Catholic Education Seminar	
Lecturer(s):	Lecturer team of Catholic Education Seminar	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lecture in just first meeting, and seminar in group of students (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	(KU102) Catholic Education	
Course Learning Outcomes:	After taking this course the students have ability to: ● CLO1. understand human duties according to the Bible ● CLO2. understand the basics of Christianity. ● CLO3. understand the basics of Christianity. ● CLO4. show the attitude and character of believers.	
Content:	The reason God created humans, The character of the prophet Moses that is exemplary, Seeing the values of a leader who pleases Allah, The types of gifts that Allah has given to people who believe, Definition and steps for implementing integrity in life, Things that should be seen from a believer, Respect and submit to the Government, The basic human need in terms of love, Learn the commitment and sincerity of the Apostle Paul, The link between Science and Theology The attitude of believers in science, Believers who study science, both exact and social and have good character, A leader who is not selfish but puts others first, Be a role model in work and attitude/character	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">CLO1–4</td><td>a. Individual task</td><td>Performance assessment</td><td>40</td></tr>
<tr><td>b. Exam
- Mid-test
- Final-test</td><td>Written test</td><td>
30
30</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Maxwell C. John. 2010. Becoming a Person of Influence: Talent is Never Enough. Yates & Yates
2. Maxwell C. John. 2009. The Right to Lead: Learning Leadership Through Character and Courage. Simple Truth
3. Apologetic Press. 2005. How Do You Know the Bible is From God? Landmark Drive</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	√
CLO2									√		√	√
CLO3									√		√	√
CLO4									√		√	√
CLO5									√		√	√
CLO6									√		√	√

KU303 Hinduism Education Seminar

Module name:	**Hinduism Education Seminar**	
Module-level, if applicable:	Bachelor	
Code:	KU303	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Lecturer team of Hinduism Education Seminar	
Lecturer(s):	Lecturer team of Hinduism Education Seminar	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lecture in just first meeting, and seminar in group of students (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	(KU103) Hinduism Education	
Course Learning Outcomes:	After taking this course the students have ability to: ● CLO1. understand human duties according to the Veda ● CLO2. understand the basics of Hinduism. ● CLO3. learn leadership from Veda characters. ● CLO4. show the attitude and character of believers.	
Content:	The reason God created humans, Maharishi Vyasa's exemplary qualities, Seeing the values of a leader, Types of Gifts bestowed on believers, Understanding and steps to implement integrity in life, Things to see from a person Those who believe, Respect and submit to the Government, Basic human needs in terms of love, Learn commitment and sincerity, The link between Science and Theology Attitudes of people who believe in science, Believers who study science, both exact and social and have good character, Leaders who not selfish but put others first, Be a role model in work and attitude/character	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">CLO1–4</td><td>a. Individual task</td><td>Performance assessment</td><td>40</td></tr>
<tr><td>b. Exam
- Mid-test
- Final-test</td><td>Written test</td><td>
30
30</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Ngurah Made Drs. I Gusti dkk. (2006). Buku Pendidikan Agama Hindu untuk perguruan Tinggi, Paramita Surabaya
2. Parisada Hindu Dharma Indonesia. (2013). Buku Swatikarana Pedoman ajaran Hindu Dharma Indonesia</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	√
CLO2									√		√	√
CLO3									√		√	√
CLO4									√		√	√
CLO5									√		√	√
CLO6									√		√	√

KU304 Buddhism Education Seminar

Module name:	**Buddhism Education Seminar**	
Module-level, if applicable:	Bachelor	
Code:	KU304	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Lecturer team of Buddhism Education Seminar	
Lecturer(s):	Lecturer team of Buddhism Education Seminar	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lecture in just first meeting, and seminar in group of students (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	(KU104) Buddhism Education	
Course Learning Outcomes:	After taking this course the students have ability to: ● CLO1. understand human duties according to the Tripitaka ● CLO2. understand the basics of Buddhism. ● CLO3. learn leadership from Tripitaka characters. ● CLO4. show the attitude and character of believers.	
Content:	The reason God created humans, Gautama's exemplary qualities, Seeing the values of a leader, Types of Gifts bestowed on believers, Understanding and steps to implement integrity in life, Things to see from a person Those who believe, Respect and submit to the Government, Basic human needs in terms of love, Learn commitment and sincerity, The link between Science and Theology Attitudes of people who believe in science, Believers who study science, both exact and social and have good character, Leaders who not selfish but put others first, Be a role model in work and attitude/character	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">CLO1–4</td><td>a. Individual task</td><td>Performance assessment</td><td>40</td></tr>
<tr><td>b. Exam
- Mid-test
- Final-test</td><td>Written test</td><td>
30
30</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Mulyadi Wahyono,SH. (2002). Pokok-Pokok Dasar Agama Buddha, Jakarta.
2. Tim Penyusun. (2003). Materi Kuliah Sejarah Perkembangan Agama Buddha, CV. Dewi Kayana Abadi: Jakarta.
3. Abhidhammattha Sangaha, (2005). Penyusun Pandit Jinaratana Kaharudin. Cetakan Pertama.</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	√
CLO2									√		√	√
CLO3									√		√	√
CLO4									√		√	√
CLO5									√		√	√
CLO6									√		√	√

KU305 Confucianism Education Seminar

Module name:	**Confucianism Education Seminar**	
Module-level, if applicable:	Bachelor	
Code:	KU305	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Lecturer team of Confucianism Education Seminar	
Lecturer(s):	Lecturer team of Confucianism Education Seminar	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lecture in just first meeting, and seminar in group of students (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	(KU105) Confucianism Education	
Course Learning Outcomes:	After taking this course the students have ability to: ● CLO1. understand human duties according to the Sishu Wujing ● CLO2. understand the basics of Confucianism. ● CLO3. learn leadership from Sishu Wujing characters. ● CLO4. show the attitude and character of believers.	
Content:	The reason God created humans, Kong Hu Cu's exemplary qualities, Seeing the values of a leader, Types of Gifts bestowed on believers, Understanding and steps to implement integrity in life, Things to see from a person Those who believe, Respect and submit to the Government, Basic human needs in terms of love, Learn commitment and sincerity, The link between Science and Theology Attitudes of people who believe in science, Believers who study science, both exact and social and have good character, Leaders who not selfish but put others first, Be a role model in work and attitude/character	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">CLO1–4</td><td>a. Individual task</td><td>Performance assessment</td><td>40</td></tr>
<tr><td>b. Exam
- Mid-test
- Final-test</td><td>Written test</td><td>
30
30</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Kitab Sishu. (2012). Kitab Suci Agama Khonghucu. Majelis Tinggi Agama Konghucu Indonesia
2. Keputusan Bersama Menteri Agama, Jaksa Agung, dan Menteri dalam Negeri RI. (2011). Tata Agama dan Tata Laksana Upacara Konghucu Jakarta: Menteri Dalam Negeri.</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	√
CLO2									√		√	√
CLO3									√		√	√
CLO4									√		√	√
CLO5									√		√	√
CLO6									√		√	√

KU400 Community Service

Module name:	**Community Service**	
Module-level, if applicable:	Bachelor	
Code:	KU400	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Chairman of the Institute for Research and Community Service, Indonesia University of Education	
Lecturer(s):	Field Lecturers are appointed by the Rector's Decree	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching:	Contact hours per week during the semester	Class Size
Community service is carried out using an individual approach, limited groups, and regeneration.	100 minutes	10
Workload:	Community service is carried out within 1 (one) month with a minimum number of working hours of 120 (one hundred and twenty) effective hours for each student	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	Have a minimum number of 68% credits of the total number of credits in each study program	
Course Learning Outcomes:	After taking this course the students have ability to: ● CLO1. Apply science, technology, art, and culture acquired in college to be applied in solving problems that exist in society. ● CLO2. Develop soft skills and student character. ● CLO3. Understand the condition of the community both in rural and urban areas, so that students have sensitivity and concern for people who need assistance. ● CLO4. Become a candidate for a national leader who sided with honesty, justice, truth, and the poor.	
Content:	The Community Service Course is packaged in a particular theme and designed to address real issues facing the community (thematically) through interdisciplinary or multidisciplinary approaches and empowering local resources. Each theme is implemented by a Community Service unit consisting of 10 students from various faculties at the Indonesia University of Education. Implementation of community service includes: 1. Pre-Implementation, including Participant Registration of Community Service, Debriefing, Taking individual equipment of Community Service participant, Permit submission of Community Service implementation activity to local government, Students placement, Consolidation of Community Service Unit, Taking Equipment / Package for Unit and Sub-unit, Briefing of Student Unit Coordinators, Campus Service Activities, Community Service Release and Direction from Rector. 2. Implementation, including Student Placement to	

<table>
<tr><td></td><td>Community Service Location, Field Operation, and Student Withdrawal from Community Service Location.
3. Assessment, including Evaluation of Student Performance by Field Supervisor</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1-4</td><td>a. Activity Plan Report
b. Student Performance Activity
c. Implementation Report</td><td>Assessment product
Performance Assessment
Assessment product</td><td>20
60
20</td></tr>
<tr><td></td><td colspan="3">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Laptop/Computer, LMS, observation sheet</td></tr>
<tr><td>Literature:</td><td>Tim Penyusun Buku Panduan KKN UPI. (2020). Buku Panduan Kuliah Kerja Nyata Universitas Pendidikan Indonesia. Lembaga Penelitian dan Pengabdian kepada Masyarakat Universitas Pendidikan Indonesia: Bandung</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1									√		√	√
CLO2									√		√	√
CLO3									√		√	√
CLO4									√		√	√

HU300 Introduction of Education

Module name:	**Introduction to Education**	
Module level, if applicable:	Bachelor	
Code:	HU300	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2nd	
Module coordinator:	Lecturer team of Introduction to Education	
Lecturer(s):	Lecturer team of Introduction to Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / General Courses (MKU)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (Expository, group discussion, presentation) 2. Structured activities (working on problem set) 3. Self-study (reading literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes of lectures (0.82 ECTS), 120 minutes of structured activities (0.99 ECTS), and 120 minutes of self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS (2 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have the ability to ● CLO1. Understand in depth the characteristics of students from physical, psychological, social, and cultural aspects for the benefit of learning ● CLO2. Explain the philosophical, juridical, historical, sociological, cultural, psychological, and empirical foundations of education ● CLO3. Explain scientific concepts and methods that overshadow the substance of the field of study in their respective fields ● CLO4. Explain the integration of technology, pedagogy, scientific content, and/or expertise, as well as communication in the context of their respective expertise ● CLO5. Explain the deepening of the field of study according to their expertise in accordance with the environment and developments of the times ● CLO6. Understand the concepts and principles of study and practice of education as a provision for life in the family, community, and environment. ● CLO7. Explain the concept of education in the context of the national education system and development	
Content:	Humans as Beings Need to be Educated, Can Be Educated and Can Be Educated, Educational Practices and Studies, Definition of Education, Educational Environment, Lifelong Education, the National Education System, Educational Problems, History of Indonesian Education, Future Society and Education, Education and Development, Ideals of Education, Factual Foundations of	

<table>
<tr><td></td><td>Education</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO1-7</td><td>Social competences:
a. Individual & groups assignments
b. Attitude
c. Attendance
d. Mid Exam
e. Final Exam</td><td>

Performance

Performance
Performance
Written test
Written test</td><td>

25

10
20
20
25</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, a project to school survey</td></tr>
<tr><td>Literature:</td><td>1. Mudyahardjo, Redja, (2001), Filsafat Ilmu Pendidikan: Suatu Pengantar, PT. Remaja Rosdakarya, Bandung.
2. Mudyahardjo, Redja, (2001), Pengantar Pendidikan, PT. Remaja Rosdakarya,
Bandung.
3. Syarifudin, T., (2008), Landasan Pendidikan, Percikan Ilmu, Bandung.</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1											√	√
CLO2											√	√
CLO3											√	√
CLO4											√	√
CLO5											√	√
CLO6											√	√
CLO7											√	√

MA100 Science, Technology, Engineering and Mathematics (STEM)

Module name:	**Science, Technology, Engineering and Mathematics (STEM)**	
Module-level, if applicable:	Bachelor	
Code:	MA100	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Dr. Ida Kaniawati, M.Si	
Lecturer(s):	Lecturer Team of STEM	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course / Core Expertise Courses of Faculty (MKKF)	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository method, discussion, presentation, simulation). 2. Structured activity: exercise (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study: Project (Creating design/prototype of solution)	150 minutes	30
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 2100 minutes (1.24 ECTS) lectures, 1260 minutes (0.74 ECTS) exercise, 2280 minutes (1.34 ECTS) structured activities, 2520 minutes (1.48 ECTS) self-study per week for 16 weeks.	
Credit points:	4.8 ECTS (3 SKS), 1 SKS = 1.6 ECTS	
Prerequisites course(s):	None	
Course Learning Outcomes:	After taking this course the students have ability to: ● CLO1. Aware and tolerance to real-life problems. ● CLO2. Literate in Mathematics, Science, Technology, and Engineering ● CLO3. Solve social, economic, and environment problems critically, creatively, integrative, and multidisciplinary. ● CLO4. Decide in solving problem by considering the local, national, and global challenges ● CLO5. Collaborate skills in group activities to achieve the goals. ● CLO6. Communicate actively and effectively	
Content:	Food sustainability and Transportation sustainability	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO2,</td><td>Subject Specific competence:
a. Group assignments</td><td>Worksheet</td><td>20</td></tr>
<tr><td>2</td><td>CLO1, CLO3, CLO4</td><td>Generic and social competence:
a. Group assignments</td><td>Communication skills
Product</td><td>15
20</td></tr>
<tr><td>3</td><td>CLO5-6</td><td>b. Peer assessment</td><td>Performance</td><td>15</td></tr>
<tr><td colspan="4">Total</td><td>100</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Powerpoints, zoom meeting, Board, LCD Projector, Laptop/Computer, stream video conference, LMS SPOT UPI</td></tr>
<tr><td>Literature:</td><td>

Osman, Amina & Ladhani, Sultana & Findlater, Emma & Mckay, Veronica. (2017). A Curriculum Framework for the Sustainable Development Goals First Edition.
Arifin,B., Noer Azam, Achsani Drajat Martianto, Linda Karlina Sari, and Ahmad Heri. Firdaus. (2018). Modeling the Future of Indonesian Food Consumption: Final Report. Jakarta: Bappenas, WFP & FAO.
Commission, E. (2001). A Framework for Indicators for the Economic and Social Dimensions of Sustainable Agriculture and Rural Development
Dillemuth,A. (2016). Growing Food Connections Partnership. Planning & Policy Brief
FAO United Nations. (2017). The future of food and agriculture: Trends and challenges. Food and Agriculture Organization of the United Nations. Retrieved from http://www.fao.org/3/a-i6583e.pdf
Food and Agriculture Organization. (2019). Moving Forward on Food Losses and Waste Production. The State of Food and Agriculture
Gabriel, A. S., Ninomiya, K., & Uneyama, H. (2018). The role of the Japanese traditional diet in healthy and sustainable dietary patterns around the world. Nutrients, 10(2). https://doi.org/10.3390/nu10020173 .
Hanh, Nguyen. (2018). Sustainable food systems Concept and framework. FAO.
Critical Issues in Transportation (2018). Transportation Research Board. https://doi.org/10.17226/25314

</td></tr>
</table>

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1	√						√	√			√	
CLO2	√						√	√			√	
CLO3	√						√	√			√	
CLO4	√						√	√			√	
CLO5	√						√	√			√	
CLO6	√						√	√			√	

MA200 Science, Technology, Engineering and Mathematics (STEM) Application

<table>
<tr><td>Module name:</td><td colspan="2">Science, Technology, Engineering and Mathematics (STEM) Application</td></tr>
<tr><td>Module-level, if applicable:</td><td colspan="2">Bachelor</td></tr>
<tr><td>Code:</td><td colspan="2">MA200</td></tr>
<tr><td>Subheading, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Classes, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Semester:</td><td colspan="2">2nd</td></tr>
<tr><td>Module coordinator:</td><td colspan="2">Dr. Ida Kaniawati, M.Si</td></tr>
<tr><td>Lecturer(s):</td><td colspan="2">Lecturer Team of STEM Application</td></tr>
<tr><td>Language:</td><td colspan="2">Bahasa Indonesia</td></tr>
<tr><td>Classification within the curriculum:</td><td colspan="2">Compulsory course / Core Expertise Courses of Faculty (MKKF)</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>1. Lecture (expository method, discussion, presentation, simulation).
2. Structured activity: exercise (assignments based on conceptual, contextual and problem-solving approaches)
3. Self-study: project (Creating design/prototype of solution)</td><td>150 minutes</td><td>40</td></tr>
<tr><td>Workload:</td><td colspan="2">The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 2100 minutes (1.24 ECTS) lectures, 1260 minutes (1.74 ECTS) exercise, 2280 minutes (1.24 ECTS) structured activities, 2520 minutes (1.48 ECTS) self-study per week for 16 weeks.</td></tr>
<tr><td>Credit points:</td><td colspan="2">4.8 ECTS (3 SKS), 1 SKS = 1.6 ECTS</td></tr>
<tr><td>Prerequisites course(s):</td><td colspan="2">MA(100) Science, Technology, Engineering and Mathematics</td></tr>
<tr><td>Course Learning Outcomes:</td><td colspan="2">After taking this course the students have ability to:
● CLO1. Aware and tolerance to real life problems.
● CLO2. Literate in Mathematics, Science, Technology, and Engineering
● CLO3. Solve social, economic, and environment problems critically, creatively, integrative, and multidisciplinary.
● CLO4. Make a decision in solving problems by considering the local, national, and global challenges.
● CLO5. Collaborative skills in group activities to achieve the goals.
● CLO6. Communicate actively and effectively.</td></tr>
<tr><td>Content:</td><td colspan="2">Energy crisis and advanced material technology development</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight (%)</th></tr>
<tr><td>1</td><td>CLO2,</td><td>Subject Specific competence:
a. Group</td><td>Worksheet</td><td>20</td></tr>
</table></td></tr>
</table>

			assignments		
	2	CLO1, CLO3, CLO4	Generic and social competence: a. Group assignments	Communication skills Product	15 20
	3	CLO5 CLO6	b. Peer assessment	Performance	15
	Total				**100**
Forms of media:	Powerpoints, zoom meeting, Board, LCD Projector, Laptop/Computer, LMS SPOT UPI				
Literature:	1. Osman, Amina & Ladhani, Sultana & Findlater, Emma & Mckay, Veronica. (2017). *A Curriculum Framework for the Sustainable Development Goals First Edition*. 2. Robert M. Capraro, Mary Margaret Capraro, James R. Morgan (2013) STEM Project-Based Learning: An Integrated Science, Technology, Engineering, and Mathematics (STEM) Approach, 2nd Ed, SENSE PUBLISHERS ROTTERDAM 3. Coyle, Eugene D. and Simmons, Richard A. (2014), "*Understanding the Global Energy Crisis"*. Purdue University Press. (Knowledge Unlatched Open Access Edition.) 4. Richard M. Felder, Rebecca Brent (2016) Teaching and Learning STEM: a Practical guide, John Wiley and Sons. 5. W.D. Callister, D.G. Rethwisch (2008) Fundamentals of materials science and engineering , John Wiley and Son				

PLO and CLO mapping

	BC-1	BC-2	BC-3	BC-4	BC-5	BC-6	BC-7	BC-8	BC-9	BC-10	BC-11	BC-12
CLO1	√						√	√			√	
CLO2	√						√	√			√	
CLO3	√						√	√			√	
CLO4	√						√	√			√	
CLO5	√						√	√			√	
CLO6	√						√	√			√	

FI120 Basic Mathematics

Module name:	Basic Mathematic	
Module level, if applicable:	Undergraduate	
Code:	FI120	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Andi Suhandi	
Lecturer(s):	Andi Suhandi and Mimin Iryanti	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, discussion and exercises). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	2 hours 30 minutes	35
Workload:	The total workload is 136 hours (4.8 ECTS / 8160 minutes) per semester, consisting of 1800 minutes (1.05 ECTS) lectures, 2160 minutes (1.27 ECTS) structured activities, 2160 minutes (1.27 ECTS) self-study per week for 12 weeks, 600 minutes (0.35 ECTS) for four exams, and 1440 minutes (0.86 ECTS) for four exam preparations.	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Describe the definition of variable and graph of equation CLO2. Describe of the definition of Limits concept CLO3. Apply the limit in solving physics problems CLO4. Describe of the derivatives concept CLO5. Apply the derivatives in solving physics problem CLO6. Describe of the integral concept CLO7. Apply the integral in solving physics problem CLO8. Describe of the transcendence concept CLO9. Apply the transcendence in solving physics problem CLO10. Describe of the Probability concept CLO11. Apply the probability in solving physics problem	

<table>
<tr><td>Content:</td><td>Variable and graph of equation, Limits, Derivatives, Integral, Transcendence, and Probability.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 - 3</td><td>Subject specific competences:
a. Individual assignments
b. Exam 1</td><td>

Written
Written test</td><td>

5%
20%</td></tr>
<tr><td>2</td><td>4 – 5</td><td>a. Individual assignments
b. Exam 2</td><td>Written
Written test</td><td>5%
20%</td></tr>
<tr><td>3</td><td>6 – 7</td><td>a. Individual assignments
b. Exam 3</td><td>Written
Written test</td><td>5%
20%</td></tr>
<tr><td>4</td><td>8 - 11</td><td>a. Individual assignments
b. Exam 4</td><td>Written
Written test</td><td>5%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Varberg, D., Purcell, E. and Rigdon, S., 2007. Calculus with differential equations. Upper Saddle River, N.J.: Pearson Prentice Hall.
2. Rohde, U. (2012). Introduction to integral calculus. Wiley.
3. Bronson, R., & Costa, G. (2014). Schaum's Outline of Differential Equations, 4th Edition. McGraw Hill Professional.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4	√											
CLO5	√											
CLO6	√											
CLO7	√											
CLO8	√											
CLO9	√											
CLO10	√											
CLO11	√											

