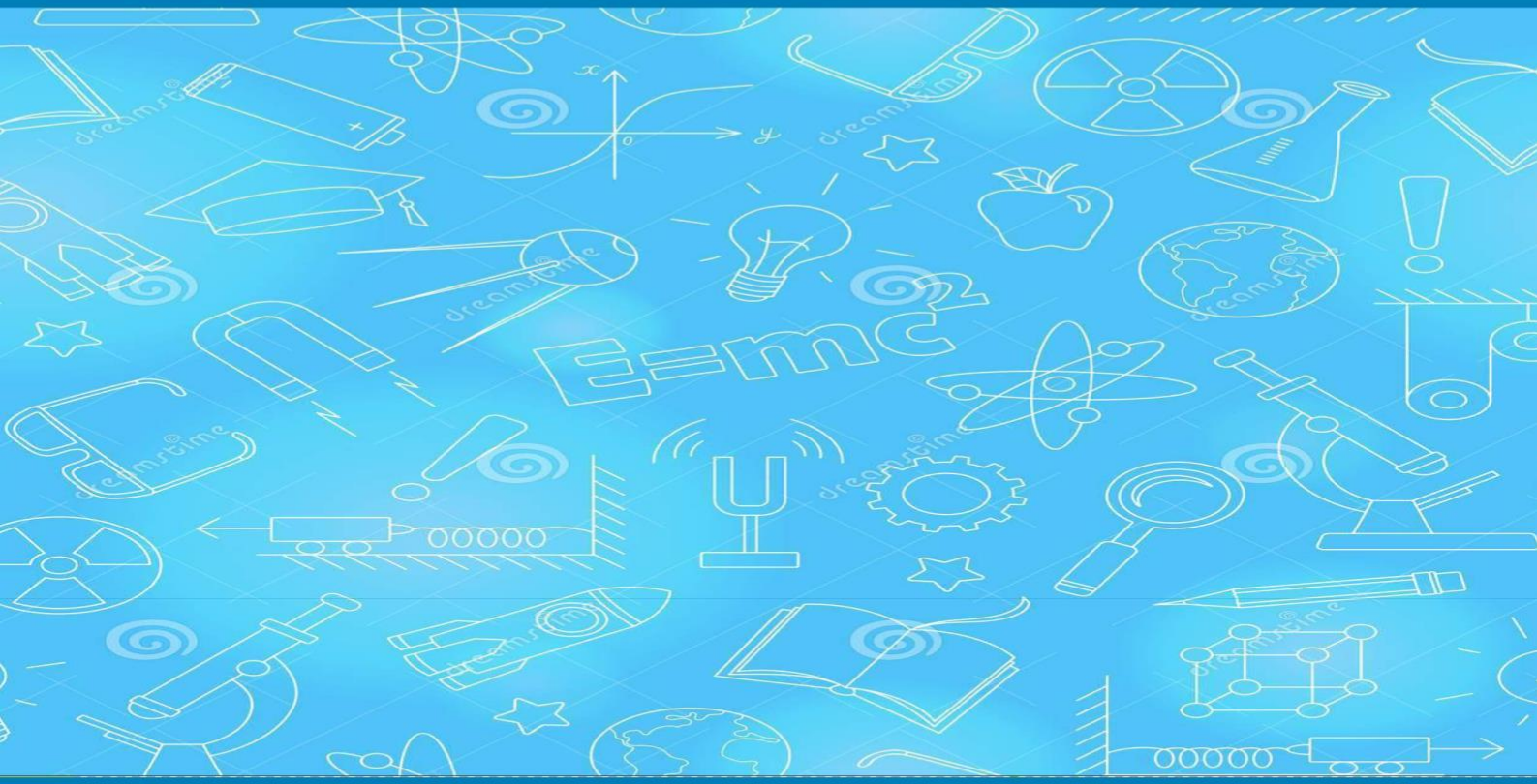
MODULE HANDBOOK



Bachelor of Physics Education

Faculty of Mathematics and Natural Science Education

Universitas Pendidikan Indonesia

CONTENT

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Bachelor of Physics Education **MODULE HANDBOOK**

Module name:	Islamic Education	
Module level, if applicable:	Undergraduate	
Code:	KU100	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Lecturer team of Islamic Education	
Lecturer(s):	Lecturer team of Islamic Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture: expository, presentation, demonstration, discussion. 2. Structured activities: paper, exercise, assignments, worksheets. 3. Self-study: reading the relevant literature	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have ability to:
CLO1. Compare various methods of understanding Islam and develop their understanding of Islamic teachings with the right 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 concept of managing and using assets in Islam as well as various problems of Islamic economics in the modern era.
CLO9. Compare various schools of thought and schools of 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 daily life.
CLO13. Analyze the concept of people's leadership in 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, 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 concept 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>CLO1 – CLO13</td><td>Subject specific competences
a. Individual assignments
b. Mid test
c. Final Test</td><td>

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

20%
40%
40%</td></tr><tr><td>2</td><td>-</td><td>Generic</td><td>-</td><td>-</td></tr></table></td></tr>
</table>

			competences		
	3	-	Social competences	-	-
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS				
Literature:	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				

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√
CLO6												√	√
CLO7												√	√
CLO8												√	√
CLO9												√	√
CLO10												√	√

CLO11												√	√
CLO12												√	√
CLO13												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Protestant Christianity Education	
Module level, if applicable:	Undergraduate	
Code:	KU101	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Lecturer team of Protestant Christianity Education	
Lecturer(s):	Lecturer team of Protestant Christianity Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture: expository, presentation, demonstration, discussion. 2. Structured activities: paper, exercise, assignments, worksheets. 3. Self-study: reading the relevant literature	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS).	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have 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. shows the attitude and character of believers</td></tr>
<tr><td>Content:</td><td>Knowing Allah, basics Christianity, character of human leading, transfer of life, integrity, bible, science 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO4</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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. 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. Jhon. 2010. Becoming a Person of Influence: Talent is Never Enough. Yates & Yates</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Catholic Christianity Education	
Module level, if applicable:	Undergraduate	
Code:	KU102	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Lecturer team of Catholic Christianity Education	
Lecturer(s):	Lecturer team of Catholic Christianity Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture: expository, presentation, demonstration, discussion. 2. Structured activities: paper, exercise, assignments, worksheets. 3. Self-study: reading the relevant literature	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have 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 are able to work together with other religious people to respond to actual problems today.
CLO3. Recognize and understand the life and work of Jesus Christ which are written in the Holy Scriptures and proclaimed by the Church so that they are able to live the life pattern of Jesus in real life.
CLO4. Descript 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 mission of the Church in the midst of society/the world.</td></tr>
<tr><td>Content:</td><td>Humanity, spiritual, religion, Jesus Christ and his relief work, church and the faith.</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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO4</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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. Ahlimedia Book.</td></tr>
</table>

	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.

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Hinduism Education	
Module-level, if applicable:	Undergraduate	
Code:	KU103	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
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	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture: expository, presentation, demonstration, discussion. 2. Structured activities: individual task 3. Self-study: religion activity	1 hour 40 minutes	45
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)	
Pre-requisites course(s):	-	

Course Learning Outcomes (CLO):	After taking this course the students have 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 CLO13: appreciate Hindu Leadership Science related to the concepts of Astabrata and Astadasa Paramiteng Prabhu
Content:	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

<table>
<tr><td></td><td>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>Weight</th></tr>
<tr><td>1</td><td>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO13</td><td>Social competences
a. Individual assignments

b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, 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

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√
CLO6												√	√
CLO7												√	√

CLO8												√	√
CLO9												√	√
CLO10												√	√
CLO11												√	√
CLO12												√	√
CLO13												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Buddhism Education	
Module-level, if applicable:	Undergraduate	
Code:	KU104	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
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	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture: expository, discussion. 2. Structured activities: individual task 3. Self-study: religion activity	1 hour 40 minutes	45
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)	
Pre-requisites course(s):	-	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: explain the position of mind and mind in 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 about 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 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
Content:	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

<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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO13</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, 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,z
5. Tim penyusun. (2010). Riwayat Buddha Gotama. Lembaga Pengkajian Dan Pengembangan Keagamaan Buddha Indonesia.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√
CLO6												√	√
CLO7												√	√
CLO8												√	√
CLO9												√	√
CLO10												√	√
CLO11												√	√
CLO12												√	√
CLO13												√	√
CLO14												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Confucianism Education	
Module-level, if applicable:	Undergraduate	
Code:	KU109	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
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	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture: expository, presentation, demonstration, discussion. 2. Structured activities: individual task 3. Self-study: religion activity	1 hour 40 minutes	45
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)	
Pre-requisites course(s):	-	

Course Learning Outcomes (CLO):	After taking this course the students have 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 about "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 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
Content:	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 ,

<table>
<tr><td></td><td>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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO23</td><td>Social competences
a. Individual assignments

b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, LMS</td></tr>
<tr><td>Literature:</td><td>1. DeLapp, K. (2022). Portraits of Confucius: The Reception of Confucianism from 1560-1960.
2. Tan, C. (2020). Confucian philosophy for contemporary education. Routledge.
3. Baumann, C., Winzar, H., & Viengkham, D. (2019). Confucianism, discipline, and competitiveness. Routledge.
4. Yu, J. (2013). The ethics of Confucius and Aristotle: Mirrors of virtue. Routledge.
5. Kitab Sishu. (2012). Kitab Suci Agama Konghucu. Majelis Tinggi Agama Konghucu Indonesia
6. Keputusan Bersama Menteri Agama, Jaksa Agung, dan Menteri dalam Negeri RI. (2011). Jakarta: Menteri Dalam Negeri.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√
CLO6												√	√
CLO7												√	√
CLO8												√	√
CLO9												√	√
CLO10												√	√
CLO11												√	√

CLO12												√	√
CLO13												√	√
CLO14												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Civic Education	
Module-level, if applicable:	Undergraduate	
Code:	KU105	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Lecturer team of Civic Education	
Lecturer(s):	Lecturer team of Civic Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching And Learning Description: 1. Lecture: Expository, group discussion, presentation 2. Structured activities: working on problem set practice from textbook 3. Self study: working on homework	1 hour 40 minutes	45
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	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After having this course, students are able 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
CLO 3: Have conceptual knowledge about National Identity
CLO4: Have conceptual knowledge about the State and the Constitution
CLO 5: Have conceptual knowledge about Human Rights and Citizens' Rights and Duties
CLO 6: 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 Organization Organization System
CLO9: Have conceptual knowledge about Indonesian Geostrategy in the form of National Resilience.</td></tr>
<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>-</td><td>Social competences:</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competencies</td><td>-</td><td></td></tr>
<tr><td>3</td><td>CLO1 - CLO9</td><td>Social competencies
a. Individual and group assignments

b. Exam
-Mid test
-Final test</td><td>Performance (rubric of report paper)

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, LMS</td></tr>
</table>

Literature:	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 Kebinekaan 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. 9. Law Number 12 of 2012 concerning Higher Education

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√
CLO6												√	√
CLO7												√	√
CLO8												√	√
CLO9												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Indonesian Language	
Module-level, if applicable:	Undergraduate	
Code:	KU106	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Lecturer team of Indonesian Language	
Lecturer(s):	Lecturer team of Indonesian Language	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: theory Teaching and learning description: 1. Lecture: Expository, group discussion, presentation 2. Structured activities: working on problem set practice from textbook 3. Self study: working on homeworks	1 hour 40 minutes	45
Workload:	Total workload is 90 hours 40 minutes (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	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After having this courses, the students having 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 prioritizing 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: Master 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 or Alenia, Scientific Writings, Papers, Research Reports, Journal Articles, Reasoning, and Scientific Presentations.
CLO9: Has a critical, sensitive, and wise nature and is 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 or Alenia, 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>-</td><td>Social competences:</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competencies</td><td>-</td><td></td></tr>
<tr><td>3</td><td>CLO1-CLO10</td><td>Social competencies
a. Individual and group assignments
b. Exam
-Quiz
-Mid test
-Final test</td><td>Performance (rubric of assignment)
Test</td><td>20%

20%
35%
35%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, LMS
Literature:	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). *KemampuanBerbahasa Indonesia*

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√
CLO6												√	√
CLO7												√	√
CLO8												√	√
CLO9												√	√
CLO10												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Pancasila Education	
Module-level, if applicable:	Undergraduate	
Code:	KU110	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2	
Module coordinator:	Lecturer team of Pancasila Education	
Lecturer(s):	Lecturer team of Pancasila Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: theory Teaching and learning description: 1. Lecture: Flipped Classroom Model 2. Structured activities: consists 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	1 hour 40 minutes	45
Workload:	Total workload is 90 hours 40 minutes (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	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: Having scientific, educative and religious attitude and behavior, and
CLO2: Having Compassion, succession, fostering in a work environment and social life that has global competitive and comparative advantages;
CLO3: Able to adapt to dynamic changing times
CLO4: Have national insight and be a good citizen warga
CLO5: Become a lifelong learner.</td></tr>
<tr><td>Content:</td><td>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</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>-</td><td>Social competences:</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competencies</td><td>-</td><td></td></tr>
<tr><td>3</td><td>CLO1-CLO5</td><td>Social competencies
a. Individual assignments (task, book report)
b. Exam
-Mid test
-Final test</td><td>Performance assignment

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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Nurgiansah, T. H. (2021). Pendidikan Pancasila. CV. Mitra Cendekia Media.
2. Iswardhana, M. R. (2020). Pendidikan Pancasila dan Kewarganegaraan: Merajut Kebinekaan dalam Menghadapi Tantangan Revolusi Industri. PT Kanisius.
3. Harefa, A., & Daliwu, S. (2020). Teori Pendidikan Pancasila Yang Terintergrasi Pendidikan Anti Korupsi. Penerbit Lutfi Gilang.
4. Sihotang, K., Mikhael, M. B., Molan, B., & Kama, V. F. (2019). Pendidikan Pancasila: Upaya Internalisasi Nilai-Nilai Kebangsaan. Penerbit Unika Atma Jaya Jakarta.
5. 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).</td></tr>
</table>

	Pendidikan Pancasila: Untuk Perguruan Tinggi. Jakarta: Kemristekdikti Ditjen Belmawa. 6. Latif, Y. (2011). Negara Paripurna : Historisistas,, Rasionalitas, Aktualitas Pancasila. Jakarta : Gramedia Pustaka Utama. 7. Naskah Undang Undang Dasar 1945

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudhi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Physical Education and Sport	
Module-level, if applicable:	Undergraduate	
Code:	KU108	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2	
Module coordinator:	Dian Budiana	
Lecturer(s):	Dian Budiana	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository, discussions and practicals methods). 2. Structured activities (Record physical fitness and physical activity) 3. Self-study (review the literature on physical fitness and physical activity)	1 hour 40 minutes	45
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 preparation.	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: analyze 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: utilize technology to help implement a healthy and active lifestyle
CLO5: interact positively, 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</td></tr>
<tr><td>Content:</td><td>Healthy and Active Lifestyle, Physical Fitness and Physical 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>CLO1 - CLO10</td><td>Generic competences (physical fitness and physical activity)
a. Individual assignments (physical fitness and physical activity)
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment

Test</td><td>40%

30%
30%</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, *gooogle fit,* LMS
Literature:	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. 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

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√
CLO6												√	√
CLO7												√	√
CLO8												√	√
CLO9												√	√
CLO10												√	√

Module name:	Art Education	
Module-level, if applicable:	Undergraduate	
Code:	KU119	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2	
Module coordinator:	Dody Mohamad Kholid	
Lecturer(s):	Dody Mohamad Kholid	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description 1. Lecture (expository, discussions, questions and answers through an appreciation and analysis approach). 2. Structured activities (art practice) 3. Self-study (reviewing and searching for relevant material literature)	1 hour 40 minutes	40
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 preparation.	
Credit points:	3,2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have:
CLO1: knowledge of the concept of art in general
CLO2: experience in playing several art forms
CLO3: a love for their own culture
CLO4: join the art culture</td></tr>
<tr><td>Content:</td><td>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>The final mark will be scored 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>CLO1 - CLO4</td><td>Generic competences
a. Individual assignments

b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
Test</td><td>40%

30%
30%</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</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, musical equipment, LMS</td></tr>
<tr><td>Literature:</td><td>1. Hendriyana, H., & Ds, M. (2022). RUPA DASAR (NIRMANA): Asas dan Prinsip Dasar Seni Visual. Penerbit Andi.
2. Salam, S., & Muhaemin, M. (2020). Pengetahuan Dasar Seni Rupa. Badan Penerbit UNM.
3. Østern, A. L., & Knudsen, K. N. (Eds.). (2019). Performative approaches in arts education: Artful teaching, learning and research. Routledge.
4. Yeningsih, T. K. (2018). Pendidikan Seni Tari: Buku untuk mahasiswa. Syiah Kuala University Press.
5. Baldacchino, J. (2018). Art as unlearning: Towards a mannerist pedagogy. Routledge.
6. Naughton, C., Biesta, G., & Cole, D. (2017). Art, artists and pedagogy. London & New York, NY: Routledge.
7. Cahnmann-Taylor, M., & Siegesmund, R. (2017). Arts-based research in education. Routledge.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Islamic Education Seminar	
Module-level, if applicable:	Undergraduate	
Code:	KU300	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Fahrudin	
Lecturer(s):	Fahrudin, Saepul Anwar	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description 1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	1 hour 40 minutes	45
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	
Pre-requisites course(s):	Islamic Education	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: analyze 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 to 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).</td></tr>
<tr><td>Content:</td><td>Islam and Education, Islam and Culture, Islam and gospel endeavour, Islam and politics, Islam and economy, Islam and law, Islam and technology, Islam and knowledge discipline</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be scored 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO6</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, stream video conference</td></tr>
<tr><td>Literature:</td><td>1. Nata, H. A. (2021). Ilmu kalam, Filsafat, dan tasawuf. Amzah.
2. Bagir, H. (2020). Mengenal Filsafat Islam. Mizan Publishing.
3. Indrianto, N. (2020). Pendidikan Agama Islam Interdisipliner Untuk Perguruan Tinggi. Deepublish.</td></tr>
</table>

	4. Azmi, M. N., & Zulkifli, M. (2018). Manusia, akal dan kebahagiaan (Studi analisis komparatif antara al-Qur'an dengan filsafat Islam). Al Qalam: Jurnal Ilmiah Keagamaan dan Kemasyarakatan, 127-147. 5. Rustam, R., & Haris, Z. A. (2018). Buku Ajar Pendidikan Agama Islam di Perguruan Tinggi. Deepublish. 6. Husaini, A. (2016). 10 Kuliah Agama Islam. Pro-U Media 7. Shihab, Q.M. (2014). Mujjizat Alquran. Bandung: Mizan. 8. Shihab, Q.M. (2014). Wawasan Alquran. Bandung: Mizan.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√
CLO5												√	√
CLO6												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Protestant Christianity Education Seminar	
Module-level, if applicable:	Undergraduate	
Code:	KU301	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Suka P. Pandia	
Lecturer(s):	Suka P. Pandia	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description 1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	1 hour 40 minutes	45
Workload:	Total workload is 91 hours (3.2 ECTS) per semester which consists of 100 minutes lectures and student group presentation in 4th meeting (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):	Protestant Christianity Education	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have 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</td></tr>
<tr><td>Content:</td><td>- 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</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be scored 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr><tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr><tr><td>3</td><td>CLO1 - CLO4</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, stream video conference</td></tr>
<tr><td>Literature:</td><td>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.</td></tr>
</table>

	6. Maxwell C. Jhon. 2010. Becoming a Person of Influence: Talent is Never Enough. Yates & Yates

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Catholic Christianity Education Seminar	
Module-level, if applicable:	Undergraduate	
Code:	KU302	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Lecturer team of Catholic Christianity Education Seminar	
Lecturer(s):	Lecturer team of Catholic Christianity Education Seminar	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description 1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exampreparation (0.28 ECTS)	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	Catholic Christianity Education	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have 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</td></tr>
<tr><td>Content:</td><td>- 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</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be scored 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr><tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr><tr><td>3</td><td>CLO1 - CLO4</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, stream video conference</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. Ahlimedia Book.
4. Magnis-Suseno, F. (2020). Menggereja di Indonesia. Percikan Kekatolikan Sekarang. Penerbit PT Kanisius.</td></tr>
</table>

	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. 7. Maxwell C. Jhon. 2010. Becoming a Person of Influence: Talent is Never Enough. Yates & Yates

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Hinduism Education Seminar	
Module-level, if applicable:	Undergraduate	
Code:	KU303	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
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	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description 1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	1 hour 40 minutes	45
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	
Pre-requisites course(s):	Hinduism Education	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. understand human duties according to the Weda
CLO2. understand the basics of Hinduism
CLO3. learn leadership from Weda characters
CLO4. show the attitude and character of believers</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 scored 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO4</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, stream video conference</td></tr>
</table>

Literature:	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

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Buddhism Education Seminar	
Module-level, if applicable:	Undergraduate	
Code:	KU304	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
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	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description 1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	1 hour 40 minutes	45
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	
Pre-requisites course(s):	Buddhism Education	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>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</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 scored 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO4</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, stream video conference</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. Tim penyusun. (2010). Riwayat Buddha Gotama. Lembaga Pengkajian Dan Pengembangan Keagamaan Buddha Indonesia.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Confucianism Education Seminar	
Module-level, if applicable:	Undergraduate	
Code:	KU309	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
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	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description 1. Lecture (expository, discussions, seminar). 2. Structured activities (group assignment, seminar resume) 3. Self-study (reviewing and searching for relevant material literature)	1 hour 40 minutes	45
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	
Pre-requisites course(s):	Confucianism Education	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>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</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 scored 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1 - CLO4</td><td>Social competences
a. Individual assignments
b. Exam
-Mid test
-Final Test</td><td>Performance (rubric of report paper)
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, stream video conference</td></tr>
<tr><td>Literature:</td><td>1. DeLapp, K. (2022). Portraits of Confucius: The Reception of Confucianism from 1560-1960.
2. Tan, C. (2020). Confucian philosophy for contemporary education. Routledge.
3. Baumann, C., Winzar, H., & Viengkham, D. (2019). Confucianism, discipline, and competitiveness. Routledge.
4. Yu, J. (2013). The ethics of Confucius and Aristotle: Mirrors of virtue. Routledge.
5. Kitab Sishu. (2012). Kitab Suci Agama Konghucu. Majelis Tinggi Agama Konghucu Indonesia</td></tr>
</table>

	6. Keputusan Bersama Menteri Agama, Jaksa Agung, dan Menteri dalam Negeri RI. (2011). Jakarta: Menteri Dalam Negeri.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Community Service	
Module-level, if applicable:	Undergraduate	
Code:	KU400	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
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	
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.	1 hour 40 minutes	10
Workload:	Community service is carried out within 1 (one) months with a minimum number of working hours of 120 (one hundred and twenty) effective hours for each student	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Have a minimum number of 68% credits of the total number of credits in each study program	
Course Learning Outcomes (CLO):	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.	