FI121 Basic Physics 1

Module name:	Basic Physics 1	
Module level, if applicable:	Undergraduate	
Code:	FI121	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Endi Suhendi	
Lecturer(s):	Endi Suhendi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	3 hours 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of: 200 minutes lectures (1.65 ECTS), 240 minutes structured activities (1.98 ECTS), 240 minutes self-study (1.98 ECTS) per week for 14 weeks, 400 minutes for two exams (0.24 ECTS), and 960 minutes for two exam preparations (0.56 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Describe physics quantities, unit systems, unit conversions, scientific notation, significant numbers, and dimensional analysis. CLO2: Describe the definition of vectors and scalars, addition of vectors geometrically, addition of vectors by components, unit vector, multiplication of vectors by scalar and vectors. CLO3: Analyze the basic concepts of mechanics. CLO4: Analyze the basic concepts of fluid. CLO5: Analyze the basic concepts of oscillation and wave. CLO6: Analyze the basic concepts of thermodynamic.	
Content:	Measurement systems and vector, basic concept of mechanics (motion in one dimension, motion in two dimensions, dynamics, work and energy, linear momentum and collisions, rotational motion, static	

<table>
<tr><td></td><td>equilibrium), basic concept of fluid mechanics, basic concept of oscillation and waves, and basic concept of thermodynamics.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 - 3</td><td>Subject specific competences
- Assignment
- Activity class
- Midterm exam</td><td>
Written
Performance
Written test</td><td>
10%
10%
30%</td></tr>
<tr><td>2</td><td>4 - 6</td><td>- Assignment
- Activity class
- Final exam</td><td>Written
Performance
Written test</td><td>10%
10%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. R.A. Serway and J.W. Jewett (2012). Phyisics For Scienctist And Enginers. 9-th Edition. Brooks/Cole Cengage Learning.
2. D.K. Randall (2013). Physisics For Scientists and Enginers. 4-th Edition. Pearson Prentice Hall.
3. Paul Allen Tipler, & Mosca, G. (2008). Physics for scientists and engineers. W.H. Freeman.
4. Walker, J., Resnick, R., & Halliday, D. (2014). Halliday & Resnick fundamentals of physics. John Wiley & Sons, Inc.
5. Giancoli, D. C. (2005). Physics. volume 1 : principles with applications. Pearson/Prentice Hall.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										

FI122 Basic Physics 2

Module name:	Basic Physics 2	
Module level, if applicable:	Undergraduate	
Code:	FI122	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2nd	
Module coordinator:	Endi Suhendi	
Lecturer(s):	Endi Suhendi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	3 hour 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of: 200 minutes lectures (1.65 ECTS), 240 minutes structured activities (1.98 ECTS), 240 minutes self-study (1.98 ECTS) per week for 14 weeks, 400 minutes for two exams (0.24 ECTS), and 960 minutes for two exam preparations (0.56 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Analyze the basic concepts of static electricity. CLO2: Analyze the basic concepts of dynamic electricity. CLO3: Analyze the basic concepts of magnetism. CLO4: Analyze the basic concepts of electromagnetic induction. CLO5: Analyze the basic concepts of inductance. CLO6: Analyze the basic concepts of alternating current circuit. CLO7: Analyze the basic concepts of electromagnetic wave.	
Content:	Static and dynamic electricity, magnetism, electromagnetic induction, inductance, alternating current circuit and introduction to electromagnetic wave.	
Study/exam achievements:		

No	CLO	Assessment Object	Assessment Techniques	Weight
1	1 - 2	Subject specific competences:		

<table>
<tr><td></td><td>
<table>
<tr><td>2</td><td>3 - 7</td><td>- Assignment
- Class Activity
- Midterm exam

Subject specific competences:
- Assignment
- Class Activity
- Midterm exam</td><td>Written
Performance
Written test

Written
Performance
Written test</td><td>10%
10%
30%

10%
10%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
The final mark will be weight as follow:</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. R.A. Serway and J.W. Jewett (2012). Phyisics For Scienctist And Enginers. 9-th Edition. Brooks/Cole Cengage Learning.
2. D.K. Randall (2013). Physisics For Scientists and Enginers. 4-th Edition. Pearson Prentice Hall.
3. Paul Allen Tipler, & Mosca, G. (2008). Physics for scientists and engineers. W.H. Freeman.
4. Walker, J., Resnick, R., & Halliday, D. (2014). Halliday & Resnick fundamentals of physics. John Wiley & Sons, Inc.
5. Giancoli, D. C. (2005). Physics. volume 1 : principles with applications. Pearson/Prentice Hall.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										

FI140 Basic Concepts of Earth and Space

Module name:	Basic Concepts of Earth and Space	
Module level, if applicable:	Undergraduate	
Code:	FI140	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Judhistira Aria Utama	
Lecturer(s):	Judhistira Aria Utama and Nanang Dwi Ardi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	2 hours and 30 minutes	35
Workload:	Total workload is 136 hours (4.8 ECTS) per semester which consists of 150 minutes lectures and a week for geology field camp (1.2 ECTS), 180 minutes structured activities (1.5 ECTS), and 180 minutes self-study per week for 14 weeks (1.5 ECTS), 150 minutes for each exam (0.2 ECTS), and 360 minutes for each exam preparation (0.4 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Explain Earth structure CLO2: Explain rock and mineral identification CLO3: Explain plate tectonics concept and its measurement CLO4: Explain earthquake mechanism CLO5: Explain volcanism CLO6: Explain hydrosphere character CLO7: Explain atmosphere layer and process CLO8: Explain astronomy as a science observation CLO9: Describe astrometry CLO10: Explain basic concept of photometry	

<table>
<tr><td></td><td>CLO11: Explain basic concept of spectroscopy
CLO12: Explain characteristic of solar system
CLO13: Explain galaxy morphology and universe formation model</td></tr>
<tr><td>Content:</td><td>Earth system, rock and mineral, plate tectonics, earthquake, volcanism, hydrosphere, atmosphere, astronomy observation, introduction to astrometry, introduction to photometry, introduction to spectroscopy, solar system and planetary system, HS Diagram and Big Bang Model</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>
1 – 13
1 – 13

1 – 7
8 – 13</td><td>Subject specific competences:
a. Assignments
b. Worksheets
c. Exam
- Mid exam
- Final exam</td><td>
Written
Written

Written test
Written test</td><td>
15%
25%

30%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, rock samples</td></tr>
<tr><td>Literature:</td><td>1. Plummer, C. C., Carlson, D. H., & Hammersley, L. (2016). Physical Geology, 15th edition. McGraw – Hill Education, New York.
2. Rothery, D. (2015). Geology Complete Introduction. McGraw – Hill Companies, Inc. United Kingdom
3. Holt, Rinehart and Winston, Earth Science, Interactive Textbook. A Harcourt Education Company, Austin.
4. Jain, P. (2015). An Introduction to Astronomy and Astrophysics. CRC Press, Boca Raton.
5. Kutner, M.L. (2003). Astronomy: A Physical Perspective, 2nd Edition. Cambridge University Press.
6. Pankaj Jain. (2015). An introduction to astronomy and astrophysics. Crc Press/Taylor & Francis Group.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										
CLO11		√										
CLO12		√										
CLO13		√										

FI220 English

<table>
<tr><td>Module name:</td><td colspan="2">English</td></tr>
<tr><td>Module level, if applicable:</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code:</td><td colspan="2">FI-220</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Classes, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Semester:</td><td colspan="2">1st</td></tr>
<tr><td>Module coordinator:</td><td colspan="2">Judhistira Aria Utama</td></tr>
<tr><td>Lecturer(s):</td><td colspan="2">Judhistira Aria Utama</td></tr>
<tr><td>Language:</td><td colspan="2">English</td></tr>
<tr><td>Classification within the curriculum:</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>1. Lecture (expository method, discussion, presentation, and exercises).
2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches)
3. Self-study (Practical)</td><td>1 hour 40 minutes</td><td>35</td></tr>
<tr><td>Workload:</td><td colspan="2">The total workload is 91 hours (5440 minutes) per semester, consisting of 1000 minutes lectures, 1200 minutes exercise, 1360 minutes structured activities, 1200 minutes self-study per week for 14 weeks, 200 minutes for two exams, and 480 minutes for two exam preparations.</td></tr>
<tr><td>Credit points:</td><td colspan="2">3.2 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td colspan="2">-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td colspan="2">After taking this course the students have ability to:
CLO1: Apply fast reading strategies in understanding scientific texts in English
CLO2: Apply the ideas in written English confidently, well, and correctly
CLO3: Apply the conversations in English
CLO4: Apply the ideas in spoken English confidently, well, and correctly</td></tr>
<tr><td>Content:</td><td colspan="2">Development of student abilities in four domains: reading, writing, listening, and speaking. Grammar-related materials related to their use in everyday conversation are also provided to complement the lecture content.</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">The final mark will be weight as follow:
<table><tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr></table></td></tr>
</table>

	1		Generic competences:		
		1 – 3	a. Weekly Task	Written	15%
			b. Exam		
		1 – 2	- Mid Exam	Written test	25%
		3	- Final Exam	Written test	25%
		4	c. Speak	Performance	35%
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer				
Literature:	1. Hewitt, P.G. (2021) *Conceptual Physics 13th Edition.* Pearson Addison Wesley 2. Murphy, R., (2019). English Grammar in Use. Cambridge University Press. 3. Taylor, L. B., & Weir, C. J. (2012). Research in reading and listening assessment. Cambridge University Press.				

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1									√			
CLO2									√			
CLO3									√			
CLO4									√			

FI221 Entrepreneurship

Module name:	Entrepreneurship	
Module level, if applicable:	Undergraduate	
Code:	FI221	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Nanang Dwi Ardi	
Lecturer(s):	Nanang Dwi Ardi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through discussions and presentation). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (project/stadium general)	1 hour 40 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lectures and one meeting for stadium general (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS	
Prerequisite's course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Create discussion rules and materials for entrepreneurial groups CLO2: Get business ideas from internalizing the field of physics or science studies CLO3: Develop academic democracy in class discussions CLO4: Create discussion and entrepreneurial groups for making business proposal	
Content:	Basic Concepts of Entrepreneurship, Characteristics of entrepreneurship, Entrepreneurial spirit, Ideas and Opportunities New Business, Business management and entrepreneurship strategy, Technic of Business Analysis, Feasibility study in business, Stadium General in Entrepreneurship, Business Ethic, Intellectual	

<table>
<tr><td></td><td>Rights, Making Business Planning and Field study, Business Proposal</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1
CLO2
CLO3
CLO4</td><td>Social competence:
a. Individual assignments
b. Stadium General
c. Proposal Presentation
d. Mid Exam
e. Final Exam</td><td>

Written
Performance
Performance
Written test
Written test</td><td>

10%
15%
25%
25%
25%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, business proposal format</td></tr>
<tr><td>Literature:</td><td>1. Direktorat Jendral Pembelajaran dan Kemahasiswaan, (2013). Modul Pembelajaran Kewirausahaan. Ditjen Pendidikan Tinggi, Kementrian Pendidikan dan Kebudayaan Republik Indonesia.
2. Muis, I, et al, (2015). Modul Kewirausahaan untuk Mahasiswa. Pusat Kewirausahaan Universitas Negeri Makassar.
3. Latief, J. (2016). Kewirausahaan: Kiat Sukses menjadi Wirausaha. Universitas Muhammadiyyah Prof. Dr. Hamka
4. Rusdiana, A., (2014). Kewirausahaan Teori Dan Praktik. Pustaka Setia, Bandung
5. Munawaroh, M., et al (2016). Kewirausahaan Untuk Program Strata 1. LP3M Universitas Muhammadiyyah Yogyakarta, Yogyakarta
6. Razilu, (2013). Strategi Mendaptkan Paten Atas Produk-Produk Inovatif Hasil Karya Dosen Dan Peneliti. Ditjen HKI Kemenkumham RI.
7. Aude d’Andria & Inés Gabarret, (2017). Building 21st Century Entrepreneurship, ISTE Ltd and John Wiley & Sons, Inc</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1						√						
CLO2						√						
CLO3						√						
CLO4						√						

FI222 Mathematical Physics I

Module name:	Mathematical Physics I	
Module level, if applicable:	Undergraduate	
Code:	FI222	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2nd	
Module coordinator:	Andi Suhandi	
Lecturer(s):	Andi Suhandi and Mimin Iryanti	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	3 hours 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 40 hours/2400 minutes lectures (1.41 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 12 weeks, 29 hour 11 minutes for four exams (1.03 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: CLO1: Explain the concept of matrix (notation, terminology), matrix algebra operations, types of matrices, the properties of determinants, co-factors, Cramer's rules, Singular Matrix, Inverse Matrix, Orthogonal Matrix, Adjoin Matrix, trace matrix. CLO2: Explain about finding singular matrices, inverse matrices, orthogonal matrices, adjoining matrices, trace matrices. CLO3: Explain the use of matrices in solving simultaneous linear equations, solving the problem of eigenvalues and matrix diagonalization	

	CLO4:	Explain about partial and total differential (definitions and notations), the differential concepts in approximate calculations, the chain rules, implicit differentiation, and more extended chain rules.
	CLO5:	Apply the concept of partial differentiation in the ordinary maximum and minimum value problem, and the maximum, minimum problem is constrained using Lagrange multipliers
	CLO6:	Explain about finding the differentiation of an integral using Leibniz's rule, the double and triple integrals.
	CLO7:	Apply the concept of double and triple integration in solving relevant math and physics problems.
	CLO8:	Explain about variable changes in fold integrals using the Jacobian concept, the surface integrals.
	CLO9:	Explain of ordinary differential equations, notation, and terminology, the formulating GDP from a physical phenomenon, to finding a first order PDB solution using various methods: variable separation method; exact. Bernoulli, Linear, Homogeneous, the second-order GDP solution that has a constant and homogeneous coefficient, to finding a second-order non-homogeneous GDP solution using the following methods: order reduction, indeterminate coefficients, parameter variations,
	CLO10:	Apply the concept of GDP in solving relevant Physics problems.
	CLO11:	Explain the calculus of variations for Stationary value problems (notation and terminology), the Fermat's principles in optical problems, the Euler equations in various types of variables, the Lagrange equations, and Hamiltonian principles,
	CLO12:	Apply the Hamiltonian principle in Mechanics problems,
	CLO13:	Explain the Van Baak variation principle
	CLO14:	Ability to apply the principle of the Van Baak variation in solving direct current electric circuit problems.
	CLO15:	Explain the power series (notation and terminology), the power series convergence test using various testing techniques, the function in power series (Taylor and McLaurin series)
	CLO16:	Apply the concept of power series in solving relevant math and physics problems.
	CLO17:	Explain the Fourier series for periodic functions, notation and terminology, the Dirichlet's condition, the odd, even, and not odd periodic functions.
	CLO18:	Expalin about expressing a periodic function in Fourier sine series, Fourier cosine series, and Fourier Sine-Cosine series
	CLO19:	Explain Parseval's theorem and Fourier's Spectrum,
	CLO20	Apply the concept of the Fourier series in relevant Physics problems.
Content:	Matrix, The partial and total differential, The Integral, the ordinary differential equations, the calculus of variations for Stationary value problems, the power series	
Study/exam achievements:		

No	CLO	Assessment Object	Assessment Techniques	Weight
1		Subject specific competences:		

<table>
<tr><td></td><td>
<table>
<tr><td></td><td>1 – 20

1 – 3
4 – 8
9 – 14
15 – 20</td><td>a. Individual assignments
b. Exam:
- Exam 1
- Exam 2
- Exam 3
- Exam 4</td><td>Written

Written test
Written test
Written test
Written test</td><td>20%

20%
20%
20%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
The final mark will be weight as follow:
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>

Boas, M. L. (2015). Mathematical methods in the physical sciences. Wiley.
Farlow, S. J., (2006), An Introduction to Differential Equations and Their Applications, Dover Publications.
Jain, M. C. (2018). Vector spaces, matrices and tensors in physics. Alpha Science International, Limited.
Blanchard, P., & Bruening, E. (2012). Mathematical Methods in Physics. Springer Science & Business Media.
Forinash, K. (2009). Mathematical methods in physics - partial differential equations, fouriers. A K Peters.
Neuenschwander, D. E. (2015). Tensor calculus for physics: a concise guide. Johns Hopkins University Press.

</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4	√											
CLO5	√											
CLO6	√											
CLO7	√											
CLO8	√											
CLO9	√											
CLO10	√											
CLO11	√											
CLO12	√											
CLO13	√											
CLO14	√											
CLO15	√											
CLO16	√											
CLO17	√											
CLO18	√											
CLO19	√											
CLO20	√											

FI223 Basic Physics Experiment I

Module name:	Basic Physics Experiment I	
Module level, if applicable:	Undergraduate	
Code:	FI223	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1st	
Module coordinator:	Mimin Iryanti	
Lecturer(s):	Mimin Iryanti and Selly Feranie	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository method, discussion, presentation, Inquiry and experiment). 2. Structure activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	1 hour 40 minutes	20
Workload:	Total workload is 90 hours 3,2 ECTS (5440 minutes) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.98 ECTS) structured activities, 1680 minutes (0.98 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	3,2 ECTS (2 SKS)	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: CLO1: Apply the concept of fundamental physics 1 CLO2: Measure physical quantities CLO3: Explain about measurement errors. CLO4: Develop the basic physics experiments CLO5: Complete the given practicum assignments according to the quality standards and the time allotted. CLO6: Retrieve and process fundamental physics experimental data. CLO7: Communicate the results of basic physics experiments.	

<table>
<tr><td></td><td>CLO8: Compile reports on the results of fundamental physics experiments.
CLO9: Apply academic ethics and disciple during lectures.</td></tr>
<tr><td>Content:</td><td>This course is a compulsory subject for Physics study program students who provide knowledge and skills to experiment with basic physics concepts. The topics/titles of the experiment include: basic measurement, spring oscillations, pendulum swings, dynamic trains, Atwood planes, viscosity, calorimeters</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 - 9</td><td>Subject specific competences:
a. Individual assignments
b. Class activity
c. Mid exam
d. Final exam</td><td>
Written
Performance
Written test
Written test</td><td>
20%
40%
20%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>

1. Squires, G. L. (2012). Practical Physics. Cambridge University Press.
2. Shailaja Mahamuni, et al. (2020). Foundations of Experimental Physics. CRC Press.
3. Werner Boeglin, (2022), a summary of Error Analysis and Statistical Method, Wanda Fiu. Edu
4. P.N Kaloyerou, 2018, Basic Concepts of Data and Error Analysis: With Introduction to Probability and Statistics and Computer Methods, Springer.
5. Herman. (2011). A Student's Guide to Data and Error Analysis. Cambridge University Press.
6. Ostdiek, V. J., & Bord, D. J. (2005). Inquiry into physics. Thomson Brooks/Cole.
7. Steven Adam & Jonathan Allday, (2013), Advance Physics, 2nd Edition, Oxford.
8. M.I. Pergament, (2015), Methods of Experimental Physics, Taylor and Francis Group.
9. Paul Allen Tipler, & Mosca, G. (2008). Physics for scientists and engineers. W.H. Freeman.
10. Walker, J., Resnick, R., & Halliday, D. (2014). Halliday & Resnick fundamentals of physics. John Wiley & Sons, Inc.
11. Giancoli, D. C. (2005). Physics. volume 1: principles with applications. Pearson/Prentice Hall.

</td></tr>
</table>

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								
CLO7				√								
CLO8				√								
CLO9				√								

FI224 Basic Physics Experiment II

Module name:	Basic Physics Experiment II	
Module level, if applicable:	Undergraduate	
Code:	FI224	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2nd	
Module coordinator:	Mimin Iryanti	
Lecturer(s):	Mimin Iryanti and Selly Feranie	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository method, discussion, presentation, and experiment). 2. Structure activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	100 minutes	20
Workload:	Total workload is 90 hours 3.2 ECTS (5440 minutes) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.98 ECTS) structured activities, 1680 minutes (0.98 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	4.8 ECTS (3 SKS)	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: CLO1: Explain various methods in a physics experiment CLO2: Describe about measurement error. CLO3: Measure physical quantities. CLO4: Develop basic physics experiments. CLO5: Retrieve and process primary physics experimental data CLO6: Communicate the results of fundamental physics experiments. CLO7: Compile reports on the results of fundamental physics experiments. CLO8: Apply academic ethics discipline during lectures	
Content:	Electrical circuits, Switch circuits, capacitors, magnetism, self-inductance, optics (reflection and refraction of light)	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 - 8</td><td>Subject specific competences:
a. Individual assignments
b. Class activity
c. Mid exam
d. Final exam</td><td>

Written

Performance
Written test
Written test</td><td>

20%

40%
20%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>
Squires, G. L. (2012). Practical Physics. Cambridge University Press.
Shailaja Mahamuni, et al. (2020). Foundations of Experimental Physics. CRC Press.
Werner Boeglin, (2022), a summary of Error Analysis and Statistical Method, Wanda Fiu. Edu
P.N Kaloyerou, 2018, Basic Concepts of Data and Error Analysis: With Introduction to Probability and Statistics and Computer Methods, Springer.
Herman. (2011). A Student’s Guide to Data and Error Analysis. Cambridge University Press.
Ostdiek, V. J., & Bord, D. J. (2005). Inquiry into physics. Thomson Brooks/Cole.
Steven Adam & Jonathan Allday, (2013), Advance Physics, 2nd Edition, Oxford.
M.I. Pergament, (2015), Methods of Experimental Physics, Taylor and Francis Group.
Paul Allen Tipler, & Mosca, G. (2008). Physics for scientists and engineers. W.H. Freeman.
Walker, J., Resnick, R., & Halliday, D. (2014). Halliday & Resnick fundamentals of physics. John Wiley & Sons, Inc.
Giancoli, D. C. (2005). Physics. volume 1: principles with applications. Pearson/Prentice Hall (2001). FISIKA, UntukSainsdanTeknik, Erlangga-Jakarta
</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								
CLO7				√								
CLO8				√								

FI240 Mathematical Physics II

Module name:	Mathematical Physics II	
Module level, if applicable:	Undergraduate	
Code:	FI240	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Andi Suhandi	
Lecturer(s):	Andi Suhandi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory Course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	3 hours 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 40 hours/2400 minutes lectures (1.41 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 12 weeks, 29 hour 11 minutes for four exams (1.03 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Mathematical Physics I	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Explain vector quantities, notations, and terminology, as well as examples in physics. CLO2: Apply vector addition, multiplication of vector quantities, differentiation of vector quantities, and integration of vector quantities. CLO3: Apply conceptual and procedural knowledge about solving a problem of integration of a function by using various special functions in the integral form. CLO4: Apply conceptual and procedural knowledge about solving a problem using Legendre polynomials, Legendre series, various forms and types of Bessel functions, Hankel functions, Laguerre polynomials and Hermite polynomials. CLO5: Apply conceptual and procedural knowledge about the use of various partial differential equations, Laplace equation,	

<table>
<tr><td></td><td>diffusion equation, and wave equation in the study and analysis of a relevant physical phenomenon.
CLO6: Apply conceptual and procedural knowledge about the use of various mathematical operations of complex numbers.
CLO7: Apply conceptual and procedural knowledge about the use of complex variable functions in solving the relevant problem.
CLO8: Apply conceptual and procedural knowledge of integral transforms, Laplace transforms, Fourier transforms, convolutions, Parseval theorem, inverse Laplace transforms (Bromwich Integral), delta Dirac functions, and Green-functions.</td></tr>
<tr><td>Content:</td><td>Vector Analysis, Special Functions-1 (Gamma, Beta, Error, Zeta-Riemann Function, Stirling's Formula, and Elliptic Integral), Special Function-2 (Legendre Polynomials, Bessel Function, Lagguere Polynomial, Hermite Polynomial), Partial Differential Equations, Complex number, Function of a Complex Variable, and Integral Transforms.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 – 8

1 – 2
3 – 4
5 – 6
7 – 8</td><td>Subject specific competences:
a. Individual assignments
b. Exam:
- Exam 1
- Exam 2
- Exam 3
- Exam 4</td><td>Written

Written test
Written test
Written test
Written test</td><td>20%

20%
20%
20%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Boas, M. L. (2015). Mathematical methods in the physical sciences. Wiley.
2. Farlow, S. J., (2006), An Introduction to Differential Equations and Their Applications, Dover Publications.
3. Jain, M. C. (2018). Vector spaces, matrices and tensors in physics. Alpha Science International, Limited.
4. Blanchard, P., & Bruening, E. (2012). Mathematical Methods in Physics. Springer Science & Business Media.
5. Forinash, K. (2009). Mathematical methods in physics - partial differential equations, fouriers. A K Peters.
6. Neuenschwander, D. E. (2015). Tensor calculus for physics: a concise guide. Johns Hopkins University PressFarlow, S. J., (2006), An Introduction to Differential Equations and Their Applications, Dover Publications.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4	√											
CLO5	√											
CLO6	√											
CLO7	√											
CLO8	√											

FI241 Analog Electronics

Module name:	Analog Electronics	
Module level, if applicable:	Undergraduate	
Code:	FI241	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Ahmad Aminudin	
Lecturer(s):	Ahmad Aminudin	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature and experiment project electronic circuit)	2 hours 30 minutes	35
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Basic Physics 1, Basic Physics 2	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Describe the role of electronics in the industrialization era, CLO2: Describe the principles of analog and digital signal representation, CLO3: Analyze the behavior of semiconductor materials), currents in semiconductors, currents, and capacitance of PN junctions, CLO4: Describe the principles of ideal diodes, PN junctions, Reverse and Zener models CLO5: Apply diode circuits for rectification, limiting and clamping,	

<table>
<tr><td></td><td>CLO6: Characterize current-voltage, direct current circuit, basic amplifier,
CLO7: Analyze small signal model, small signal amplifier analysis,
CLO8: Describe the Biased Circuits, Transistor Discrete Amplifiers,
CLO9: Describe Thyristor concept: PNPN, DIAC TRIAC and SCS basic devices,
CLO10: Analyze the structure and workings of the device, the characteristics of the voltage current, the direct current circuit of the MOSFET,
CLO11: Utilize the MOSFET: Basic power amplifier, small signal model, small signal amplifier analysis, bias circuit and MOSFET amplifier,
CLO12: Apply Operational Amplifiers: inverting and non-inverting, differentiators, integrators, and detectors,
CLO13: Describe the oscillators and filters.</td></tr>
<tr><td>Content:</td><td>This course is a core expertise course of the Study Program. In this course, students will study Introduction, signal representation, Semiconductors: the behavior of semiconductor materials, currents in semiconductors, currents and capacitance of PN junctions; Diodes: ideal, PN junctions, Reverse and Zener models, rectifier circuits, limiting and clamping; Transistor: Current-voltage characteristic, Direct current circuit, Basic amplifier, small signal model, small signal amplifier analysis, Bias circuit, Transistor discrete amplifier. Thyristor: PNPN, DIAC TRIAC and SCS basic devices. MOSFET: device structure and operation, characteristics of current voltage, direct current circuit, Basic power amplifier, small signal model, analysis of small signal amplifiers, bias and amplifier circuits. Operational Amplifiers: Inverting and non-inverting, differentiator, integrator and Detectors, Operational Amplifiers (Op-Amp), Oscillators and Filters.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO13</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>
Written

Written Test
Written Test</td><td>
20 %

25%
25%</td></tr>
<tr><td>2</td><td>CLO5, CLO6, CLO11</td><td>Subject specific competences:
a. Class Activity
b. Experiment</td><td>
Performance
Performance</td><td>
10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Bob Dobkin and John Hamburger. (2015). Analog Circuit Design, First edition. Linear Technology Corporation. Published by Elsevier Inc.
2. Williams, J. (2016). Analog Circuit Design. Elsevier Science & Technology.</td></tr>
</table>

	3. Paul Horowitz & Winfield Hill. (2015). *The art Electronis third edition 2015*, Cambridge University Press 4. Boylestad, et al. (2013). *Electronic Devices and Theory, eleventh edition*, Pearson Education, Inc.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4			√									
CLO5			√									
CLO6			√									
CLO7			√									
CLO8			√									
CLO9			√									
CLO10			√									
COL11			√									
CLO12			√									
CLO13			√									

FI242 Algorithm and Programming

Module name:	Algorithm and Programming	
Module level, if applicable:	Undergraduate	
Code:	FI242	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4th	
Module coordinator:	Waslaluddin	
Lecturer(s):	Waslaluddin	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and experiment). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	2 hours 30 minutes	35
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Basic Physics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Explain Algorithm, Basic Algorithm Structure, Algorithmic Notation, Types of operators and expressions. CLO2: Apply a certain programming language to execute/ run algorithms. CLO3: Apply information technology to engineer algorithms into programming languages. CLO4: Formulate physical symptom algorithms through programming languages for physical symptom solutions. CLO5: Generate physical model algorithms for implementation in programming languages. CLO6: Analyse alternative solutions in various physical symptom solution algorithms. CLO7: Report the results of making physical symptom application products through the stages of algorithms, data	

<table>
<tr><td></td><td>structures and programming.</td></tr>
<tr><td>Content:</td><td>Algorithms and Programming are compulsory basic programming skills, but because they must be applied to physics problems and prioritize computer simulations, the position of this course is placed after Basic Physics as a necessary condition. This course provides an understanding of factual knowledge, conceptual and procedural principles, concepts and techniques of Algorithms and computer Programming and practice and can apply them to problems of physics relevant. Able to solve problems in the field of physics application systems systematically with planning based on algorithms. Mastering basic knowledge of programming algorithms. Knowing the Programming language platform such as C and Java. The material for this course includes (1) Introduction to Algorithms (2) Basic structure of algorithms (3) Algorithmic Notation (4) Types of operators and expressions (5) Sequencing (6) Selection/conditional (7) Looping (8) Introduction to Programming Modular (Procedures and Functions) (9) Array (10) Matrix (11) Search Algorithm (12) Sort Rhythm (13) Recursive Rhythm Algorithm</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO6</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>
Written

Written Test
Written Test</td><td>
20 %

25%
25%</td></tr>
<tr><td>2</td><td>CLO7</td><td>Subject specific competences:
c. Class Activity
d. Experiment report</td><td>
Performance
Written</td><td>
10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Lee, K. D., & Hubbard, S. (2015). Data structures and algorithms with Python. Springer.
2. Chun, W. (2012). Core Python applications programming. Prentice Hall.
3. Jaworski, Michał., & ZiadéT. (2019). Expert Python Programming: Become a Master in Python by Learning Coding Best Practices and Advanced Programming Concepts in Python 3.7. Packt Publishing, Limited.
4. Waslaluddin (2019) Practical Instructions, unpublished</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2			√									
CLO3			√									
CLO4					√							
CLO5					√							
CLO6					√							
CLO7					√							

FI340 Mechanics

Module name:	Mechanics	
Module level, if applicable:	Undergraduate	
Code:	FI340	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Selly Feranie	
Lecturer(s):	Selly Feranie	
Language:	Bahasa Indonesia	
Classification within the curriculum	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	3 hours 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 40 hours/2400 minutes lectures (1.41 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 12 weeks, 29 hour 11 minutes for four exams (1.03 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Basic Physics I, Mathematical Physics I, Mathematical Physics II	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Apply procedural knowledge and mathematics skills in solving problems of kinematics particles systematically and logically CLO2: Apply procedural knowledge and mathematics skills in solving problems of dynamics of particles systematically and logically CLO3: Apply procedural knowledge and mathematics skills in solving problems of oscillations systematically and logically CLO4: Apply procedural knowledge and mathematics skills in solving problems of gravitation and central field systematically and logically CLO5: Apply procedural knowledge and mathematics skills in solving problems of non-inertial reference frame systematically and logically CLO6: Apply procedural knowledge and mathematics skills in solving problems of dynamics of system particles	

<table>
<tr><td></td><td>systematically and logically
CLO7: Apply procedural knowledge and mathematics skills in solving problems of mechanics of rigid bodies systematically and logically
CLO8: Apply procedural knowledge and mathematics skills in solving problems of Lagrangian mechanics systematically and logically
CLO9: Apply basic programming, computational physics to solve physics-related problems</td></tr>
<tr><td>Content:</td><td>Kinematics particle, Dynamics particle, oscillation, Gravitation and Central Field, Non-inertial reference frame, dynamics of System Particles, Mechanics of Rigid bodies, Lagrangian Mechanics</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>9

1 – 2
3 – 4
5 – 6
7 – 8</td><td>Subject specific competences:
a. Individual assignments

b. Exam
- Exam 1
- Exam 2
- Exam 3
- Exam 4</td><td>Written and programming-based problem

Written test
Written test
Written test
Written test</td><td>40%

15%
15%
15%
15%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. John L. Bohn. (2018). A Student's Guide to Analytical Mechanics (Student's Guides) 1st Edition
2. Hamill, P., & Cambridge University Press. (2018). A student's guide to Lagrangians and Hamiltonians. Cambridge University Press.
3. Grant R. Fowles and George L. Cassiday (2004), Analytical Mechanics 7th Edition, Publisher Cengage Learning
4. David Morin. (2008). Introduction to Classical Mechanics with Problems and Solutions, Cambridge university press
5. Deshmukh, P. C. (2019). Foundations of classical mechanics. Cambridge University Press.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9					√							

FI341 Thermodynamics

Module name:	Thermodynamics	
Module level, if applicable:	Undergraduate	
Code:	FI-341	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Lilik Hasanah	
Lecturer(s):	Lilik Hasanah	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches). 3. Self-study (reading literature)	2 hours 30 minutes	35
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Basic Physics I and II, Basic Mathematic, Mathematical Physics I and II	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Describe thermodynamic coordinates for hydrostatic, dielectric, and paramagnetic systems. CLO2: Analyse mathematics for thermodynamics and its applications CLO3: Describe temperature and its measurements are based on the zeroth law of thermodynamics. CLO4: Describe the first law of thermodynamics. CLO5: Describe the second law of thermodynamics and its application in various cycles of combustion engines and cooling engines. CLO6: Analyse the Carnot cycle and reversibility. CLO7: Analyse the Entropy. CLO8: Analyse the Thermodynamic potential.	

<table>
<tr><td>Content:</td><td>Thermodynamic coordinates for hydrostatic, dielectric, and paramagnetic systems; mathematics for thermodynamics and its applications, temperature and its measurements are based on the zeroth law of thermodynamics; working principle of various thermometers based on their thermometric properties; systems and equations of state; quasistatic processes in thermodynamics; external mechanical effort; the first law of thermodynamics for closed systems; Ideal Gases; the second law of thermodynamics and its application in various cycles of combustion engines and cooling engines; Carnot cycle and reversibility, entropy, thermodynamic potential, and the complete formulation of thermodynamics according to Maxwell's formula.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 - CLO8</td><td>Subject specific competences:
a. Individual assignments
b. Exam:
- Quiz
- Mid exam
- Final exam</td><td>

Written

Written test
Written test
Written test</td><td>

10 %

30 %
30 %
30 %</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Çengel Y. A., & Boles, M. A. (2011). Thermodynamics: an engineering approach. Mcgraw-Hill.
2. Granet, I., Alvarado, J., & Bluestein, M. (2020). Thermodynamics and Heat Power, Ninth Edition. CRC Press.
3. Saeful Karim. (2001). Matematika untuk Termodinamika (Diktat), Jurusan Pendidikan Fisika FPMIPA UPI.
4. Paul Allen Tipler, & Mosca, G. (2008). Physics for scientists and engineers. W.H. Freeman.
5. Steane, A. M. (2017). Thermodynamics. Oxford University Press.
6. Wolfgang Nolting. (2017). Theoretical physics. 5, Thermodynamics. Springer.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2	√											
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										

FI342 Optics

Module name:	Optics	
Module-level, if applicable:	Undergraduate	
Code:	FI342	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Wiendartun	
Lecturer(s):	Wiendartun	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions, exercises and presentation). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches, Presentation) 3. Self-study (reading literature)	1 hour 40 minutes	35
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11hour 54 minutes/714 minutes for two exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Analyze geometrical optics, CLO2: Explain the working principle of optical instruments, CLO3: Analyze physical optics.	
Content:	Concept of: Geometric Optics, Optical instruments, Physical Optics	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 - 3</td><td>Subject specific competences:
a. Individual assignments</td><td>Written</td><td>20 %</td></tr>
<tr><td></td><td>CLO1
CLO3</td><td>b. Exam
- Midterm exam
- Final exam</td><td>Written test
Written test</td><td>30%
30%</td></tr>
<tr><td>2</td><td>CLO2</td><td>c. Presentation</td><td>Performance</td><td>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector and Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Sears dan Zemansky (2003). University Physics Volume 2, 10th edition, Erlangga, Indonesia
2. Jenkins, F. A., & Harvey Elliott White. (2018). Fundamentals of optics. Mcgraw-Hill.
3. Singh, D. (2015). Fundamentals of optics, second edition. Phi learning pvt. Ltd.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√										
CLO 2		√										
CLO 3		√										

FI343 Fluid Physics

Module name:	Fluid Physics	
Module level, if applicable:	Undergraduate	
Code:	FI-343	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Judhistira Aria Utama	
Lecturer(s):	Judhistira Aria Utama	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and presentation). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches, Presentation) 3. Self-study (reading literature)	1 hour 40 minutes	35
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11hour 54 minutes/714 minutes for two exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course, the students have ability to: CLO1: Explain the basic principles of fluid physics and to describe various types of fluid flow that are encountered in everyday life. CLO2: Determine the variation of pressure in a fluid at rest and calculate the pressure and momentum exerted by a fluid at rest against the flat and curved walls of an immersed plane. CLO3: Describe Lagrangian and Eulerian: velocity fields and acceleration fields. CLO4: Apply Reynolds transport theorem. CLO5: Differences the characteristics of laminar and turbulent flow based on the Reynolds number. CLO6: Identify the various forces and momentum acting on the	

<table>
<tr><td></td><td>control volume.
CLO7: Describe the usefulness and limitations of the Bernoulli equation in its application to various fluid flow problems.
CLO8: Explain the general properties of internal flow: laminar, transition, and turbulent.
CLO9: Explain the general properties of external flow, the concept of drag and lift and be able to determine the magnitude and direction of these forces
CLO10: Apply the concept of similarity and be able to apply it in experimental modeling.
CLO11: Design and construct simple educational teaching aids as a medium for learning fluid physics in independent work and teamwork</td></tr>
<tr><td>Content:</td><td>(i)FLUID STATICS includes measures of mass and fluid weight, laws, principles, and basic equations, variations in static fluid pressure, hydrostatic forces on flat and curved surfaces; (ii) FLUID KINEMATICS including velocity field, acceleration field, Reynolds transport theorem, laminar flow, turbulent flow; (iii) FLUID DYNAMICS includes Newton's second law, Bernoulli's equation and the application limitations of Bernoulli's equation, viscous flow in pipes, flow in immersed bodies (lift and drag), and dimensional analysis & modelling.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO10</td><td>Subject specific competences:
a. Weekly Task
b. Exam:
- Mid exam
- Final exam</td><td>

Written

Written test
Written test</td><td>

20%

30%
30%</td></tr>
<tr><td>2</td><td>CLO 11</td><td>c. Presentation</td><td>Performance</td><td>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Cengel, Y.A. & Cimbala, J.M. (2017). Fluid Mechanics: Fundamentals and Applications 4th Edition. McGrawHill
2. Munson, B.R. dkk. (2018). Fundamentals of Fuid Mechanics 8th Edition. John Willey and Sons Inc.
3. Massey, B. S., & Ward-Smith, A. J. (2018). Mechanics of fluids. Crc Press.
4. Franz Durst. (2008). Fluid mechanics an introduction to the theory of fluid flows; with 13 tables. Berlin Heidelberg Springer.</td></tr>
</table>

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										
CLO11		√										

FI344 Electricity and Magnetism

Module name:	Electricity and Magnetism	
Module level, if applicable:	Undergraduate	
Code:	FI344	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4th	
Module coordinator:	Selly Feranie	
Lecturer(s):	Selly Feranie	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	3 hour 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 40 hours/2400 minutes lectures (1.41 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 12 weeks, 29 hour 11 minutes for four exams (1.03 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Basic Physics II, Mathematical Physics I, Mathematical Physics II	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Apply procedural knowledge and mathematics skills in solving problems of electrostatics systematically and logically CLO2: Apply procedural knowledge and mathematics skills in solving problems of electric field in matter systematically and logically CLO3: Apply procedural knowledge and mathematics skills in solving problems of magneto statics systematically and logically CLO4: Apply procedural knowledge and mathematics skills in solving problems of magnetic field in matter systematically and logically CLO5: Apply procedural knowledge and mathematics skills in solving	

<table>
<tr><td></td><td>problems of electro dynamics systematically and logically
CLO6: Apply procedural knowledge and mathematics skills in solving problems of Maxwell equations in boundary and matter systematically and logically
CLO7: Design a project that solve problems related to electricity and magnetism</td></tr>
<tr><td>Content:</td><td>Electrostatics, electric field in matter, magnetostatics, magnetic field in matter, electrodynamics</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – 8

CLO1
CLO2 - 3
CLO4 - 5
CLO6 - 7</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Exam 1
- Exam 2
- Exam 3
- Exam 4</td><td>
Written

Written test
Written test
Written test
Written test</td><td>
20%

20%
20%
20%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. David J. Griffiths, (2017), Introduction to Electrodynamics 4th Edition, Cambridge University Press
2. Joseph Edminister, (2013), Schaum's Outline of Electromagnetics, 4th Edition (Schaum's Outlines) 4th Edition, McGraw-Hill Education
3. Noah M MacKay, (2020), Theory of Physics, Volumes 1 & Classical Mechanics & Electromagnetism, independently published</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										