<table>
<tr><td>Content:</td><td>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 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 Community Service Location, Field Operation, 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>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr><tr><td>CLO1-CLO4</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 colspan="3">Total</td><td>100%</td></tr></table></td></tr>
<tr><td>Forms of media:</td><td>Laptop/Computer, LMS</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

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1												√	√
CLO2												√	√
CLO3												√	√
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Fundamentals of Education	
Module-level, if applicable:	Undergraduate	
Code:	DK300	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2	
Module coordinator:	Lecture Team of Fundamentals of Education	
Lecturer(s):	Babang Robandi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture (Presentation, Discussion, and Question & Answer) 2. Structured activities (Working on student worksheets) 3. Self-study (literature review)	1 hour 40 minutes	45
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	
Pre-requisites course(s):	-	

Course Learning Outcomes (CLO):	After taking this course the students: CLO1: formulate fundamentals of education, identify types of fundamentals of education, explain the functions of fundamentals of education in education practice and study, explain the uses of fundamentals of education for educators. CLO2: explain human nature, identify the anthropophilosophical principles of educational necessity, and identify the anthropophilosophical principles of the possibility of education. CLO3: compare the concept of education in a broad and narrow sense, identifying the definition of education according to a review of four disciplines, understanding the concept of education based on a systems approach, understanding the concept of education based on a systems approach, understanding the concept of education based on a phenomenological approach, explaining the implications of the concept of human nature on the concept of education. CLO4: distinguish between educational studies and educational practice, explain the definition of education science, explain the assumptions of education as an art, explain the meaning of education as a blend of science and art. CLO5: explain the assumption of the need for a philosophical foundation of idealism, realism, and pragmatism education, explain the foundation of national education (Pancasila). CLO6: explain the stages of individual development, the task of individual development, the factors that influence individual development, the implications of stages and tasks of individual development on education, various learning theories, and compare learning theories and their implications for education. CLO7: identify the assumptions of the importance of socialization and enculturation in a society, explain education as a social institution, explain the functions of education in the context of society and its culture, compare the characteristics of informal, formal, and non-formal educational institutions, explain the concept of education based on the orientation of patterns of social activities, identify the types of teachers based on their attitude towards students. CLO8: explain the social and cultural conditions of society from ancient times to the days of the Dutch colonial government, the implications of the socio-cultural conditions of society in ancient times to the Dutch colonial era for education, the education of the national movement as a means of fighting for independence and administering national education, the state of education during the militarism occupation. Japan, Indonesian education for the

<table>
<tr><td></td><td>period 1945-1969, and Indonesian education during the PJP I.
CLO9: identify the type of juridical basis for the national education system, the contents of the 1945 Constitution relating to education, the contents of the Republic of Indonesia Law no. 20 concerning the National Education system, PP RI No. 19 of 2005 concerning National Education Standards, and the contents of Law no. 14 of 2005 concerning Teachers and Lecturers.</td></tr>
<tr><td>Content:</td><td>The concept of the foundation of education, the implications of human nature for education, the notion of education, education as a science and art, the philosophical foundation of education, the psychological basis of education, the sociological and anthropological basis of education, the historical basis of education and the juridical basis of 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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>CLO1 - CLO9</td><td>Generic competences
a. Group paper and presentation
b. Student worksheet
c. Exam
-Mid test
-Final Test</td><td>

Performance assessment

Performance assessment
Test</td><td>

15%

15%

30%
30%</td></tr>
<tr><td>3</td><td>CLO1 - CLO9</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, LMS, books, handouts, or presentation materials (Powerpoint)</td></tr>
<tr><td>Literature:</td><td>1. Siregar, R. S., Saputro, A. N. C., Saftari, M., Panggabean, N. H., Simarmata, J., Kholifah, N., ... & Harianja, J. K. (2022). Konsep Dasar Ilmu Pendidikan. Yayasan Kita Menulis.
2. Hasan, M., Harahap, T. K., Sos, S., Inanna, M. S. D., & Pd, U. K. M. (2021). Landasan pendidikan. Penerbit Tahta Media Group.</td></tr>
</table>

	3. Mudyahardjo, Redja, (2001), Filsafat Ilmu Pendidikan: Suatu Pengantar, PT. Remaja Rosdakarya, Bandung. 4. Ramadhani, Y. R., Tanjung, R., Saputro, A. N. C., Utami, N. R., Purba, P. B., Purba, S., ... & Musyadad, V. F. (2021). Dasar-Dasar Perencanaan Pendidikan. Yayasan Kita Menulis. 5. Syafril, M. P., & Zen, Z. (2019). Dasar-dasar ilmu pendidikan. Prenada Media.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1						√		√	√				
CLO2						√		√	√				
CLO3						√		√	√				
CLO4						√		√	√				
CLO5						√		√	√				
CLO6						√		√	√				
CLO7						√		√	√				
CLO8						√		√	√				
CLO9						√		√	√				

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Psychology of Education and Counselling	
Module-level, if applicable:	Undergraduate	
Code:	DK301	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Lecture Team of Psychology Of Education and Counselling	
Lecturer(s):	Nandang Budiman	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture (Inquiry discovery, Group discussion, Assignment, Development practice) 2. Structured activities (Resume of lecture material, Group paper) 3. Self-study (literature review)	1 hour 40 minutes	45
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	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students:
CLO1: understand educational psychology in educational science and practice.
CLO2: understand the characteristics of effective teachers in the perspective of educational psychology.
CLO3: understand students in education.
CLO4: understand student learning.
CLO5: understand the development of talents and interests of students.
CLO6: understand the development of students' creativity.
CLO7: understand the development of students' motives and motivation in learning.
CLO8: understand the problems of student behavior in learning.
CLO9: understand the application of educational psychology in inclusive education.
CLO10: understand educational evaluation.</td></tr>
<tr><td>Content:</td><td>Educational psychology in educational science and practice, Characteristics of effective teachers in the perspective of educational psychology, Students in education, Student learning, Development of students' talents and interests, Development of students' creativity, Development of students' motives and motivations in learning, Behavioral problems students in learning, Application of educational psychology in inclusive education, Educational evaluation</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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>CLO1 - CLO10</td><td>Generic competences
a. Resume of lecture material
b. Group paper
c. Exam
-Mid test
-Final Test</td><td>
Performance assessment
Performance assessment
Test</td><td>
15%
15%

30%
30%</td></tr>
<tr><td>3</td><td>CLO1 - CLO10</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, LMS, Handouts, Reference Books</td></tr>
</table>

Literature:	1. Bonnett, M. (2020). Environmental consciousness, nature and the philosophy of education: Ecologizing education. Routledge. 2. Andersson, J., Garrison, J., & Östman, L. (2018). Empirical philosophical investigations in education and embodied experience. Springer. 3. Noddings, N. (2018). Philosophy of education. Routledge. 4. Budiman, N. (2010). *Memahami Perkembangan Peserta Didik*. Publikasi Jurusan PPB: Bandung. 5. Syamsuddin. A. (2010). Psikologi Kependidikan: Peragkat Pembelajaran Sistem Modul. Rosdakarya: Bandung.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1						√		√	√				
CLO2						√		√	√				
CLO3						√		√	√				
CLO4						√		√	√				
CLO5						√		√	√				
CLO6						√		√	√				
CLO7						√		√	√				
CLO8						√		√	√				
CLO9						√		√	√				

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Curriculum and Learning	
Module-level, if applicable:	Undergraduate	
Code:	DK303	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Lecture Team of Curriculum and Learning	
Lecturer(s):	Toto Fathoni	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture (Presentation, Response, Discussion, Problem solving, Case study) 2. Structured activities (individual task) 3. Self-study (literature review)	1 hour 40 minutes	45
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	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students:
CLO1: Understanding the nature of the curriculum
CLO2: Understanding components of curriculum
CLO3: Understand the foundation of curriculum builder
CLO4: Criticizing the application of curriculum development principles
CLO5: Understanding approaches and models of curriculum
CLO6: Understanding approaches and models of curriculum
CLO7: Understanding Evaluation of Curriculum
CLO8: Understanding the nature and principles of teaching and learning
CLO9: applying components of learning
CLO10: Understanding approaches and models of learning
CLO11: Understanding approaches and models of learning
CLO12: Understanding evaluation of learning
CLO13: Understanding Innovation of curriculum and Learning</td></tr>
<tr><td>Content:</td><td>The nature of the curriculum (position, understanding, function, and role of the curriculum); Components of curriculum; Foundations of curriculum development; Principles of curriculum development; Approaches and models of curriculum; Evaluation and innovation of curriculum; The nature of teaching and learning; Components of learning; Principles of teaching and learning; Model of learning; and Innovation in the implementation of learning.</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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>CLO1 - CLO13</td><td>Generic competences
a. Individual task
b. Presentation
c. Exam
-Mid test
-Final Test</td><td>
Performance assessment
Performance assessment
Test</td><td>
15%
15%

30%
30%</td></tr>
<tr><td>3</td><td>CLO1 - CLO13</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>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, LMS, books, handouts, presentation materials (Powerpoint)
Literature:	1. Triwiyanto, T. (2022). Manajemen kurikulum dan pembelajaran. Bumi Aksara. 2. Fauzan, M. A., & Arifin, F. (2022). Desain Kurikulum dan Pembelajaran Abad 21. Prenada Media. 3. Purba, P. B., Siregar, R. S., Purba, D. S., Iman, A., Purba, S., Purba, S. R. F., ... & Purba, B. (2021). Kurikulum dan Pembelajaran. Yayasan Kita Menulis. 4. SUPARMAN, D. T., & PD, M. (2020). Kurikulum dan Pembelajaran. Penerbit CV. SARNU UNTUNG. 5. Hamalik, Oemar (2016). Dasar-Dasar Pengembangan Kurikulum. Bandung: Remaja Rosda. 6. Oliva, P. F. And Gordon II W. R. (2012). Developing The Curriculum. Cambridge: Pearson Education, Inc. 7. Sutrisno & Suyadi (2016). Desain Kurikulum Pendidikan Tinggi: Mengacu Kerangka Kualifikasi Nasional Indonesia. Bandung: Remaja Rosda. 8. Sukiman (2015). Pengembangan Kurikulum Perguruan Tinggi. Bandung: Remaja Rosda. 9. Depdiknas. (2013). Peraturan perundang-undangan yang diberlakukan pada pelaksanaan kurikulum 2013. Jakarta 10. Tim MKDK. (2012). Kurikulum dan Pembelajaran. Jakarta: Rajawali Press Rajagrafindo Persada. Edisi Kedua Cetakan keempat 11. Arifin, Zainal (2011). Konsep dan Model Pengembangan Kurikulum. Bandung: Remaja Rosda.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1						√		√	√				
CLO2						√		√	√				
CLO3						√		√	√				
CLO4						√		√	√				
CLO5						√		√	√				
CLO6						√		√	√				
CLO7						√		√	√				
CLO8						√		√	√				
CLO9						√		√	√				

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Management of Education	
Module-level, if applicable:	Undergraduate	
Code:	DK304	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Lecture Team of Management of Education	
Lecturer(s):	Lecture Team of Management of Education	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture (class presentations and dialogues) 2. Structured activities (group papers and portfolios) 3. Self-study (literature review)	1 hour 40 minutes	45
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	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students:
CLO1: have knowledge of concepts, functions, roles, theoretical perspectives, and management principles that underlie the process of providing education and implementing the main tasks of education in educational units.
CLO2: have the ability to analyze the conditions and situations (organization) of education, both school and non-school critically and positively.
CLO3: have the ability to identify problems, find solutions to problems faced in the implementation of education.
CLO4: have the ability to develop innovative ideas for effective, efficient, transparent and accountable education management practices.</td></tr>
<tr><td>Content:</td><td>Basic insights in education management, philosophical studies, theories and concepts of educational administration, educational organization, school management, educational leadership in schools, student management, management of educators and education personnel, management of educational facilities and infrastructure, management of curriculum implementation, management of finance/financing Education, Partnership Management and school entrepreneurship, Education Supervision, Education Information System Management, Education Quality Management.</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>-</td><td>Subject specific competences</td><td>-</td><td>-</td></tr>
<tr><td>2</td><td>CLO1 - CLO4</td><td>Generic competences
a. Group paper and presentation
b. Student worksheet
c. Exam
-Mid test
-Final Test</td><td>
Performance assessment
Performance assessment
Test</td><td>
15%
15%

30%
30%</td></tr>
<tr><td>3</td><td>CLO1 - CLO4</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, LMS, Podcasts, learning videos, books, collections of teaching materials or presentation materials in the form of powerpoints and links to certain web sites</td></tr>
</table>

Literature:	1. Purba, S., dkk (2021). Teori Manajemen Pendidikan. Yayasan Kita Menulis. 2. Suhelayanti, S., dkk & Simarmata, J. (2020). Manajemen Pendidikan. Yayasan Kita Menulis. 3. Wahyudin, U. R. (2020). Manajemen Pendidikan (Teori Dan Praktik Dalam Penyelenggaraan Sistem Pendidikan Nasional). Deepublish. 4. Tim Dosen Jurusan Administrasi Pendidikan. (2018) Bungai Rampai: Administrasi Pendidikan. Bandung: Alfabetha. 5. Suryana, Asep. (2012). Value-Based Leadership. Nurani Press: Bandung 6. Guskey, R., Thomas and Michael Huberman. (2010). Professional Development in Education; New Paradigms & Practices. New York and London: Teachers College. 7. Komariah, Aan. (2010). Visionary Leadership. Alfabetha: Bandung.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1						√							
CLO2						√							
CLO3								√					
CLO4									√				

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Mathematics, Science, Technology, and Engineering	
Module-level, if applicable:	Undergraduate	
Code:	MA100	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Irma Rahma Suwarma	
Lecturer(s):	Irma Rahma Suwarma, Ida Kaniawati, Agus Danawan, Lilik Hasanah, Endi Suhendi, Hera Novia, Mimin Iryanti	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching and learning: theory 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)	2 hour 30 minutes	24
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	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. awareness and tolerance to the real life problems.

CLO2. literate in Mathematics, Science, Technology, and Engineering

CLO3. solve social, economic, and environmental 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>Food sustainability and Transportation sustainability</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-CLO4</td><td>Subject specific competences
a. Group assignments
b. Communication skills
c. Product</td><td>
Performance (rubric of group assignment)
Performance (rubric of communication skills)
Performance (rubric of product)</td><td>
50%
15%
20%</td></tr>
<tr><td>2.</td><td>CLO5-CLO6</td><td>Generic competences</td><td>Peer assessment</td><td>15%</td></tr>
<tr><td>3.</td><td>-</td><td>Social competences</td><td>Performance assessment</td><td>-</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. Food and Agriculture Organization. (2019). Moving Forward on Food Losses and Waste Production. The State of Food and Agriculture
2. National Academies of Sciences, Engineering, and Medicine 2019. Environmental and Physical Sciences; National Academy of Engineering; National Academies of</td></tr>
</table>

	Engineering for the 21st Century: Addressing Grand Challenges. Washington, DC: Sciences, Engineering, and Medicine The National Academies Press. https://doi.org/10.17226/25121. 3. National Academies of Sciences, Engineering, and Medicine 2019. Measuring the Effectiveness of Public Involvement in Transportation Planning and Project Development. Washington, DC: The National Academies Press. https://doi.org/10.17226/25447. 4. Kramer, Lindsay. (2019). Methods of Food Processing. https://bizfluent.com/. Majeed A. (2017). Food Toxicity: Contamination Sources, Health Implications And Prevention. J Food Sci Toxicol. Vol. 1 No. 1. 5. The economist. (2018). Fixing Food 2018 Best Practices Towards the Sustainable Development Goals. Calcuta: Barilla center for food and nutrition. 6. Nguyen, Hanh. 2018. Sustainable food systems Concept and framework. FAO. 7. National Academies of Sciences, Engineering, and Medicine 2018. Critical Issues in Transportation 2019. Washington, DC: The National Academies Press. https://doi.org/10.17226/25314. 8. 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 9. Firdaus. (2018). Modeling the Future of Indonesian Food Consumption: Final Report. Jakarta: Bappenas, WFP & FAO. 10. A. Leicht, J. Heiss and W. J. Byun. 2018. Issues and trends in Education for Sustainable Development, UNESCO Publishing 11. Amina Osman, Sultana Ladhani, Emma Findlater and Veronica McKay, 2017. Curriculum Framework for the Sustainable Development Goals. The Commonwealth. 12. 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

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1	√												
CLO2	√						√						
CLO3							√	√					
CLO4							√	√					
CLO5							√	√					
CLO6							√	√					

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Applied Mathematics, Science, Technology, and Engineering	
Module-level, if applicable:	Undergraduate	
Code:	MA200	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2	
Module coordinator:	Irma Rahma Suwarma	
Lecturer(s):	Irma Rahma Suwarma, Ida Kaniawati, Agus Danawan, Lilik Hasanah, Endi Suhendi, Hera Novia, Mimin Iryanti	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 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)	2 hour 30 minutes	24
Workload:	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.	
Credit points:	4,8 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: awareness 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>Energy crisis and advanced material technology development</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-CLO4</td><td>Subject specific competences
a. Group assignments
b. Communication skills
c. Product</td><td>
Performance (rubric of group assignment)
Performance (rubric of communication skills)
Performance (rubric of product)</td><td>
50%
15%
20%</td></tr>
<tr><td>2.</td><td>CLO5-CLO6</td><td>Generic competences</td><td>Peer assessment</td><td>15%</td></tr>
<tr><td>3.</td><td>-</td><td>Social competences</td><td>Performance assessment</td><td>-</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. Karpatne, A., Kannan, R., & Kumar, V. (Eds.). (2022). Knowledge Guided Machine Learning: Accelerating Discovery using Scientific Knowledge and Data. CRC Press.</td></tr>
</table>

	2. A. Leicht, J. Heiss and W. J. Byun. 2018. Issues and trends in Education for Sustainable Development, UNESCO Publishing 3. Amina Osman, Sultana Ladhani, Emma Findlater and Veronica McKay, 2017. Curriculum Framework for the Sustainable Development Goals. The Commonwealth. 4. Coyle, Eugene D. and Simmons, Richard A. (2014), "*Understanding the Global Energy Crisis"*. Purdue University Press. (Knowledge Unlatched Open Access Edition.) 5. Pradeep T, 2015. "Summary of Indonesia's Energy Sector Assessment", ADB Papers on Indonesia, openaccess.adb.org/termsofuse 6. IEA, 2015; DG, EBTKE (2014). "New and Renewable Energy and Energy Conservation Sector Strategy," presentation to IEA, March 2014, ESDM, Jakarta.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1	√												
CLO2	√						√						
CLO3							√	√					
CLO4							√	√					
CLO5							√	√					
CLO6							√	√					

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Strategy of Physics Learning	
Module level, if applicable:	Undergraduate	
Code:	FI251	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Harun Imansyah	
Lecturer(s):	Harun Imansyah, Purwanto, Didi Teguh Chandra, Parsaoran Siahaan	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (Class discussions, simulations, watching videos of a learning model) 2. Structured Activities (exercise, assignments, worksheets) 3. Self-study (reading the relevant literature)	136 hours	25
Workload:	The total workload is 136 hours (4.8 ECTS) per semester, consisting of: 150 minutes lectures (1.24 ECTS), 180 minutes structured activities (1.48 ECTS), 180 minutes self-study (1.48 ECTS) per week for 14 weeks, 300 minutes for two exams (0.18 ECTS), and 720 minutes for two exam preparation (0.48 ECTS)	
Credit points:	4,8 ECTS	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. have a deep conceptual knowledge of the philosophy of learning and the development of learning theories.
CLO2. know conceptual and procedural to design a physics lesson.
CLO3. innovate and be creative in learning Physics in accordance with the demands of the 21st century
CLO4. make decisions in an effort to improve physics learning based on the results of the analysis of observations on a physics lesson
CLO5. demonstrate an attitude of concern and responsibility for problems related to learning physics in schools</td></tr>
<tr><td>Content:</td><td>Learning theories; the Nature of Science/Physics; science process skills; Various kinds of models, strategies, methods and approaches in learning of physics; Teacher skills (questioning skills; classroom management skills, discussion management skills (individual and group); teacher competence (professional, pedagogic, social and personal); and classroom observation of physics learning in school / class.</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</td><td>Subject specific competences
a. Activity/participation at Class
b. Individual and group assignments
c. Examination
- Mid Exam
- Final Exam</td><td>Performance assessment
Test</td><td>10%
15%
30%
30%</td></tr>
<tr><td>2</td><td>CLO3, CLO4</td><td>Generic competences</td><td>Performance assessment (observation)</td><td>10%</td></tr>
<tr><td>3</td><td>CLO5</td><td>Social competences</td><td>Performance assessment (observation)</td><td>5%</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, Videos, Laptop/komputer</td></tr>
</table>

Literature:	1. Amelia, P, dkk. 2021. Bahan ajar melalui strategi pembelajaran Pdeode*e berbantuan Phet. CV. Media Edukasi Indonesia - Tangerang 2. Suhandi, A., Samsudin, A., dan Tesniyadi, D. 2020. Model real-virtual CCLab : remediasi miskonsepsi melalui aktivitas lab. CV. Media Edukasi Indonesia - Tangerang 3. Sokołowska, D., & Michelini, M. (Eds.). (2018). The role of laboratory work in improving physics teaching and learning. Berlin/Heidelberg, Germany: Springer. 4. Joyce Bruce, Marsha,W., Emily,C., (2015). Models of Teaching, Ninth Edition, Boston, Pearson Education. 5. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 22 of 2016 concerning Education Process Standars 6. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 34 of 2018 concerning National Standards for Vocational High School Education/Madrasah Aliyah

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1						√	√						
CLO2					√			√					
CLO3									√				
CLO4												√	
CLO5													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Media and ICT Literacy in Physics Learning	
Module-level, if applicable:	Undergraduate	
Code:	FI252	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Taufik Ramlan Ramalis	
Lecturer(s):	Taufik Ramlan Ramalis, Purwanto, Arif Hidayat	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practicals methods). 2. Structured activities (exercise, assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (review the literature on various media used in learning Physic)	1 hour 40 minutes	45
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 preparation.	
Credit points:	3,2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: utilize local materials and use ICT as a medium for learning Physics.
CLO2: use ICT media in implementing and managing Physics learning properly and correctly.
CLO3: demonstrate a willingness to cooperate in designing, creating, and using Physics learning media.
CLO4: distinguish, analyze, and select various media used in learning Physics.</td></tr>
<tr><td>Content:</td><td>1. The theory and philosophy of Physics learning media that are relevant to the demands of the National Education Standards Agency.
2. Designing, creating, and using: Posters/Charts, PowerPoint, Prezi, ICT as MPF, and Web/blogs as physics learning media</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 - CLO3</td><td>Subject specific competences
a. Individual assignment
b. Exam
-Mid test
-Final Test</td><td>

Performance assessment
Test</td><td>

25%

30%
40%</td></tr>
<tr><td>2</td><td>CLO4</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</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. Panggabean, D. D., & Ramadhani, I. (2021). Pembuatan Media Video Pembelajaran Fisika SMA Dengan Whiteboard Animation. Media Sains Indonesia.
2. Amelia, P, dkk. 2021. Bahan ajar melalui strategi pembelajaran Pdeode*e berbantuan Phet. CV. Media Edukasi Indonesia - Tangerang
3. Danilo M. B., Andrian D. (2015). Essentials of Teaching and Integrating Visual and Media Literacy. Springer International Publishing Switzerland
4. Ramalis T. R., et al. (2014), Kerangka Kompetensi TIK Bagi Guru (Editor: Munir), Alfa Beta, Bandung.</td></tr>
</table>

	5. McDougall J. & Potamitis N. (2010), *The Media Teacher's Book*, 2nd ed., Hodder Education part of Hachette UK, London. 6. Adams C. (2011), *Educational Media and Technology*: *PowerPoint and the Pedagogy of Digital Media Technologies*, Springer Science & Business Media.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1						√	√						
CLO2						√	√						
CLO3					√			√	√				
CLO4												√	√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Lesson Plan in Physics Learning	
Module-level, if applicable:	Undergraduate	
Code:	FI551	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester	6	
Module coordinator:	Unang Purwana,	
Lecturer(s):	Unang Purwana, Muslim, Iyon Suyana, Ida Kaniawati, Didi Teguh Chandra, Winny Liliawati, Parsaoran Siahaan, Sutrisno	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory 1. Lecture : expository, discussion 2. Exercise 3. Practical/project	2 hour 30 minutes	15
Workload:	The total workload is 136 hours (8160 minutes) per semester, consisting of 2100 minutes lectures, 1260 minutes exercise, 1260 minutes structured activities, 2520 minutes self-study per week for 14 weeks, 300 minutes for two exams, and 720 minutes for two exam preparation.	
Credit points:	4,8 ECTS	
Pre-requisites course(s):	Physics Learning Strategy, Physics Learning Evaluation, Classical Mechanics for School, Thermodynamics and Wave Optics for School, Electromagnetism and Modern Physics for School	
Course Learning Outcomes:	After having this course, students are able to: CLO1. Have conceptual and procedural knowledge about physics curriculum in secondary schools. CLO2. Have skills in designing activity-based physics learning plans to develop the thinking skills of high school students.	