FI345 Wave

Module name:	Wave	
Module level, if applicable:	Undergraduate	
Code:	FI345	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4th	
Module coordinator:	Andhy Setiawan	
Lecturer(s):	Andhy Setiawan	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	3 hour 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 40 hours/2400 minutes lectures (1.41 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 12 weeks, 29 hour 11 minutes for four exams (1.03 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Basic Physics 1 (FI121), Basic Physics 2 (FI122), Mathematical Physics 1 (FI222)	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Analyze oscillation and kinematics of waves. CLO2: Analyze mechanical waves. CLO3: Analyze electromagnetic waves. CLO4: Analyze interference, diffraction, and modulation of waves.	
Content:	Oscillation, Kinematics of Waves, Mechanical Waves, Electromagnetics Waves, Interference and Diffraction, Modulation of Waves.	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td></td><td></td><td>Subject specific competences</td><td></td><td></td></tr>
<tr><td>1</td><td>CLO1</td><td>- Assignment
- Exam 1</td><td>Written
Written test</td><td>10%
15%</td></tr>
<tr><td>2</td><td>CLO2</td><td>- Assignment
- Exam 2</td><td>Written
Written test</td><td>10%
15%</td></tr>
<tr><td>3</td><td>CLO3</td><td>- Assignment
- Exam 3</td><td>Written
Written test</td><td>10%
15%</td></tr>
<tr><td>4</td><td>CLO4</td><td>- Assignment
- Exam 4</td><td>Written
Written test</td><td>10%
15%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS, internet line.</td></tr>
<tr><td>Literature:</td><td>1. Daniel Fleisch and Laura Kinnaman, (2015), A Students Guide to Waves, Cambridge University Press, UK
2. Towne, D. H. (2014). Wave Phenomena. Dover Publications.
3. Elmore, W. C. (2012). Physics of Waves. Dover Publications.
4. Hirose, A., & Karl Erik Lonngren. (2003). Introduction to Wave Phenomena.
5. H. John Pain. (2005). The Physics of Vibrations and Waves. John Wiley & Sons Incorporated.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										

FI346 Volcano Physics

Module name:	Volcano Physics	
Module level, if applicable:	Undergraduate	
Code:	FI346	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Nanang Dwi Ardi	
Lecturer(s):	Nanang Dwi Ardi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	100 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Explain volcano definition CLO2: Explain magma CLO3: Identify form and structure of volcano CLO4: Describe volcano eruption CLO5: Explain rock volcano's concept CLO6: Explain Volcano and geothermal potency CLO7: Explain volcano mitigation hazard CLO8: Explain Paleo Volcano definition CLO9: Describe the method of volcano identification CLO10: Explain Paleo Volcano in Indonesia CLO11: Analyse Krakatau as submarine volcano based on scientific data	

<table>
<tr><td>Content:</td><td>Volcano definition and Volcano in Indonesia, Magma, Form and Volcano structure, Volcano Eruption, The rock of volcano, Volcano and geothermal, Volcano mitigation hazard, Paleo volcano, Identification volcano activities, Paleo volcano in Indonesia, Krakatau special case.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1-CLO11</td><td>Subject specific competence:
a. Individual assignments
b. Mid Exam
c. Final Exam</td><td>

Written test

Written test
Written test</td><td>

30%

35%
35%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, relevant volcano documentary movie</td></tr>
<tr><td>Literature:</td><td>1. Plummer, C.C., et al. (2016). Physical Geology, 15th edition. McGraw – Hill Education, New York.
2. Holt, Rinehart and Winston. (2018). Earth Science, Interactive Textbook. A Harcourt Education Company, Austin.
3. Rothery, D. (2015). Geology Complete Introduction. McGraw – Hill Companies, Inc. United Kingdom</td></tr>
</table>

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								
CLO7				√								
CLO8				√								
CLO9				√								
CLO10				√								
CLO11					√							

FI347 Information and Communication Technology

Module name:	Information and Communication Technology	
Module level, if applicable:	Undergraduate	
Code:	FI347	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3rd	
Module coordinator:	Waslaludin	
Lecturer(s):	Waslaludin	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and simulation). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	1 hour 40 minutes	35
Workload:	Total workload is 90 hours 3,2 ECTS (5440 minutes) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.98 ECTS) structured activities, 1680 minutes (0.98 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: CLO1: Explain industrial revolution 4.0 and society 5.0. CLO2: Explain information communication technology and Office Applications. CLO3: Explain cloud computing and web programming CLO4: Explain visual programming, visual "block" programming code studio. CLO5: Explain Neuro-linguistic programming. CLO6: Explain the concept of digitalization of automation in Revolution Industry 4.0. CLO7: Explain Learn digital literacy 1, improvement of positive	

<table>
<tr><td></td><td>content skills such as fact-checking, influencers, blogging, YouTubers, and wisdom social media, digital economic development such as online sales, digital start-ups, and also digital parenting.
CLO8: Explain digital literacy 2, improved anti-negative content skills such as hoaxes, cyberbullying, hate speech, pornography, piracy, radicalism, and racial intolerance
CLO9: Explain digital literacy 3, development of digital transformation skills such as coding, big data analytics, cybersecurity, privacy awareness, regulation, and artificial intelligence.</td></tr>
<tr><td>Content:</td><td>Industrial Revolution 4.0 and Society 5.0; Information Communication Technology and Office Applications; cloud computing and web programming; visual programming, visual "block" programming code studio; Neuro-linguistic programming; The concept of digitalization of automation in Revolution Industry 4.0; Learn digital literacy 1 (improvement of positive content skills such as fact-checking, influencers, blogging, YouTubers, and wisdom social media, digital economic development such as online sales, digital start-ups, and also digital parenting); digital literacy 2 (improved anti-negative content skills such as hoaxes, cyberbullying, hate speech, pornography, piracy, radicalism, and racial intolerance); digital literacy 3 (development of digital transformation skills such as coding, big data analytics, cybersecurity, privacy awareness, regulation, and artificial intelligence)</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 – 5</td><td>Subject specific competences:
a. Individual assignments
b. Mid Exam</td><td>
Written
Written test</td><td>
10%
40%</td></tr>
<tr><td>2</td><td>6 – 9</td><td>c. Individual assignments
d. Final Exam</td><td>Written
Written test</td><td>10%
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Heeks, R. (2018). Information and communication technology for development (ICT4D). Routledge, Taylor & Francis Group.
2. Amit Joshi. (2021). Information and Communication Technology for Competitive Strategies (ICTCS 2020): ICT: Applications and Social Interfaces. Springer.
3. Garcia, O. A., & Kotturi, P. (2019). Information and Communication Technologies for Development Evaluation.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2			√									
CLO3			√									
CLO4			√									
CLO5			√									
CLO6			√									
CLO7			√									
CLO8			√									
CLO9			√									

FI348 Electrical Circuit Analysis

Module name:	Electrical Circuit Analysis	
Module level, if applicable:	Undergraduate	
Code:	FI348	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4th	
Module coordinator:	Waslaluddin	
Lecturer(s):	Waslaluddin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective Courses	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches, Presentation) 3. Self-study (practical/project)	1 hour 40 minutes	25
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11hour 54 minutes/714 minutes for two exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Basic Physics II	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Explain the Great 's Power, Variable Signal and Model Signals CLO2: Explain Model tool, Laws of Association, Rule circuit, and Theorem Networks CLO3: Apply Analysis Methods for Applications in EneRgy Proc essing Circuits CLO4: Apply ICT Method of Analysis for Applications In circuit Processing Energy CLO5: Order Circuit Transient Analysis CLO6: Analyse of Transient Series of electrics circuits Order 2 CLO7: Explain Electric Machines Model Introduction Model	

<table>
<tr><td></td><td>CLO8: Analyse Circuit in the Phasor Region
CLO9: Analyse Circuit in the s Region
CLO10: Report the results of making the Electric Circuit Model
CLO11: Report the results of making Models of Electrical Machines</td></tr>
<tr><td>Content:</td><td>(1) Amount of Electricity and Variables Signals (2) Model Signals (3) Model tool (4) Laws Basic (5) Rules of circuit (6) Theorem of circuit (7) Method of Analysis (8) Applications in the circuit Processing Energy (Flow Unidirectional) (9) Applications on Networks Processing Signal (Diodes & Op-Amp) (10) Analysis of Transient Networks Order-1 (11) Analysis of Transient Networks Order-2 (12) Analysis of Networks in Region Phasor (13) introduction of on Machinery Electric, and (14) Analysis of Networks in Regions. Learning proses using methods Problem Solving, recitation, demonstration, and discussion, with facilities media application presentation-electronics, with application of the computer as a tool to help.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – 9

CLO1 – 5
CLO6 – 9
CLO10-11</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Mid exam
- Final exam
c. Class activity
d. Project</td><td>
Written

Written test
Written test

Performance
Report</td><td>
20 %

25%
25%

10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Bakshi, Uday A, Bakshi, Late Ajay V. (2020). Electrical Circuit Analysis. First ed. Technical Publications.
2. Sudirham, Sudaryatno (2010). Electrical Circuit Analysis. Volume-1. ITB e-book
3. Sudirham, Sudaryatno (2010). Electrical Circuit Analysis. Volume-2. ITB e-book
4. Hayt, WH, et al. (2005) Electrical Circuits sixth edition. Erlangga Publisher
5. Ozgur Ergul. (2017). Introduction to Electrical Circuit Analysis. John Wiley & Sons.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3			√									
CLO4			√									
CLO5			√									
CLO6			√									
CLO7			√									
CLO8			√									
CLO9				√								

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO10				√								
CLO11				√								
CLO12				√								

FI349 Automation and Control

Module name:	Automation and Control	
Module level, if applicable:	Undergraduate	
Code:	FI349	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4th	
Module coordinator:	Ahmad Aminudin	
Lecturer(s):	Ahmad Aminudin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches, discussions, and practice method). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	1 hour 40 minutes	25
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11 hour 54 minutes/714 minutes for two exams and exam preparations (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Electrical Circuit Analysis and Mathematical Physics II	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain control system processes and parameters. CLO2. Analyse the principles Transfer Function diagram block, Laplace Transform, signal flow graph and mason formula. CLO3. Explain control test requirements, proportional control, integral and differential control. CLO4. Apply analogue controller. CLO5. Explain the presumed transition of the first order and second-order systems. CLO6. Analyses the stability of the control system. CLO7. Analyses frequency response and time propagation system control. CLO8. Apply the digital control.	

<table>
<tr><td>Content:</td><td>In this course, students will learn a parameter control system ; Transfer function and diagram block; Laplace transform, Signal flow graphs and mason formulas, flow charts and block diagrams; Test signal and control devices, Control device PID; Analog controllers; First order system switching response, proportional control device in first order system; Second order system switching response, second order system response time; Second order system switching response, second order system response time; System stability with the Routh and Hurwitz method ; Stability system with continuous fractional method and the domicile of the roots ; Frequency response : bode diagram, amplitude margin and margin phase, Nyquist stability; System with propagation time : the elaboration of a mathematical equation, use proportional control; Digital Controller System</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1,
CLO2,
CLO3,
CLO4,</td><td>Subject specific competences:
a. Individual assignments
b. Class Activity
c. Mid Exam</td><td>

Written
Performance
Written test</td><td>

10%
10%
30%</td></tr>
<tr><td>2</td><td>CLO5,
CLO6,
CLO7,
CLO8,</td><td>a. Individual assignments
b. Class Activity
c. Final Exam</td><td>
Written
Performance
Written test</td><td>
10%
10%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Giri, F. (2013). AC electric motors control: advanced design techniques and applications. John Wiley & Sons Inc.
2. Potter, A. (2017). Modern Control Systems and Engineering. The English Press
3. Katsuhiko Ogata. (2010). Modern control engineering. Prentice Hall.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3			√									
CLO4			√									
CLO5			√									
CLO6			√									
CLO7			√									
CLO8			√									

FI360 Modern Physics

Module name:	Modern Physics	
Module level, if applicable:	Undergraduate	
Code:	FI360	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Selly Feranie	
Lecturer(s):	Selly Feranie	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	3 hour 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 40 hours/2400 minutes lectures (1.41 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 12 weeks, 29 hour 11 minutes for four exams (1.03 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Basic Physics II, Mathematical Physics I, Mathematical Physics II	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Apply procedural knowledge and mathematics skills in solving problems of Relativity systematically and logically CLO2. Apply procedural knowledge and mathematics skills in solving problems of wave particle dualism systematically and logically CLO3. Apply procedural knowledge and mathematics skills in solving problems of atomic models systematically and logically CLO4. Apply procedural knowledge and mathematics skills in solving problems of quantum mechanics systematically and logically	

<table>
<tr><td></td><td>CLO5. Apply procedural knowledge and mathematics skills in solving problems of Many Electron atoms systematically and logically
CLO6. Apply procedural knowledge and mathematics skills in solving problems of Solid-State Physics systematically and logically
CLO7. Apply procedural knowledge and mathematics skills in solving problems of Nuclear Structure and Radioactivity systematically and logically
CLO8. Apply procedural knowledge and mathematics skills in solving problems of elementary particle systematically and logically</td></tr>
<tr><td>Content:</td><td>Relativity, wave particle dualism, atomic models, quantum mechanics, Many Electron atoms, Solid State Physics, Nuclear Structure and Radioactivity and elementary particles</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – 8

CLO1 - 2
CLO3 - 4
CLO5 - 6
CLO7 - 8</td><td>Subject specific competences:
a. Individual assignment
b. Exam
- Exam 1
- Exam 2
- Exam 3
- Exam 4</td><td>Written

Written test
Written test
Written test
Written test</td><td>20%

20%
20%
20%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, props for demonstrations</td></tr>
<tr><td>Literature:</td><td>1. Selly Feranie dan Arianto (2020) Pengantar Fisika Partikel, CV. Media Edukasi Indonesia - Tangerang
2. Kenneth S Krane (2019) Modern Physics - 4th-Asia Edition, John Wiley & Sons Inc, Newyork United states
3. Arthur Beiser (1994), Concepts of Modern Physics: 6th Edition, McGraw-Hill Higher Education
4. Peleg, Y., Pnini, R., Zaarur, E., & Hecht, E. (2010). Schaum's Outline of Quantum Mechanics, Second Edition. McGraw-Hill Education.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8					√							

FI361 Geological Geophysics

Module name:	Geological Geophysics	
Module level, if applicable:	Undergraduate	
Code:	FI361	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Nanang Dwi Ardi	
Lecturer(s):	Nanang Dwi Ardi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and presentation). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	2 hours 30 minutes	20
Workload:	Total workload is 136 hours (4.8 ECTS) per semester which consists of 150 minutes lectures and a week for geology field camp (1.2 ECTS), 180 minutes structured activities (1.5 ECTS), and 180 minutes self-study per week for 14 weeks (1.5 ECTS), 150 minutes for each exam (0.2 ECTS), and 360 minutes for each exam preparation (0.4 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Basic Physics 1, Basic Physics 2	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain the technique of physical identification of the division of layers within the Earth based on geophysical studies CLO2. Explain the method of direct rock sampling identification in the field based on real rock outcrop data. CLO3. Explain the identification method of physical weathering and rock sedimentation processes CLO4. Explain the method of measuring the weather with the help of manual and automatic tools CLO5. Apply procedural knowledge and mathematics skills in solving problems of Many Electron atoms systematically and logically CLO6. Explain simple techniques for potential mineral and	

<table>
<tr><td></td><td>energy resources in the surrounding environment through visual data and rock weather measurements assisted by manual and automatic tools
CLO7. Explain simple geological disaster mitigation procedures
CLO8. Explain topographic map techniques for interpreting physical geological data
CLO9. Describe geological map techniques for interpreting physical geological data.
CLO10. Explain the technique of geological maps and geological cross-sections to interpret geological data
CLO11. Explain geological engineering and geophysical instrumentation in cases in the environment</td></tr>
<tr><td>Content:</td><td>Rock identification, Weathering, Time of Geology, Rock Deformation, Mineral and Energy Resources, Geological mitigation hazard, Topography and Geology mapping, Geology Exploration</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1-CLO11</td><td>Subject specific competence:
a. Individual assignments
b. Discussion participation
c. Presentation
d. Mid Exam
e. Final Exam</td><td>

Written test
Performance
Performance
Written test
Written test</td><td>

10%
5%
25%
30%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, journal article, resistivity meter, hammer and compass set, rock samples</td></tr>
<tr><td>Literature:</td><td>1. Borrero, F et al. (2013). Earth Science; Geology, the Environment, and the Universe. Glencoe Science-National Geographic: McGraw-Hill
2. Waltham, T. (2009). The Foundation of Engineering Geology, 3rd Edition, Taylor & Francis Ltd
3. Busch, R.M (2015). Laboratory Manual in Physical Geology, 10th Edition, American Geosciences Institute. Pearson Education, Inc. United States of America
4. Griffiths, D. H., & King, R. F. (2014). Applied Geophysics for Geologists and Engineers. Elsevier Science.</td></tr>
</table>

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								
CLO7				√								
CLO8				√								
CLO9				√								
CLO10				√								
CLO11				√								

FI362 Space Physics

Module name:	Space Physics	
Module level, if applicable:	Undergraduate	
Code:	FI362	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Judhistira Aria Utama	
Lecturer(s):	Judhistira Aria Utama	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and presentation) 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches, Presentation) 3. Self-study (Mini research project)	2 hours 30 minutes	20
Workload:	Total workload is 136 hours 4.8 ECTS (8.160 minutes) per semester which consists of 2100 minutes (1.22 ECTS) lectures, 2520 minutes (1.58 ECTS) structured activities, 2520 minutes (1.58 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Describe the physical processes that take place in the Solar System from the formation to the birth of the Solar System CLO2. Describe the concept of emission law and its application in reducing the temperature formulation of dark objects in the Solar System CLO3. Describe the structure of the Sun CLO4. Describe the concepts of tidal forces and Roche limits, a configuration of Solar System objects, and eclipse phenomena, including the discussion of the Saros series as an eclipse predictor	

<table>
<tr><td></td><td>
CLO5. Describe the formation of the phases of the Moon and the function model of the visibility of near-Sun celestial objects
CLO6. Describe the origin of small Solar System objects (asteroids and comets) and their groupings as well as procedural knowledge of the use of asteroid light curves for determining the rotation period
CLO7. Identify the asteroid objects, angular velocity, and their equatorial coordinates from observed portrait plates
CLO8. Describe the types of double stars and procedural knowledge in determining the physical size of stars from double star observations
CLO9. Describe the types of variable stars
CLO10. Describe the types of star clusters and procedural knowledge of the use of the Hertzsprung-Russel diagram as a tracker of the evolution of star clusters
CLO11. Describe the light pollution and its multidimensional impact
CLO12. Measure the light intensity (illuminance & luminance) using photometer instruments (eg Sky Quality Meter) and processing measurement data
CLO13. Disseminate the results of research/scientific study results in the form of reports according to standard scientific rules and present them in lectures
CLO14. Process of data acquisition and ethics in the use of public data
</td></tr>
<tr><td>Content:</td><td>The solar system, the Emission law, the structure of the Sun, the tidal forces and Roche limits, the phases of the Moon, the small Solar System objects (asteroids and comets), the types of double stars, variable stars, the star clusters, the light pollution, the light intensity (illuminance & luminance)</td></tr>
<tr><td>Study/exam achievements:</td><td>
The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 - 8</td><td>Subject specific competence:
a. Individual assignments
b. Mid Exam</td><td>

Written
Written test</td><td>

15%
25%</td></tr>
<tr><td>2</td><td>9 – 12</td><td>c. Individual assignments
d. Final Exam</td><td>Written
Written test</td><td>15%
25%</td></tr>
<tr><td>3</td><td>13-14</td><td>e. Project Presentation</td><td>Performance</td><td>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>
1. Jain, P. (2015). An Introduction to Astronomy and Astrophysics. CRC Press
2. Carroll, B.W., Ostlie, D.A. (2007). An Introduction to Modern Astrophysics 2nd Edition. Pearson Addison Wesley.
</td></tr>
</table>

	3. Bohm-Vitense, E. (1989). *Introduction to Stellar Astrophysics Vol 1: Basic stellar observation and data*. Cambridge University Press. 4. Narisada, K., Schreuder, D. (2004). *Light Pollution Handbook*. Springer 5. Sutantyo, W. (1984). *Astrofisika: Mengenal bintang*. Penerbit ITB.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										
CLO11		√										
CLO12		√										
CLO13		√										
CLO14		√										

FI363 Material Physics

Module name:	Material Physics	
Module level, if applicable:	Undergraduate	
Code:	FI363	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Andhy Setiawan	
Lecturer(s):	Andhy Setiawan	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and presentation). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	2 hours 30 minutes	20
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Basic Physics I, Basic Physics II.	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Analyze materials science and engineering. CLO2. Analyze properties of materials. CLO3. Analyze metal alloy, ceramic, polymer, and composite. CLO4. Identify of the types and properties of materials, and the material physics research in scientific articles	
Content:	Materials Science and Engineering, Metals Alloy, Ceramic, Polymer, Composite, Properties of Solid Materials (Mechanical, Electrical, Magnetic, Optical, Thermal, Deteriorative)	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1,
CLO2,
CLO3,</td><td>Subject specific competences:
a. Assignments
b. Worksheets
c. Exam
- Mid exam
- Final exam</td><td>

Written
Written

Written test
Written test</td><td>

10%
10%

25%
25%</td></tr>
<tr><td>2</td><td>CLO4</td><td>Subject specific competences:
Presentation</td><td>

Performance</td><td>

30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS, internet line.</td></tr>
<tr><td>Literature:</td><td>1. Callister, W.D. Jr. and Rethwisch, D.G, 2018, Materials Science and Engineering an Introduction 10th Ed. John Wiley and Sons Inc. USA.
2. Hasse Fredriksson, & Ulla Åkerlind. (2008). Physics of Functional Materials. John Wiley & Sons.
3. Naumann, R. J. (2008). Introduction to the Physics and Chemistry of Materials. CRC Press.
4. Various articles in the field of material physics from international journals (at least last 10 years issue).</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										

FI364 Metrology and Calibration

Module name:	Metrology and Calibration	
Module level, if applicable:	Undergraduate	
Code:	FI364	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Ahmad Aminudin	
Lecturer(s):	Ahmad Aminudin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (Practical/project)	2 hour 30 minutes	20
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Analog Electronics, Digital Electronics	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. Describe the principles measurement and error
CLO2. Describe measurement standard and calibrations
CLO3. Apply direct current and alternating current indicator instruments
CLO4. Describe the principles of potentiometer in measuring instruments
CLO5. Apply potentiometer in measuring instrument
CLO6. Describe the workings of direct current, alternating current
CLO7. Apply direct current bridge, alternating current in measuring instrument.
CLO8. Describe the working of oscilloscopes, multimeter, wave generators, and electronic counters
CLO9. Utilize oscilloscope, multimeter, wave generator, electronic counter
CLO10. Describe the working principle of sensor and transducer the instrumentation system
CLO11. Analyse the use of measurement reliability</td></tr>
<tr><td>Content:</td><td>In this course, students will study Introduction, Measurements and Errors, Measurement and Calibration Standards, Direct current indicating instruments, Instruments for Indicating Alternating Current, Principles and usage of potentiometer, Direct current bridges and their applications: Wheatstone bridges, Kelvin bridges, Wheatstone bridges with safety, Wheatstone bridge applications in heat and light detection, Alternating current bridges and their applications: General forms of alternating current bridges, comparison bridges, Maxwel bridges, Hay, Schering, Unbalanced conditions, Wien bridges, magnetic grounding devices, Bridge applications in AC measurement; (ix) Oscilloscope, Multimeters, Waveform generation and analysis: Oscillator circuits, pulse and square generators, signal generators, function generators, wave analyzers, harmonic distortion analysers, spectrum analysers; Electronic counter and its applications, Instrumentation system input element transducers: Transducer positioning in instruments, Transducer grouping, transducer selection, Transducer applications in measurement, Reliability Measuring instruments</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO11</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>

Written

Written test
Written test</td><td>

20 %

25%
25%</td></tr>
<tr><td>2</td><td>CLO3, CLO5, CLO7, CLO8, CLO9, CLO11</td><td>Subject specific competences:
- Class Activity
- Project</td><td>
Performance
Performance</td><td>
10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS
Literature:	4. Raghavendra, N. V., & L Krishnamurthy. (2013). *Engineering metrology and measurements*. Oxford University Press. 5. Slaev, V. A., Chunovkina, A. G., & Mironovsky, L. A. (2019). *Metrology and Theory of Measurement*. Walter de Gruyter GmbH & Co KG. 6. Northrop, R. B. (2018). *Introduction to Instrumentation and Measurements*. CRC Press.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2			√									
CLO3			√									
CLO4			√									
CLO5			√									
CLO6			√									
CLO7			√									
CLO8				√								
CLO9				√								
CLO10				√								
CLO11				√								

FI381 History of Physics

Module name:	History of Physics	
Module level, if applicable:	Undergraduate	
Code:	FI381	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Nanang Dwi Ardi	
Lecturer(s):	Nanang Dwi Ardi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (discussions and presentation). 2. Structured activities (assignments based on conceptual approaches) 3. Self-study (reading literature)	1 hour 40 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lectures (before mid-exam) and (student presentation after mid exam) (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Analyse the development of experimental methods in physics CLO2. Analyse the development of classical physics and modern physics CLO3. Formulate the paradigm of the development of physics in the early classical physics and the development of modern physics	
Content:	Periodization of the History of Physics, Pre-Science, Ancient Babylonian, Egyptian and Greek Contributions to Physics, Islam contribution in the development of Physics, The Development of Experimental Methods in Physics, The development of classical physics, Developments in physics at the end of the 19th century, Modern physics development, - The development of philosophy and science from the 20th century to the present.	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1,
CLO2,
CLO3,</td><td>Subject specific competence:
a. Individual assignments
b. Article
c. Presentation
d. Mid Exam
e. Final Exam</td><td>

Written

Written
Performance
Written test
Written test</td><td>

10%

15%
25%
25%
25%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, relevant documentary movies</td></tr>
<tr><td>Literature:</td><td>1. Bynum, W. (2012). A Little History of Science. Yale University Press US.
2. Mcclellan and Dorn. (2015). Science and Technology in World History: An Introduction. Johns Hopkins University Press.
3. Varvoglis, H. (2014). History and Evolution of Concepts in Physics. Springer International Publishing Switzerland ISBN 978-3-319-04291-6
4. Williams, H.S., 1904-1910 (2016). A History of Science. New York Harper</td></tr>
</table>

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3				√								

FI441 Digital Electronics

Module name:	Digital Electronics	
Module level, if applicable:	Undergraduate	
Code:	FI441	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4th	
Module coordinator:	Ahmad Aminudin	
Lecturer(s):	Ahmad Aminudin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature and experiment project electronic circuit)	2 hours 30 minutes	35
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Analog Electronics	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. Describe Number System: Analog versus Digital, Binary Numbers, Octal, Decimal and Hexadecimal.
CLO2. Describe the principles and application of Logic NOT, AND, OR, NAND, N OR, XOR and XNOR gates
CLO3. Describe the concept of Logic Transistors and CMOS Logic technology
CLO4. Describe the principles of a bolean algebra, K-Map for circuit simplification techniques
CLO5. Describe the principles of Arithmetic Circuits
CLO6. Apply Arithmetic Circuits
CLO7. Describe workings of Multiplexer, Demultiplexer, Encoder and Decoder circuits
CLO8. Apply a series of Multiplexers, Demultiplexers, Encoders and Decoders
CLO9. Describe the concept of Programmable Logic Device
CLO10. Describe the concept of Multivibrator, Flip-Flop
CLO11. Describe the concept of counter and Register
CLO12. Implement a series of Counter and Register
CLO13. Implement the Data Conversion Series: DA C, ADC and their specifications
CLO14. Implement Display: seven segment, Dot matrix LED, LCD</td></tr>
<tr><td>Content:</td><td>In this course, students will study Number Systems: Analog versus Digital, Binary Numbers, Octal, Decimal and Hexadecimal .; Logic NOT, AND, OR gates; NAND, N OR, XOR, XNOR, Logic Gates; Logic transistors, CMOS Logic; Boolean algebra, K-Map, circuit simplification technique; Arithmetic Circuit: Combined logic circuit, Half Adder, Full Adder; Multiplexer, Demultiplexer, Encoder and Decoder; Programmable Logic Device: Programmable ROM, Programmable Logic Array, Programmable Array Logic; Multivibrator: Bistable, Monostable and Astable; Flip-Flop: RS-FF, JK FF, D-FF; Counter: Synchronous Counter, Modulus Counter, Decoding counter, Practicum; Register: Shift Register, Shift register counter; Data Conversion Series: DA C, ADC and their specifications; Display: even segment, Dot matrix, LED, LCD.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 - CLO14</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>

Written

Written Test
Written Test</td><td>

20 %

25%
25%</td></tr>
<tr><td>2</td><td>CLO6, CLO8, CLO12, CLO13, CLO14</td><td>Subject specific competences:
- Class Activity
- Experiment</td><td>
Performance
Performance</td><td>
10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package,
Literature:	1. Tomal, D. R., & Agajanian, A. (2014). *Electronic Troubleshooting, Fourth Edition*. McGraw Hill Professional. 2. Subir Kumar Sarkar, Asish Kumar De, & Sarkar, S. (2015). *Foundation of digital electronics and logic design*. Pan Stanford Pub. 3. Maini, A. K. (2007). *Digital electronics: principles, devices and applications*. John Wiley & Sons.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2			√									
CLO3			√									
CLO4			√									
CLO5			√									
CLO6			√									
CLO7			√									
CLO8			√									
CLO9			√									
CLO10			√									
CLO11			√									
CLO12			√									
CLO13			√									
CLO14			√									

FI460 Wave and Electromagnetism Experiment

<table>
<tr><td>Module name:</td><td colspan="2">Wave and Electromagnetism Experiment</td></tr>
<tr><td>Module level, if applicable:</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code:</td><td colspan="2">FI460</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Classes, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Semester:</td><td colspan="2">5th</td></tr>
<tr><td>Module coordinator:</td><td colspan="2">Andhy Setiawan</td></tr>
<tr><td>Lecturer(s):</td><td colspan="2">Andhy Setiawan, Wiendartun, Mohammad Arifin</td></tr>
<tr><td>Language:</td><td colspan="2">Bahasa Indonesia</td></tr>
<tr><td>Classification within the curriculum:</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>1. Lecture (experiment and presentation)
2. Structured activities for practice preparation and making report
3. Self-study (reading literature)</td><td>2 hours 30 minutes</td><td>15</td></tr>
<tr><td>Workload:</td><td colspan="2">Total workload is 90 hours 40 minutes (3.2 ECTS) which consist of 40 hours of laboratory activities (1.41 ECTS) and 50 hours 40 minutes of practice preparation, making report and self-study (1.75 ECTS)</td></tr>
<tr><td>Credit points:</td><td colspan="2">3.2 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td colspan="2">Electricity and Magnetism (FI344), Wave (FI345).</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td colspan="2">After taking this course the students have ability to:
CLO1. Apply concepts of electromagnetic and waves in planning the experiment.
CLO2. Conduct experiment in electromagnetic and waves.
CLO3. Analyze experimental data as result of experiment in electromagnetic and waves.
CLO4. Apply concepts of electromagnetic and waves in discussing the experiment result.
CLO5. Make reports and present the results of electromagnetic and wave experiments.</td></tr>
<tr><td>Content:</td><td colspan="2">Thomson Experiment, Millikan Oil Drop Experiment, Experiment of Light Propagation Speed, Michelson Iinterferometer Experiment, Hall Effect Experiment, Experiment of Diffraction by Rreflection Grid, Experiment of Sound Propagation Speed.</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2"><table><tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr></table></td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>1</td><td>CLO1</td><td>Subject specific competences:
- Assignment
- Written test</td><td>Written
Written test</td><td>10%
10%</td></tr>
<tr><td>2</td><td>CLO2, CLO3, CLO4, CLO5</td><td>Subject specific competences:
- Experiment Report.
- Presentation</td><td>Written
Performance</td><td>45%
35%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
The final mark will be weight as follow:
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD projector, laptop/computer, Experimental tools, LMS, internet line.</td></tr>
<tr><td>Literature:</td><td>

Pergament, M. I. (2019). Methods Of Experimental Physics. CRC Press.
Fleisch, D. A., & Kinnaman, L. (2015). A student’s guide to waves. Cambridge University Press.
Melissinos, A. C., & Napolitano, J. (2011). Experiments in modern physics. Academic Press.
Elmore, W. C., & Heald, M. A. (2012). Physics of waves. Dover Publications.

</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2				√								
CLO3				√								
CLO4		√										
CLO5				√								

FI461 Computational Physics

Module name:	Computational Physics	
Module level, if applicable:	Undergraduate	
Code:	FI461	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Waslaluddin	
Lecturer(s):	Waslaluddin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (Experiment and Computing Numerical)	3 hour 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 40 hours/2400 minutes lectures (1.41 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 12 weeks, 29 hour 11 minutes for two exams and two exam preparations (1.03 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Mathematical Physics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain arithmetic and logic in computer systems, analysing errors in data storage and processing. CLO2. Describes characteristic number of decimals, binary, and floating-point number in computer systems CLO3. Explain arithmetic and logic in Python system. CLO4. Apply microprocessor technology as *Scientific Tools* for Computational Physics (Mathematical modelling, Programming using Python, Running and displays results)	

<table>
<tr><td></td><td>CLO5. Apply microprocessor technology as a numerical method solution for computational physics principles and applications
CLO6. Apply the technology of micro- processor as the basis of data analysis computation results
CLO7. Apply theICT in using microprocessor technology as a computing instrument
CLO8. Explain Numerical Method Analysis of Non-Linear Equations, Interpolation and Approximation
CLO9. Explain Numerical Analysis for Differential and Numerical Integral
CLO10. Create numerical models for physical systems whose solutions use mathematical systems as a tool.
CLO11. Explain Numerical analysis for PDP system
CLO12. Explain Numerical analysis for physical systems
CLO13. Report the results of solving problems with numerical methods for relevant physics cases
CLO14. Report the results of solving problems using numerical methods for chaos and fractal cases</td></tr>
<tr><td>Content:</td><td>The material discussed in this lecture includes Arithmetic and Logic in Python , Numerical Computing (Mathematical Models, Selection of Methods, Algorithms, Programming, Running, Interpretation of Results) Numerical Methods (Solution of Non-linear Equations, Systems of Linear Equations, Interpolation and Approximation, Differential and Numerical Integrals, Ordinary Differential Equations, Systems of Differential Equations, Partial Differential Equations) Case Studies Numerical computing in physics (Motion, Magnetism, Kinetic Theory of Gases, Thermodynamics, Sound, Modern Physics and Chaos and fractals)</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – 12

CLO1 – 6
CLO6 – 12
CLO13-14</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Mid exam
- Final exam
c. Class activity
d. Project</td><td>Written

Written test
Written test
Performance
Report</td><td>20 %

25%
25%
10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration, LMS</td></tr>
<tr><td>Literature:</td><td>1. Gezerlis, A. (2020). Numerical methods in physics with Python. Cambridge University Press.
2. Boudreau, J. F., Swanson, E. S., & Bianchi, R. M. (2017). Applied computational physics.
3. Landau, R. H., Páez, M. J., & Bordeianu, C. C. (2015). Computational Physics. John Wiley & Sons.
4. Epperson, J. F. (2013). An introduction to numerical methods and analysis. Wiley-Interscience.
5. Gerald, C. F., & Wheatley, P. O. (2007). Applied numerical analysis. Pearson, Addison Wesley.
6. Rao, S. S. (2002). Applied numerical methods for engineers and scientists. Prentice Hall.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4			√									
CLO5			√									
CLO6			√									
CLO7				√								
CLO8					√							
CLO9					√							
CLO10					√							
CLO11					√							
CLO12					√							
CLO13					√							
CLO14					√							

FI462 Modern Physics Experiments

Module name:	Modern Physics Experiments	
Module level, if applicable:	Undergraduate	
Code:	FI462	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Andhy Setiawan	
Lecturer(s):	Andhy Setiawan, Wiendartun, Mohammad Arifin.	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (Experiment and presentation) 2. Structured activities for experiment preparation and making report 3. Self-study (reading literature)	2 hours 30 minutes	15
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) which consist of 40 hours of laboratory activities (1.41 ECTS) and 50 hours 40 minutes of practice preparation, making report and self-study (1.75 ECTS)	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Modern Physics (FI360)	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Apply concepts of modern physics in planning the experiment. CLO2. Conduct experiment in modern physics. CLO3. Analyze experimental data as result of experiment in modern physics CLO4. Apply concepts of modern physics in discussing the experiment result. CLO5. Make reports and present the results of modern physics experiments.	
Content:	Experiment of Hydrogen Atomic Spectrum, Frank Hertz Experiment, Experiment of Sodium Atomic Spectrum, Experiment of Photocell, Experiment of Photo Electric, Experiment of Electron Diffraction, and Experiment of Geiger Muller Radioactive Counter.	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1</td><td>Subject specific competences:
- Assignment
- Written test</td><td>
Written
Written test</td><td>
10%
10%</td></tr>
<tr><td>2</td><td>CLO2, CLO3, CLO4, CLO5</td><td>Subject specific competences:
- Experiment Report
- Presentation</td><td>
Written
Performance</td><td>
45%
35%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD projector, laptop/computer, Experimental tools, LMS, internet line.</td></tr>
<tr><td>Literature:</td><td>1. Pergament, M.I. (2019). Methods of Experimental Physics. CRC Press LLC.
2. Noce. (2020). Modern Physics: A Critical Approach. Institute of Physics Publishing, United Kingdom.
3. Melissinos, A. C., & Napolitano, J. (2011). Experiments in Modern Physics. Academic Press.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2				√								
CLO3				√								
CLO4		√										
CLO5				√								

FI481 Modeling and Simulation of Physics

Module name:	Modeling and Simulation of Physics	
Module level, if applicable:	Undergraduate	
Code:	FI-481	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Lilik Hasanah	
Lecturer(s):	Lilik Hasanah	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature and project)	2 hours 30 minutes	35
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 20 hours/1200 minutes lectures (0.71 ECTS) per week for 8 week, 57 hours/3420 minutes structured activities (1.48 ECTS) and 51 hours/3060 minutes self-study (1.71 ECTS) per week for 14 weeks, 8 hours/160 minutes for two exams (0.9 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Basic Physics, Mathematical Physics, and Computational Physics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Describe system and model. CLO2. Describe physics modelling principal. CLO3. Describe numerical modelling techniques using various software. CLO4. Analyse computer simulation process. CLO5. Analyse the validation process.	
Content:	System and Model, Modelling system and signal, Physics Modelling Principal, Numerical Modelling Techniques using MATLAB, Linear System Analysis, Nonlinear System Analysis, Simulation, Model Validation.	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1, CLO2, CLO3</td><td>Subject specific competences:
a. Assignments
b. Exam:
- Mid exam</td><td>

Written

Written test</td><td>

25 %

30 %</td></tr>
<tr><td>2</td><td>CLO4, CLO5</td><td>Subject specific competences:
- Final Project
- Presentation</td><td>

Performance
Performance</td><td>

30%
15%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Sridadi, B. (2009), Pemodelan dan Simulasi Sistem: Teori, Aplikasi dan Contoh Program dalam Bahasa C. Penerbit Informatika, Bandung.
2. Suarga. (2005). Fisika Komputasi Solusi Problema Fisika dengan Matlab. Penerbit Andi, Yogyakarta.
3. Ljung., Lennart., Glad., Tarkel., Hansson., Anders. (2021). Modeling and Identification of Dynamic Systems. Student literature.
4. Hilpisch, Y. (2015). Derivatives analytics with Python: Data analysis, models, simulation, calibration and hedging. John Wiley & Sons.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLo5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3			√									
CLO4			√									
CLO5			√									

FI501 Celestial Mechanics

Module name:	Celestial Mechanics	
Module level, if applicable:	Undergraduate	
Code:	FI-501	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Judhistira Aria Utama	
Lecturer(s):	Judhistira Aria Utama	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective Course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches, Presentation) 3. Self-study (Mini research project)	1 hour 40 minutes	25
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11hour 54 minutes/714 minutes for two exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain the formulation of the equations of motion of two objects and mathematical procedures to obtain the solution. CLO2. Explain the consequences of solutions to the equations of motion of two objects and recognize the elements of classical orbits used in determining the size, shape, and orientation of the orbit and placing the position of celestial objects in their orbit. CLO3. Explain the problem of three finite bodies and the solution steps and understand the existence of gravitational equilibrium points in a 3-body system. CLO4. Explain procedural knowledge and understanding of orbits	

<table>
<tr><td></td><td>and positions determination.
CLO5. Explain the virial theorem and apply it to problems of orbital energy and motion of planets and satellites.
CLO6. Apply the law of conservation of linear momentum in formulating rocket propulsion, explain the factors that affect the dynamics of the artificial satellite orbit, and calculate orbital elements and parameters in performing orbital maneuvers using Hohmann transfer.
CLO7. Extract information from Two Line Element (TLE).
CLO8. Identify various orbit integrators (Windows and Linux based) that can be used to propagate the orbits of celestial bodies.
CLO9. Explain the tools for orbital integrators and be able to use them in conducting mini-research projects.
CLO10. Describe the international issues related to space debris and their impact on space exploration and life on Earth.
CLO11. Apply information and communication technology as well as standard software for studying celestial orbits in the process of data acquisition and ethics in the use of public data.
CLO12. Disseminate the results of mini research in the form of written reports according to standard scientific rules and presents in the classroom.</td></tr>
<tr><td>Content:</td><td>Equations of motion and solutions of equations of motion of two bodies, Equations of orbits and elements of Keplerian orbits, Restricted 3-body problem and Lagrange points, Determination of orbits and positions in orbits, Virial theorems and an overview of the energy of motion of planets and satellites, Rocket propulsion, Dynamics of artificial satellites of the Earth, Orbit manoeuvre, Introduction to TLE, orbit integrators and related tools, Space debris and conjunction analysis, and Mini research projects.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO7, CLO10</td><td>Subject specific competences:
a. Weekly Task
b. Exam:
- Mid exam
- Final exam</td><td>Written

Written test
Written test</td><td>

15%

20%
20%</td></tr>
<tr><td>2</td><td>LO8, 9, 11, 12</td><td>c. Paper & Presentation</td><td>Report & Performance</td><td>45%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Scheeres, D. J. (2012). Orbital Motion In Strongly Perturbed Environments: Applications to Asteroid, Comet and Planetary Satellite Orbiters. Springer.
2. Karttunen, H. et al., (2017). Fundamental Astronomy 6th Edition. Springer
3. Roy, A.E. (2005). Orbital Motion. CRC Press
4. Roy, A.E., Clark, D., Astronomy Principles and Practice. Institute of Physics Publishing
5. Serway, R.A., Jewett, J.W., (2004). Physics for Scientists and Engineers 6 Edition. Thomson Brooks</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										
CLO11		√										
CLO12		√										

FI502 Industrial Instrumentation

Module name:	Industrial Instrumentation	
Module level, if applicable:	Undergraduate	
Code:	FI502	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Ahmad Aminudin	
Lecturer(s):	Ahmad Aminudin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective Courses	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (Practical/project)	1 hour 40 minutes	25
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11 hour 54 minutes/714 minutes for two exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Digital Electronics, Algorithms and Programming, Metrology and Calibration	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Describe the knowledge about manufacturing/Industry CLO2. Describe the knowledge of actuator systems and mechanical systems in industry CLO3. Analyse the working principles of pneumatic and hydraulic systems in their application in industry CLO4. Describe the knowledge of PLC architecture CLO5. Create and analyse basic programming, timers, counters, arithmetic, master control and sequential PLC CLO6. Describe the knowledge of Robot Control with PLC and PLC Networks CLO7. Analyse related installation, troubleshooting and maintenance of PLC	

<table>
<tr><td>Content:</td><td>In this course, students will study (i) an explanation of the Industrial Instrumentation course , Introduction to Manufacturing / Industry, (ii) Actuators and Mechanics: Electromechanical actuators, fluid actuators, actuators based on active materials, bearings, pulleys, belt chain, cam and follower; (iii) Pneumatic and hydraulic elements: Compressor, Piston type and operation, Valve type, regulator, filter; (iv) Pneumatic and hydraulic applications in industry ; (v) PLC architecture: CPU, Input module, output module, Memory, Power Supply; (vi) Basic Programming: Ladder Diagrams; (vii) Timer Instructions: Basic functions of PLC timer, Timer Type and timer programming; (viii) Counter Instructions: Basic functions of PLC Counter, Counter Programming and Combined Timer-counter programming; (ix) PLC Arithmetic Instructions: Addition, subtraction, multiplication and division; (x) Skip Instructions and control master: SKIP Instructions, MC Instructions, Jump Instructions; (xi) Sequential instructions: Sequential functions, Sequential time format, sequential programming; (xii) Robot Control with PLC: Two-axis robot basics, robot sequential programming and industrial robot control; (xiii) PLC network: Industrial control network tier, PLC network communication, DCS; (xiv) PLC installation, troubleshooting and maintenance: checking, assembly, grounding, testing, wiring, protection, troubleshooting and maintenance procedures.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>
1 – 7

1 – 4
4 – 7</td><td>Subject specific competences:
a. Assignments
b. Exam
- Mid exam
- Final exam</td><td>
Written

Written test
Written test</td><td>
20 %

25%
25%</td></tr>
<tr><td>2</td><td>
5 & 7</td><td>Subject specific competences:
- Class Activity
- Project</td><td>
Performance
Performance</td><td>
10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Paul, B. (2014). Industrial Electronics and Control Including Programmable Logic Controller Third Edition. PHI Learning Private Limited, Delhi.
2. Bolton, W. (2015). Programmable Logic Controllers Sixth edition. Elsevier Ltd.
3. Ridley, J. (2004). Mitsubishi FX Programmable Logic Controllers Applications and Programming. Elsevier.
4. Webster, J. G., & Eren, H. (2017). Measurement, instrumentation, and sensors handbook: Electromagnetic, optical, radiation, chemical, and biomedical measurement. CRC Press.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2			√									
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								
CLO7					√							

FI503 Geomechanics of Soil and Rock

Module name:	Geomechanics of Soil and Rock	
Module level, if applicable:	Undergraduate	
Code:	FI503	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Selly Feranie	
Lecturer(s):	Selly Feranie	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches, Presentation) 3. Self-study (reading literature and project)	1 hour 40 minutes	25
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11 hour 54 minutes/714 minutes for three exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Apply procedural knowledge and mathematics and computational skills in analyzing landslide data in various condition to predict runout distance, safety factor and failure surface. CLO2. Apply procedural knowledge and mathematics and computational skills in analyzing cone penetration and standard penetration data to predict liquefaction potential. CLO3. Apply procedural knowledge and mathematics and computational skills to construct, characterize and model 3D rock structure using image analysis.	