<table>
<tr><td></td><td>CLO3. Have skills in carrying out activity-based physics learning practices in peer teaching for the development of thinking skills of high school students.
CLO4. Analyze problems and find alternative problem-solving in physics learning following the nature of physics.
CLO5. Demonstrate independent, quality, and measurable performance in developing physics learning implementation plans in secondary schools based on information and data analysis results.
CLO6. Be devoted to God Almighty and showing a religious attitude after attending a physics learning planning course.
CLO7. Show a critical, participatory, and responsible attitude in completing tasks related to planning physics learning in secondary schools.</td></tr>
<tr><td>Content:</td><td>The legal basis for curriculum development, the basic framework and curriculum structure, physics learning approaches and models, assessment of physics learning outcomes, training in planning physics learning, and implementing physics learning practices in secondary schools based on the 2013 curriculum through peer teaching activities</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</th></tr>
<tr><td>1.</td><td>CLO1-CLO4</td><td>Subject specific competences
a. Individual assignment
b. Exam</td><td>Performance (rubric of lesson plan project)
Test</td><td>15%
45%</td></tr>
<tr><td>2.</td><td>CLO5</td><td>Generic competences (lesson plan and peer-teaching skills)</td><td>Performance</td><td>30%</td></tr>
<tr><td>3.</td><td>CLO6
CLO7</td><td>Social competences</td><td>Performance</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Kemendikbud. (2018). Permendikbud No.35 tahun 2018 Tentang Kurikulum 2013 SMP/MTs
2. Kemendikbud. (2018). Permendikbud No.36 tahun 2018 Tentang Kurikulum 2013 SMA/MA
3. Kemendikbud. (2018). Permendikbud No.37 tahun 2018 Tentang Perubahan Atas Permendikbud Nomor 24 Tahun 2016 Tentang KI dan KD Pelajaran Pada Kurikulum 2013</td></tr>
</table>

	4. Kemendikbud. (2016). Permendikbud No.20 tahun 2016 Tentang Standar Kompetensi Lulusan Pada Pendidikan Dasar dan Pendidikan Menengah 5. Kemendikbud. (2016). *Permendikbud No.21 tahun 2016* Tentang Standar Isi Pada Pendidikan Dasar dan Pendidikan Menengah 6. Kemendikbud. (2016). *Permendikbud No.22 tahun 2016* Tentang Standar Proses Pada Pendidikan Dasar dan Pendidikan Menengah 7. Kemendikbud. (2016). *Permendikbud No.23 tahun 2016* Tentang Standar Penilaian Pada Pendidikan Dasar dan Pendidikan Menengah 8. *Peraturan Pemerintah No.13 tahun 2015 Perubahan Kedua Atas PP No.19 tahun 2005* Tentang Standar Nasional Pendidikan

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CO1							√						
CO2						√							
CO3						√							
CO4					√			√					
CO5												√	
CO6													√
CO7									√				

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Evaluation in Physics Learning	
Module-level, if applicable:	Undergraduate	
Code:	FI590	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Muslim	
Lecturer(s):	Muslim, Unang Purwana, Ridwan Efendi, Harun Imansyah, Winny Liliawati, Parsaoran Siahaan, Purwanto	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture (conceptual, contextual and problem-solving approaches using expository, discussions, presentations methods). 2. Structured activities (exercise, assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading the relevant literature, project of assessment result data analysis)	2 hour 30 minutes	25
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, 1260 minutes (0.74 ECTS) structured activities, 2520 minutes (1.48 ECTS) self-study per week for 14 weeks, 300 minutes (0.18 ECTS) for two exams, and 720 minutes (0.42 ECTS) for two exam preparation	

Credit points:	4.8 ECTS
Pre-requisites course(s):	Statistics
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: analyze the concepts, principles, and theories of physics learning assessment. CLO2: design a physics learning assessment to develop thinking skills according to the characteristics of physics material, and scientific attitude. CLO3: carry out an assessment of physics learning to develop thinking skills in accordance with the characteristics of physics material, and scientific attitude. CLO4: Solve problems that are relevant to issues related to physics learning assessment. CLO5: Make decisions based on the results of the assessment by thinking openly, critically, innovatively, and confidently. CLO6: apply logical, critical, systematic, and innovative thinking in the context of developing physics learning assessment. CLO7: show independent, quality, and measurable performance in developing physics learning assessment. CLO8: make appropriate decisions in the context of solving physics learning assessment problems based on the results of information and data analysis. CLO9: fear God Almighty and be able to show a religious attitude in attending physics learning evaluation lectures. CLI10: collaborate and have social sensitivity and concern in completing tasks related to physics learning assessment. CLO11: demonstrate a responsible attitude towards completing tasks related to the assessment of physics learning.
Content:	Educational assessment standards, basic concepts of assessment, aspects of assessment (cognitive, affective, psychomotor), assessment techniques (test and non-test), assessment of science process skills, test analysis (difficulty level, discriminatory power, distractor test, validity, and reliability), data processing and interpretation of assessment results (Banner Reference Assessment and Norm Reference Assessment), as well as reporting and utilization of assessment results.

<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-CLO5</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>20%

25%
35%</td></tr>
<tr><td>2</td><td>CLO6-CLO8</td><td>Generic competences</td><td>Performance assessment (observation)</td><td>10%</td></tr>
<tr><td>3</td><td>CLO9-CLO11</td><td>Social competences</td><td>Performance assessment (observation)</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Lacy, A. C., & Williams, S. M. (2018). Measurement and evaluation in physical education and exercise science. Routledge.
2. Kemendikbud. (2016). Peraturan Menteri Pendidikan dan Kebudayaan Nomor 23 Tahun 2016 tentang Standar Penilaian Pendidikan.
3. Kemendikbud. (2015). Panduan Penilaian untuk Sekolah Menengah Atas. Direktorat Jenderal Pendidikan Dasar dan Menengah. Jakarta
4. Arikunto, (2013). Dasar-Dasar Evaluasi Pendidikan. Jakarta: Bumi Aksara
5. Gronlund, N. E & Waugh, C.K. (2013). Assessment of Student Achievement, 10th Edition. Pearson.
6. Anderson, R. & Krathwohl. (2001). Taxonomy of Bloom,s Revision for Learning Instruction and Assessing.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1													
CLO2						√							
CLO3						√							
CLO4					√			√					
CLO5					√			√					
CLO6									√				
CLO7												√	
CLO8												√	
CLO9													√
CLO10							√						√
CLO11							√						√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Calculus	
Module-level, if applicable:	Undergraduate	
Code:	FI111	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Arif Hidayat	
Lecturer(s):	Arif Hidayat, 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
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (conceptual, contextual and problem-solving approaches using expository, discussions, presentations methods). 2. Structured activities (exercise, assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading the relevant literature)	1 hour 40 minutes	45
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 1800 minutes (1.06 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 (0.85 ECTS) for two exam preparations.	
Credit points:	3.2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: conceptual about Variables, Functions, Continuity of Functions and Limits
CLO2: knowledge of the concept of derivative (differentiation), differentiation of algebraic functions, implicit differentiation, tangents and normal lines, maximum and minimum values of functions, and applied maximum and minimum values of functions
CLO3: conceptual about the differentiation of trigonometric functions, differentiation of trigonometric inverse functions, differentiation of exponential and logarithmic functions, and differentiation of hyperbolic functions
CLO4: conceptual about integration concepts, basic integration formulas, partial integration, trigonometric integrals, substitution trigonometrics, integration with partials, various substitutions and integration of hyperbolic functions
CLO5: conceptual of the use of indeterminate integrals, certain integrals, applied integration in calculating the area and volume of rotating objects, applied integration in several physical problems (center of gravity, moment of inertia and work), improper integrals
CLO6: logical, critical, systematic, and innovative thinking in the context of implementing calculus material in various fields of life
CLO7: responsibility in completing various tasks related to calculus teaching materials independently and with high commitment</td></tr>
<tr><td>Content:</td><td>Variables and functions, Limits and continuity of functions, Differentiation and differential, differentiation of various mathematical functions, Application of the concept of differentiation in relevant physics problems, Integration, Basic integration formulas, Integration of various mathematical functions, Various techniques of integration of complex functions, Indefinite integrals and certain, the application of the concept of integration in relevant mathematics and physics problems, and improper integrals</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-CLO5</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Unit test 1
- Unit test 2</td><td>Performance assessment
Test</td><td>10%

20%
20%</td></tr>
</table></td></tr>
</table>

			- Unit test 3 - Unit test 4		20% 20%
	2	CLO6	Generic competences	Performance assessment (observation)	5%
	3	CLO7	Social competences	Performance assessment (observation)	5%
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, LMS				
Literature:	1. Daftardar-Gejji, V. (Ed.). (2019). Fractional Calculus and Fractional Differential Equations. Springer Singapore. 2. Fortney, J. P. (2018). A visual introduction to differential forms and calculus on manifolds. Springer International Publishing. 3. Spivak, M. (2018). Calculus on manifolds: a modern approach to classical theorems of advanced calculus. CRC press. 4. James Stewart .2011. Kalkulus, Jilid 1, Jakarta : Unversitas Indonesia Press. 5. Purcell. 2010., Jilid 1 dan 2, Kalkulus, edisi kesembilan, Jakarta: Erlangga.				

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5		√											
CLO6									√				
CLO7													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Fundamental of Physics I	
Module-level, if applicable:	Undergraduate	
Code:	FI112	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Saeful Karim	
Lecturer(s):	Saeful Karim	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, presentation, demonstration, discussion). 2. Structured activities (exercise, Independent assignments working on Student Worksheets for each topic) 3. Self-study (reading the relevant literature)	3 hour 20 minutes	45
Workload:	Total workload is 181 hours 20 minutes (6.4 ECTS) which consist of 53 hours 20 minutes of lectures (1.88 ECTS), 64 hours of structured activities (2.28 ECTS) and 64 hours of self-study (2.28 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	-	

Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Apply unit systems, unit conversions, scientific notation, significant figures, and dimensional analysis into simple physics problems. CLO2: understand the meaning of vectors and scalars, geometric addition of vectors, vector addition based on components, unit vectors, vector multiplication by vector, and vector multiplication by scalar. CLO3: explain temperature concepts and temperature measurement, constant gas volume thermometer, thermal expansion, Ideal gas law, molecular interpretation of temperature (kinetic theory of gases), heat capacity and specificity, phase change and latent heat, Thermal energy transfer (conduction, convection, radiation)), First law of thermodynamics for closed systems, work on PV diagrams, Adiabatic and quasistatic expansion of ideal gases, Second law of thermodynamics and its applications. CLO4: Analyze physical quantities in the kinematics of particle motion: Speed, displacement, velocity, average speed, average velocity, velocity at any time, acceleration, average acceleration, and acceleration at any time, Motion with constant acceleration, displacement versus time graph and velocity versus time graph, displacement vector, velocity vector, velocity vector, velocity vector over time, acceleration vector, acceleration vector, acceleration vector over time, acceleration vector over time, relative velocity, physical quantities in projectile motion: velocity vector in motion, maximum height and farthest reach, physical quantities in motion: acceleration vector acceleration, acceleration of the petal delivery, tangential acceleration. CLO5: explain Newton's first law (Law of Inertia), inertial frame of reference, concept of force, concept of mass, Newton's second law, force due to gravity (gravity), Newton's third law (Law of action and reaction), and apply Newton's Laws to simple problems (a picture hanging by two wires, a ball of rope moving in a horizontal circle, a bucket of water being rotated in a vertical circle, a person standing on a scale in an elevator, etc.), the concept of a spring force, the concept of a rope tension force, the concept of a normal force. CLO6: explain friction force, static friction force, kinetic friction force, graph of force against friction force, application of Newton's Laws involving the concept of friction force (on a rotating car wheel, a rolling wheel without slipping, a car on an inclined bend, cases with two or more objects), as well as analyzing physical quantities

		in a non-inertial frame of reference, so that Newton's Laws apply: fictitious forces, centrifugal forces, Coriolis forces.
	CLO7:	explain the Definition of Energy, understanding of work as energy transfer, Relationship of work and kinetic energy (motion in one dimension with a constant force), Work-energy theorem (Relationship of work with changes in kinetic energy), work by changing forces, Work and energy for system of particles (potential energy concept), Work by conservative forces, Conservation of mechanical energy, work by non-conservative forces (general work-energy theorem), power concept.
	CLO8:	explain the "particle" approach that can be accounted for, the concept of center of mass of particle systems, determines the center of mass of discrete and continuous particle systems (mathematically), determines the center of mass of various irregular shapes (practically), Gravitational potential energy of particle systems, motion of the center of mass of a particle system, understanding of momentum, the law of conservation of linear momentum and its application, terms of reference for the center of mass, kinetic energy of a particle system, and applying the law of conservation of momentum in collisions in one dimension, collisions in two and three dimensions, impulses and average forces time of a force, rocket and their equations.
	CLO9:	explain angular speed, angular velocity, angular acceleration, torque and moment of inertia, determining the moment of inertia of uniform objects of various shapes rotated on a certain axis, parallel axis theorem, and applying Newton's second law for rotational motion, kinetic energy of rotational motion, angular momentum, law of conservation of angular momentum, rolling objects, gyroscope case, static and dynamic imbalance.
	CLO1:	explain the definition of rigid bodies, equilibrium conditions, center of gravity, application of equilibrium conditions in various cases (a simple board on a scale, a hand holding a load), and applying equilibrium conditions in various advanced cases (a billboard hanging , stairs on rough floors, people climbing stairs), coupling, equilibrium stability (stable, unstable, neutral).
	CLO11:	explain Kepler's Laws (1,2,3), Newton's Laws of Gravity, Earth's Gravitational Field, Gravitational mass and inertial mass, apart from the earth, gravitational potential energy at the earth's surface, gravitational field of a spherical shell and a solid sphere.

<table>
<tr><td></td><td>CLO12: explain the concept of density, pressure in a fluid, Pascal's principle, buoyancy and Archimedes' principle, surface tension and capillarity, Ideal fluid flow, the concept of volume flow rate, Equation of continuity, Bernoullli's equation and its applications, Tocicelli's law, Venturi effect, Poiseuille's law .
CLO13; explaini simple Harmonic Motion (load on a spring), period and frequency, equations of simple harmonic motion, Energy in Simple Harmonic Motion, objects in vertical springs, simple pendulum, physical pendulum, damped oscillations, forced oscillations and resonance.
CLO14: explain the definition of waves, transverse waves, longitudinal waves, wave functions, the principle of superposition, wave rate, harmonic waves, harmonic wave functions, energy transmission by waves, superposition and interference of harmonic waves Standing waves, sound waves, sound wave equations, intensity levels sound waves, Doppler effect.
CLO15: apply logical, critical, systematic, and innovative thinking in the context of the development of science and technology
CLO16: demonstrate independent, quality, measurable, critical, creative performance, and able to make appropriate decisions in the context of problem solving
CLO17: religious attitude as a servant of God who is devoted to God, which is shown by honesty and upholding human values
CLO18: responsible attitude to master science independently, internalize the spirit of independence, struggle, and entrepreneurship, have sincerity, commitment, sincerity to develop attitudes, values, and have the motivation to act for the benefit of society in general</td></tr>
<tr><td>Content:</td><td>Measurement systems and vector, motion in one dimension, motion in two dimensions, dynamics, work and energy, linear momentum and collisions, rotational motion, static equilibrium, fluid mechanics, vibrations, waves, and 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>CLO1-CLO14</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid Exam
- Final Exam</td><td>Performance assessment
Test</td><td>20%

30%
30%</td></tr>
<tr><td>2</td><td>CLO15</td><td>Generic</td><td>Performance</td><td>10%</td></tr>
</table></td></tr>
</table>

		CLO16	competences	assessment (observation)	
	3	CLO17 CLO18	Social competences	Performance assessment (observation)	10%
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, 31 Topics of Student Worksheet, LMS				
Literature:	1. Yang, X. J. (2021). Theory and Applications of Special Functions for Scientists and Engineers. Springer Singapore, New York, USA. 2. Korzhik, M., Tamulaitis, G., & Vasil'ev, A. N. (2020). Physics of fast processes in scintillators (Vol. 262). Cham: Springer. 3. Gonsalves, A. J., & Danielsson, A. T. (2020). Physics Education and Gender. Springer International Publishing. 4. Cherepanov, G. P. (2019). Invariant integrals in Physics. Springer International Publishing. 5. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman 6. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning. 7. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education 8. Trachanas, S. (2018). An introduction to quantum physics: a first course for physicists, chemists, materials scientists, and engineers. John Wiley & Sons. 9. Paul A. Tipler (Dr. Bambang Soegijono). (2001). *FISIKA Jilid 1, Untuk Sains dan Teknik*, Erlangga-Jakarta. 10. Douglas C. Giancoli. (2001). *FISIKA Jilid 1*, Erlangga-Jakarta				

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5		√											
CLO6		√											
CLO7		√											
CLO8		√											
CLO9		√											
CLO10		√											
CLO11		√											
CLO12		√											
CLO13		√											
CLO14		√											
CLO15									√				
CLO16													√
CLO17													√
CLO18													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Experiment on Fundamental of Physics I	
Module-level, if applicable:	Undergraduate	
Code:	FI211	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	1	
Module coordinator:	Mimin Iryanti	
Lecturer(s):	Mimin Iryanti, Selly Feranie	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussion, presentation, simulation, Inquiry). 2. Structured activities (exercise, independent assignments working on Student Worksheets) 3. Self-study (reading the relevant literature, prototype project)	1 hour 40 minutes	25
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):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: apply of fundamental of physics 1.
CLO2: measure physical quantities.
CLO3: apply measurement error
CLO4: plan experiments.
CLO5: complete the given practicum assignments according to the quality standards and the time given.
CLO6: retrieve and process experimental data.
CLO7: communicate the results of experiments..
CLO8: compile reports on the results of experiments.
CLO9; apply academic ethics and disciple during lectures</td></tr>
<tr><td>Content:</td><td>Principles of measurement and measuring instruments; Theory of error using various basic measuring instruments; Processing data from single, repeated; one and two variable measurements using statistical and graphic methods; Planning, implementing, compiling and communicating experimental reports</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-CLO3</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid Exam
- Final Exam</td><td>Performance assessment
Test</td><td>20%

20%
20%</td></tr>
<tr><td>2</td><td>CLO4-CLO8</td><td>Generic competences</td><td>Performance assessment (observation)</td><td>20%</td></tr>
<tr><td>3</td><td>CLO9</td><td>Social competences</td><td>Performance assessment (observation)</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, Demonstration Equipment Package, LMS</td></tr>
<tr><td>Literature:</td><td>1. Diktat Perkuliahan Laboratorium Fisika Dasar 1. 2022. UPI
2. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman
3. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning.
4. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education
5. Trachanas, S. (2018). An introduction to quantum physics: a first course for physicists, chemists, materials scientists, and engineers. John Wiley & Sons.
6. Paul A. Tipler (Dr. Bambang Soegijono). (2001). FISIKA Jilid 1, Untuk Sains dan Teknik, Erlangga-Jakarta.</td></tr>
</table>

	7. Douglas C. Giancoli. (2001). *FISIKA Jilid 1*, Erlangga-Jakarta

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4									√				√
CLO5									√				√
CLO6									√				√
CLO7									√				√
CLO8									√				√
CLO9									√				√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Fundamental of Physics II	
Module-level, if applicable:	Undergraduate	
Code:	FI113	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2	
Module coordinator:	Saeful Karim	
Lecturer(s):	Saeful Karim	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, presentation, demonstration, discussion). 2. Structured activities (exercise, Independent assignments working on Student Worksheets for each topic) 3. Self-study (reading the relevant literature)	3 hour 20 minutes	45
Workload:	Total workload is 181 hours 20 minutes (6.4 ECTS) which consist of 53 hours 20 minutes of lectures (1.88 ECTS), 64 hours of structured activities (2.28 ECTS) and 64 hours of self-study (2.28 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Calculus	

Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1; describe the meaning of electrically charged objects, quantization of electric charges, and the law of conservation of charge, conductors, insulators, and electrostatic induction, applies Coulomb's Law to determine the electric field by a system of electrically charged point objects and electric dipoles, and analyzes the motion of electrically charged point objects in electric fields, behavior of dipoles in electric fields, and behavior of other polar molecules in electric fields. CLO2: apply Coulomb's Law and Gauss's Law for the determination of the electric field at a finite line charge distribution, an infinite line charge distribution, a ring charge distribution, a disk charge distribution, and an infinite plane charge distribution, point charged bodies, cylindrical shell charge distribution , and the charge distribution of an infinitely long solid cylinder, the charge distribution on a spherical shell, the charge distribution on a solid sphere, and the electric charge distribution in two parallel planes.. CLO3: apply the concept of electric potential to determine the magnitude of the electric potential by a charged point object, the electric potential by a discrete system of charged point objects, and the electrostatic potential energy of a system of charged point objects, distribution of charge on a ring, distribution of charge on a disc, distribution of charge on an infinite plane , and charge distribution in spherical shells, equipotential surfaces, electric charge sharing, and dielectric breakdown. CLO4: determines the capacitance of parallel-keeping capacitors, cylindrical capacitors, and spherical capacitors, energy density in an electrostatic field, and calculates the equivalent capacitance of a combination of series capacitors, combinations of parallel capacitors, and combinations of parallel series capacitors.. CLO5: explain the meaning of electric current (macroscopically and microscopically), drift velocity, the equation of electric current associated with drift velocity, resistance of a conductor, Ohm's Law, ohmic and non-ohmic materials, resistivity and electrical conductivity, temperature coefficient of resistivity, superconductivity, energy in electric circuits, emf and battery, internal resistance, electric power, microscopic picture of conduction (classical model), the equation of conductivity or resistivity associated with the collision time and the average free path of charge carriers in the

	atomic fabric of the material, as well as Calculating the equivalent resistance of the combination series and parallel resistors.. CLO6: apply Kirchhoff's Laws to analyze single loops and multiple loops, analyze circuits with symmetry, RC circuits, graphs of charge versus time in RC circuits, discharge from capacitors, time constants, and charging into capacitors, and explain the working principle of Galvanometer, Ammeter , Voltmeter, and Ohmmeter. CLO7: analyze the force on an electrically charged point object moving by a magnetic field, the force on a current-carrying wire by a magnetic field, magnetic field lines, the moment of force on a loop of current in a magnetic field, the magnetic dipole moment, the behavior of the magnetic dipole moment in a magnetic field , definition of magnetic pole strength, Hall effect, as well as applying the concept of magnetic force to determine the speed of cathode rays, measurement of e/m for electrons by Thomson. CLO8; apply the Biot-Savart Law to determine the magnetic field in moving electrically charged point objects, in straight and circular wires carrying an electric current, in solenoids and wires carrying a square, magnetic force and conservation of momentum, and the definition of Ampere. CLO9: apply Ampere's Law to determine the magnetic field by a current-carrying straight wire, toroid, and solenoid. CLO10: apply Faraday's Law and Lenz's Law to determine the direction of induced current in solenoids, explain the working principle of generators and electric motors, determine self-inductance and mutual inductance of solenoids, and analyze current versus time graphs in LR circuits, magnetic energy in an inductor, and density magnetic energy CLO11: explain the concepts of magnetization, magnetic susceptibility, magnetic moment and angular momentum, Bohr magneton, Paramagnetic Materials, Curie's Law, and distinguishes the characteristics of ferromagnetic materials and diamagnetic materials based on their Hysteresis curves CLO12: explain the meaning of alternating current and rms current, and analyzes the characteristics of alternating current in inductors and capacitors, inductive reactance, capacitive reactance, phasors, LC and LCR circuits without a generator, LCR circuits with generators, LCR series circuit impedance, Resonance , resonant frequency, Power factor, resonant curve, and

<table>
<tr><td></td><td>Transformer.
CLO13: explain the essence of Maxwell's Equations for electromagnetic fields, Maxwell's displacement currents, physical analysis of 4 Maxwell's equations for electromagnetic waves, determining the wave equations for electromagnetic waves, wave equations for electric fields, wave equations for magnetic fields, Linear polarized waves, and telecommunications waves.
CLO14: apply logical, critical, systematic, and innovative thinking in the context of the development of science and technology
CLO15: demonstrate independent, quality, measurable, critical, creative performance, and able to make appropriate decisions in the context of problem solving
CLO16: religious attitude as a servant of God who is devoted to God, which is shown by honesty and upholding human values
CLO17: responsible attitude to master science independently, internalize the spirit of independence, struggle, and entrepreneurship, have sincerity, commitment, sincerity to develop attitudes, values, and have the motivation to act for the benefit of society in general</td></tr>
<tr><td>Content:</td><td>Electric field by discrete charge distribution, Electric field by continuous charge distribution, Electric potential, Capacitance, dielectric and electrostatic energy, electric current, Direct current circuits, magnetic fields, Sources of magnetic fields, Magnetic Induction, Magnetism in matter, Alternating current circuits reverse, Maxwell's Equation and Electromagnetic Waves</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>Performance assessment
Test</td><td>20%

30%
30%</td></tr>
<tr><td>2</td><td>CLO14
CLO15</td><td>Generic competences</td><td>Performance assessment (observation)</td><td>10%</td></tr>
<tr><td>3</td><td>CLO16
CLO17</td><td>Social competences</td><td>Performance assessment (observation)</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, 31 Topics of Student Worksheet, LMS</td></tr>
</table>

Literature:	1. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman 2. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning. 3. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education 4. Trachanas, S. (2018). An introduction to quantum physics: a first course for physicists, chemists, materials scientists, and engineers. John Wiley & Sons. 5. Paul A. Tipler (Dr. Bambang Soegijono). (2001). *FISIKA Jilid 1, Untuk Sains dan Teknik*, Erlangga-Jakarta. 6. Douglas C. Giancoli. (2001). *FISIKA Jilid 1*, Erlangga-Jakarta