<table>
<tr><td>Content:</td><td>Soil Mechanics (Landslide, Liquefaction), Rock physics (construct, characterize, model 3D structure rock physics using image analysis)</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 - 3</td><td>Subject specific competences:
a. Individual assignments</td><td>Written</td><td>10%</td></tr>
<tr><td></td><td>CLO1
CLO2
CLO3</td><td>b. Exam
- Exam 1
- Exam 2
- Exam 3</td><td>Written Test
Written Test
Written Test</td><td>15%
15%
20%</td></tr>
<tr><td></td><td>CLO1 - 3</td><td>c. Project Performance</td><td>Performance</td><td>40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer,</td></tr>
<tr><td>Literature:</td><td>1. Feranie, S. (2020). Analisis potensi likuifaksi berdasarkan data Cone Penetration Test (CPT) dan Standard Penetration Test (SPT).
2. Darwis. (2018). Dasar-dasar Mekanika Tanah. Yogyakarta, Pena Indis.
3. Montoya-Araque, E. A., & Suarez-Burgoa, L. O. (2018). Application Software for 2D Slope Stability Analysis of Block-in-matrix and Homogeneous Materials. Exploration Software X, 383-387.
4. Latief, FSE., Fauzi, U., Feranie, S. (2012). Digital Isolation Technique for Reconstruction and Visualization of Cracks in Micro-CT Images of Geothermal Reservoir Rock. Microscopy and Analysis.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√		√							
CLO2			√		√							
CLO3			√		√							

FI504 Superconductor

Module name:	Superconductor	
Module-level, if applicable:	Undergraduate	
Code:	FI504	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Yuyu Rachmat Tayubi	
Lecturer(s):	Yuyu Rachmat Tayubi, Wiendartun	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective Course	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches, Presentation) 3. Self-study (simulation and presentation)	1 hour 40 minutes	25
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11 hour 54 minutes/714 minutes for two exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Material Physics, Modern Physics	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. Explain conceptual knowledge of the basic properties of superconductors, such as zero resistivity, critical temperature, and the Meissner effect.
CLO2. Explain procedural knowledge of the theory and laws that apply to the formation of superconducting materials.
CLO3. Explain conceptual knowledge about Cuprite-based superconducting materials with high critical temperature Tc.
CLO4. Explain conceptual knowledge about the different types of organic and inorganic superconducting materials.
CLO5. Explain conceptual and procedural knowledge for the manufacture of superconducting materials, both electron doping and hole doping.
CLO6. Explain conceptual and procedural knowledge of the use of characterization tools such as XRD and Four Point Probe.
CLO7. Explain conceptual and procedural knowledge about data analysis methods from XRD and Four Point Probe measurements</td></tr>
<tr><td>Content:</td><td>BCS theory, electron pairs, coherence length, electrical resistivity, Meissner effect, magnetic susceptibility, Mott oscillator, type 1 and 2 superconductors, electron and hole doping theory, electron, and hole doping phase diagrams, VRH (Variable Rang Hoping) X-ray diffraction theory, and solid reaction theory.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>

CLO1-4

CLO1-2
CLO3-4
CLO5-7</td><td>Subject specific competences:
a.Assignment
b.Exam:
- Mid exam
- Final exam
c. Presentation</td><td>

Written

Written Test
Written Test
Performance</td><td>

15%

30%
30%
25%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Philippe Mangin, Rémi Kahn (2017). Superconductivity An introduction, Springer International Publishing
2. J. Robert Schrieffer Editor James S. Brook (2007), Handbook of High-Temperature Superconductivity Theory and Experiment, Springer Science + Business Media, LLC
3. Kristian Fossheim and Asle Sudbø (2004), Superconductivity Physics and Applications, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										

FI505 Meteorology and Space Weather

Module name:	Meteorology and Space Weather	
Module level, if applicable:	Undergraduate	
Code:	FI505	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Nanang Dwi Ardi	
Lecturer(s):	Nanang Dwi Ardi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, and discussions). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	1 hour 40 minutes	35
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lectures and one meeting for stadium general (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), and 120 minutes self-study per week for 14 weeks (0.99 ECTS), 100 minutes for each exam (0.12 ECTS), and 240 minutes for each exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain basic concept of meteorology and climatology CLO2. Explain earth and sun relationship and its consequences CLO3. Explain element of weather system CLO4. Explain radiation and earth-sun system CLO5. Explain hydrology cycle CLO6. Explain weather measurement principle CLO7. Explain climate and human life CLO8. Explain basic concept of space weather CLO9. Explain major disturbance in space weather CLO10. Explain impact of solar activity to earth CLO11. Explain Solar Activity Index CLO12. Explain flare CLO13. Explain Filament/Prominence	

<table>
<tr><td></td><td>CLO14. Explain Corona Mass Ejection
CLO15. Explain Solar Radio Emission
CLO16. Explain Solar Proton Event
CLO17. Explain The dynamic of magnetosphere
CLO18. Explain Earth magnetic field parameter
CLO19. Explain Geomagnetic Index
CLO20. Explain the dynamic of Ionosphere
CLO21. Explain the impact space weather to earth</td></tr>
<tr><td>Content:</td><td>Climate and weather parameter, Earth and sun relationship, Atmosphere circulation, Global air mass movement, Solar Radiation, Hydrology cycle, Sun and space weather, Solar activity, Magnetosphere, Ionosphere, Impact space weather to earth.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1-CLO21</td><td>Subject specific competence:
a. Individual assignments
b. Mid Exam
c. Final Exam</td><td>

Written
Written test
Written test</td><td>

30%
35%
35%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, relevant volcano documentary movie</td></tr>
<tr><td>Literature:</td><td>1. Soewarno, (2015). Klimatologi: Pengukuran dan Pengolahan Data Curah Hujan,Contoh Aplikasi Hidrologi dalam Pengelolaan Sumber Daya Air (Seri Hidrologi),Graha Ilmu, Yogyakarta.
2. Nuraeni, F dkk, (2016). SWIFtS: Space Weather Information and Forecast Services. Pusat Sains Antariksa Lembaga Penerbangan dan Antariksa Nasional.
3. Seargent, D. A. (2012). Weird weather: Tales of astronomical and atmospheric anomalies. Springer Science & Business Media.</td></tr>
</table>

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								
CLO7				√								
CLO8				√								
CLO9				√								
CLO10				√								
CLO11				√								
CLO12				√								
CLO13				√								
CLO14				√								
CLO15				√								
CLO16				√								
CLO17				√								
CLO18				√								
CLO19				√								
CLO20				√								
CLO21				√								

FI560 Quantum Physics

Module name:	Quantum Physics	
Module level, if applicable:	Undergraduate	
Code:	FI-560	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5th	
Module coordinator:	Mohammad Arifin	
Lecturer(s):	Mohammad Arifin and Yuyu Rahmat Tayubi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	3 hour 20 menit	45
Workload:	The total workload is 181 hour 20 minutes (6.4 ECTS) per semester, consisting of 46 hour 20 minutes /2800 minutes lectures (1.65 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 14 weeks, 22 hour 23 minutes for two exams (0.79 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Math Physics I and II, Modern Physics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Describe the basic concepts of quantization of physical quantities, general representations and formal operations of the basic laws of physics in quantum mechanics both physically-phenomenologically and mathematically. CLO2. Apply it to solve problems: stationary quantum systems for simple cases, the basic characteristics of many-body systems: atoms, molecules, atomic nuclei and particles, and materials in general. CLO3. Participate in developing it in the breadth of standard physics disciplines and science and technology in general in the global literature.	

<table>
<tr><td>Content:</td><td>Quantization of physical quantities, black body radiation and quantization of electromagnetic wave energy, the limits of the applicability of Newtonian classical mechanics and the necessity of modern physics, de Broglie's concept of wave-particle dualism, description and representation of wave packets (scalar and vector space): states stationary and time dependent, Heisenberg uncertainty principle, physical interpretation of Max Born wave packet functions, concepts of Dirac notation (Hilbert spaces, bra-kets, observables, and operators), representation and transformation of coordinates (orthogonal and canonical), characteristics and properties of operators , postulates in quantum mechanics, the Schrödinger equation and examples of its solution in cases of stationary states for simple 1, 2 and 3 dimensional potentials, application of the postulates to simple non-relativistic states: spin 1/2 and two-level systems, states- discrete states of single and degenerated quantum systems and Hamiltonian characteristics, methods and approaches of pe solving problems in quantum physics: perturbation theory, WKB (Wentzel-Kramers-Brillouin), and numerical (tentative); general concepts and properties of angular momentum, characteristics of angular momentum operators, one-dimensional harmonic oscillator systems, particles in central potential: quantum theory of the hydrogen atom, state functions of the hydrogen atom: spherical, radial, spin harmonic functions, single electron orbitals and atomic, molecular, solid-body and many-body systems in general</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow

<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1, CLO2, CLO3</td><td>Subject specific competences:
a. Assignments
b. Quiz
c. Exam:
- Mid Exam
- Final Exam</td><td>

Written
Written test

Written test
Written test</td><td>

20 %
10 %

30 %
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Cohen-Tannoudji, Claud, Diu, Bernard, Laloë, (2019), Quantum Mechanics, Vol. I, 2nd edition, John Wiley & Sons, New York, USA.
2. Dirac, P.A.M., (2013), The Principles of Quantum Mechanics, www.snowballpublishing.com
3. Gasiorowicz, Stephen, (2003), Quantum Physics, 3rd edition, John Wiley & Sons, Inc., Singapore.
4. Griffiths, David J., (2005), Introduction to Quantum Mechanics, Second Edition, Pearson Prentice Hall, Upper Saddle River, New Jersey, USA.
5. Sakurai, J. J. and Napolitano, Jim, (2011), Modern Quantum Mechanics, Second Edition, Pearson Education, Inc., Publishing as Addison-Wesley, 1301, Sansome Street, San Francisco, CA 94111.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										

FI561 Solid State Physics

Module name:	Solid State Physics	
Module-level, if applicable:	Undergraduate	
Code:	FI561	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Wiendartun	
Lecturer(s):	Wiendartun and Endi Suhendi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, discussions and presentation). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	3 hours 20 minutes	45
Workload:	The total workload is 181 hour 20 minutes (6.4 ECTS) per semester, consisting of 46 hour 20 minutes /2800 minutes lectures (1.65 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 14 weeks, 22 hour 23 minutes for two exams (0.79 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Modern Physics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Analyze the crystal structure CLO2. Explain the principle of X-ray diffraction CLO3. Participate in developing it in the breadth of standard physics disciplines and science and technology in general in the global literature. CLO4. Analyze the lattice vibrations CLO5. Analyze the thermal properties of solid CLO6. Analyze the free electron fermi gas CLO7. Explain the theory of energy bands CLO8. Explain the Drude and Sommerfeld theory of metals CLO9. Analyze the characteristic of Tight-Binding Method	

<table>
<tr><td>Content:</td><td>Concept of: Crystal Stucture, Xray diffraction, interatomic forces in solid, lattice vibration, thermal properties of solid, Free electron fermi gas, Energy bands, The Drude theory of Metals, The Sommerfeld theory of metals Failures of the Free Electron Model and Classification of Bravais Lattices and Crystal Structures and the Tight-Binding Method.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1-9

CLO1-5
CLO6-9
CLO5-9</td><td>Subject specific competences:
a. Individual assignments
b. Exam:
- Mid Exam
- Final Exam
c. Presentation</td><td>
Written

Written Test
Written Test
Performance</td><td>
20%

30%
30%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector and Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. J.J. Quinn & K. Soo Yi (2009). Solid State Physics, Principles and Modern Applications, Springer, London
2. C. Kittel (2005). Introduction to Solid State Physics, 8th Edition, John Wiley & Sons, New York
3. J.R. Hook & H.E. Hall (2013). Solid State Physics, 2nd Edition, John Wiley & Sons, New York
4. Sólyom, J. (2007). Fundamentals of the physics of solids: Volume 1: Structure and dynamics. Springer.
5. Patterson, J., & Bailey, B. (2011). Solid-state physics: Introduction to the theory. Springer.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√										
CLO 2		√										
CLO 3		√										
CLO 4		√										
CLO 5		√										
CLO 6		√										
CLO 7		√										
CLO 8		√										
CLO 9		√										

FI562 Nuclear Physics

Module name:	Nuclear physics	
Module level, if applicable:	Undergraduate	
Code:	FI-562	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Mohammad Arifin	
Lecturer(s):	Mohammad Arifin	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of teaching format	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	3 hours 20 minutes	35
Workload:	The total workload is 181 hour 20 minutes (6.4 ECTS) per semester, consisting of 46 hour 20 minutes /2800 minutes lectures (1.65 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 14 weeks, 22 hour 23 minutes for two exams (0.79 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Math Physics I and II, Modern Physics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain the basic concepts of structure, reactions, and basic physical processes in the nucleus and on nucleonic and sub-nucleonic particles. CLO2. Apply it in everyday life, in technology and technology products (devices and instrumentation) CLO3. Participate in developing it in the breadth of standard physics disciplines and science and technology in general in the global literature	
Content:	Survey and review of the basic characteristics of matter-energy and the structure of the universe (particles and fundamental tools), the development of chronological atomic models, the discovery of the atomic nucleus and the Coulomb Rutherford scattering experiment (quantitative and qualitative), the general characteristics of the atomic	

<table>
<tr><td></td><td>nucleus (dimensions, mass, electric charge, abundance, isotopes, isobars, isotopes, isomers, spin-parity, spin, isospin, etc.), introduction to quantum mechanics for nuclear physics, natural decay of radioactive elements (single and multiple), concepts of force and nuclear potential (Yukawa , Wood Saxon, potential models: effective, phenomenological/realistic, etc.), nuclear models (Fermi gas, liquid drop, shell, cluster, and complex), alpha, beta and gamma decay reactions, general concepts of nuclear reactions (nucleus simple and composite), fission and fusion reactions, introduction to reactor physics (characteristics and types of fission and fusion reactors), application of radioisotopes in everyday life (radiometry and instrumentation: agriculture, medicine, industry, etc.), in technology and technological products (devices/instruments), introduction to high energy physics (physics of accelerators, sub-nucleonic particles and fundamentals), introduction to astrophysics and nuclear cosmology.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:

<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1, CLO2, CLO3</td><td>Subject specific competences:
a. Assignments
b. Quiz
c. Exam:
- Mid Exam
- Final Exam</td><td>

Written
Written test

Written test
Written test</td><td>

20 %
10 %

30 %
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Beiser, Arthur, (2003), Concepts of Modern Physics, Sixth Edition, McGraw-Hill Higher Education, A Division of The McGraw-Hill Companies 1221, Avenue of the Americas, New York, NY, 10020, USA.
2. Blatt, John M. and Victor F. Weisskopf, (2010), Theoretical Nuclear Physics, Dover Publications Inc., Copy Right Springer Verlag, New York.
3. Das, A. and Ferbel, T., (2003), Introduction to Nuclear and Particle Physics, Second Edition, World Scientific Publishing Co. Pte. Ltd., 5 Toh Tuck Link, 596224, Singapore.
4. Shultis, J. Kenneth and Faw, Richard E., (2008), Fundamentals of Nuclear Science and Engineering, 2nd Edition, CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.
5. Wong, Samuel S. M., (2004), Introductory Nuclear Physics, Second Edition, Wiley-VCH Verlag GmbH & Co. KgaA, Germany.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										

FI563 Research Method and Scientific Publication

Module name:	Research Method and Scientific Publication	
Module level, if applicable:	Undergraduate	
Code:	FI563	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Nanang Dwi Ardi	
Lecturer(s):	Nanang Dwi Ardi, Andhy Setiawan, Dadi Rusdiana, Lilik Hasanah	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, discussions and presentation). 2. Structured activities (assignments based on conceptual approaches) 3. Self-study (reading literature)	2 hours 30 minutes	35
Workload:	Total workload is 136 hours (4.8 ECTS) per semester which consists of 150 minutes lectures and two weeks student presentation (1.2 ECTS), 180 minutes structured activities (1.5 ECTS), and 180 minutes self-study per week for 14 weeks (1.5 ECTS), 150 minutes for each exam (0.2 ECTS), and 360 minutes for each exam preparation (0.4 ECTS).	
Credit points:	4.8 ECTS	
Prerequisite's course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain lecture rules and the importance of lectures CLO2. Explain research management and scientific publication CLO3. Explain Scientific Research Characteristic CLO4. Identify various science research CLO5. Explain Research Methods CLO6. Identify Research Methods CLO7. Explain citation technic and bibliography with communication and information technology CLO9. Explain Scientific Writing Ethics CLO10. Explain a good scientific presentation CLO11. Explain type of scientific presentation CLO12. Identify a good scientific presentation CLO13. Analyse on physics and its application scientific articles CLO14. Formulate scientific problems for drafting article and scientific presentation in physics and its application	

	CLO15. Determine scientific problems for drafting article and scientific presentation in physics and its application CLO16. Analyse title and abstract on selective physics and its application articles CLO17. Communicate title and abstract in the form of writing language in peer group discussion CLO18. Analyse introduction on selective physics and its application articles CLO19. Communicate introduction in the form of writing language in peer group discussion CLO20. Analyse methodology and result on selective physics and its application articles CLO21. Communicate methodology and result in the form of writing language in peer group discussion CLO22. Analyse conclusion and references on selective physics and its application articles CLO23. Communicate conclusion and references in the form of writing language in peer group discussion CLO24. Analyse scientific poster on selective physics and its application articles CLO25. Analyse scientific oral presentation on selective physics and its application articles CLO26. Apply citation and bibliography technic with communication and information technology CLO27. Make simulation on scientific publication online CLO28. Disseminate selective scientific poster CLO29. Disseminate selective scientific oral presentation
Content:	Importance Research Management and Scientific Publication, Science Research Characteristic, Research Methods, Report and Scientific Report/Article, Writing Ethics and Scientific Publication, Scientific Presentation, Problem Analysis on Scientific Articles, Title and Abstract analysis on Scientific Articles, Introduction analysis on Scientific Articles, Methodology and Result analysis on Scientific Articles, Conclusion and References analysis on Scientific Articles, Scientific Poster Presentation analysis, Scientific Oral Presentation analysis
Study/exam achievements:	The final mark will be weight as follow:

No	CLO	Assessment Object	Assessment Techniques	Weight
1	CLO12, CLO15, CLO16, CLO18, CLO20, CLO22, CLO27, CLO28, and CLO29	a. Individual assignments	Written	15%
		b. Discussion participation	Performance	10%
		c. Presentation	Performance	25%
		d. Mid Exam	Written test	25%
		e. Final Exam	Written test	25%
Total				100%