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5		√											
CLO6		√											
CLO7		√											
CLO8		√											
CLO9		√											
CLO10		√											
CLO11		√											
CLO12		√											
CLO13		√											
CLO14									√				
CLO15													√
CLO16													√
CLO17													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Experiments on Fundamental of Physics II	
Module-level, if applicable:	Undergraduate	
Code:	FI212	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2	
Module coordinator:	Iyon Suyana	
Lecturer(s):	Iyon Suyana, Heni Rusnayati, Ika Mustika Sari, M. Gina Nugraha	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and experiment). 2. Structured activities (exercise, assignment, worksheet) 3. Self-study (reading relevant literature)	1 hour 40 minutes	25
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS).	
Credit points:	3,2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>Experiments on Fundamental Physics I</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. complete the given practicum assignments according to the quality standards and the time given.
CLO2. have conceptual knowledge of various methods in physics practicum
CLO3. have conceptual knowledge of physics on static electricity, unidirectional electric circuits, dynamic electricity and optics from practical material
CLO4. have conceptual knowledge about measurement error.
CLO5. measure physical quantities
CLO6. make a plan of basic physics experiments
CLO7. retrieve and process basic physics experimental data
CLO8. communicate the results of basic physics experiments.
CLO9. compile reports on the results of basic physics experiments
CLO10. apply academic ethics and disciple during lectures</td></tr>
<tr><td>Content:</td><td>Experiment circuit switches, capacitors, magnetism, self-inductance, reflection and refraction of light.</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, CLO9</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>30%

20%
30%</td></tr>
<tr><td>2</td><td>CLO8</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td>3</td><td>CLO10</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, Experiment apparatus, LMS, worksheet.</td></tr>
<tr><td>Literature:</td><td>1. Diktat Perkuliahan Laboratorium Fisika Dasar 2. 2022. UPI
2. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman
3. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning.
4. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education</td></tr>
</table>

	5. Trachanas, S. (2018). An introduction to quantum physics: a first course for physicists, chemists, materials scientists, and engineers. John Wiley & Sons. 6. Paul A. Tipler (Dr. Bambang Soegijono). (2001). *FISIKA Jilid 1, Untuk Sains dan Teknik*, Erlangga-Jakarta. 7. Douglas C. Giancoli. (2001). *FISIKA Jilid 1*, Erlangga-Jakarta

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4									√				
CLO5									√				
CLO6									√				
CLO7									√				
CLO8									√				
CLO9									√				
CLO 10													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	English	
Module-level, if applicable:	Undergraduate	
Code:	FI231	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Heni Rusnayati	
Lecturer(s):	Heni Rusnayati, Hera Novia	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture: expository, discussions, presentations 2. Structured activities: individual assignments read and understand the study of physics, project 3. Self-study: reading the relevant literature	1 hour 40 minutes	45
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	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: have conceptual knowledge about English for academic proposals, Physics Term and Mathematical Notation
CLO2: have skills and ability to understand English through the listening process in learning physics concepts
CLO3: have skills and ability to understand English through the writing process in studying physics concepts.
CLO4: have skills and ability to understand English through the Reading process in learning physics concepts
CLO5: have skills and ability to communicate in English in explaining physics concepts.</td></tr>
<tr><td>Content:</td><td>The notation used in physics, physics concepts conveyed in English through the process of reading, writing and reexplaining the material given, explaining orally in English the physics concepts that have been studied based on a scientific paper (paper).</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-CLO5</td><td>Subject specific competences
a. Individual assignments

b. Exam
- Mid exam
- Final exam</td><td>Performance (rubric of individual assignment)
Test</td><td>20%

30%
40%</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</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, Experiment apparatus, LMS, worksheet.</td></tr>
<tr><td>Literature:</td><td>1. Tim Bahasa Inggris, 2022. English for Academic Purposes: Physics (Power Point).
2. Kaplan, M. (2020). English Grammar for University Students: A Useful Grammar Book for TOEFL, IELTS, and Other English Exams (Vol. 1). Murat Kaplan.
3. Calderón, S. S. (2020). Learning English through ICT tools. Wanceulen SL.
4. Eaglestone, R. (2017). Doing English: A guide for literature students. Routledge.</td></tr>
</table>

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4				√									
CLO5				√									

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Mathematical Physics I	
Module level, if applicable:	Undergraduate	
Code:	FI311	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2	
Module coordinator:	Achmad Samsudin	
Lecturer(s):	Achmad Samsudin, Arif Hidayat, Roswati Mudjiarto	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository, presentation, problem solving, demonstration, discussion). 2. Structured activities (exercise, assignments, worksheets) 3. Self-study (reading the relevant literature)	3 hours 20 minutes	45
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 preparation (0.56 ECTS)	
Credit points:	6.4 ECTS	
Prerequisites course(s):	Calculus	

<table>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have ability to:
CLO1: know concept of matrices, their notation and terminology, matrix algebraic operations, determinant properties, factors and Cramer's rules.
CLO2: know procedure about the use of matrices in solving simultaneous linear equations and dividing matrices
CLO3: know concept of the definition and notation of partial and total differentials
CLO4: know procedure in the use of differential concepts in approximate calculations, use of Lagrange multipliers, Leibniz's rules, and Jacobian concepts.
CLO5: know procedure about finding first order PDB solutions using various methods: variable separation method; exact. Bernoulli, Linear, Homogeneous
CLO6: know concept and procedure of Euler's equations in various types of variables, Lagrange's equations and the Hamiltonian principle, and the Van Baak principle of variation.
CLO7: know procedure in expressing a function in a power series: Taylor and McLaurin series.
CLO8: know procedure about expressing a periodic function in the Fourier sine series, the Fourier cosine series and the Fourier Sine-Cosine series, the Parseval theorem, and the Fourier Spectrum.</td></tr>
<tr><td>Content:</td><td>Matrices and Determinants, Partial Differentials, Multiples Integral, Ordinary Differential Equations (ODE), Calculus of Variation, Power Series, and Fourier Series.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be scored 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. Group assigment
c. Examination
- Quiz
- Mid Exam
- Final Exam</td><td>
Performance assessment

Test</td><td>
20%
10%

10%
30%
30%</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Media presentations (PowerPoint) and an integrated online learning system (SPOT) with the help of WAG</td></tr>
<tr><td>Literature:</td><td>1. Robert, D., & Combescure, M. (2021). Coherent states and applications in mathematical physics. Swizerland: Springer.
2. Steven P. Starkovich. (2021). The Structures of Mathematical Physics An Introduction. Springer International Publishing
3. Allen, J. (2020). An Invitation to Mathematical Physics and Its History. Springer International Publishing
4. Balakrishnan, V. (2020). Mathematical physics: applications and problems. Springer Nature.</td></tr>
</table>

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1		√											
CLO2	√												
CLO3		√											
CLO4	√												
CLO5	√												
CLO6		√											
CLO7	√												
CLO8	√												

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Statistics	
Module-level, if applicable:	Undergraduate	
Code:	FI131	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Parsaoran Siahaan	
Lecturer(s):	Parsaoran Siahaan, Ridwan Efendi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository method, discussion, presentation, simulation). 2. Structured Activities (assignments based on conceptual, contextual and problem-solving approaches, Practical/project (Peer Teaching) 3. Self-study (reading the relevant literature)	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	

<table>
<tr><td>Credit points:</td><td>3,2 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:

CLO1: know of basic understanding in statistics
CLO2: present data frankly and responsibly
CLO3: understand the measures of central tendency, locations, and deviations
CLO4: understand the principle of symmetry of a curve and its kurtosis, as well as its slope
CLO5: know of the basic theory of probability and its application in life
CLO6: understand the probability distribution and the types
CLO7: mastering how to perform normality testing of a set of data
CLO8: understand the concept of sampling distribution and several types of sampling distribution
CLO9: have critical thinking skills in problem solving through hypothesis testing
CLO10: understand the concept of regression and simple linear correlation
CLO11: understand the basic principles of non-parametric statistics</td></tr>
<tr><td>Content:</td><td>Basic understandings in statistics, data presentation, central tendency and location size, symmetry and slope, deviation size, probability theory and probability distribution, sampling distribution, correlation, several tests: normality test, homogeneity test of variance, average difference test, some tests in non-parametric statistics include: sign test, and Wilcoxon test</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, CLO3, CLO4, CLO5, CLO6 CLO7, CLO8, CLO10,CLO11</td><td>Subject specific competencies
a. Individual assignments
b. Group assignment
c. Test:
Mid-term Exam
Final Exam</td><td>

Task set
Task set
Written test</td><td>

20%
20%
40%</td></tr>
<tr><td>2</td><td>CLO9</td><td>Generic competencies (Performance)</td><td>Observation</td><td>10 %</td></tr>
</table></td></tr>
</table>

	3	CLO2	Social competencies (Performance)	Observation	10 %
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, LMS				
Literature:	1. David W. Scott. (2020). Statistics: A Concise Mathematical Introduction for Students, Scientists, and Engineers. Wiley 2. Rees, D. G. (2018). Essential statistics. Chapman and Hall/CRC 3. David S. Moore, William I Notz, Michael Fligner. (2018). 4. The Basic Practice of Statistics. Macmillan Learning 5. Gravetter Frederick,J., Larry, B,W.,(2013), Statistics for the Behavioral Sciences. Wadsworth, Cengage Learning 6. Sugiyono, (2013), Statistik Non Parametris, bandung, Alfabeta 7. Hesse, Cristian Akrong.(2011), Elementary Statistical Methods, Ghana, Methodist University College				

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1	√												
CLO2	√												
CLO3	√												
CLO4	√												
CLO5	√												
CLO6	√												
CLO7	√												
CLO8	√												
CLO9									√				
CLO10	√												
CLO11	√												

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Earth and Space Science	
Module-level, if applicable:	Undergraduate	
Code:	FI132	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Winny Liliawati	
Lecturer(s):	Winny Liliawati, Agus Fany Chandra	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, presentation, demonstration, discussion). 2. Structured activities (exercise, Independent assignments working on Student Worksheets) 3. Self-study (reading the relevant literature)	2 hour 30 minutes	45
Workload:	Total workload is 136 hours/8160 minutes (4.8 ECTS) per semester which consists of 1950 minutes (1.15 ECTS) lectures, 1170 minutes (0.69 ECTS) exercise, 1170 minutes (0.69 ECTS) structured activities, 2520 minutes (1.48 ECTS) self-study per week for 14 weeks, 450 minutes (0.26 ECTS) for each exam (3 exam), and 900 minutes (0.53 ECTS) for each exam preparation.	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Fundamental of Physics I, Fundamental of Physics II	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: conceptual of the concepts, principles, laws and theories of physics applied to earth science and astronomy
CLO2: procedural of the concepts, principles, laws and theories of physics applied to earth science and astronomy
CLO3: logical, critical, systematic and innovative thinking skills
CLO4: honest attitude and uphold ethics
CLO5: spirit of independence, not giving up easily, being responsible, internalizing academic values, norms and ethics</td></tr>
<tr><td>Content:</td><td>Motion and position of celestial bodies; Solar System: Earth and other planets and cycles on Earth; plate tectonics, stars, and 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</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid Exam
- Final Exam</td><td>Performance assessment
Test</td><td>20%

30%
30%</td></tr>
<tr><td>2</td><td>CLO3</td><td>Generic competences</td><td>Performance assessment (observation)</td><td>10%</td></tr>
<tr><td>3</td><td>CLO4
CLO5</td><td>Social competences</td><td>Performance assessment (observation)</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. Wu, J., Xu, Y., & Bai, Q. (2021). Introduction to Space Science. Springer.
2. Masson-Zwaan, T., & Hofmann, M. (2019). Introduction to space law. Kluwer Law International BV.
3. Jain, Pankaj. 2016. An introduction to astronomy and astrophysics. CRC Press,
4. Karttunen, Hannu, Pekka Kröger, Heikki Oja, Markku Poutanen, and Karl Johan Donner, eds. 2016 Fundamental astronomy. Springer.
5. Kay, Laura, Stacy Palen, and George Blumenthal. 2016. 21st century astronomy. WW Norton & Company
6. Seeds, Michael A., and Dana Backman. 2015 The solar system. Cengage Learning
7. Tarbuck, Edward J., Frederick K. Lutgens, Dennis Tasa, and Dennis Tasa. 2015. Earth: an introduction to physical geology. Upper Saddle River: Pearson/Prentice Hall,</td></tr>
</table>

	8. James Trefit dkk. 2010. Science Integrated Approach. John Wiley & Sons Inc

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2	√												
CLO3									√				
CLO4													√
CLO5													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Mathematical Physics II	
Module level, if applicable:	Undergraduate	
Code:	FI331	
Subheading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Achmad Samsudin	
Lecturer(s):	Achmad Samsudin, Arif Hidayat, Roswati Mudjiarto	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository, problem solving, presentation, demonstration, discussion). 2. Structured activities (exercise, assignments, worksheets) 3. Self-study (reading the relevant literature)	3 hours 20 minutes	45
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 preparation (0.56 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Calculus and Mathematical Physics I	

<table>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have ability to:
CLO1: know the concept of vector quantities, notations, and terminology, as well as examples in physics.
CLO2: know the procedure about vector addition, multiplication of vector quantities, differentiation of vector quantities, and integration of vector quantities.
CLO3: know the procedure about solving a problem of integration of a function by using various special functions in the integral form.
CLO4: know the concept of Legendre polynomials, Legendre series, various forms and types of Bessel functions, Hankel functions, Laguerre functions, Laguerre polynomials, Hermit functions and Hermite polynomials.
CLO5: know the procedure about solving a problem using Legendre polynomials, Legendre series, various forms and types of Bessel functions, Hankel functions, Laguerre functions, Laguerre polynomials, Hermit functions and Hermite polynomials.
CLO6: know the concept of partial differential equations and their characteristics, as well as examples in physics.
CLO7: know the procedure about the use of various partial differential equations, Laplace equation, diffusion equation, and wave equation in the study and analysis of a relevant physical phenomenon.
CLO8: know the concept 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>Vectors and Their Analysis, Special Functions in Integral Form, Special Functions of Differential Equation solutions, Partial Differential Equation (PDP), Complex Numbers, Complex Variable Functions, and Integral Transformation.</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. Group assigment
c. Examination
- Quiz
- Mid Exam
- Final Exam</td><td>
Performance assessment

Test</td><td>
20%
10%

10%
30%
30%</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Media presentations (PowerPoint) and an integrated online learning system (LMS) with the help of WAG</td></tr>
</table>

Literature:	1. Robert, D., & Combescure, M. (2021). Coherent states and applications in mathematical physics. Swizerland: Springer. 2. Steven P. Starkovich. (2021). The Structures of Mathematical Physics An Introduction. Springer International Publishing 3. Allen, J. (2020). An Invitation to Mathematical Physics and Its History. Springer International Publishing 4. Balakrishnan, V. (2020). Mathematical physics: applications and problems. Springer Nature.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1		√											
CLO2	√												
CLO3	√												
CLO4		√											
CLO5	√												
CLO6		√											
CLO7	√												
CLO8		√											

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Mechanics for School	
Module-level, if applicable:	Undergraduate	
Code:	FI332	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Unang Purwana	
Lecturer(s):	Unang Purwana, Muslim, Sutrisno, Heni Rusnayati, Hera Novia	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussion, presentation and assignment based on conceptual, contextual and problem solving approaches). 2. Structured activities (assignments in the form of making papers and presentations) 3. Self-study (explore relevant references)	1 hour 40 minutes	25
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1920 minutes (1.13 ECTS) structured activities, and 1680 minutes (0.09 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for two exam, and 240 minutes (0.14 ECTS) for each exam preparation.	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Fundamental of Physics I, Fundamental of Physics II	

Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: analyze mechanics for schools based on Core Competencies and Basic Competencies in Science subjects for Junior High School and Senior High School Physics CLO2: determine the subject matter, the breadth and depth of the material, essential concepts, and prerequisite concepts on mechanics for schools that are in accordance with Core Competencies and Basic Competencies in Science subjects for Junior High School and Senior High School Physics CLO3: diagnosing misconceptions in mechanics for schools based on Core Competencies and Basic Competencies in Sciences subjects for Junior High School and Senior High School Physics CLO4: creating material structures, concept maps or material charts, and the order of delivery of mechanics for schools that are in accordance with Core Competencies and Basic Competencies in Sciences subjects for Junior High School and Senior High School Physics CLO5: make materials development tools for mechanics for schools using scientific principles and instructional design principles independently in accordance with the applicable curriculum CL06: apply logical, critical, systematic, and innovative thinking in the context of developing materials for mechanics for schools CL07: demonstrate independent, quality, and measurable performance in developing mechanics for schools CLO8: fear God Almighty and be able to show a religious attitude in attending lectures on mechanics for schools CLO9: work together and have social sensitivity and concern in completing tasks related to mechanics for schools CLO10: responsible attitude towards completing tasks related to mechanics for schools
Content:	Basic Framework and Structure of the 2013 Junior and Senior High School Curriculum, Syllabus for junior high school science and high school physics subjects, Guidelines for Junior High School Science Subjects and Senior High School Physics, The nature of physics and scientific procedures, Measurement, Vector, Kinematics, Projectile motion, Circular motion, Newton's law in motion, Newton's law of universal gravitation, Work and Energy, Impulse and Momentum, Rotational kinematics, Rotational dynamics, and Fluids

<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-CLO5</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid Exam
- Final Exam</td><td>Performance assessment
Test</td><td>30%

20%
20%</td></tr>
<tr><td>2</td><td>CLO6
CLO7</td><td>Generic competences (presentation and Participation in discussions)</td><td>Performance assessment (observation)</td><td>20%</td></tr>
<tr><td>3</td><td>CLO8-CLO10</td><td>Social competences</td><td>Performance assessment (observation)</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</td></tr>
<tr><td>Literature:</td><td>1. Serway, R.A., Vuille, C. 2018. College Physics, 11th Edition. Cengage Learning: Boston USA.
2. Knight, R. D., Jones, B., Field, S. 2017. College Physics, 3rd edition. Pearson: Boston USA.
3. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 21 of 2016 concerning Content Standards for Primary and Secondary Education
4. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 22 of 2016 concerning Standards for the Process of Primary and Secondary Education
5. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 37 of 2018 concerning Amendments to Permendikbud Number 24 of 2016 concerning Core Competencies and Basic Competencies of Lessons in the 2013 Curriculum in Basic Education and Secondary Education
6. Halliday, D., Resnick, R., Walker,J. 2014. Fundamentals of Physics Extended, 10th Edition. John Wiley & Sons: USA.</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√	√										
CLO2		√	√										
CLO3		√	√										
CLO4		√	√										
CLO5						√							
CLO6									√				

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO7													
CLO8													√
CLO9													√
CLO10													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Electronics	
Module level, if applicable:	Undergraduate	
Code:	FI333	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Agus Danawan	
Lecturer(s):	Agus Danawan; Amsor	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class size
Type of teaching: Practicum/Experiment Teaching and learning description: 1. Lecture (expository, presentation, demonstration, discussion). 2. Structured activities (exercise, assignments, worksheets) 3. Self-study (reading the relevant literature)	2 hours 30 minutes	45
Workload	The total workload is 136 hours (4.8 ECTS) per semester, consisting of: 150 minutes lectures (1.24 ECTS), 180 minutes structured activities (1.48 ECTS), 180 minutes self-study (1.48 ECTS) per week for 14 weeks, 300 minutes for two exams (0.18 ECTS), and 720 minutes for two exam preparation (0.48 ECTS)	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Fundamental of physics 1 and Fundamental of physics 2	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: responsible in doing practical tasks independently.
CLO2: know concept of AC and DC electricity quantities
CLO3: know concept of basic meter and analog multimeter working principles
CLO4: mastering procedural knowledge related to the use of electric measuring instruments and measuring aids
CLO5: know concept of the basics of electronic passive components
CLO6: know concept of the basics of active electronic components
CLO7: mastering conceptual knowledge of types of equivalent / equivalent circuits in electrical circuits
CLO8: know concept of RC passive filters
CLO9: know concept of the gain factor characteristics of various transistor configurations
CLO10: know concept about the characteristics of the operational amplifier IC amplification factor
CLO11: know concept in determining technical specifications of electronic passive components
CLO12: know procedure in determining the technical specifications of active electronic components
CLO13: know procedure in assembling various diode circuits
CLO14: know procedure in assembling various transistor configurations
CLO15: know procedure in assembling Ic Op-amp configurations
CLO16: use electric measuring tools and measuring aids to measure electrical quantities
CLO17: investigate RC integrator circuit, differentiator, low pass filter and high pass filter
CLO18: present the processed experimental data in the form of graphs and calculations
CLO19: make a stratified wave rectifier circuit
CLO20: investigate the voltage gain factor in transistor amplifier circuits and IC op-Amp</td></tr>
<tr><td>Content:</td><td>Passive components, active components, filter circuits, RLC circuits in ac, diode circuit, wave rectifier circuits, transistor amplifiers and op-amps</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>CLO2-CLO20</td><td>Subject specific competencies
a. Practice activities (practical report)</td><td>Performance (rubric of practical report)
Test</td><td>30%</td></tr>
</table></td></tr>
</table>

			b. Exam -Mid Exam -Final Exam		 30% 30%
	2	-	Generic competences	-	-
	3	CLO1	Social competences	Observation	10%
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, electronics component Equipment Package,				
Literature:	1. Massaro, A. (2021). Electronics in Advanced Research Industries: Industry 4.0 to Industry 5.0 Advances. Wiley 2. Prasad, R. (2021). Analog and Digital Electronic Circuits: Fundamentals, Analysis, and Applications. Springer International Publishing 3. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman 4. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning. 5. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education				

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1													√
CLO2	√	√											
CLO3	√	√											
CLO4	√	√											
CLO5	√	√											
CLO6	√	√											
CLO7	√	√											
CLO8	√	√											
CLO9	√	√											
CLO10	√	√											
CLO11	√	√											
CLO12	√	√											
CLO13	√	√											
CLO14	√	√											
CLO15	√	√											
CLO16	√	√											
CLO17	√	√											
CLO18	√	√											

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO19	√	√											
CLO20	√	√											

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Thermodynamics and Optical Waves for Schools	
Module-level, if applicable:	Undergraduate	
Code:	FI334	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Muslim	
Lecturer(s):	Muslim, Unang Purwana, Sutrisno, Iyon Suyana	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (Team Based Project/Project Based Learning, Presentation). 2. Exercise (Assignments based on conceptual, contextual and problem-solving approaches 3. Self-study (reading the relevant literature)	1 hour 40 minutes	20
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two 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: analyze thermodynamics and optical waves for schools based on Core Competencies and Basic Competencies in Science subjects for Junior High School and Senior High School Physics CLO2: determine the subject matter, the breadth and depth of the material, essential concepts, and prerequisite concepts on thermodynamics and optical waves for schools that are in accordance with Core Competencies and Basic Competencies in Science subjects for Junior High School and Senior High School Physics CLO3: diagnose misconceptions in thermodynamic and optical waves for schools based on Core Competencies and Basic Competencies in Sciences subjects for Junior High School and Senior High School Physics CLO4: create material structures, concept maps or material charts, and the order of delivery of thermodynamics and optical waves for schools that are in accordance with Core Competencies and Basic Competencies in Sciences subjects for Junior High School and Senior High School Physics CLO5: make materials development tools for thermodynamics and optical waves for schools using scientific principles and instructional design principles independently in accordance with the applicable curriculum CLO6: apply logical, critical, systematic, and innovative thinking in the context of developing materials for thermodynamics and optical waves for schools CLO7: demonstrate independent, quality, and measurable performance in developing thermodynamic materials and optical waves for schools CLO8: fear God Almighty and be able to show a religious attitude in attending lectures on thermodynamics and optical waves for schools CLO9: work together and have social sensitivity and concern in completing tasks related to thermodynamics and optical waves for schools CLO10: show a responsible attitude towards completing tasks related to thermodynamics and optical waves for schools
Content:	Basic Framework and Structure of the 2013 Junior and Senior High School Curriculum, Syllabus for junior high school science and high school physics subjects, Guidelines for Junior High School Science Subjects and Senior High School Physics, Heat and Heat Transfer, Kinetic Theory of Gas, Thermodynamic Laws, Harmonic Vibration, Elasticity and Hooke's Law,

<table>
<tr><td></td><td>Characteristics of Waves Mechanic, Traveling and Standing Waves, Sound Waves, Light Waves, Geometry Optics, Optical Tools, Global Warming Phenomenon</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>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1-CLO5</td><td>Subject specific competences
a. Individual assignments
b. Exam
-Mid Exam
-Final Exam</td><td>Performance (rubric of individual assignments)
Test</td><td>20 %
20%
20%</td></tr>
<tr><td>2</td><td>CLO6, CLO7</td><td>Generic competences (Participation in discussions)</td><td>Performance (observation)</td><td>10%</td></tr>
<tr><td>3</td><td>CLO8-CLO10</td><td>Social competences (Performance in presentation)</td><td>Performance (observation)</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, Practical equipment</td></tr>
<tr><td>Literature:</td><td>1. Lim, S. C., Lai, C. H., & Kwek, L. C. (Eds.). 2021. Problems and solutions on thermodynamics and statistical mechanics. World Scientific.
2. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 37 tahun 2018 tentang Perubahan Atas Permendikbud Nomor 24 Tahun 2016 tentang Kompetensi Inti dan Kompetensi Dasar Pelajaran Pada Kurikulum 2013 Pada Pendidikan Dasat dan Pendidikan Menengah.
3. Serway, R.A., Vuille, C. 2018. College Physics, 11th Edition. Cengage Learning: Boston USA.
4. Han, F. (2017). Problems And Solutions In University Physics: Optics, Thermal Physics, Modern Physics. World Scientific Publishing Company
5. Knight, R. D., Jones, B., Field, S. 2017. College Physics, 3rd edition. Pearson: Boston USA.</td></tr>
</table>

	6. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 21 tahun 2016 tentang Standar Isi Pendidikan Dasar dan Menengah. 7. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 22 tahun 2016 tentang Standar Proses Pendidikan Dasar dan Menengah. 8. Halliday, D., Resnick, R., Walker,J. 2014. Fundamentals of Physics Extended, 10th Edition. John Wiley & Sons: USA.

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1		√	√										
CLO2		√	√										
CLO3		√	√										
CLO4		√	√										
CLO5						√							
CLO6									√				
CLO7													√
CLO8													√
CLO9													√
CLO10													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Mechanics	
Module level, if applicable:	Undergraduate	
Code:	FI335	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Dedi Sasmita	
Lecturer(s):	Dedi Sasmita	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository, presentation, demonstration, discussion). 2. Structured activities (exercise, assignments, worksheets) 3. Self-study (reading the relevant literature)	3 hours 20 minutes	45
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 preparation (0.56 ECTS)	
Credit points:	6,4 ECTS (4 SKS)	
Pre-requisites course(s):	-	

Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: Formulate kinematic quantities (position, velocity and acceleration vectors) in 4 main coordinate systems (Cartesian, polar, cylindrical, and spherical) CLO2: Identify the properties of kinematic quantities (directions, values, components) in various coordinate systems CLO3: Apply the kinematic quantity formula to various case models of physical systems CLO4: Recognize Newton's law expressions both verbally and mathematically (in acceleration or momentum) CLO5: Apply the Newton's laws to the case model of a particular physical system CLO6: Know the concept of conservative force and its relationship to the scalar potential function CLO7: Formulate the relationship between work and energy changes (kinetic and potential) CLO8: Recognize the concept of conservation of energy and apply it to case models of certain physical systems CLO9: Recognize the variety and basic properties of harmonic physical systems (spring-mass, pendulum, LC circuit) CLO10: Apply the force approach to describe harmonic motion CLO11: Apply the energy approach to describe simple harmonic motion CLO12: Get to know the concept, representation, and conservative nature of the central force CLO13: Apply the force approach to describe the motion of a physical system under the influence of a central force CLO14: Apply the energy approach to describe the motion of a physical system under the influence of a central force CLO15: Identify the shape of the orbital motion of the particle under the influence of the central force (conic section, eccentricity) CLO16: Confirming the Kepler's law expression from the results of the motion formula CLO17: Recognize the concept of center of mass (discrete particle system) and moment of inertia (continuous particle system) CLO18: Apply the Newton's laws to describe the motion of a system of particles CLO19: Perform calculation of center of mass and moment of inertia of various particle systems (parallel axis and vertical axis theorem) CLO20: Formulate the motion of particles in a non-inertial coordinate system (translation, rotation)

<table>
<tr><td></td><td>CLO21: Apply the results of the formulation (CLO20) to various particle system case models
CLO22: Recognize the basic ideas of Newtonian to Lagrange mechanical changes
CLO23: Get to know new concepts in Lagrange mechanics (general coordinates, general velocity, general momentum, general force)
CLO24: Formulate Lagrange equations in various coordinate systems (polar, cylindrical and spherical)
CLO25: Apply the Lagrange's equations to various case models of physical systems
CLO26: Description of the motion of a physical system under the influence of a constraint
CLO27: Recognize the basic idea of converting Lagrange mechanics to Hamiltonian mechanics
CLO28: Formulate Hamiltonian equations for the description of motion in various coordinate systems (polar, cylindrical, spherical)
CLO29: Identify the relationship between Lagrange mechanics and Hamiltonian mechanics
CLO30: Apply the Hamiltonian equations to various case models of physical systems</td></tr>
<tr><td>Content:</td><td>Kinematics in various coordinate systems, Newtonian mechanics (particle dynamics, harmonic motion, conservative forces, central forces), particle systems and their dynamics (discrete, continuous), non-inertial frames of reference, Lagrange mechanics, and Hamiltonian 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>CLO1 - CLO18

CLO19 - CLO30</td><td>Subject specific competences
a. Individual assignments

b. Class Activity

c. Exam
-Mid Exam
-Final Exam</td><td>
Problem set (rubric of individual assignments)
Performance (rubric of class sctivity)
Test</td><td>
20%
10%
20%

20%
10%
20%</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, and web aplication (development)
Literature:	1. Serway, R.A., Vuille, C. 2018. College Physics, 11th Edition. Cengage Learning: Boston USA. 2. Knight, R. D., Jones, B., Field, S. 2017. College Physics, 3rd edition. Pearson: Boston USA. 3. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 21 of 2016 concerning Content Standards for Primary and Secondary Education 4. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 22 of 2016 concerning Standards for the Process of Primary and Secondary Education 5. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 37 of 2018 concerning Amendments to Permendikbud Number 24 of 2016 concerning Core Competencies and Basic Competencies of Lessons in the 2013 Curriculum in Basic Education and Secondary Education 6. Halliday, D., Resnick, R., Walker,J. 2014. Fundamentals of Physics Extended, 10th Edition. John Wiley & Sons: USA.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
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	√	√											
CLO30	√	√											

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Thermodynamics	
Module level, if applicable:	Undergraduate	
Code:	FI336	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Saeful Karim	
Lecturer(s):	Saeful Karim	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository, presentation, demonstration, discussion). 2. Structured activities (exercise, Independent assignments working on Student Worksheets for each topic) 3. Self-study (reading the relevant literature)	2 hours 30 minutes	45
Workload:	The total workload is 136 hours (4.8 ECTS) per semester, consisting of: 150 minutes lectures (1.24 ECTS), 180 minutes structured activities (1.48 ECTS), 180 minutes self-study (1.48 ECTS) per week for 14 weeks, 300 minutes for two exams (0.18 ECTS), and 720 minutes for two exam preparation (0.48 ECTS)	
Credit points:	4,8 ECTS (3 SKS)	

Pre-requisites course(s):	Fundamental of Physics I, Fundamental of Physics II, Calculus, Mathematical Physics I and Mathematical Physics II
Course Learning Outcomes:	After taking this course the students have ability to: CLO1: Apply the concepts of partial differentials, exact and inexact differentials, and important relationships of partial differentials to solve various cases in thermodynamics, and describe thermodynamic coordinates for hydrostatic systems, dielectric systems, and paramagnetic systems. CLO2: Apply the zeroth law of thermodynamics regarding thermal equilibrium to define temperature and its measurement, procedural knowledge to explain the working principle of various thermometers based on their thermometric properties CLO3: Formulate the Equation of State of the system based on the terms of thermodynamic equilibrium, namely thermal equilibrium, phase equilibrium, mechanical equilibrium, and chemical equilibrium CLO4: Apply quasistatic processes in thermodynamics to formulate quasistatic work and quasistatic heat transfer CLO5: Formulate the external mechanical work formula in thermodynamics for hydrostatic, paramagnetic and dielectric systems CLO6: Apply the first law of thermodynamics to analyze a closed system CLO7: Formulate the equations of state for ideal gases and real gases based on an analysis of the Joule bebas free expansion CLO8: Apply the second law of thermodynamics to determine the efficiency of various combustion engines and cooling engines CLO9: Prove that the Carnot cycle is the most nearly reversible cycle based on the terms of reversibility CLO10: Apply the concept of Entropy to analyze reversible and non-reversible processes and cycles, both macroscopically and microscopically CLO11: Explain the 4 thermodynamic potentials and their properties (P-V-T Diagram) CLO12: Organize the Thermodynamic coordinates into Complete Thermodynamic Formulations or Maxwell Equations based on their thermodynamic potentials CLO13: Have a responsible attitude to master science independently, internalize the spirit of independence, struggle, and entrepreneurship, have sincerity, commitment, sincerity to develop attitudes, values, and have the motivation to act for the benefit of society in general

<table>
<tr><td></td><td>CLO14: Able to apply logical, critical, systematic, and innovative thinking in the context of the development of science and technology
CLO15: Able to show independent, quality, measurable, critical, creative performance, and able to make appropriate decisions in the context of problem solving
CLO16: Demonstrate a religious attitude as a servant of God who is devoted to Him, which is shown by honesty and always upholds human values</td></tr>
<tr><td>Content:</td><td>Mathematical introduction to thermodynamics, Zeroth law of thermodynamics (Temperature and its measurement), Systems and their Equations of state, Quasistatic Work, Heat and the First Law of Thermodynamics, Ideal Gases, Second Law of Thermodynamics, Carnot Cycle and Reversibility, Entropy, Potential Thermodynamics, Complete Formulation 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>CLO1 - CLO 6

CLO7 - CLO12</td><td>Subject specific competences
a. Individual assignments
b. Class Activity
c. Exam
- Mid exam
- Final exam</td><td>Performance (rubric of individual assignment)
Performance (rubric of class activity)
Test</td><td>10%
10%
30%
30%</td></tr>
<tr><td>2</td><td>CLO14, CLO15</td><td>Generic competences</td><td>Performance (observation)</td><td>10%</td></tr>
<tr><td>3</td><td>CLO13, CLO16</td><td>Social competences</td><td>Performance (observation)</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, 11 Problem Solving worksheet</td></tr>
</table>

Literature:	1. Lim, S. C., Lai, C. H., & Kwek, L. C. (Eds.). 2021. Problems and solutions on thermodynamics and statistical mechanics. World Scientific. 2. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 37 tahun 2018 tentang Perubahan Atas Permendikbud Nomor 24 Tahun 2016 tentang Kompetensi Inti dan Kompetensi Dasar Pelajaran Pada Kurikulum 2013 Pada Pendidikan Dasat dan Pendidikan Menengah. 3. Serway, R.A., Vuille, C. 2018. College Physics, 11th Edition. Cengage Learning: Boston USA. 4. Knight, R. D., Jones, B., Field, S. 2017. College Physics, 3rd edition. Pearson: Boston USA. 5. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 21 tahun 2016 tentang Standar Isi Pendidikan Dasar dan Menengah. 6. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 22 tahun 2016 tentang Standar Proses Pendidikan Dasar dan Menengah. 7. Halliday, D., Resnick, R., Walker,J. 2014. Fundamentals of Physics Extended, 10th Edition. John Wiley & Sons: USA.

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5		√											
CLO6		√											
CLO7		√											
CLO8		√											
CLO9		√											
CLO10		√											
CLO11		√											
CLO12		√											
CLO13									√				
CLO14													√
CLO15													√
CLO16													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Waves and Optics	
Module level, if applicable:	Undergraduate	
Code:	FI337	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Dedi Sasmita	
Lecturer(s):	Dedi Sasmita; Iyon Suyana	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository method, discussion, presentation, simulation). 2. Structured Activities (assignments based on conceptual, contextual and problem-solving approaches, Practical/project (Peer Teaching) 3. Self-study (reading the relevant literature)	3 hours 20 minutes	45
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 preparation (0.56 ECTS)	
Credit points:	6.4 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>Fundamental of Physics 1, Fundamental of Physics 2, Mathematical Physics 1</td></tr>
<tr><td>Course Learning Outcomes:</td><td>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.</td></tr>
<tr><td>Content:</td><td>Oscillation, Kinematics of Waves, Mechanical Waves, Electromagnetics Waves, Interference and Diffraction, Modulation of Waves.</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>Assesment 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. Quiz

c. Exam
-Mid Exam
-Final exam</td><td>

Performance (rubric of individual assigments)
Performance (rubric of quiz)
Test</td><td>

20%

20%

30 %
30 %</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</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. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman
2. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning.
3. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education
4. Trachanas, S. (2018). An introduction to quantum physics: a first course for physicists, chemists, materials scientists, and engineers. John Wiley & Sons.</td></tr>
</table>

	5. Han, F. (2017). Problems And Solutions In University Physics: Optics, Thermal Physics, Modern Physics. World Scientific Publishing Company 6. Paul A. Tipler (Dr. Bambang Soegijono). (2001). *FISIKA Jilid 1, Untuk Sains dan Teknik*, Erlangga-Jakarta. 7. Douglas C. Giancoli. (2001). *FISIKA Jilid 1*, Erlangga-Jakarta

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CO1		√											
CO2		√											
CO3		√											
CO4		√											

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	School Physics Laboratory	
Module-level, if applicable:	Undergraduate	
Code:	FI254	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Purwanto	
Lecturer(s):	Purwanto , Agus Fany, Sutrisno	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussion, presentation and assignment project based on conceptual, contextual and problem solving approaches). 2. Structured activities (assignments in the form of making papers and presentations) 3. Self-study (explore relevant references and demonstration/ experimental tools in learning physics)	1 hour 40 minutes	25
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1920 minutes (1.13 ECTS) structured activities, and 1680 minutes (0.09 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for two exam, and 240 minutes (0.14 ECTS) for each exam preparation.	
Credit points:	3.2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>Fundamental of Physics I, Fundamental of Physics II</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: use and maintain the tools contained in the school physics kit,
CLO2: compose practicum instructions, compose worksheets, assemble experimental tools, and conduct school physics experiments.
CLO3: utilize local materials to design and make demonstration/experimental tools, as well as present them.
CLO4: demonstrate a willingness to cooperate in designing, making, and using demonstration/experimental tools in learning Physics.
CLO5: responsible for designing, manufacturing and using physics laboratory equipment independently.</td></tr>
<tr><td>Content:</td><td>Use and maintenance of Mechanics kits, Wave kits, Optical kits, Electrical - magnet kits, and Thermodynamics kits. Designing and creating demonstration tools</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-CLO3</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid Exam
- Final Exam</td><td>Performance assessment
Test</td><td>20%

20%
20%</td></tr>
<tr><td>2</td><td>CLO4</td><td>Generic competences (designing, making, and using demonstration/ experimental tools in learning physics, presentation and participation in discussions)</td><td>Performance assessment (observation)</td><td>30%</td></tr>
<tr><td>3</td><td>CLO5</td><td>Social competences</td><td>Performance assessment (observation)</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/ experimental tools in learning physics</td></tr>
</table>

Literature:	1. Lucas, R. (2022). Physics Virtual Laboratory. Taylor & Francis Limited 2. Sani, R. A. (2021). Pengelolaan laboratorium ipa sekolah. Bumi Aksara. 3. Stevenson, W. H. (2019). Soil Physics Laboratory Guide. Creative Media Partners, LLC 4. White, S. and Read, J., (2018), Physics Lab, Pearson Education Limited, London. 5. Baird, D., (2010), Laboratory Manual for Conceptual Physical Science Explorations, 2nd Edition, Pearson.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2			√										
CLO3				√									
CLO4													√
CLO5													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Electromagnetism and Modern Physics for School	
Module level, if applicable:	Undergraduate	
Code:	FI351	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Sutrisno	
Lecturer(s):	Sutrisno, Iyon Suyana, Parlindungan Sinaga, Amsor	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class size
Type of teaching: Practicum/Experiment Teaching and learning description: 1. Lecture: expository, presentation, demonstration, discussion 2. Structured activities: exercise, assignments, worksheets 3. Self-study: reading the relevant literature	1 hours 30 minutes	45
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	
Pre-requisites course(s):	Fundamental of Physics I, Fundamental of Physics II	

<table>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have ability to:
CLO 1: obey all the rules of behavior and dress.
CLO 2: comply with all procedures for collecting paper assignments and presentation materials and turn presentations
CLO 3: describe the material of electricity, magnetism, and modern high school physics in the form of depth, breadth, sequence of delivery, cognitive aspects, both factual, conceptual, procedural, and metacognitive dimensions, affective and psychomotor aspects
CLO 4: explain the competency
CLO 5: mastery the concepts that apply to DC power circuits for secondary schools and their application
CLO 6: mastery the concept of static electricity for high school
CLO 7: mastery the concept of induction and magnetic force for middle school
CLO 8: mastery the concept of Electromagnetic Induction for high school
CLO 9: mastery the concepts that apply to AC electric circuits for high schools and their application
CLO 10: mastery the concept of electromagnetic radiation for high school.
CLO 11: mastery the concept of black body radiation for high school
CLO 12: mastery the concept of the photoelectric effect and Compton scattering for high school
CLO 13: mastery the concepts of core physics and radioactivity for high school
CLO 14: mastery the concept of energy resources for secondary schools and their limitations</td></tr>
<tr><td>Content:</td><td>Basic concepts of high school physics and the ability to describe Core Competencies (KI) and Basic Competencies (KD) Permendikbud no 24 of 2016 material for electricity, magnets and modern physics, depth, breadth, order of delivery, cognitive aspects, both factual, conceptual, procedural, and metacognitive affective and psychomotor aspects and examples of the application of learning materials DC electric circuits and their applications, Static electricity, induction, and magnetic forces, Electromagnetic induction, AC electric circuits and their applications, electromagnetic radiation, black body radiation, photoelectric effect and Compton scattering, data transmission digital, core physics and radioactivity, energy resources and their limitations in schools</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 competencies a. Individual</td><td>Practice (rubric of Individual</td><td>30%</td></tr></table></td></tr>
</table>

			assignments (paper) b. Exam -Mid Exam -Final Exam	assignments) Test	 20% 20%
	2	CLO2 CLO3	Generic competences (presentation and participation in discussions)	Performance (observation)	20%
	3	CLO1	Social competences	Performance (observation)	10%
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, electronics component Equipment Package,				
Literature:	1. Wald, R. (2022). Advanced Classical Electromagnetism. Princeton University Press 2. Heilbron, J. L. (2022). Elements of early modern physics. Univ of California Press. 3. Krane, S. K. (2019). Modern Physics. Wiley 4. Deruelle, N., & Uzan, J. P. (2018). Relativity in Modern Physics. Oxford University Press. 5. Stupakov, G., & Penn, G. (2018). Classical mechanics and electromagnetism in accelerator physics (Vol. 61). Cham, Switzerland: Springer. 6. Halliday&Resnick (2012), Fisika Jilid 2, Jakarta, Erlangga 7. Joan Fong, at all. (2010), Science Matters, Singapore, Marshall Cavendish Education,				

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1											√		
CLO2	√	√							√	√		√	
CLO3	√	√							√	√		√	
CLO4	√	√							√	√		√	
CLO5	√	√							√	√		√	
CLO6	√	√							√	√		√	
CLO7	√	√							√	√		√	
CLO8	√	√							√	√		√	
CLO9	√	√							√	√		√	
CLO10	√	√							√	√		√	

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO11	√	√							√	√		√	
CLO12	√	√							√	√		√	
CLO13	√	√							√	√		√	
CLO14	√	√							√	√		√	

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Electromagnetism	
Module level, if applicable:	Undergraduate	
Code:	FI352	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	David E Tarigan	
Lecturer(s):	David E Tarigan	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class size
Type of teaching: Practicum/Experiment Teaching and learning description: 1. Lecture: expository, presentation, demonstration, discussion 2. Structured activities: exercise, assignments, worksheets 3. Self-study: reading the relevant literature	3 hours 20 minutes	45
Workload	Total workload is 181 hours 20 minutes (6.4 ECTS) which consist of 46 hours 40 minutes lectures (1.88 ECTS), 56 hours structured activities (1.98 ECTS) and 52 hours of self-study (1.84 ECTS) per week for 14 weeks, 6 hours 40 minutes (0.24 ECTS) for each exam, and 20 (0.71 ECTS) for each exam preparation.	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Fundamental Physics II	

Course Learning Outcomes:	After taking this course the students have ability to: CLO 1: understand the objectives and achievement of lecture competencies so that they are able to show independent, quality and structural performance CLO 2: know the concept of electric magnet further with mastery of mathematics that needs to be mastered CLO 3: master mathematics, especially the use of vector derivatives in understanding concepts and solving problems CLO 4: know the concepts, formulations and methods of determining electrostatic quantities: electric fields, electric potentials, energy work from various point and continuous charge distributions CLO 5: understand the divergence and curl of an electric field. Application of Gauss's law, Basic properties of conductors, insulators. Induction charge CLO 6: understand the meaning of using the shadow method and the Poisson equation and Laplace's equation CLO 7: able to solve problems related to the shadow method, Poisson and Laplace equations at various coordinates in determining the potential distribution at various coordinates CLO8: understand electric dipoles, polarization characteristics of materials when exposed to an electric field, the concept of bound charge, electric shift, linear dielectric CLO 9: understand the application of electric fields in materials: capacitors CLO 10: know the concepts, formulations and methods of determining magnetostatistical quantities: magnetic fields, vector potentials, from various current sources CLO 11: understand the divergence and curl of a magnetic field. Application of Ampere's law CLO 12: analyze the force, torque and work and the characteristics of the motion of charged particles in a magnetic field and an electric field, CLO 13: understand magnetic dipoles, magnetization, differences in the characteristics of a material when placed in an external magnetic field, bound current and magnetic shift pergeseran CLO 14: understand the application of magnetic fields in materials: Magnetic circuits, transformers CLO 15: understand the emf, Ohm's Law, Resistor, the concept of electromagnetic induction, inductance and its application The concept of power, vector Poynting and the law of conservation in electrodynamics CLO 16: understand Maxwell's equations to derive the characteristics of electromagnetic waves in 133

<table>
<tr><td></td><td>materials, special relativity in electromagnetics and maxwell's equations of covariance
CLO 17: understand the use of Maxwell's equations in analyzing the propagation of electric and magnetic fields between different material fields
CLO18: apply logical, critical, systematic, and innovative thinking in the context of the development or implementation of science and technology that pays attention to and applies appropriate humanities values by internalizing the spirit of independence, struggle, and entrepreneurship through attractive, original and innovative project designs and tool repair and video creation
CLO 19: demonstrate independent performance, about electromagnets.</td></tr>
<tr><td>Content:</td><td>Vector analysis, electrostatistic, electrical field,
Study/exam achievements: magnetosatis, magnetic field in mater</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 competencies
a. Individual assignments
b. Exam
-Mid Exam
-Final Exam</td><td>Practice (rubric of Individual assignments)
Test</td><td>20%

30%
20%</td></tr>
<tr><td>2</td><td>CLO18
CLO19</td><td>Generic competences</td><td>Performance (observation)</td><td>20%</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</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, electronics component Equipment Package,</td></tr>
<tr><td>Literature:</td><td>1. Wald, R. (2022). Advanced Classical Electromagnetism. Princeton University Press
2. A. B. Bhattacharya, Atanu Nag. (2021). Physics: Introduction to Electromagnetic Theory. KHANNA PUBLISHING HOUSE
3. Stupakov, G., & Penn, G. (2018). Classical mechanics and electromagnetism in accelerator physics (Vol. 61). Cham, Switzerland: Springer.
4. Franklin, J. (2017). Classical Electromagnetism: Second Edition. Dover Publications</td></tr>
</table>

	5. Halliday&Resnick (2012), Fisika Jilid 2, Jakarta, Erlangga 6. Joan Fong, at all. (2010), Science Matters, Singapore, Marshall Cavendish Education,