Forms of media:	Board, LCD Projector, Laptop/Computer, stream video conference, online journal system, Citation and bibliography management software

Literature:	1. Dresch, A, et all. (2015). *Design Science Research: A Method for Science and Technology Advancement*. Springer International Publishing Switzerland. 2. Jatmiko, W., et all. (2015). *Panduan Penulisan Artikel Ilmiah*. Fakultas Ilmu Komputer, Universitas Indonesia. 3. Alley, M. (2003). *The Craft of Scientific Presentations*. Springer. 4. Abdullah, M. (2016). *Tuntunan Praktis Menulis Makalah untuk Jurnal Ilmiah Internasional*. Institut Teknologi Bandung. 5. Lindsay, D. (2011). *Scientific writing = thinking in words*. CSIRO PUBLISHING Australia. 6. Setiyo, M. (2017). *Teknik Menyusun Manuskrip dan Publikasi Ilmiah Internasional*. Deepublish Publisher Yogyakarta.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1							√					
CLO2							√					
CLO3								√				
CLO4								√				
CLO5								√				
CLO6								√				
CLO7								√				
CLO8								√				
CLO9								√				
CLO10								√				
CLO11								√				
CLO12									√			
CLO13									√			
CLO14									√			
CLO15									√			
CLO16									√			
CLO17									√			
CLO18									√			
CLO19									√			
CLO20									√			
CLO21									√			
CLO22									√			
CLO23									√			
CLO24									√			
CLO25									√			
CLO26										√		
CLO27										√		
CLO28									√			
CLO29									√			

FI564 Geophysical Exploration

Module name:	Geophysical Exploration	
Module level, if applicable:	Undergraduate	
Code:	FI564	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Nanang Dwi Ardi	
Lecturer(s):	Nanang Dwi Ardi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and field exploration). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	2 hours 30 minutes	20
Workload:	Total workload is 136 hours (4.8 ECTS) per semester which consists of 150 minutes lectures and a week for field camp exploration (1.2 ECTS), 180 minutes structured activities (1.5 ECTS), and 180 minutes self-study per week for 14 weeks (1.5 ECTS), 150 minutes for each exam (0.2 ECTS), and 360 minutes for each exam preparation (0.4 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Geological Geophysics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain importance survey design in earth exploration CLO2. Explain principle, acquisition, processing and modelling electrical method CLO3. Explain principle, acquisition, processing and modelling electromagnetic method CLO4. Explain principle, acquisition, processing and modelling gravity method CLO5. Explain principle, acquisition, processing and modelling magnetic method CLO6. Explain principle, acquisition, processing and modelling passive seismic method CLO7. Explain principle, acquisition, processing and modelling	

<table>
<tr><td></td><td>refraction seismic method
CLO8. Explain principle, acquisition, processing and modelling reflection seismic method
CLO9. Explain principle, acquisition, and processing well logging data
CLO10. Explain principle, acquisition, radiometric method
CLO11. Apply geophysical method in field exploration</td></tr>
<tr><td>Content:</td><td>Survey design, electrical method, electromagnetic method, gravity method, magnetic method, passive seismic method, refraction seismic method, reflection seismic method, well logging, radiometric method, field exploration</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1-CO10,

CLO11</td><td>Subject specific competence:
a. Individual assignments
b. Field exploration
c. Mid Exam
d. Final Exam</td><td>

Written test

Performance

Written test
Written test</td><td>

15%

25%

30%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, article, resistivity meter</td></tr>
<tr><td>Literature:</td><td>1. Milsom J., and Eriksen A., (2012). Field Geophysics, Fourth Edition. John Wiley and Sons, Ltd.
2. Dentith M., and Mudge S.T, (2014). Geophysics for the Mineral Exploration Geoscientist. Cambridge University Press USA.
3. Everett, M.E, (2013). Near-Surface Applied Geophysics. Cambridge University Press USA.</td></tr>
</table>

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								
CLO7				√								
CLO8				√								
CLO9							√					
CLO10					√							
CLO11					√							

FI565 Astrophysics

Module name:	Astrophysics	
Module level, if applicable:	Undergraduate	
Code:	FI565	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Judhistira Aria Utama	
Lecturer(s):	Judhistira Aria Utama	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and presentation) 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches, Presentation) 3. Self-study (Mini research project)	2 hours 30 minutes	20
Workload:	Total workload is 136 hours 4.8 ECTS (8.160 minutes) per semester which consists of 2100 minutes (1.22 ECTS) lectures, 2520 minutes (1.58 ECTS) structured activities, 2520 minutes (1.58 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: CLO1. Describe the concept of light as information from the sky and instruments light collector CLO2. Explain the operation and determination of telescope optical parameters CLO3. Conduct astronomical observations and be able to assemble portable telescopes or procedures for accessing remote/robotic telescopes in observation sessions to obtain data (can be in the form of images) of observed celestial objects CLO4. Describe the law of black body radiation,	

<table>
<tr><td></td><td>CLO5. Measure and calculate specific intensity, flux, and luminosity by considering stars as black bodies
CLO6. Describe the fundamental quantities and laws in astronomy and of the measurement of basic quantities in astronomy through astronomical observations
CLO7. Describe the concept of star photometry,
CLO8. Measure and determine magnitude and correction star photometry
CLO9. Describe stellar spectroscopy and the process of star spectrum formation
CLO10. Measure and determine the strength of the spectral line of celestial bodies
CLO11. Explaind the proper motion of stars
CLO12. Measure and determine proper motion
CLO13. Disseminate the results of research/scientific study results in the form of reports according to standard scientific principles and present them in lectures
CLO14. Process of data acquisition and ethics in the use of public data</td></tr>
<tr><td>Content:</td><td>The light as information from the sky and instruments light collector, the telescope optical parameters, the law of black body radiation, the laws in astronomy, the star photometry, the stellar spectroscopy, the proper motion of stars</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 – 6</td><td>Subject specific competences:
d. Individual assignments
e. Mid Exam</td><td>

Written
Written test</td><td>

15%
25%</td></tr>
<tr><td>2</td><td>7 – 12</td><td>f. Individual assignments
g. Final Exam</td><td>Written
Written test</td><td>15%
25%</td></tr>
<tr><td>3</td><td>13 – 14</td><td>h. Presentation</td><td>Project</td><td>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Carroll, B.W., Ostlie, D.A. (2007). An Introduction to Modern Astrophysics 2nd Edition. Pearson Addison Wesley.
2. Karttunen, H. et al. (2017). Fundamental Astronomy 6th Edition. Springer.
3. Kutner, M.L. (2003). Astronomy: A physical perspective. Cambridge University Press.
4. LeBlanc, F. (2010). An Introduction to Stellar Astrophysics. Weley.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										
CLO11		√										
CLO12		√										
CLO13		√										
CLO14		√										

FI566 Physics of Semiconductor Device

Module name:	Physics of Semiconductor Device	
Module level, if applicable:	Undergraduate	
Code:	FI566	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Andi Suhandi	
Lecturer(s):	Andi Suhandi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Optional course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, and discussions) 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	2 hours 30 minutes	20
Workload:	Total workload is 136 hours 4.8 ECTS (8.160 minutes) per semester which consists of 2100 minutes (1.22 ECTS) lectures, 2520 minutes (1.58 ECTS) structured activities, 2520 minutes (1.58 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Basic Physics 1 & 2, Material Physics	
Course Learning Outcomes (CLO):	After taking this course the students have the ability to: CLO1. Explain various semiconductor devices (electronic devices and optoelectronic devices) and their different electronic systems/devices. CLO2. Apply concepts, laws, principles, and principles of physics to semiconductor materials and devices CLO3. Explain the basic structure of semiconductor devices (electronic and optoelectronic devices). CLO4. Explain the structure and physical mechanism of operation of various electronic devices. CLO5. Explain the structure and physical mechanism of operation of various optoelectronic devices. CLO6. Explain the characteristics of various electronic devices. CLO7. Explain the characteristics of various optoelectronic devices. CLO8. Apply various electronic and optoelectronic devices in electronic systems/devices that are widely used in	

<table>
<tr><td></td><td>everyday life.
CLO9. Explain the process of characterizing the physical properties of various electronic and optoelectronic devices.
CLO10. Analyze of physical properties of various electronic and optoelectronic devices based on the data from the characterization of different electronic and optoelectronic devices</td></tr>
<tr><td>Content:</td><td>Various semiconductor devices (electronic devices and optoelectronic devices) and their different electronic systems/devices. Concepts, laws, principles, and principles of physics to semiconductor materials and devices. The basic structure of semiconductor devices (electronic and optoelectronic devices). The system and the physical mechanism of operation of various electronic devices. The structure and the physical mechanism of operation of various optoelectronic devices. The characteristics of various electronic devices. Various optoelectronic devices. The characterizing the physical properties of various electronic and optoelectronic devices.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Score</th></tr>
<tr><td>1</td><td>1 – 3</td><td>Subject specific competence:
a. Individual assignments
b. Mid Exam</td><td>

Written
Written test</td><td>

10%
40%</td></tr>
<tr><td>2</td><td>4 – 10</td><td>c. Individual assignments
d. Final Exam</td><td>Written
Written test</td><td>10%
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Suhandi dan Y. R. Tayubi (2017) Fisika Piranti Semikonduktor, Belum diterbitkan.
2. S. M. Sze, and Ming-Kwei Lee, (2012). Semiconductor Devices: Physics and Technology, John Wiley & Sons.
3. J. Singh, (2019) Semiconductor Optoelectronics; Physics & Technology, McGraw-Hill Inc.
4. Kwok K. Ng, (2002). Complete Guide to Semiconductor Devices, 2nd Edition. Wiley-IEEE Press.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										

FI567 Instrumentation System

Module name:	Instrumentation System	
Module level, if applicable:	Undergraduate	
Code:	FI567	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Ahmad Aminudin	
Lecturer(s):	Ahmad Aminudin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (Practical/project)	2 hours 30 minutes	20
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Analog Electronics, Digital Electronics, Metrology and Calibration	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. Describe the characteristics of sensors and transducers
CLO2. Describe the knowledge of position, displacement and level measurement
CLO3. Apply ideas in the instrument design of speed and acceleration measuring
CLO4. Apply in the design and construct of force and torque measuring.
CLO5. Apply in the design and construct of pressure and temperature measuring
CLO6. Apply in the design and construct of flow measuring
CLO7. Apply in the design and construct of acoustic measuring
CLO8. Apply ideas in the design of a light measuring instrument
CLO9. Apply ideas in the design and construct of humidity measuring instruments
CLO10. Apply ideas in the design and construct of chemical measuring
CLO11. Describe how material works and sensor technology
CLO12. Make troubleshooting and manufacture instruments</td></tr>
<tr><td>Content:</td><td>In this course, students will study (i) Definition and characteristics of the instrument; (ii) Position-displacement and level measurements consist of potentiometric, capacitive, inductive, magnetic, optical, ultrasonic, radar sensors and level sensors; (iii) measurement of velocity and acceleration includes the characteristics of the accelerometer, capacitive accelerometer, piezoresistive accelerometer, thermal accelerometer and gyroscope ; (iv) Measurement of force and strain consisting of strain gauge and piezoelectric; (v) Pressure measurement consists of methods of mercury, bellows, membrane, thin plate, piezoresistive, capacitive (vi) flow measurement load dynamics of flow, pressure gradient technique, thermal transport, ultrasonic, electromagnet, mass flow; (vii) Acoustic sensors via resistive, condenser, piezoelectric and solid-state acoustic methods; (viii) Moisture sensors with capacitive, conductive, thermal, optical and oscillating methods; (ix) Light sensor via photodiode, phototransistor, photoresistor, thermopile, pyroelectric, IR sensor; (x) Temperature sensors with thermistor, thermoelectric, and PN semiconductors; (xi) Chemical sensors with electrochemical, biochemical and enzyme methods; (xii) Sensor materials and technology.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO12</td><td>Subject specific competences:
a. Assignments
b. Exam
- Mid exam
- Final exam</td><td>

Written

Written test
Written test</td><td>

20 %

25%
25%</td></tr>
<tr><td>2</td><td>CLO3 - CLO10</td><td>Subject specific competences:
- Class Activity
- Project</td><td>

Performance
Performance</td><td>

10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS
Literature:	1. Instrumentation, Measurement and Analysis, BC Nakra KK Chaudhry, 2009, 3rd edition, McGraw-Hill Publishing Company 2. Morris, A. S., & Langari, R. (2015). *Measurement and instrumentation: Theory and application*. Academic Press. *3.* Figliola, R.S., & Beasley, D.E. (2011). *Theory and Design for Mechanical Measurements*. John Wiley & Sons, Inc. 4. George, B., Roy, J. K., Kumar, V. J., & Mukhopadhyay, S. C. (2017). *Advanced interfacing techniques for sensors: Measurement circuits and systems for intelligent sensors*. Springer. 5. Fraden, J. (2015). *Handbook of modern sensors: Physics, designs, and applications*. Springer.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2			√									
CLO3			√									
CLO4			√									
CLO5			√									
CLO6			√									
CLO7			√									
CLO8			√									
CLO9			√									
CLO10			√									
CLO11			√									
CLO12			√									

FI580 Statistical Physics

Module name:	Statistical Physics	
Module level, if applicable:	Undergraduate	
Code:	FI-580	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Lilik Hasanah	
Lecturer(s):	Lilik Hasanah	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions, exercises and presentations). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	2 hour 30 minutes	35
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Modern Physics, Mathematical Physics I and II, Thermodynamics, and Quantum Physics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Describe macroscopic and equilibrium systems. CLO2. Describe the probability in physics systems. CLO3. Analyse the basic statistical description of particle systems. CLO4. Analyse the thermal interactions. CLO5. Analyse the Maxwell-Boltzmann Statistics and their applications. CLO6. Analyse the Bose-Einstein Statistics and their applications. CLO7. Analyse the Maxwell-Boltzmann Statistics and their applications.	

<table>
<tr><td>Content:</td><td>1. Characteristics of macroscopic and equilibrium systems.
2. Basic concepts of probability
3. Statistical description of particle system
4. Thermal interactions
5. Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac statistics and their applications.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO7</td><td>Subject specific competences:
a. Assignments
b. Exam
- Mid exam
- Final exam</td><td>

Written

Written test
Written test</td><td>

20 %

30%
25%</td></tr>
<tr><td>2</td><td>CLO5, CLO6, CLO7</td><td>Subject specific competences:
- Presentation</td><td>

Performance</td><td>

25%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Stowe K. (2007). An Introduction to Thermodynamic and Statistical Mechanics. Cambridge University Press.
2. Reif F. (2018). Statistical Physics. Berkeley Physics Course, New York.
3. Olla, P. (2014). An introduction to thermodynamics and statistical physics. Springer.
4. Setiya Utari, Lilik Hasanah, Endi Suhendi. (2016). Pengantar Fisika Statistik. UPI Press.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2	√	√										
CLO3	√	√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										

FI581 Seminar on Physics

<table>
<tr><td>Module name:</td><td colspan="2">Seminar on Physics</td></tr>
<tr><td>Module level, if applicable:</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code:</td><td colspan="2">FI581</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Classes, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Semester:</td><td colspan="2">7th</td></tr>
<tr><td>Module coordinator:</td><td colspan="2">Dadi Rusdiana</td></tr>
<tr><td>Lecturer(s):</td><td colspan="2">Dadi Rusdiana, Andhy Setiawan, Wiendartun, Mimin Iryanti, M. Arifin</td></tr>
<tr><td>Language:</td><td colspan="2">Bahasa Indonesia</td></tr>
<tr><td>Classification within the curriculum:</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>1. Lecture (seminars and discussion).
2. Structured activities (Preparing seminar and making report)
3. Self-study (reading literature)</td><td>2 hours 30 minutes</td><td>20</td></tr>
<tr><td>Workload:</td><td colspan="2">The total workload is 136 hours (4.8 ECTS/8160 minutes) per semester, consisting of 2100 minutes (1.23 ECTS) lectures, 1260 minutes (0.74 ECTS) exercise, 2280 minutes (1.34 ECTS) structured activities, 2520 minutes (1.49 ECTS) self-study per week for 16 weeks</td></tr>
<tr><td>Credit points:</td><td colspan="2">4.8 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td colspan="2">-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td colspan="2">After taking this course, the students have the ability to:
CLO1. Analyze data techniques in the field of physical science, which is the focus of his study.
CLO2. Make appropriate decisions in the context of solving problems based on the results of information and data analysis.
CLO3. Predict the potential application of behavior of physical phenomena in technology
CLO4. Disseminate the results of the study of problems in the form of reports according to standard scientific principles.
CLO5. Show good responsibility, autonomy, struggle, and be an entrepreneur</td></tr>
<tr><td>Content:</td><td colspan="2">Knowledge of technology based on physics and application</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2"><table><tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr><tr><td>1</td><td>1 – 5</td><td>Subject specific competence:</td><td></td><td></td></tr></table></td></tr>
</table>

			a. Individual assignments b. Presentation c. Report	Written Performance Written	20% 40% 40%
	Total				100%
	The final mark will be weight as follow:				
Forms of media:	Board, LCD Projector, Laptop/Computer, LMS				
Literature:	1. Journals according to the subject group of science 2. The article according to the subject group of science. 3. Pedoman penulisan Tugas akhir, Penerbit UPI				

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1							√					
CLO2								√				
CLO3							√					
CLO4									√			
CLO5										√		

FI582 Geophysical Data Analysis

Module name:	Geophysical Data Analysis	
Module level, if applicable:	Undergraduate	
Code:	FI582	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Nanang Dwi Ardi	
Lecturer(s):	Nanang Dwi Ardi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, and discussions). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	2 hours 30 minutes	20
Workload:	Total workload is 136 hours (4.8 ECTS) per semester which consists of 150 minutes lectures (1.2 ECTS), 180 minutes structured activities (1.5 ECTS), and 180 minutes self-study per week for 14 weeks (1.5 ECTS), 150 minutes for each exam (0.2 ECTS), and 360 minutes for each exam preparation (0.4 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Geological Geophysics, Geophysical Exploration	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain importance data analysis in earth exploration CLO2. Explain principle geophysics statistical data CLO3. Explain principle signal and its classification CLO4. Make statistic solution in geophysics cases CLO5. Differentiate between analogue and digital signal CLO6. Explain inversion model	
Content:	Introduction to Processing Software in Geophysics, Statistical geophysics data analysis, signal and its classification, Digital Signal Processing, Fourier transform in geophysics, Signal Filtering, Digital Image Processing, Sparse representation, Inversion model	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1-CLO6,</td><td>Subject specific competence:
a. Individual assignments
b. Mid Exam
c. Final Exam</td><td>

Written

Written test
Written test</td><td>

30%

35%
35%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, stream video conference, geophysics processing software</td></tr>
<tr><td>Literature:</td><td>1. Madrinovella, I, dkk., (2020). Metode Komputasi Geofisika Menggunakan Python. Universitas Pertamina
2. Trauth, M.H., (2010). MATLAB Recipes for Earth Sciences. Springer-Verlag Berlin Heidelberg.
3. Menke, M., (2012). Geophysical Data Analysis: Discrete Inverse Theory, Vol. 45 MATLAB Edition. Academic Press.
4. Pine, D.J., (2019). Introduction to Python for Science and Engineering -CRC Press.
5. Downey, B. A., (2016). Think DSP: Digital Signal Processing in Python. O'Reilly Media.
6. Unpingco, J., (2014). Python for Signal Processing Featuring IPython Notebooks. Springer International Publishing.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3				√								
CLO4				√								
CLO5				√								
CLO6				√								

FI583 Geothermal Physics

Module name:	Geothermal Physics	
Module level, if applicable:	Undergraduate	
Code:	FI583	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Mimin Iryanti	
Lecturer(s):	Mimin Iryanti	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository and discussions). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	1 hour 40 minutes	20
Workload:	Total workload is 90 hours 3.2 ECTS (5440 minutes) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.98 ECTS) structured activities, 1680 minutes (0.98 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: CLO1. Describe geothermal systems CLO2. Explain the concept of the earth system CLO3. Explain the Geochemistry in the geothermal system CLO4. Explain the Geothermometer in the geothermal system CLO5. Apply the law thermodynamics in geothermal systems. CLO6. Explain the Geothermal energy CLO7. Explain thermal properties of Rocks CLO8. Explain Identification of Geothermal Minerals CLO9. Explain Geothermal Systems in Indonesia, CLO10. Explain Classification of Geothermal Systems CLO11. Explain Classification of Power Plants from Geothermal Systems	

<table>
<tr><td></td><td>CLO12. Explain Geothermal Environments,
CLO13. Explain Geothermal Explorations</td></tr>
<tr><td>Content:</td><td>Geothermal Systems, Geochemistry, Geothermometers, Thermodynamics, Geothermal Energy, Thermal Properties of Rocks, Identification of Geothermal Minerals, Geothermal Systems in Indonesia, Classification of Geothermal Systems, Classification of Power Plants from Geothermal Systems, Geothermal Environments, and Geothermal Explorations.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 - 8</td><td>Subject specific competence:
a. Individual assignments
b. Mid Exam</td><td>