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1											√		
CLO2	√	√							√	√		√	
CLO3	√	√							√	√		√	
CLO4	√	√							√	√		√	
CLO5	√	√							√	√		√	
CLO6	√	√							√	√		√	
CLO7	√	√							√	√		√	
CLO8	√	√							√	√		√	
CLO9	√	√							√	√		√	
CLO10	√	√							√	√		√	
CLO11	√	√							√	√		√	
CLO12	√	√							√	√		√	
CLO13	√	√							√	√		√	
CLO14	√	√							√	√		√	
CLO15	√	√							√	√		√	
CLO16	√	√							√	√		√	
CLO17	√	√							√	√		√	
CLO18	√	√							√	√		√	
CLO19	√	√							√	√		√	

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Modern Physics	
Module level, if applicable:	Undergraduate	
Code:	FI353	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Parlindungan Sinaga	
Lecturer(s):	Parlindungan Sinaga	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of Teaching and Learning: Theory 1. Lecture (expository method, discussion, presentation, virtual laboratory experiment). 2. Structured activities: working on problem practice, conduct virtual experiment 3. self-study: working on homework, writing the virtual experiment report	3 hours and 20 minutes	45
Workload:	Total workload is 159 hours (9520 minutes) per semester which consists of 2800 minutes lectures, 2400 minutes structured activities, 3360 minutes self-study per week for 14 weeks, 480 minutes for two exams, and 480 minutes for two exam preparation.	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	Fundamental of Physics I, Fundamental of Physics II	

Course Learning outcomes:	After taking this course the students have ability to: CLO1. Describe relativistic mechanics as an extension of the limitations of the applicability of classical mechanics and the equivalence of mass energy; CLO2. Describes the quantization of electromagnetic wave energy, particle wave dualism of light and its applications; CLO3. Evaluate various atomic models and the limitations of their respective applicability CLO4. Analyze the wave properties of particles, the Heisenbergh uncertainty principle and the limitations of classical physics in explaining the state of a particle at the atomic and subatomic level. CLO5. Explain the equation of state of a particle in quantum mechanics and how to determine the probability, expected value, variance and uncertainty of an observable CLO6. Apply the Schrodinger equation which is a fundamental equation in quantum mechanics in the simple one-dimensional case for free particles and the quantum model of the hydrogen atom. CLO7. Analyze the electron configuration of many-electron atoms, the properties of the elements, the determination of the periodic table of the elements and the magnetic properties of the elements CLO8. Describe the bonds between atoms or bonds between molecules in molecules and how to determine the total energy of the molecule CLO9. Analyze the structure of the atomic nucleus, nuclear stability, radioactivity and its application in technology CLO10. Describe nuclear fission and fusion reactions, and the advantages and disadvantages of applying the technology to humans and the environment CLO11. Describe the structure of solids, electrical properties of solids and their application to semiconductor technology CLQ12. Explain the basic concepts of statistical mechanics with examples of its application CLO13. be skilled in carrying out modern physics experiments virtually CLO14. be skilled in oral and written communication when presenting and writing papers
Content:	Special relativity and its consequences, quantum theory of light, atomic structure and atomic model, wave properties of matter, Shrodinger equation on introduction to quantum mechanics, quantum theory of the hydrogen atom, many electron atoms, molecular structure, nuclear structure, nuclear reactions and their applications, introduction to physics Solids, and introduction to statistical mechanics

<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-CLO4
CLO5-CLO8
CLO9-CLO12</td><td>Subject specific competences
a. Test I
b. Test II
c. Test III</td><td>
Test
Test
Test</td><td>
25%
25%
25%</td></tr>
<tr><td>2.</td><td>CLO13
CLO14</td><td>Generic competences
a. Virtual laboratory experiment report
b. Individual report</td><td>
Performance (rubric of experiment report)
Performance (rubric of experiment report)</td><td>
10%
15%</td></tr>
<tr><td>3.</td><td>-</td><td>Social competences</td><td>-</td><td>-</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, internet,social media</td></tr>
<tr><td>Literature:</td><td>1. Heilbron, J. L. (2022). Elements of early modern physics. Univ of California Press.
2. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman
3. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning.
4. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education
5. Krane, S. K. (2019). Modern Physics. Wiley
6. Deruelle, N., & Uzan, J. P. (2018). Relativity in Modern Physics. Oxford University Press.
7. Sinaga, P. (2016). Fisika Modern. UPI
8. Halliday&Resnick (2012), Fisika Jilid 2, Jakarta, Erlangga
9. Joan Fong, at all. (2010), Science Matters, Singapore, Marshall Cavendish Education,</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5		√											
CLO6.		√											
CLO7		√											

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO8		√											
CLO9									√				
CLO 10									√				
CLO 11									√				
CLO 12									√				
CLO 13									√				
CLO14									√				

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Seminar of Physics Education	
Module-level, if applicable:	Undergraduate	
Code:	FI552	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Ridwan Efendi	
Lecturer(s):	Ridwan Efendi, Parsaoran Siahaan, Harun Imansyah, Purwanto, Irma Rahma Suwarma, Hera Novia, Muhamad Gina Nugraha	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussion, presentation and seminar based on conceptual, contextual and problem solving approaches) 2. Structured activities (assignments in the form of journal analysis and synthesis, making papers and presentations) 3. Self-study (explore journal and relevant references)	2 hour 30 minutes	20
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 4800 minutes lectures (2.82 ECTS), 2310 minutes (1.36 ECTS) self-study per week for 11 weeks (630 minutes (0.37 ECTS) searching journal per week for three weeks, 8400 minutes (4.94 ECTS) analyzing journal per week for four weeks, 840 minutes (0.49 ECTS) synthesizing journal per week for four weeks), 630 minutes (0.37 ECTS) for three presentation preparation and 420	

	minutes (0.25 ECTS) for two presentation.
Credit points:	4,8 ECTS
Pre-requisites course(s):	Research Methodology of Physics Education
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1: apply learning theory, curriculum concepts and physics learning, physics learning methods and strategies, physics lesson planning, development of teaching materials, media and assessment of physics learning and development of physics laboratory tools for schools. CLO2: apply physics education research methodology, laboratory management for physics learning and entrepreneurial concepts. CLO3: analyze problems, finding sources of problems, solving problems related to Physics education in accordance with the scientific rules of Physics education and proposing various alternative solutions to problems and concluding them for making the right decisions and becoming lifelong learners who are more independent and able to adapt to dynamic changing times. CLO4: conduct reflective analysis of Physics education problems to improve the quality of Physics learning, conducting research with quantitative and/or qualitative approaches to solving Physics learning problems, reviewing research results and making reports on study results in the form of scientific reports. CLO5: apply logical, critical, systematic and innovative thinking in the context of developing or implementing theoretical literature studies in Physics education research that pays attention to and applies appropriate character values. CLO6: demonstrate independent, quality, measurable, critical, creative performance and able to make appropriate decisions in the context of problem solving related to the theoretical study of literature based on the results of information and data analysis. CLO7: demonstrate a responsible attitude towards independent literature review and internalize the spirit of independence to develop abilities and have the motivation to act for the benefit of the results of the study.
Content:	The nature of journals, how to analyze journals and study topics studied by students through literature reviews from journals and supporting journals, text books, the internet, and the results of physics education research.

<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-CLO4</td><td>Subject specific competences (analyze problems, finding sources of problems, solving problems related to physics education in accordance with the scientific rules of Physics education)</td><td>Performance assessment (paper assessment rubric)</td><td>20%</td></tr>
<tr><td>2</td><td>CLO5
CLO6</td><td>Generic competences
a. searching journal
b. analyzing journal competences
c. synthesizing journal
d. presentation
- Initial presentation
- Final presentation</td><td>Performance assessment (paper assessment rubric and observation)</td><td>
10%
10%
10%
40%</td></tr>
<tr><td>3</td><td>CLO7</td><td>Social competences</td><td>Performance assessment (observation)</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Yang, X. J. (2021). Theory and Applications of Special Functions for Scientists and Engineers. Springer Singapore, New York, USA.
2. Korzhik, M., Tamulaitis, G., & Vasil'ev, A. N. (2020). Physics of fast processes in scintillators (Vol. 262). Cham: Springer.
3. Gonsalves, A. J., & Danielsson, A. T. (2020). Physics Education and Gender. Springer International Publishing.
4. Cherepanov, G. P. (2019). Invariant integrals in Physics. Springer International Publishing.
5. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman
6. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning.
7. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1			√										
CLO2				√									
CLO3					√			√					
CLO4							√						
CLO5									√				
CLO6												√	
CLO7											√		

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Research Methodology of Physics Education	
Module-level, if applicable:	Undergraduate	
Code:	FI553	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Winny Liliawati	
Lecturer(s):	Winny Liliawati, Taufik Ramlan Ramalis, Parlindungan Sinaga, Ridwan Efendi, Agus Fany Chandra	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussion, presentation and project task based on conceptual, contextual and problem solving approaches) 2. Structured activities (assignments of making research proposals and presentations) 3. Self-study (explore journal, research and other relevant references)	2 hour 30 minutes	25
Workload:	Total workload is 136 hours/8160 minutes (4.8 ECTS) per semester which consists of 1950 minutes (1.15 ECTS) lectures, 1080 minutes (0.64 ECTS) exercise, 1260 minutes (0.74 ECTS) structured activities, 2520 minutes (1.48 ECTS) self-study per week for 14 weeks, 450 minutes (0.26 ECTS) for each exam (3 exam), and 900 minutes (0.53 ECTS) 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: conceptual about the nature of research; approach, type and research method/design (quantitative, qualitative, mixed, action research, and research-based design research); population, sample and sampling technique; research instruments, instrument analysis techniques (validity and reliability of instruments); data processing and analysis techniques. CLO2: procedural about the preparation of research proposals: field studies, problem identification, theoretical studies, determination of research methods and designs, preparation of research instruments, data processing and analysis techniques); and procedures for conducting research CLO3: able to review the results of physics education research with quantitative and/or qualitative approaches to solve physics learning problems CLO4: logical, critical, systematic and innovative thinking skills, in reviewing and implementing various innovations (learning, media and assessment) that can be implemented in research, making research instruments, processing and analyzing data manually / using software, writing research proposal skills CLO5: solve problems in physics education and learning independently, openly, critically, innovatively, and confidently CLO6: able to analyze problems, find sources of problems, solve problems in physics education, propose solutions and make appropriate decisions. CLO7: honest attitude and uphold ethics in writing scientific papers such as plagiarism CLO8: spirit of independence, does not give up easily, is responsible, internalizes academic values, norms and ethics
Content:	The nature of research; approach, type and research method/design (quantitative, qualitative, mixed research); population, sample and sampling technique; research instruments, instrument analysis techniques (validity and reliability of instruments); data processing and analysis techniques. Students are trained in the preparation of research proposals: field studies, problem identification, theoretical studies, determination of research methods and designs, preparation of research instruments, data processing and analysis techniques); and procedures for conducting research. Students are trained in the skills of formulating problems, conducting preliminary studies, choosing research methods and designs, making research

<table>
<tr><td></td><td>instruments, processing data, and compiling research proposals</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</td><td>Subject specific competences
a. Individual assignments

b. Exam
- Mid Exam
- Final Exam</td><td>Performance assessment (research proposal assessment rubric)
Test</td><td>30%

25%
25%</td></tr>
<tr><td>2</td><td>CLO3 - CLO6</td><td>Generic competences</td><td>Performance assessment (activity and presentation assessment rubric)</td><td>20%</td></tr>
<tr><td>3</td><td>CLO7
CLO8</td><td>Social competences</td><td>Performance assessment (observation)</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Pandey, P., & Pandey, M. M. (2021). Research methodology tools and techniques. Bridge Center.
2. Nayak, J. K., & Singh, P. (2021). Fundamentals of research methodology problems and prospects. SSDN Publishers & Distributors.
3. Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches Fifth Edition. Sage publications.
4. Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research Third Edition. Sage Publication.
5. Johnson, R. B., & Christensen, L. (2014). Educational research: Quantitative, qualitative, and mixed approaches Fifth Edition. Sage publications.
6. Creswell, J. W (2012). Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research 4th Edition. Pearson publications</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1				√									
CLO2				√									

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO3										√			
CLO4									√				
CLO5												√	
CLO6												√	
CLO7													√
CLO8											√		

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Nuclear physics	
Module level, if applicable:	Undergraduate	
Code:	FI554	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Arif Hidayat	
Lecturer(s):	Arif Hidayat	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of teaching	Contact hours per week during the semester	Class Size
1. Lecturer: expository, group discussion, problem based. 2. Structured activities: working on problem practice,writing lesson summary, presenting literature study results 3. Self-study: working on homeworks, working on study literature on article/paper related to nuclear application	2 hours and 30 minutes	45
Workload:	Total workload is 8160 minutes per semester which consists of 2100 minutes lectures,1260 exercises, 1260 minutes structured activities, 2520 minutes self-study per week for 14 weeks, 300 minutes for two exams, and 720 minutes for two exam preparation.	
Credit points:	4, 8 ECTS	

Pre-requisites course(s):	Modern Physics
Course outcomes:	After taking this course the students have ability to: CLO 1.Have conceptual knowledge about the limitations of classical physics, developments in modern physics, atomic nuclei, the discovery of atomic nuclei, and reactions in atomic nuclei. CLO 2.Have conceptual knowledge of quantum mechanics as a basic framework of thinking and solving solutions in explaining models of the atomic nucleus and reactions in the atomic nucleus. CLO 3.Have conceptual knowledge of nuclear decay as a basic framework for understanding radioactive substances. CLO 4.Have conceptual knowledge about radioactive substances and their propagation processes in nuclear reactors. CLO 5.Have conceptual knowledge about technology and technological products from radioactive substances that are useful in various fields such as agriculture and health. CLO 6.Use English language skills in reviewing scientific papers on the application of nuclear technology in various fields. CLO 7.Use English skills in understanding core physics concepts through referenced text books book
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 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

<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-CLO7</td><td>Subject specific competences
a. Individual assignment
b. Exam
-Mid Exam
-Final Exam</td><td>
Performance

Test</td><td>
20%

40%
40%</td></tr>
<tr><td>2.</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3.</td><td>-</td><td>Social competences</td><td>-</td><td>-</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. Andrew E. Ekpenyong. (2022). Mathematical Physics for Nuclear Experiments. CRC Press
2. Robertson, J. (2022). Nuclear Physics: Theory and Applications. WILLFORD Press
3. Heyde, K. (2020). Basic Ideas and Concepts in Nuclear Physics: An Introductory Approach, Third Edition. CRC Press
4. Heisenberg, W. (2019). Nuclear Physics. Philosophical Library/Open Road
5. Zelevinsky, V. dan Volya, A. (2017). Physics of Atomic Nuclei. Wiley</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5		√											
CLO6	√												
CLO7	√												

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Quantum Physics	
Module level, if applicable:	Undergraduate	
Code:	FI571	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Parlindungan Sinaga	
Lecturer(s):	Parlindungan Sinaga	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Typeof Teaching	Contact hours per week during the semester	Class Size
Type of teaching: theory 1. Lecture (expository method, discussion, presentation,). 2. Exercise: working on problem set practices 3. Self-study: working on homeworks	2 hours and 30 minutes	45
Teaching format / class hours per week during the semester:	170 minutes lectures, 100 minutes structured activities and 180 minutes self-study per week	
Workload:	Total workload is 8160 minutes per semester which consists of 2100 minutes lectures,1260 exercises, 1260 minutes structured activities, 2520 minutes self-study per week for 14 weeks, 300 minutes for two exams, and 720 minutes for two exam preparations.	
Credit points:	4.8 ECTS	
Prerequisites course(s):	Modern Physics,	

<table>
<tr><td>Course Learning outcomes:</td><td>After taking this course the students have ability to:
CLO1. Explain the limitations of the applicability of classical mechanics when applied to microscopic objects at the atomic and subatomic level; that quantum mechanics is more general than classical mechanics
CLO2. Describe the dynamic state of a system according to classical and quantum mechanics
CLO3. Describe the postulates of quantum mechanics and the probability waves of matter
CLO4. Determine the probability of finding a particle at time t and at a position between x and x + x, the expected price, variance, and uncertainty of an observable
CLO5. Apply the postulates of quantum mechanics
CLO6. Describe a single particle wave function space.
CLO7. Apply operator and commutator properties in various problems
CLO8. Describe the time-dependent schrodinger equation, and the time-independent schrodinger equation for one-dimensional and three-dimensional
CLO9. Apply the time-independent Schroedinger equation to one dimension to a simple problem
CLO10. Apply the time-independent Schroedinger equation for three dimensions to single particles in the Cartesian coordinate system and the spherical coordinate system
CLO11. Apply the schrodinger equation to determine the equation of state for the electron in the hydrogen atom (orbital equations and radial equations)
CLQ12. Describe the angular momentum, intrinsic momentum and total momentum of an electron in an atom
CLO13. Be skilled in communicating both orally and in writing when working on assignments to make papers and present them</td></tr>
<tr><td>Content:</td><td>basic ideas of quantum mechanics, state formulation in quantum mechanics, state space transformations, wave probability of matter, single particle wave function space, schrodinger equation, application of schrodinger equation to simple problems for one and three dimensional cases with cartesian and spherical coordinate systems, central force problem, angular momentum, approximation method, and state representation of a system in Hilberth space according to Dirac notation</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</th></tr>
<tr><td>1.</td><td>CLO1-CLO6
CLO7-CLO12</td><td>Subject specific competences
a. Mid Test
b. Final Test</td><td>
Test
Test</td><td>
40%
45%</td></tr>
</table></td></tr>
</table>

	2.	CLO13	Generic competences (communication skills)	Performance (rubric of communication skills)	15%	
	3.	-	Social competences	-	-	
	Total				100%	
Forms of media:	Board, LCD Projector, Laptop/Computer, internet,social media					
Literature:	1. Ney, A. (2021). The world in the wave function: a metaphysics for quantum physics. Oxford University Press. 2. French, A. P., & Taylor, E. F. (2018). An introduction to quantum physics. Routledge. 3. Lvovsky, A. I. (2018). Quantum Physics: An Introduction Based on Photons. Springer. 4. Friebe, C., Kuhlmann, M., Lyre, H., Näger, P. M., Passon, O., & Stöckler, M. (2018). The philosophy of quantum physics. Wiesbaden: Springer. 5. Le Bellac, M. (2011). Quantum physics. Cambridge University Press.					

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CO1		√									√		
CO2		√									√		
CO3		√									√		
CO4		√									√		
CO5		√									√		
CLO6.		√									√		
CLO7		√									√		
CLO8		√									√		
CLO9		√									√		
CLO10		√									√		
CLO11		√									√		
CLO12		√									√		
CLO13										√	√		

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Statistical Physics	
Module level, if applicable:	Undergraduate	
Code:	FI572	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7	
Module coordinator:	Saeful Karim	
Lecturer(s):	Saeful Karim	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: theory 1. Lecture: expository, discussion, Presentation 2. Exercise: working on problem set practice 3. Self-study: working on study literature related to Statistical Physics theme	2 hours and 30 minutes	45
Workload:	The total workload is 136 hours (4.8 ECTS) per semester, consisting of 2100 minutes (1.24 ECTS) lectures, 2160 minutes (1.27 ECTS) structured activities, 2880 minutes (1.69 ECTS) self-study per week for 14 weeks, 300 minutes (0.18 ECTS) for two exams, and 720 minutes (0.42 ECTS) for two exam preparation	
Credit points:	4,8 ECTS (3 SKS)	
Pre-requisites course(s):	Modern Physics, Quantum Physics and Thermodynamics	

<table>
<tr><td>Course Learning Outcomes:</td><td>CLO1: Have insight into the scope and approaches used in statistical physics
CLO2: Have conceptual knowledge of the basics of statistics
CLO3: Have conceptual knowledge of the statistical description of particle systems
CLO4: Have conceptual knowledge of thermal interactions and entropy
CLO5: Have conceptual knowledge of classical statistical physics and its applications
CLO6: Have conceptual knowledge of quantum statistical physics and its applications
CLO7: Have procedural knowledge in determining and using basic statistical equations
CLO8: Have procedural knowledge in using mathematical equations and statistical concepts to describe particle systems
CLO9: Have procedural knowledge in using mathematical equations and statistical concepts to describe thermal interactions and entropy
CLO10: Have procedural knowledge in using mathematical equations to describe various physical systems that meet classical statistics
CLO11: Have procedural knowledge in using mathematical equations to describe various physical systems that meet quantum statistics</td></tr>
<tr><td>Content:</td><td>Applications of thermodynamics to simple systems, Kinetic Theory, Intermolecular forces (Transport phenomena), Statistical Thermodynamics, Applications of Statistic to gases, Applications of Quantum Statistics to other Systems,</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</th></tr>
<tr><td>1.</td><td>CLO1-CLO7</td><td>Subject specific competences
a. Individual assignment
b. Class activity
c. Exam
-Mid Exam
-Final Exam</td><td>

Performance

Performance Test

</td><td>

20%

20%

30%
30%</td></tr>
<tr><td>2.</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3.</td><td>-</td><td>Social competences</td><td>-</td><td>-</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>
</table>

Literature:	1. Heissenberg, C. and Sagnotti, A. (2022). Classical and Quantum Statistical Physics: Fundamentals and Advanced Topics. Cambridge University Press 2. Apostol, M. (2021). Statistical Physics. Cambridge Scholars Publishing 3. Landau, D., & Binder, K. (2021). A guide to Monte Carlo simulations in statistical physics. Cambridge university press. 4. James P. Sethna. (2021). Statistical Mechanics: Entropy, Order Parameters, and Complexity. OUP Oxford 5. Michael V. Sadovskii. (2019). Statistical Physics. De Gruyter

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√							√	√			
CLO2		√							√	√			
CLO3		√							√	√			
CLO4		√							√	√			
CLO5		√							√	√			
CLO6		√							√	√			
CLO7		√							√	√			
CLO8		√							√	√			
CLO9		√							√	√			
CLO10		√							√	√			
CLO11		√							√	√			

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Solid State Physics	
Module level, if applicable:	Undergraduate	
Code:	FI573	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Heni Rusnayati	
Lecturer(s):	Heni Rusnayati, Hera Novia	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of Teaching and Learning: Theory 1. Lecture: expository discussion 2. Structured activities: working on problem practice 3. self-study: study literature	2 hours and 30 minutes	45
Workload:	The total workload is 136 hours (4.8 ECTS) per semester, consisting of 2100 minutes (1.24 ECTS) lectures, 2160 minutes (1.27 ECTS) structured activities, 2880 minutes (1.69 ECTS) self-study per week for 14 weeks, 300 minutes (0.18 ECTS) for two exams, and 720 minutes (0.42 ECTS) for two exam preparation	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Modern Physics, Quantum Physics	
Course Learning outcomes:	After taking this course the students have ability to: CLO1. Understand the arrangement of atoms in a crystal. CLO2. Understand the relationship between x-rays and crystal structure. CLO3. Calculate the binding energy of the crystal.	

<table>
<tr><td></td><td>CLO4. Describes the vibrations of atoms in monatomic and diatomic crystals
CLO5. Knowing the difference in heat capacity according to Bose Einstein and Debye.
CLO6. Explain the free electron theory
CLO7. Explains the energy band theory.
CLO8. Understand the crystal characteristics of intrinsic and extrinsic semiconductors
CLO9. Understand the characteristics of superconductors with low critical temperature (<23 K) and superconductors with high critical temperature (> 78 K).</td></tr>
<tr><td>Content:</td><td>Crystal structure, Crystal diffraction, Crystal binding, Lattice vibrations, Thermal properties, Free electron Fermi gas, Energy bands, semiconductor crystal, Superconductor crystal.</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-CLO4
CLO5-CLO8
CLO9-CLO12</td><td>Subject specific competences
a. Test I
b. Test II
c. Test III</td><td>
Test
Test
Test</td><td>
25%
25%
25%</td></tr>
<tr><td>2.</td><td>CLO13
CLO14</td><td>Generic competences
a. Virtual laboratory experiment report
b. Individual report</td><td>
Performance (rubric of experiment report)
Performance (rubric of experiment report)</td><td>
10%
15%</td></tr>
<tr><td>3.</td><td>-</td><td>Social competences</td><td>-</td><td>-</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, internet,social media</td></tr>
<tr><td>Literature:</td><td>1. Snoke, D. W. (2020). Solid state physics: Essential concepts. Cambridge University Press.
2. Junker, G. (2019). Supersymmetric methods in quantum, statistical and solid state physics. Bristol: IOP Publishing.
3. Lawrence, A. (2019). Solid State Physics. LARSEN & KELLER EDUCATION
4. Kittel, C., & McEuen, P. (2018). Introduction to solid state physics. John Wiley & Sons.
5. Sinaga, P. (2016). Fisika Modern. UPI</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CO1		v							v	v	v	v	v
CO2		v							v	v	v	v	v
CO3		v							v	v	v	v	v
CO4		v							v	v	v	v	v
CO5		v							v	v	v	v	v
CO6		v							v	v	v	v	v
CO7		v							v	v	v	v	v
CO8		v							v	v	v	v	v
CO9		v							v	v	v	v	v

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Bachelor of Education Physics **MODULE HANDBOOK**

Module name:	Physics for Elementary School	
Module-level, if applicable:	Undergraduate	
Code:	FI133	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Muslim	
Lecturer(s):	Muslim	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (Team Based Project/Project Based Learning, Presentation). 2. Structured Activities (Exercise, assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading the relevant literature)	1 hour 40 minutes	45
Workload:	The total workload is 90,6 hours (5440 minutes) per semester, consisting of 1400 minutes lectures, 840 minutes exercise, 840 minutes structured activities, 1680 minutes self-study per week for 14 weeks, 200 minutes for two exams, and 480 minutes for two exam preparations.	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: analyze the basic concepts of physics in science learning in elementary schools based on Core Competencies and Basic Competencies for elementary science subjects.
CLO2: analyze problems, find sources of problems, and solve problems in developing basic concepts of physics in science learning in elementary schools in accordance with scientific principles of physics.
CLO3: apply logical, critical, systematic, and innovative thinking in the context of developing basic concepts of physics in science learning in elementary school.
CLO4: demonstrate independent, quality, and measurable performance in developing basic concepts of physics in science learning in elementary school.
CLO5: demonstrate a responsible attitude in completing tasks related to Physics lectures for Basic Education.</td></tr>
<tr><td>Content:</td><td>Analysis of the competence and scope of physics material in science learning in elementary schools based on the applicable curriculum, the nature of science and scientific procedures, motion and force, energy, simple machines, sound, light, temperature and heat, heat transfer, electricity, magnetism, electrical energy, solar system, earth, eclipse.</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,</td><td>Subject specific competencies
a. Individual assignments

b. Exam
-Mid Exam
-Final Exam</td><td>
Performance (rubric of individual assignments)
Test</td><td>
20%

20%
20%</td></tr>
<tr><td>2</td><td>CLO3, CLO4</td><td>Generic competencies (Performance in discussions)</td><td>Performance (Observation)</td><td>10%</td></tr>
<tr><td>3</td><td>CLO5</td><td>Social competencies (Performance in presentation)</td><td>Performance (Observation)</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, Practical equipment</td></tr>
</table>

Literature:	1. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman 2. Ernawulan, dkk. (2019). Desain pengembangan pembelajaran sains (science didactical book) : panduan praktis pembelajaran sains berbasis proses bagi guru TK/PAUD. CV. Media Edukasi Indonesia – Tangerang 3. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning. 4. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education 5. Trachanas, S. (2018). An introduction to quantum physics: a first course for physicists, chemists, materials scientists, and engineers. John Wiley & Sons. 6. Muslim., Yunansah, H. (2010). Bahan Belajar Mandiri (BBM): Konsep Dasar Fisika untuk SD. Program S1 PGSD UPI. Penerbit: UPI Press.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2									√				
CLO3						√							
CLO4													√
CLO5													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Environmental Physics	
Module level, if applicable:	Undergraduate	
Code:	FI338	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Agus Danawan	
Lecturer(s):	Agus Danawan; Iyon Suyana	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository, presentation, demonstration, discussion). 2. Structured activities (paper, exercise, assignments, worksheets) 3. Self-study (reading the relevant literature)	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	Fundamental of Physics 1 and Fundamental of Physics 2	

<table>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students:
CLO1: have responsible attitude in doing practical tasks independently.
CLO2: have conceptual knowledge about the environment, natural environment, and ethno-physics in life
CLO3: have conceptual knowledge of physical phenomena in the air, water and soil environment
CLO4: have conceptual knowledge of physical phenomena in solids, liquids and gases and their use in life and science and technology.
CLO5: have conceptual knowledge of noise and acoustic phenomena and their use in everyday life.
CLO6: have conceptual knowledge of phenomena by sunlight and its use in science and technology and life
CLO7: have conceptual knowledge of weather and climate elements
CLO8: have conceptual knowledge about the basics of radiation, protection and monitoring of environmental radiation
CLO9: have conceptual knowledge about the phenomenon of heat transport and its use in life and science and technology
CLO10: have conceptual knowledge of electricity and magnetism phenomena and their use in life and science and technology
CLO11: have procedural knowledge of making diagrams of residential electrical installation plans
CLO12: have conceptual knowledge of the basics of residential electrical installation systems
CLO13: have skills in how to arrange residential electrical installations</td></tr>
<tr><td>Content:</td><td>Physical phenomena in air (atmosphere) / gas, liquid / water (hydrosphere), sunlight, solids, soil, utilization of air, water, sun in science and technology and daily life, noise, vibration, radiation, radiation protection, and radiation monitoring, the application of various electrical physics concepts, magnetism in life, sources of electrical energy and their use in homes and their distribution installation systems</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>CLO2 – CLO13</td><td>Subject specific competences
a. Paper presentation
b. Class Activity
c. Exam
- Mid exam
- Final exam</td><td>

Performance (rubric of paper presentation)
Performance (rubric of class activity)
Test</td><td>

10%
10%

35%
35%</td></tr></table></td></tr>
</table>

	2	-	Generic competences	-	-
	3	CLO1	Social competences	Observation	10 %
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration electrical installation components				
Literature:	1. Abel Rodrigues, Raul Albuquerque Sardinha, Gabriel Pita. (2021). Fundamental Principles of Environmental Physics. Springer International Publishing 2. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman 3. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning. 4. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education 5. Trachanas, S. (2018). An introduction to quantum physics: a first course for physicists, chemists, materials scientists, and engineers. John Wiley & Sons. 6. Bolivar, N. (2018). Environmental Physic. Arcler Education Incorporated				

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CO1													√
CO2		√											
CO3		√											
CO4		√											
CO5		√											
CO6		√											
CO7		√											
CO8		√											
CO9		√											
CO10		√											
CO11		√											
CO12		√											
CO13		√											

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Taxonomy of Physics Education	
Module-level, if applicable:	Undergraduate	
Code:	FI339	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	3	
Module coordinator:	Taufik Ramlan Ramalis	
Lecturer(s):	Taufik Ramlan Ramalis	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussions, questions and answers, assignments, and presentations). 2. Structured activities (book chapter/journal analysis and synthesis report, create an instrument based on a specific taxonomic framework) 3. Self-study (literature study based on book chapters/ journals)	1 hour 40 minutes	45
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 preparation.	
Credit points:	3,2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>Evaluation in physics learning</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: good knowledge of various taxonomies of physics learning
CLO2: utilize and use taxonomic variants in implementing and managing Physics learning properly and correctly
CLO3: build concepts, knowledge, analytical techniques and their implementation in content pedagogy and adaptive abilities to learning and learning physics.
CLO4: demonstrate a willingness to cooperate in designing, making, and using assessment instruments in learning Physics</td></tr>
<tr><td>Content:</td><td>Taxonomy position on educational purposes, cognitive, affective, psychomotor taxonomy development, Bloom's taxonomy, Taxonomy of Science Education (McCormack & Yager), Psychomotor Taxonomy (Dave), SOLO-Structure of the Observed Learning Outcome (Biggs & Collis), Revised Bloom's Taxonomy , Taxonomy of Significant Learning (Fink), The New Taxonomy of Educational Objectives (Marzano & Kendall)</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-CLO3</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>10%

30%
40%</td></tr>
<tr><td>2</td><td>CLO4</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td>3</td><td>CLO4</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Irvine, J. (2017). A Comparison of Revised Bloom and Marzano’s New Taxonomy of Learning. Research in Higher Education Journal, 172608.
2. Prasida . (2016). Relative Effectiveness of Mc Cormack and Yager Taxonomy and Bloom'S Taxonomy in Teaching Physics. International Education & Research Journal [IERJ], Vol. 2, Issue : 12, p. 132-135.
3. Munzenmaier, C. & Rubin, N. (2013). Bloom’s Taxonomy Whats Old is New Again. The eLearning Guild. Stony Point, Santa Rosa.</td></tr>
</table>

	4. APA (2012). *The Education and Training Guidelines: A Taxonomy for Education and Training in Professional Psychology Health Service Specialties*, American Psychological Association (APA), NE Washington. 5. Biggs J. & Tang, C. (2011). *Teaching for Quality Learning at University: What the Student Does*, Fourth Edition, McGraw-Hill Education. Berkshire, England.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1			√										
CLO2								√					
CLO3							√						
CLO4													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Technology and Engineering in Physics Education	
Module-level, if applicable:	Undergraduate	
Code:	FI431	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Didi teguh Chandra	
Lecturer(s):	Didi teguh Chandra, Irma Rahma Suwarma	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussions, questions and answers, assignments, and presentations). 2. Structured activities (book chapter/journal analysis and synthesis report, create an instrument based on a specific taxonomic framework) 3. Self-study (literature study based on book chapters/ journals)	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	
Credit points:	3,2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: having awareness and tolerance to the real life problems.
CLO2: having literate inTechnology, and Engineering
CLO3: having factual knowledge in analyzing technology and engineering application in daily life
CLO4: having skills and ability to take decision correctly and professionally based on the analysis result of information and data
CLO5: able to chose alternative solution individually or in group to solve problems based on science and technology development.</td></tr>
<tr><td>Content:</td><td>Engineering and technology in education, implementation of Study/exam achievements: technology and engineering in daily life, implementation of basic skills in technology and engineering, materials types, reinforcement and splicing 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>CLO2-CLO4</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>20%

20%
40%</td></tr>
<tr><td>2</td><td>CLO5</td><td>Generic competences</td><td>Performance assessment</td><td>20%</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</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. Heywood, dkk. (2022). Philosophy and Engineering Education: New Perspectives, An Introduction. Morgan & Claypool Publishers
2. Penprase, B. E. (2020). STEM Education for the 21st Century. Springer International Publishing
3. Kirkup, L. (2019). Experimental Methods for Science and Engineering Students: An Introduction to the Analysis and Presentation of Data. Cambridge University Press</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1			√										
CLO2								√					
CLO3							√						
CLO4													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	E-Learning in Physics Education	
Module-level, if applicable:	Undergraduate	
Code:	FI432	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Taufik Ramlan Ramalis	
Lecturer(s):	Agus Fany Candra, Arif Hidayat	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussions, questions and answers, assignments, and presentations). 2. Structured activities (book chapter/journal analysis and synthesis report, create an instrument based on a specific taxonomic framework) 3. Self-study (literature study based on book chapters/ journals)	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	
Credit points:	3,2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>Fundamentals of Physics, Classical Mechanics for School, Thermodynamics and Wave Optics for School, and Electromagnetism and Modern Physics for School.</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: Have ability to distinguish and analyze various media used in learning Physics.
CLO2: Have ability and skills in designing and making Physics learning media.
CLO3: Have ability to utilize local materials and use ICT as a medium for learning physics.
CLO4: Have ability to use media in implementing and managing Physics learning properly and correctly
CLO5: Demonstrate a willingness to work together in designing and creating physics learning media. (attitude).</td></tr>
<tr><td>Content:</td><td>The paradigm behind e-Learning, ICT in the Industrial Study/exam achievements: Revolution 4.0, ICT Competence for Teachers, Web-based teaching materials, computer networks, Webblogs as elearning,and Project Tasks.</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-CLO3</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>20%

20%
40%</td></tr>
<tr><td>2</td><td>CLO4</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td>3</td><td>CLO5</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. UNESCO, (2018), ICT Competency Framework for Teachers version 3, United Nations Educational, Scientifi and Cultural Organization.
2. Dordal, P. L., (2018), An Introduction to Computer Networks Release 1.9.16, Department of Computer Science, Loyola University Chicago.
3. Clark, R., C., & Mayer, R. E. (2016). E-learning and the science of instruction : proven guidelines for consumers and designers of multimedia learning, John Wiley & Sons, Inc., Hoboken, New Jersey.
4. Scbwab, K. (2016), The Fourth Industrial Revolution, World Economic Forum, Cologny/Geneva, Switzerland</td></tr>
</table>

	5. Vieira, E., M., Marialice de Moraes, M., and Rossato, J., (2016), Evaluation of Virtual Objects: Contributions for the Learning Process, International Review of Research in Open and Distributed Learning, Vol. 17, No. 6. 6. Tomei, L. (editor), (2010), ICTs for modern educational and instructional advancement : new approaches to teaching, Information Science Reference, Hershey-New York.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1			√										
CLO2								√					
CLO3							√						
CLO4													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	ICT in Physics Learning	
Module-level, if applicable:	Undergraduate	
Code:	FI433	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Taufik Ramlan Ramalis	
Lecturer(s):	Taufik Ramlan Ramalis, Arif Hidayat	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussions, questions and answers, assignments, and presentations). 2. Structured activities (book chapter analysis and synthesis report, designing and creating ICT-based physics learning projects) 3. Self-study (literature study of relevant references)	1 hour 40 minutes	45
Workload:	The total workload is 91 hours/5440 minutes (3,2 ECTS) per semester, consisting of 1400 minutes (0,82 ECTS) lectures, 960 minutes (0,56 ECTS) exercise, 960 minutes (0,56 ECTS) structured activities, 1680 minutes (0,99 ECTS) self-study per week for 14 weeks, 200 minutes (0,12 ECTS) for two exams, and 240 minutes (0,14 ECTS) for two exam preparation.	
Credit points:	3,2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: knowledge of various digital multimedia in physics learning both offline and online along with its development trends.
CLO2: ability and skills to utilize and use ICT in implementing and managing Physics learning properly and correctly
CLO3: ability to build concepts, knowledge, analytical techniques and their implementation in content pedagogy and adaptive abilities to ICT-based physics learning and learning
CLO4: willingness to cooperate in designing, creating, and using ICT in learning Physics</td></tr>
<tr><td>Content:</td><td>ICT Applications in Education; ICT Competencies for Teachers, Analysis and Testing of ICT-based Physics Learning, and ICT-based Physics learning 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</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>20%

25%
35%</td></tr>
<tr><td>2</td><td>CLO2
CLO3</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td>3</td><td>CLO4</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Micropoulus, dkk. (2021). Research on E-Learning and ICT in Education: Technological, Pedagogical and Instructional Perspectives. Springer International Publishing
2. Dordal, P., L., (2018). An Introduction to Computer Networks, https://www.tutorialspoint.com/data_communication_computer_network/ data_communication_computer_network_tutorial.pdf
3. Hine, P. (editor), (2011), ICT Competency Framework for Teachers, Version 2.0, UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000213475. Version 3: https://unesdoc.unesco.org/ark:/48223/pf0000265721</td></tr>
</table>

	4. Raholm, M., B. (2010). Theory Development and the Logic of Discovery, *International Journal for Human Caring*, Vol. 14, No. 3 5. Tomei, L. (editor), (2010), *ICTs for modern educational and instructional advancement : new approaches to teaching*, Information Science Reference, Hershey-New York.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1			√										
CLO2								√					
CLO3							√						
CLO4													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Bachelor of Physics Education **MODULE HANDBOOK**

Module name:	Applied Statistics for Education	
Module-level, if applicable:	Undergraduate	
Code:	FI434	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Parsaoran Siahaan	
Lecturer(s):	Parsaoran Siahaan, Achmad Samsudin	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, problem solving, discussion, and assignment) 2. Structured activities (student worksheet-based independent assignments) 3. Self-study (literature study of relevant references)	1 hour 40 minutes	45
Workload:	The total workload is 91 hours/5440 minutes (3,2 ECTS) per semester, consisting of 1400 minutes (0,82 ECTS) lectures, 960 minutes (0,56 ECTS) exercise, 960 minutes (0,56 ECTS) structured activities, 1680 minutes (0,99 ECTS) self-study per week for 14 weeks, 200 minutes (0,12 ECTS) for two exams, and 240 minutes (0,14 ECTS) for two exam preparation.	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	Statistics	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: analyze differences in descriptive and inferential statistics, and levels of data based on their characteristics, and simple linear correlations.
CLO2: present data in tables and diagrams
CLO3: test the normality of the distribution of a set of data in a frequency distribution table and single data, homogeneity of two or more variances, one-party and two-party hypotheses, one-way and two-way variances,
CLO4: estimate the magnitude associated with the sampling distribution
CLO5: make the right decisions in analysing statistical data
CLO6: demonstrate a responsible attitude in applying statistical knowledge independently</td></tr>
<tr><td>Content:</td><td>The lecture material consists of: descriptive and inferential statistics; Data levels (nominal, ordinal, interval and ratio); Presentation of data, size of centre, size of location and size of distribution; normal curve and testing; Homogeneity test of two or more variances; Size estimates in the sampling distribution; Hypothesis test; Test one party and two parties; T 'test; One-way and two-way Analysis of Variance; Regression Analysis and Linear Correlation; Non-Parametric Statistics</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-CLO4</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>20%

25%
35%</td></tr>
<tr><td>2</td><td>CLO5</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td>3</td><td>CLO6</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. David W. Scott. (2020). Statistics: A Concise Mathematical Introduction for Students, Scientists, and Engineers. Wiley
2. Rees, D. G. (2018). Essential statistics. Chapman and Hall/CRC
3. David S. Moore, William I Notz, Michael Fligner. (2018). The Basic Practice of Statistics. Macmillan Learning
4. Illowsky Barbara, Susan Dean (2018), Introductory Statistics, Houston, OpenStax Rice University</td></tr>
</table>

	5. Sugiyono, (2017). Statistika Untuk Penelitian. Bandung: Alfabeta 6. Hesse Christian Akrong , Ofusu,J,B, (2015), Elementary Statistical Methods, Ghana, Methodist University College 7. Sugiyono, (2015), Statistik Non Parametris untuk Penelitian, Bandung: Alfabeta. Bandung, Alfabeta 8. Gravetter Frederick,J., Larry, B,W.,(2013), Statistics for the Behavioral Sciences. Wadsworth, Cengage Learning 9. Sugiyono, (2013), Statistik Non Parametris, bandung, Alfabeta 10. Hesse, Cristian Akrong.(2011), Elementary Statistical Methods, Ghana, Methodist University College 11. Brink David (2010), Essentials 0f Statistics, Ventus Publishing ApS, ISBN 978-87-7681-408-3, ebook Bookboon.com

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1	√												
CLO2	√												
CLO3	√												
CLO4	√												
CLO5													√
CLO6													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Applied Electronics	
Module level, if applicable:	Undergraduate	
Code:	FI435	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Agus Danawan	
Lecturer (s)	Agus Danawan; Amsor	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class size
Type of teaching: Practicum/Experiment Teaching and learning description: 1. Lecture (expository, presentation, demonstration, discussion, practical activities). 2. Structured activities (exercise, assignments, worksheets) 3. Self-study (reading the relevant literature)	1 hours 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	
Credit points:	3,2 ECTS (2 SKS)	

<table>
<tr><td>Pre-requisites course(s):</td><td>Electronics</td></tr>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have ability to:
CLO1: responsible in doing practical tasks independently.
CLO2: know procedure in determining whether or not passive and active electronic components
CLO3: know procedure in the use of an oscilloscope
CLO4: know procedure in assembling a regulated power supply
CLO5: know procedure in assembling various passive components in electronic devices
CLO6: know procedure in assembling the tone control filter
CLO7: know procedure in assembling the pre-amplifier
CLO8: know procedure in assembling a simple amplifier with the mosfet
CLO9: have the skills to use electric measuring tools to determine whether or not passive and active components of electronics are good
CLO10: have the skills to design and manufacture automatic lamp circuits
CLO11: have the skills to design and manufacture a series of tone control filters
CLO12: have the skills to design and manufacture emergency light circuits
CLO13: have the skills to design and manufacture regulated power supply circuits
CLO14: have the skills to design and build a simple power amplifier circuit with a mosfet</td></tr>
<tr><td>Content:</td><td>Test electronic components with measuring instruments, lay out technique for PCB, regulated power supply circuits, emergency light circuits, automatic light circuits, tone control circuits, and simple amplifier circuits with mosfet</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>CLO2 - CLO14</td><td>Subject specific competences
a. Product Report
b. practice activities
c. Exam
-Mid Exam
-Final exam</td><td>

Performance (rubric of Product report)
Performance (rubric of practice activities)
Test</td><td>

20%
10%

30%
30%</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1</td><td>Social</td><td>Observation</td><td>10 %</td></tr>
</table></td></tr>
</table>

			competences		
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, Electronic Component Equipment Package,				
Literature:	1. Massaro, A. (2021). Electronics in Advanced Research Industries: Industry 4.0 to Industry 5.0 Advances. Wiley 2. Prasad, R. (2021). Analog and Digital Electronic Circuits: Fundamentals, Analysis, and Applications. Springer International Publishing 3. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman 4. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning. 5. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education				

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1													√
CLO2		√											
CLO3		√											
CLO4		√											
CLO5		√											
CLO6		√											
CLO7		√											
CLO8		√											
CLO9		√											
CLO10		√											
CLO11		√											
CLO12		√											
CLO13		√											
CLO14		√											

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Computational Physics	
Module level, if applicable:	Undergraduate	
Code:	FI436	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Amsor	
Lecturer(s):	Amsor; Waslaluddin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective Course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository method, Experiment Computing Numerical discussion, presentation, simulation). 2. Structured Activities (Exercise, assignments based on conceptual, contextual and problem-solving approaches 3. Self-study (reading the relevant literature)	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	

<table>
<tr><td>Credit points:</td><td>3,2 ECTS (2 SKS)</td></tr>
<tr><td>Pre-requisites course(s):</td><td>Mathematical Physics</td></tr>
<tr><td>Course Learning Outcomes:</td><td>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 decimal, binary, and floating-point number in computer systems
CLO3: Explain arithmetic and logic in Python system.
CLO4: Using microprocessor technology as Scientific Tools for Computational Physics (Mathematical modelling, Programming using Python, Running and displays results)
CLO5: Using microprocessor technology as a numerical method solution for computational physics principles and applications
CLO6: Using the technology of micro- processor as the basis of data analysis computation results
CLO7: Understand the numerical Method Analysis of Non-Linear Equations, Interpolation and Approximation
CLO8: Understand the numerical Analysis for Differential and Numerical Integral
CLO9: Create numerical models for physical systems whose solutions use mathematical systems as a tool.
CLO10: Analyze the numerical analysis for PDP system
CLO11: Analyze the numerical analysis for physical systems
CLO12: Report the results of solving problems with numerical methods for relevant physics cases
CLO13: Report the results of solving problems using numerical methods for chaos and fractal cases</td></tr>
<tr><td>Content:</td><td>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>
</table>
</td></tr>
</table>

	1	CLO1-CLO13	Subject specific competences a. Individual assignments b. Class Activity c. Experiment Activity d. Exam -Mid Exam -Final Exam	Performance (rubric of individual assigment) Performance (rubric of class activity) Performance (rubric of experiment activity) Test	20% 10% 20% 25% 25%
	2	-	Generic competences	-	-
	3	-	Social competences	-	-
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration, LMS				
Literature:	1. Peters, J. F. (2020). Computational geometry, topology and physics of digital images with applications. Springer International Publishing. 2. Joseph F. Boudreau, Eric Scott Swanson. (2018). Applied Computational Physics. Oxford University Press 3. Omair Zubairi, Fridolin Weber. (2018). Introduction to Computational Physics for Undergraduates. Morgan & Claypool Publishers 4. Koonin, S. E. (2018). Computational physics: Fortran version. CRC Press.				