Written
Written test</td><td>

10%
40%</td></tr>
<tr><td>2</td><td>9 - 13</td><td>c. Individual assignments
d. Final Exam</td><td>Written
Written test</td><td>10%
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Glaslley, W. E. (2010). Geothermal Energy Renewable and the Environment. CRC Press, Taylor and Francis Group LLC.
2. Gupta, H and Roy, S. (2007). Geothermal Energy an Alternative resource for the 21st Century. Elsevier.
3. Rogers, G. F., & Mayhew, Y. R. (2013). Thermodynamic and transport properties of fluids. John Wiley & Sons.
4. Min, K. (2009). Introduction to heat transfer.
5. Min, K. (2009). Reservoir geomechanics.
6. Cangel, Y. A. dan Michael Boles. (2011). Thermodynamics an engineering approach. Mcgraw-Hill.
7. Manfred Koch. (2013). Geothermal Energy, Geophysical concepts, application and limitations.
8. Saepuloh, A. (2016). SAR principle and theory for earth resource exploration. ITB.
9. Reynolds, J. M. (2011). An introduction to applied and environmental geophysics. Wiley.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										
CLO11		√										
CLO12		√										
CLO13		√										

FI584 Positional Astronomy

Module name:	Geothermal Physics	
Module level, if applicable:	Undergraduate	
Code:	FI583	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Mimin Iryanti	
Lecturer(s):	Mimin Iryanti	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
4. Lecture (conceptual, contextual, and problem-solving approaches through expository and discussions). 5. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 6. Self-study (reading literature)	1 hour 40 minutes	20
Workload:	Total workload is 90 hours 3.2 ECTS (5440 minutes) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1680 minutes (0.98 ECTS) structured activities, 1680 minutes (0.98 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: CLO1. Describe geothermal systems CLO2. Explain the concept of the earth system CLO3. Explain the Geochemistry in the geothermal system CLO4. Explain the Geothermometer in the geothermal system CLO5. Apply the law thermodynamics in geothermal systems. CLO6. Explain the Geothermal energy CLO7. Explain thermal properties of Rocks CLO8. Explain Identification of Geothermal Minerals CLO9. Explain Geothermal Systems in Indonesia, CLO10. Explain Classification of Geothermal Systems CLO11. Explain Classification of Power Plants from Geothermal Systems	

<table>
<tr><td></td><td>CLO12. Explain Geothermal Environments,
CLO13. Explain Geothermal Explorations</td></tr>
<tr><td>Content:</td><td>Geothermal Systems, Geochemistry, Geothermometers, Thermodynamics, Geothermal Energy, Thermal Properties of Rocks, Identification of Geothermal Minerals, Geothermal Systems in Indonesia, Classification of Geothermal Systems, Classification of Power Plants from Geothermal Systems, Geothermal Environments, and Geothermal Explorations.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 - 8</td><td>Subject specific competence:
e. Individual assignments
f. Mid Exam</td><td>

Written
Written test</td><td>

10%
40%</td></tr>
<tr><td>2</td><td>9 - 13</td><td>g. Individual assignments
h. Final Exam</td><td>Written
Written test</td><td>10%
40%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>10. Glaslley, W. E. (2010). Geothermal Energy Renewable and the Environment. CRC Press, Taylor and Francis Group LLC.
11. Gupta, H and Roy, S. (2007). Geothermal Energy an Alternative resource for the 21st Century. Elsevier.
12. Rogers, G. F., & Mayhew, Y. R. (2013). Thermodynamic and transport properties of fluids. John Wiley & Sons.
13. Min, K. (2009). Introduction to heat transfer.
14. Min, K. (2009). Reservoir geomechanics.
15. Cangel, Y. A. dan Michael Boles. (2011). Thermodynamics an engineering approach. Mcgraw-Hill.
16. Manfred Koch. (2013). Geothermal Energy, Geophysical concepts, application and limitations.
17. Saepuloh, A. (2016). SAR principle and theory for earth resource exploration. ITB.
18. Reynolds, J. M. (2011). An introduction to applied and environmental geophysics. Wiley.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										
CLO11		√										
CLO12		√										
CLO13		√										

FI585 Stellar Physics

Module name:	Stellar physics	
Module level, if applicable:	Undergraduate	
Code:	FI585	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Judhistira Aria Utama	
Lecturer(s):	Judhistira Aria Utama	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and presentation) 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches, Presentation) 3. Self-study (project)	150 minutes	20
Workload:	Total workload is 136 hours 4.8 ECTS (8.160 minutes) per semester which consists of 2100 minutes (1.22 ECTS) lectures, 2520 minutes (1.58 ECTS) structured activities, 2520 minutes (1.58 ECTS) self-study per week for 14 weeks, 400 minutes (0.2 ECTS) for each exam, and 480 (0.22 ECTS) minutes for each exam preparation.	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Basic Physics 1 & 2	
Course Learning Outcomes (CLO):	After taking this course the students have the ability to: CLO1. Explain the stellar atmosphere modeling, including absorption coefficients, emission coefficient, and emission conductivity equation CLO2. Explain the inner-stellar structure, including pressure, temperature, mass density, differential equations of star structure, energy generation mechanisms CLO3. Explain the interstellar matter and its role and influence on astronomical observations CLO4. Explain stellar evolution, starting from star formation and main-sequence evolution, late life-history star CLO5. Explain the characteristic time scale of stellar evolution, including dynamic time scale, thermal time scale, nuclear	

<table>
<tr><td></td><td>time scale, of star clusters, including star populations, galactic clusters and globular clusters, isochrons, and cluster ages, and variable stars
CLO6. Solve the emission differential equations, differential equations of star structures
CLO7. Determine the age of star clusters
CLO8. Explain the spectroscopic observations in helping to understand the composition of celestial objects
CLO9. Disseminate the results of research/scientific study results in the form of reports following standard scientific principles in the study
CLO10. Process of data acquisition and ethics in the use of public data</td></tr>
<tr><td>Content:</td><td>The stellar atmosphere modeling, including absorption coefficients, emission coefficient, and emission conductivity equation. The inner-stellar structure including pressure, temperature, mass density, differential equations of star structure, energy generation mechanisms. The interstellar matter and its role and influence on astronomical observations. The stellar evolution, starting from star formation and main-sequence evolution, late life-history star. The characteristic time scale of stellar evolution, including dynamic time scale, thermal time scale, nuclear time scale, of star clusters, including star populations, galactic clusters, and globular clusters, isochrons and cluster ages, and variable stars. The age of star clusters, the spectroscopic observations in helping to understand the composition of celestial objects</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 – 3</td><td>Subject specific competence:
a. Individual assignments
b. Mid Exam</td><td>

Written
Written test</td><td>

15%
25%</td></tr>
<tr><td>2</td><td>4 – 8</td><td>c. Individual assignments</td><td>Written</td><td>15%</td></tr>
<tr><td>3</td><td>9 – 10</td><td>d. Final Exam
e. Project presentation</td><td>Written test
Performance</td><td>25%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. Karttunen, H. et al. (2017). Fundamental Astronomy 6th Edition. Springer.
2. Prialnik, D. (2009), An Introduction to the Theory of Stellar Structure and Evolution, 2nd Edition, Cambridge University Press
3. LeBlanc, F. (2010). An introduction to stellar astrophysics. Wiley.
4. Carroll, B.W., Ostlie, D.A. (2007). An Introduction to Modern Astrophysics 2nd Edition. Pearson Addison Wesley.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										
CLO8		√										
CLO9		√										
CLO10		√										

FI586 Nanomaterial

Module name:	Nanomaterial	
Module level, if applicable:	Undergraduate	
Code:	FI586	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Endi Suhendi	
Lecturer(s):	Endi Suhendi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches, discussions and presentation). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	1 hours 40 minutes	20
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11 hour 54 minutes/714 minutes for two exams and exam preparations (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Basic Physics 1, Basic Physics 2	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain the need for nanometer-sized materials. CLO2. Analyze the effect of size on material properties CLO3. Explain the synthesis and characterization of nanometer-sized materials. CLO4. Explain the concept, synthesis, characterization, and application of quantum dot material. CLO5. Explain the concept, synthesis, characterization, and application of nano wire. CLO6. Explain nanocomposite materials CLO7. Analyze the properties, synthesis, characterization, and	

<table>
<tr><td></td><td>application of the latest nanomaterials (carbon nanotubes and graphene).</td></tr>
<tr><td>Content:</td><td>Knowledge of the need for nanometre-sized materials; Effect of size on material properties; properties, synthesis and application of quantum dot materials, nanowires, nanocomposites, and the latest nanomaterials (carbon nanotubes and graphene).</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>1 - 6</td><td>Subject specific competences:
- Assignment
- Class activity
- Midterm exam</td><td>
Written
Performance
Written test</td><td>
10%
10%
30%</td></tr>
<tr><td>2</td><td>7</td><td>Subject specific competences:
- Presentation
- Final exam</td><td>
Performance
Written test</td><td>
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. Abdullah, M. (2009). Pengantar Nanosains, Penerbit ITB.
2. Vollath, D. (2013). Nanomaterials: An Introduction to Synthesis, Properties and Applications, 2nd Edition, Wiley-VCH.
3. Pokropivny, V., Lohmus, R., Hussainova, I., Pokropivny, A., & Vlassov, S. (2007). Introduction to Nanomaterials and Nanotechnology, Tartu University Press.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		√										
CLO2		√										
CLO3		√										
CLO4		√										
CLO5		√										
CLO6		√										
CLO7		√										

FI587 Processing and Characterization of Semiconductor Materials

Module name:	Processing and Characterization of Semiconductor Materials	
Module level, if applicable:	Undergraduate	
Code:	FI587	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Dadi Rusdiana	
Lecturer(s):	Dadi Rusdiana	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective Course	
Type of teaching	Contact hours per week during the semester	Class Size
1. Lecture (expository method, discussion, exercises, experiment, and presentation) 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature)	2 hours 30 minutes	20
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Solid State Physics	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain the technique of making semiconductor materials and their characterization both conceptually and procedurally CLO2. Develop and apply it in accordance with the development of science and technology.	
Content:	Techniques for making bulk targets, techniques for making thin layers of semiconductors, techniques for making masks and etchings in the lithography process, thin film characterization methods such as X-ray diffraction, scanning electron microscopy, Ultraviolet Visible spectroscopy, and measurement of electrical properties/Hall effect.	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1</td><td>Subject specific competences:
a. Assignments
b. Exam
- Mid exam
- Final exam</td><td>
Written

Written test
Written test</td><td>
10 %

35%
35%</td></tr>
<tr><td>2</td><td>CLO2</td><td>Subject specific competences:
- Experiment report
- Presentation</td><td>
Written

Performance</td><td>
10%

10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, LMS</td></tr>
<tr><td>Literature:</td><td>1. G.S. May and C.J. Spanos, (2006). Fundamentals of Semiconductor Manufacturing and Process Control, 1st Edition, Wiley-IEEE Press
2. S.A. Campbell, (2012). Fabrication Engineering at the Micro- and Nanoscale (The Oxford Series in Electrical and Computer Engineering), 4th Edition, Oxford University Press
3. M.P. Groover, (2011). Introduction to Manufacturing Processes, 1st Edition, Wiley</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								

FI588 Intelligent Instrumentation

Module name:	Intelligent Instrumentation	
Module level, if applicable:	Undergraduate	
Code:	FI588	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Waslaluddin	
Lecturer(s):	Waslaluddin	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual, and problem-solving approaches through expository, discussions, presentation, and experiment). 2. Structured activities (assignments based on conceptual, contextual, and problem-solving approaches) 3. Self-study (reading literature and project)	1 hours 40 minutes	20
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11hour 54 minutes/714 minutes for two exams (0.42 ECTS).	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Microprocessor Application	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Describe microprocessor technology as a computational and controller based on artificial intelligence algorithms CLO2. Explain technology of microcontroller as the base instrument, sensor and control intelligent CLO3. Apply microprocessor technology as an artificial intelligence-based computing and control system CLO4. Apply microcontroller technology as the basis for artificial intelligence-based sensor and control instruments CLO5. Apply the technology of information to manipulate sensors and control based on artificial intelligence	

<table>
<tr><td></td><td>CLO6. Analyse alternative sensor- actuator Technology solutions with artificial Intelligence-based microprocessors
CLO7. Report the results of making sensor- actuator technology products with artificial intelligence-based microcontrollers</td></tr>
<tr><td>Content:</td><td>This course provides an understanding of factual, conceptual and procedural knowledge about the principles, concepts and techniques of Intelligence-Based Instrumentation and their implementation and can apply them to relevant physics problems. The material of this course includes (1) Intelligent systems, (2) Artificial Intelligence, (3) Intelligence-based instruments, (4) Fuzzy Logic Control Systems and their applications, (5) Artificial Neural Networks and their Applications, (6) Genetic Algorithms and their applications, (7) Ants algorithm and Applications (8) Hybrid System and Its Application</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO6</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Mid exam
- Final exam
c. Experiment report
d. Project report
e. Presentation</td><td>Written

Written Test
Written Test

Written
Written
Performance</td><td>10 %

25%
25%

10%
20%
10%</td></tr>
<tr><td>Total</td><td></td><td></td><td></td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer</td></tr>
<tr><td>Literature:</td><td>1. D’Ascoli, Steven. (2022). Artificial Intelligence and Deep Learning with Python Every Line of Code Explained for Readers New to AI and New to Python: Every Line of Code Explained for Readers New to AI and New to Python. Kindle Edition. Amazon.
2. Lam, H., Ling, S. H., Ling, S. S., & Nguyen, H. T. (2012). Computational Intelligence and Its Applications: Evolutionary Computation, Fuzzy Logic, Neural Network and Support Vector Machine Techniques. World Scientific.
3. Kuswandi, Son, (2007). Intelligent Control Theory and Its Practical Application, Andi Yogyakarta
4. Waslaluddin. (2016). Guidelines Practical Uses Minimum System Microcontroller for Intelligence Artificial, not published</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2				√								
CLO3					√							
CLO4					√							
CLO5					√							
CLO6					√							
CLO7					√							

FI589 Microprocessor Application

Module name:	Microprocessor Application	
Module level, if applicable:	Undergraduate	
Code:	FI589	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7th	
Module coordinator:	Waslaluddin	
Lecturer(s):	Waslaluddin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions, experiment and presentation). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (project)	2 hours 30 minutes	20
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Analog Electronics, Digital Electronics, Algorithm and Programming	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Describe microprocessor technology as a computational and control instrument CLO2. Explain microcontroller technology as the basis of sensors and control instruments CLO3. Apply microprocessor technology as a computing and control instrument CLO4. Apply microcontroller technology as the basis for sensor and control instruments CLO5. Apply microprocessor technology as a computing and control instrument CLO6. Apply microcontroller technology as the basis for sensor and control instruments	

<table>
<tr><td></td><td>CLO7. Apply microprocessor technology as a computational and control instrument
CLO8. Apply ICT in microcontroller technology as the basis of sensors and control instruments
CLO9. Analyse of sensors and actuators valid for microprocessor technology as a computational and control instrument
CLO10. Analyse of valid sensors and actuators for microcontroller technology as the basis for control instruments
CLO11. Report the results of the manufacture of micro- processor-based sensor-actuator technology products
CLO12. Report the results of the manufacture of sensor-actuator technology products based on the r microcontroller</td></tr>
<tr><td>Content:</td><td>After completing this course, students are expected to have factual, conceptual, and procedural knowledge and insight to adapt to follow-up lectures on Instrumentation studies, especially microprocessors and microcontrollers as the basis for control instruments. This course discusses (1) understanding and history of microprocessor development, (2) microprocessor structure and working principles, number system and language in microprocessors, (3) Programming and downloaders, (4) LED control program practice, stepper motors and traffic lights, Wired and wireless communication (5) Microcontroller and Minimum system (6) Microcontroller-based Physics Instrument System Project. The learning process uses the problem-solving method, recitation, demonstration and discussion, with electronic presentation application media facilities, microprocessor and microcontroller practical kits with a computer as a tool.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO10

CLO11-CLO12</td><td>Subject specific competences:
a. Individual assignments
b. Exam
- Mid exam
- Final exam
c. Experiment report
d. Project report
e. Presentation</td><td>Written

Written Test
Written Test
Written
Written
Performance</td><td>10 %

25%
25%
10%
20%
10%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Hendry, Iain. (2019). 34 Arduino Sensor Projects. Kindle Edition.
2. Manual Kentac 800Z MK2. Practice program of Z80 CPU. Showadengyosha Co., LTD
3. Kentac PCP User's Manual. Showadengyosha Co., LTD
4. Malvino, AP, Brown, JA (2011) Digital Principles and Application, 7th-ed. McGraw-Hill International Editions
5. Bolton, W. (2015). Instrumentation and Control Systems, 2nd-ed. Elsevier Ltd.
6. Waslaluddin. (2019). Practical Instructions for Using Kentack and Minimum Microcontroller Systems. Unpublished</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1				√								
CLO2				√								
CLO3					√							
CLO4					√							
CLO5					√							
CLO6					√							
CLO7					√							
CLO8					√							
CLO9					√							
CLO10					√							
CLO11					√							
CLO12					√							

FI591 Field Practice (Internship)

Module name:	Field Practice	
Module-level, if applicable:	Undergraduate	
Code:	FI591	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	8th	
Module coordinator:	Lecturer coordinator of field practice	
Lecturer(s):	All study program lecturers and industry practitioners	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (Students do practical work in industry) 2. Structured activities (Students analyze and write daily notes on the results of practical work, make reports, and prepare presentations)	11 hours 20 minutes	One supervisor for one-three students
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 117 hours 20 minutes lectures (4.16 ECTS), and 64 hours structured activities (2.28 ECTS).	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	At least 80% of the credits of the entire study program have reached 80% with a minimum GPA of > 2.50;	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1. Explain the workplace related to the field of physics. CLO2. Apply various academic knowledge and skills (soft and hard skills) related to the field of physics in real workplace situations. CLO3. Gain professional work experience in accordance with the field of physics. CLO4. Present and defend scientific arguments on the results of thinking, concepts, implementation, and results of the analysis in writing and oral.	
Content:	Field practice	

<table>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Score</th></tr>
<tr><td>1</td><td>CLO1-CLO2</td><td>Subject Specific competences
a. Report</td><td>Writing</td><td>30%</td></tr>
<tr><td>2</td><td>CLO3-CLO4</td><td>Generic and social competences:
b. Implementation
c. Presentation report</td><td>Performance
Performance</td><td>50%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Projector and screens, social media communication platform</td></tr>
<tr><td>Literature:</td><td>Guidelines for Field Practice of Faculty of Natural Science Education, Universitas Pendidikan Indonesia, 2020</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1										√		
CLO2	√	√	√	√	√	√						
CLO3							√	√		√	√	√
CLO4									√			

FI598 Thesis

<table>
<tr><td>Module name:</td><td colspan="2">Thesis</td></tr>
<tr><td>Module-level, if applicable:</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code:</td><td colspan="2">FI598</td></tr>
<tr><td>Sub-heading, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Classes, if applicable:</td><td colspan="2">-</td></tr>
<tr><td>Semester:</td><td colspan="2">8th</td></tr>
<tr><td>Module coordinator:</td><td colspan="2">Coordinator of thesis team</td></tr>
<tr><td>Lecturer(s):</td><td colspan="2">The supervisor is proposed by the thesis team coordinator and decided through the Dean's Decree</td></tr>
<tr><td>Language:</td><td colspan="2">Bahasa Indonesia</td></tr>
<tr><td>Classification within the curriculum:</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>100 minutes consultation and 920 minutes structured activities per week</td><td>272 hours</td><td>One student guided by two lecturers</td></tr>
<tr><td>Workload:</td><td colspan="2">Total workload is 272 hours (9.6 ECTS) per semester, which consists of 100 minutes (0.06 ECTS) consultation per week, 920 minutes (0.54 ECTS) individual study per week, in total is 16 weeks per semester</td></tr>
<tr><td>Credit points:</td><td colspan="2">9.6 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td colspan="2">1. Have passed a minimum of 105 credits with a minimum GPA of 2.5.
2. Have passed or are taking part in field practice
3. Have passed all Concentration Competency Course
4. Currently contracting a thesis course</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td colspan="2">After taking this course the students have ability to:
CLO1: Apply the knowledge that has been learned in previous courses,
CLO2: Analyze and provide solutions from the point of view of physics.
CLO3: Apply write scientific presentations.
CLO4: Apply self-confidence, good ethics, and good performance in communication.</td></tr>
<tr><td>Content:</td><td colspan="2">The thesis topic can come from students or research groups</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">The final mark will be weight as follow:
<table>
<tr><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>CLO1-CLO4</td><td>1. Attitude and work ethic in thesis research
- Independence, craft, tenacity, and perseverance</td><td>Performance assessment (rubric of thesis assessment)</td><td>30%</td></tr>
</table></td></tr>
</table>

		- Collaboration with supervisors/fellow researchers - Creativity in dealing with various problems that arise during research and thesis preparation 2. Scientific insight in research - Mastery of basic knowledge and skills related to research material - Critical ideas or ideas to solve the problem under study 3. Skills in writing and compiling thesis - Use of writing rules - Systematics of thesis writing - Skills in writing thesis		40% 40%
	Total			100%
Forms of media:	White Board, paper, Laptop/Computer, Laboratory, LMS, Books or journals related to the topics.			
Literature:	1. Academic Directorate. (2020). *Guidelines for the Implementation of Education at the Indonesian University of Education*. Indonesian University of Education: Bandung 2. Academic Directorate. (2019). *Guidelines for Writing Scientific Papers*. Indonesian University of Education: Bandung 3. Education and Teaching Quality Control Group. (2010). *Standard Operating Procedures*. Department of Physics Education, FPMIPA, Indonesian University of Education: Bandung 4. Books or journals related to the topics.			

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√	√	√	√	√	√						
CLO2					√	√						
CLO3									√			
CLO4							√	√		√	√	√