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1	√												
CLO2	√												
CLO3	√												
CLO4	√												
CLO5	√												
CLO6	√												
CLO7	√												

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO8	√												
CLO9	√												
CLO10	√												
CLO11	√												
CLO12	√												
CLO13	√												

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Item Response Theory	
Module-level, if applicable:	Undergraduate	
Code:	FI531	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	4	
Module coordinator:	Taufik Ramlan Ramalis	
Lecturer(s):	Taufik Ramlan Ramalis, Ridwan Efendi	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practicals methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (study literature and test analysis using computer program applications)	1 hour 40 minutes	45
Workload:	The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 1400 minutes lectures (0.82 ECTS), 840 minutes exercise (0.49 ECTS), 840 minutes structured activities (0.49 ECTS), 1680 minutes self-study per week for 14 weeks (0.99 ECTS), 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS).	
Credit points:	3.2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>Statistics</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: retain the concepts, principles, and applications of statistics and computation to support the construction, validation and interpretation of tests as an assessment instrument for learning physics.
CLO2: retain physics learning assessment theory, especially related to developing tests for assessment of physics learning in schools.
CLO3: apply logical, critical, systematic and innovative thinking in the context of implementing the theory of test development and application of computer programs that pay attention to and apply the principles of assessment.
CLO4: demonstrate independent, quality, measurable, critical, creative, network maintenance, and be able to make correct decisions in the context of construction, validation and interpretation of tests based on the results of data analysis.
CLO5: demonstrate a responsible attitude in the construction process, validate and interpret tests independently, internalize the spirit of independence, have sincerity, commitment, sincerity to develop attitudes, values, and the ability to construct, validate and interpret tests based on assessment principles and have motivation to do for the benefit of the quality of the test.
CLO6: analyze problems and solve test development problems in the physics learning assessment process in accordance with the rules of test development and propose various alternative solutions to test development problems and conclude them for correct decision making and become lifelong learners who are more independent and able to adapt to changes in test development theory dynamic.</td></tr>
<tr><td>Content:</td><td>The comparison of classical test theory and item response theory, item response theory models: 3-parameter models, 2-parameter models, and 1-parameter models, ability scale, item parameter estimation and ability parameter, information function, reliability estimation and standard error of measurement; and test analysis using a computer program 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>Score</th></tr>
<tr><td>1</td><td>CLO1
CLO2</td><td>Subject specific competences
a. Individual assignments
b. Exam</td><td>Performance assessment
Test</td><td>10%</td></tr>
</table></td></tr>
</table>

			- Mid exam - Final exam		30% 40%
	2	CLO3 CLO4	Generic competences	Performance assessment	10%
		CLO5 CLO6	Social competences	Performance assessment	10%
	Total				100%
Forms of media:	Board, LCD Projector, Laptop/Computer, LMS				
Literature:	1. R. Darrell Bock, Robert D. Gibbons. (2021). Item Response Theory. Wiley 2. Laliyo, L. A. R. (2021). Mendiagnosis Sifat Perubahan Konseptual Siswa: Penerapan Teknik Analisis Stacking Dan Racking Rasch Model. Deepublish. 3. Sumintono, B. (2021). Penilaian Keterampilan Berpikir Tingkat Tinggi: Aplikasi Pemodelan Rasch pada Asesmen Pendidikan. Prosiding Magister Pendidikan Ilmu Pengetahuan Alam, 1(1). 4. DeMars, C. (2010). Item Response Theory. Oxford University Press, Inc.				

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1	√												
CLO2			√										
CLO3									√				
CLO4													√
CLO5													√
CLO6													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Innovation of Physics Teaching Material	
Module-level, if applicable:	Undergraduate	
Code:	FI354	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Parlindungan Sinaga	
Lecturer(s):	Parlindungan Sinaga	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (direct instruction, discussion, presentation and project-based learning based on a multi-representational and multi-mode representation approach). 2. Structured activities (assignments in the form of making teaching materials, and presentations) 3. Self-study (explore relevant references and making teaching materials)	1 hour 40 minutes	45
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1920 minutes (1.13 ECTS) structured activities, and 1680 minutes (0.09 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for two exam, and 240 minutes (0.14 ECTS) for each exam preparation.	
Credit points:	3.2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>-</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: analyze the important factors of physics teaching materials for students and for teachers
CLO2: analyze the demands of the high school physics curriculum based on graduate competency standards and basic competencies in determining the form of teaching materials for the most appropriate learning and teaching process.
CLO3: describe quality independent teaching materials
CLO4: apply concept maps to determine the order of teaching materials from general to specific or vice versa
CLO5: translate a concept from one mode of representation to another
CLO6: representing a concept in the form of multiple representations
CLO7: writing printed teaching materials using multi-mode representation
CLO8: create electronic teaching materials using multimode representation
CLO9: develop science subjects at school through the development of teaching materials
CLO10: make scientific arguments about their decisions in choosing and making the most appropriate teaching materials based on the basic competencies they hear and the characteristics of their audience.
CLO11: seek and process feedback to improve the quality of teaching materials as an effort to improve the quality of learning
CLO12: collaborate with colleagues in groups and with other stakeholders in the school in producing quality teaching materials
CLO13: demonstrate an entrepreneurial spirit in creating, publishing and marketing teaching materials</td></tr>
<tr><td>Content:</td><td>The nature, function and role of teaching materials for students and for teachers, types of teaching materials, printed teaching materials and electronic teaching materials, process models for making printed teaching materials (work books, print books), process models for making electronic teaching materials (e-books, smart book), evaluation of the quality of teaching materials, evaluation of the effectiveness of teaching materials in achieving the objectives of writing teaching materials</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</td><td>Performance assessment
Test</td><td>10%
35%</td></tr>
</table></td></tr>
</table>

			b. Exam - Mid exam - Final exam		35%	
	2	CLO9 - CLO11	Generic competences	Performance assessment	15%	
		CLO12CLO13	Social competences	Performance assessment	5%	
	Total				100%	
Forms of media:	Board, LCD Projector, Laptop/Computer, LMS					
Literature:	1. Jenaro Guisasola, Kristina Zuza. (2020). Research and Innovation in Physics Education: Two Sides of the Same Coin. Springer International Publishing 2. Sinaga, P., Amsor,.& Cahyanti, F,B.(2019). Effectiveness of the new generation e-book application for mobile phones in improving the conceptual mastery of kinematics, *Int. J. Mobile Learning and Organisation, Vol. 13, No. 2,* 3. Sinaga, P.(2017).Model Proses Menulis Materi Ajar Sain.. Universitas pendidikan Indonesia 4. Sinaga,P.,Kaniawati, I.,& Setiawan, A.(2017). Improving Secondary School Students' Scientific Literacy Ability Through The Design Of Better Science Textbooks. Journal of Turkish Science Education, Volume 14, Issue 4**.** 5. Kemendikbud (2013).*Dokumen Kurikulum 2013*. Jakarta: Kemendikbud.					

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1			√										
CLO2			√										
CLO3			√										
CLO4			√										
CLO5			√										
CLO6			√										
CLO7			√										
CLO8			√										
CLO9									√				
CLO10													√
CLO11													√
CLO12													√
CLO13													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Bachelor of Physics Education **MODULE HANDBOOK**

Module name:	History of Physics	
Module level, if applicable:	Undergraduate	
Code:	FI355	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Dedi Sasmita	
Lecturer(s):	Dedi Sasmita	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (expository, presentation, demonstration, discussion). 2. Structured activities (exercise, assignments, worksheets) 3. Self-study (reading the relevant literature)	1 hour 40 minutes	45
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two exams (0.12 ECTS), and 480 minutes for two exam preparation (0.28 ECTS)	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Fundamental of Physics 1 dan Fundamental of Physics 2	

<table>
<tr><td>Course learning outcomes:</td><td>After taking this course the students have ability to:
CLO1: Describe the concept of scientific truth, scientific method and characteristics of scientific attitude
CLO2: Recognize the shift in thinking from natural philosophy to physics
CLO3: Recognize the profiles and significant contributions of scientists who contributed to the development of classical physical thought (Newton, Lagrange, Hamiltonian, optics, static magnetism, electromagnetism, thermodynamics and the kinetic theory of gases)
CLO4: Analyze the timeline of the development of thought in the field of classical physics
CLO5: Recognize the profiles and significant contributions of scientists who contributed to the development of modern physical thought (atomic theory, relativity, quantum mechanics)
CLO6: Analyze the timeline of the development of thought in the field of modern physics
CLO7: Make scientific papers regarding the development of certain concepts / fields of physics or certain figures (individuals or groups)
CL08: Presenting scientific papers in class forums (individually or collectively)</td></tr>
<tr><td>Content:</td><td>Description of scientific truth, scientific attitude, and characteristics of scientific attitude in science, shift from natural philosophy to physics, development of classical mechanical thought (Newton, Lagrange, Hamiltonian, optics, static magnetism, electromagnetism, thermodynamics and the kinetic theory of gases), development of thought modern physics (atomic theory, relativity, quantum mechanics)</td></tr>
<tr><td>Study/exam achievements:</td><td>
<table>
<tr><th>No</th><th>CLO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1-CLO8</td><td>Subject specific competences
a. Individual assigment
b. Group assignment
c. Exam
-Mid Exam
-Final Exam</td><td>

Performance (rubric of Individual assignment)
Performance (rubric of group assignment)
Test</td><td>
10%
10%
40%
40%</td></tr>
<tr><td>2</td><td>-</td><td>Generic competences</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>-</td><td>Social</td><td>-</td><td>-</td></tr>
</table>
</td></tr>
</table>

	competences Total 100% The final mark will be weight as follow:
Forms of media:	Board, LCD Projector, Laptop/Computer, web application (development)
Literature:	1. Jordan Maxwell. (2020). History of Physics: The Story of Newton, Feynman, Schrodinger, Heisenberg and Einstein. Discover the Men who Uncovered the Secrets of Our Universe. Independently Published 2. Heilbron, J. L. (2018). The History of Physics: A Very Short Introduction. Oxford University Press 3. Alberto Rojo, Anthony Bloch. (2018). The Principle of Least Action: History and Physics. Cambridge University Press 4. Varvoglis, H. (2014). History and evolution of concepts in physics, Springer, Switzerland

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1		✓											
CLO2		✓											
CLO3		✓											
CLO4		✓											
CLO5		✓											
CLO6		✓											
CLO7		✓											
CLO8		✓											

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Wave and Electromagnetism Experiment	
Module level, if applicable:	Undergraduate	
Code:	FI451	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Parlindungan Sinaga	
Lecturer(s):	Parlindungan Sinaga; Andhy Setiawan; Wiendartun; Mohammad Arifin; David Edison Tarigan; Muhamad Gina Nugraha	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective Course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and experiment). 2. Structured activities (exercise, assignment, worksheet) 3. Self-study (reading relevant literature)	1 hour 40 minutes	25
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two weeks presentation (0.12 ECTS), and 480 minutes for two presentation preparation (0.28 ECTS).	

<table>
<tr><td>Credit points:</td><td>3.2 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td>Electromagnetism, Wave and optics</td></tr>
<tr><td>Course learning outcomes:</td><td>After taking this course the students have ability to:
CLO1: know the rules of work in the laboratory and work safety in the laboratory.
CLO2: design experiments related to the subject of electricity, magnetism, optical waves, and thermodynamics for learning purposes in high school
CLO3: analyze experimental data both statistically, graphically and in other ways.
CLO4: write a practicum report based on the data obtained from the experiment properly and correctly.
CLO5: explain the concepts, laws and theories related to the type practiced
CLO6: communicating or presenting experimental results and arguing
CLO7: collaborate with in a group
CLO8: think creatively to generate ideas in the development of experimental tools</td></tr>
<tr><td>Content:</td><td>Thomson Experiment, Millikan Oil Drop Experiment, Experiment of Light Propagation Speed, Michelson Interferometer Experiment, Hall Effect Experiment, Experiment of Diffraction by Reflection Grid, Experiment of Sound Propagation Speed.</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. Pre-Experiment report
c. Post-Experiment report
d. Presentation</td><td>

Performance (rubric of individual assignment)
Performance (rubric of experiment report)
Performance (rubric of experiment report)
Performance (rubric of presentation)
Test</td><td>

20 %
25 %
25%
20%</td></tr>
<tr><td>2</td><td>CLO8</td><td>Generic competences</td><td>Performance (Observation)</td><td>5%</td></tr>
<tr><td>3</td><td>CLO7</td><td>Social competences</td><td>Performance (Observation</td><td>5%</td></tr>
</table></td></tr>
</table>

	) Total 100%
Forms of media:	Board, LCD projector, laptop/computer, Experimental tools, LMS, internet line.
Literature:	1. Wald, R. (2022). Advanced Classical Electromagnetism. Princeton University Press 2. A. B. Bhattacharya, Atanu Nag. (2021). Physics: Introduction to Electromagnetic Theory. KHANNA PUBLISHING HOUSE 3. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman 4. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning. 5. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education 6. Trachanas, S. (2018). An introduction to quantum physics: a first course for physicists, chemists, materials scientists, and engineers. John Wiley & Sons.Stupakov, G., & Penn, G. (2018). Classical mechanics and electromagnetism in accelerator physics (Vol. 61). Cham, Switzerland: Springer. 7. Franklin, J. (2017). Classical Electromagnetism: Second Edition. Dover Publications 8. Halliday&Resnick (2012), Fisika Jilid 2, Jakarta, Erlangga 9. Joan Fong, at all. (2010), Science Matters, Singapore, Marshall Cavendish Education,

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO1 2	PLO1 3
CLO1		√											
CLO2				√									
CLO3				√									
CLO4		√											
CLO5				√									
CLO6				√									
CLO7													√
CLO8													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Electronic Instrumentation and Measurement Technique	
Module-level, if applicable:	Undergraduate	
Code:	FI452	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6	
Module coordinator:	Agus Danawan	
Lecturer(s):	Agus Danawan	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussion, question and answer based on a conceptual approach, and project). 2. Structured activities (assignments in the form of making papers, presentations, and project) 3. Self-study (explore relevant references and demonstration/experimental tools in learning physics)	1 hour 40 minutes	45
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1920 minutes (1.13 ECTS) structured activities, and 1680 minutes (0.09 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for two exam, and 240 minutes (0.14 ECTS) for each exam preparation.	
Credit points:	3.2 ECTS	
Pre-requisites course(s):	Fundamentals of Physics I, Fundamentals of Physics II, Electronics	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CO1: conceptual about measurement principles and types of measuring instruments
CO2: conceptual about error in measurement
CO3: conceptual about reliability and security systems
CO4: conceptual about variable conversion elements and technology sensors (
CO5: conceptual about measuring physical quantities and their analysis
CO6: conceptual about translational and rotational motion transducers
CO7: designing measuring instruments and procedures for selecting measurement elements
CO8: procedural about the introduction of the physical environment in everyday life
CO9: use measuring tools using certain measurement elements
CO10: responsible attitude in doing tasks independently.</td></tr>
<tr><td>Content:</td><td>Measurement principles and characteristics of measuring instruments, errors in measurement, reliability and security systems, elements of variable conversion and sensor technology, measurement of physical quantities and their analysis, motion transducers, and measurements of fission quantities around us, digital and analog instrumentation systems</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>CLO1-CLO6</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Project Task</td><td>Performance assessment
Test</td><td>10%

35%
35%</td></tr>
<tr><td>2</td><td>CLO7-CLO9</td><td>Generic competences</td><td>Performance assessment</td><td>15%</td></tr>
<tr><td></td><td>CLO10</td><td>Social competences</td><td>Performance assessment</td><td>5%</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, electronics components</td></tr>
<tr><td>Literature:</td><td>1. Massaro, A. (2021). Electronics in Advanced Research Industries: Industry 4.0 to Industry 5.0 Advances. Wiley
2. Prasad, R. (2021). Analog and Digital Electronic Circuits: Fundamentals, Analysis, and Applications. Springer International Publishing
3. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman
4. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning.</td></tr>
</table>

	5. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5		√											
CLO6		√											
CLO7									√				
CLO8									√				
CLO9													√
CLO10													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Bachelor of Education Physics **MODULE HANDBOOK**

Module name:	Physics Education for Sustainable Development	
Module-level, if applicable:	Undergraduate	
Code:	FI574	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Ida Kaniawati	
Lecturer(s):	Ida Kaniawati, Harun Imansyah	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching: Theory Teaching and learning description: 1. Lecture (Team Based Project/Project Based Learning, Presentation). 2. Structured Activities (Exercise, assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading the relevant literature)	1 hour 40 minutes	45
Workload:	The total workload is 90,6 hours (5440 minutes) per semester, consisting of 1400 minutes lectures, 840 minutes exercise, 840 minutes structured activities, 1680 minutes self-study per week for 14 weeks, 200 minutes for two exams, and 480 minutes for two exam preparations.	
Credit points:	3,2 ECTS	
Pre-requisites course(s):	-	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CO1: demonstrate an attitude of responsibility for work in his field of expertise independently.
CO2: have a good knowledge of sustainable development goals (SDGs), Issus and trends for ESD, educational contributions in ESD, ESD competencies, Rethinking
195 Study/exam achievements:
Education and the Pillars of Sustainable Education Economics, environment and social in Indonesia associated with Physical Education.
CO3: has the ability and skills to utilize and use ICT in implementing and managing Physics learning properly.
CO4: has the ability to build concepts, knowledge, analysis techniques and their implementation in the development of ESD-based Physics learning tools (Physics Education for Sustainable Development)</td></tr>
<tr><td>Content:</td><td>Assessing sustainable development goals, Issus and trends for ESD, the contribution of education in ESD, ESD competence, Rethinking Education and the Pillars of Sustainable Economic, Environmental and Social Education in Indonesia, Curriculum Framework of ESD and SDGs, sustainability awareness, efforts to improve the quality of life in support capacity supporting ecosystems, identification of physical ecosystems, local material-based learning, contextual problem-based learning for sustainable development.</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>CLO2,
CLO4,</td><td>Subject specific competencies
a. Individual assignments

b. Exam
-Mid Exam
-Final Exam</td><td>

Performance (rubric of individual assignments)
Test</td><td>

20%

30%
40%</td></tr>
<tr><td>2</td><td>-</td><td>Generic competencies</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>CLO1
CLO3</td><td>Social competencies</td><td>Performance (Observation)</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, LMS, Practical equipment</td></tr>
</table>

Literature:	1. UNESCO. 2019 Teaching and learning transformative engagement, https://unesdoc.unesco.org/ark:/48223/pf0000368961 (Accessed 24 Jan 2020) 2. UNESCO, 2019. Gender Report, Building Bridges oh Gender Equality. UNESCO Publisher 3. A. Leicht, J. Heiss and W. J. Byun, 2018. Issues and trends in Education for Sustainable Development. UNESCO Publishing 4. Amina Osman, Sultana Ladhani, Emma Findlater and Veronica McKay, 2017. Curriculum Framework for the Sustainable Development Goals. The Commonwealth. 5. Kementerian PPN dan Bapennas, 2017. Meta Data Indikator Tujuan Pembangan Berkelanjutan Inonesia, Pilar Pembangunan Ekonomi. Kementerian PPN 6. Kementerian PPN dan Bapennas, 2017. Meta Data Indikator Tujuan Pembangan Berkelanjutan Inonesia Pilar Pembangunan Sosial. Kementerian PPN 7. Kementerian PPN dan Bapennas, 2017. Meta Data Indikator Tujuan Pembangan Berkelanjutan Inonesia Pilar Pembangunan Lingkungan. Kementerian PPN 8. UNESCO, 2015. Rethinking Education, Towards a global common good? UNESCO Publisher 9. Steele, F. 2010. Mainstreaming education for sustainability into pre-service teacher education in Australia: enablers and constraints. Sydney, Australian Research Institute in Education for Sustainability (ARIES). Available at: http://aries.mq.edu.au/projects/preservice3/PreService_Teacher_Ed3.pdf (Accessed 12 June 2018) 10. UNESCO. 2010a. Teaching and Learning for a Sustainable Future: a multimedia teacher education programme. Paris, UNESCO. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000125238 (Accessed 12 June 2018) 11. UNESCO. 2010b. Education for Sustainable Development Lens: A Policy and Practice Review Tool. Paris, UNESCO. Available at: http://unesdoc.unesco.org/images/0019/001908/190898e.pdf (Accessed 12 June 2018)

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2									√				
CLO3						√							
CLO4													√
CLO5													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Management of School Physics Laboratory	
Module-level, if applicable:	Undergraduate	
Code:	FI471	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7	
Module coordinator:	Purwanto	
Lecturer(s):	Agus Fany, Sutrisno	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (expository, discussion, presentation and assignment project based on conceptual, contextual and problem solving approaches). 2. Structured activities (assignments in the form of making papers and presentations) 3. Self-study (explore relevant references and demonstration/experimental tools in learning physics)	1 hour 40 minutes	45
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 1400 minutes (0.82 ECTS) lectures, 1920 minutes (1.13 ECTS) structured activities, and 1680 minutes (0.09 ECTS) self-study per week for 14 weeks, 200 minutes (0.12 ECTS) for two exam, and 240 minutes (0.14 ECTS) for each exam preparation.	
Credit points:	3.2 ECTS	

<table>
<tr><td>Pre-requisites course(s):</td><td>Fundamentals of Physics I, Fundamentals of Physics II, School Physics Laboratory</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: design physics laboratory space and facilities at school.
CLO2: identify consumables and physics laboratory equipment at school.
CLO3: manage school physics laboratory administration.
CLO4: planning activities and work safety in the school physics laboratory
CLO5: demonstrate a willingness to cooperate in designing, making, and using demonstration/experimental tools in learning Physics.
CLO6: responsible for designing, manufacturing and using physics laboratory equipment independently.</td></tr>
<tr><td>Content:</td><td>Design, facilities, and laboratory equipment, administration of laboratory management, planning of laboratory activities, safety in the laboratory, and field study to schools.</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>CLO1-CLO4</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Project Task</td><td>Performance assessment
Test</td><td>10%

30%
40%</td></tr>
<tr><td>2</td><td>CLO5</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td></td><td>CLO6</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Lucas, R. (2022). Physics Virtual Laboratory. Taylor & Francis Limited
2. Sani, R. A. (2021). Pengelolaan laboratorium ipa sekolah. Bumi Aksara.
3. Stevenson, W. H. (2019). Soil Physics Laboratory Guide. Creative Media Partners, LLC
4. White, S. and Read, J., (2018), Physics Lab, Pearson Education Limited, London.
5. White, S. and Read, J., (2018), Physics Lab, Pearson Education Limited, London.
6. Baird, D., (2010), Laboratory Manual for Conceptual Physical Science Explorations, 2nd Edition, Pearson.</td></tr>
</table>

PLO and CO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1			√										
CLO2			√										
CLO3			√										
CLO4			√										
CLO5													√
CLO6													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Bachelor of Physics Education **MODULE HANDBOOK**

Module name:	Experiments on Modern Physics	
Module level, if applicable:	Undergraduate	
Code:	FI472	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7	
Module coordinator:	Parlindungan Sinaga	
Lecturer(s):	Parlindungan Sinaga; Andi Setiawan; D.E Tarigan; Wiendartun, M.Arifin	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective Course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: practicum/experiment Teaching and learning description: 4. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and experiment). 5. Structured activities (exercise, assignment, worksheet) 1. Self-study (reading relevant literature)	1 hour 40 minutes	25
Workload:	The total workload is 90 hours 40 minutes (3.2 ECTS) per semester, consisting of: 100 minutes lectures (0.82 ECTS), 120 minutes structured activities (0.99 ECTS), 120 minutes self-study (0.99 ECTS) per week for 14 weeks, 200 minutes for two weeks presentation (0.12 ECTS), and 480 minutes for two presentation preparation (0.28 ECTS).	

<table>
<tr><td>Credit points:</td><td>3.2 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td>Modern Physics</td></tr>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have ability to:
CLO 1: know the rules of work in the laboratory and work safety in the laboratory
CLO 2: know procedure of modern physics experiments
CLO 3: using measuring tools appropriately and accurately
CLO 4: analyze experimental data both statistically, graphically and in other ways.
CLO 5: write a practicum report based on the data obtained honestly, well and correctly.
CLO 6: explain the concepts, laws and theories related to the types practiced in modern physics experimental courses.
CLO 7: communicating or presenting experimental results both orally and in writing
CLO8: Creatively in developing new ideas for modern physics experiments</td></tr>
<tr><td>Content:</td><td>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.</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
e. Individual assignments
f. Pre-Experiment report
g. Post-Experiment report
h. Presentation</td><td>

Performance (rubric of individual assignment)
Performance (rubric of experiment report)
Performance (rubric of experiment report)
Performance (rubric of presentation)
Test</td><td>

20 %
25 %
25%
20%</td></tr>
<tr><td>2</td><td>CLO8</td><td>Generic competences</td><td>Performance (Observation)</td><td>5%</td></tr>
<tr><td>3</td><td>-</td><td>Social competences</td><td>-</td><td>-</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
</table>

Forms of media:	Board, LCD projector, laptop/computer, Experimental tools, LMS, internet line.
Literature:	1. Heilbron, J. L. (2022). Elements of early modern physics. Univ of California Press. 2. Paul A. Tipler, Gene Mosca · 2020. Physics for Scientists and Engineers. W. H. Freeman 3. Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning. 4. Douglas C. Giancoli. (2018). Physics. Principles with Applications Volume II (Chs. 16-33). Pearson Education 5. Krane, S. K. (2019). Modern Physics. Wiley 6. Deruelle, N., & Uzan, J. P. (2018). Relativity in Modern Physics. Oxford University Press. 7. Sinaga, P. (2016). Fisika Modern. UPI 8. Halliday&Resnick (2012), Fisika Jilid 2, Jakarta, Erlangga 9. Joan Fong, at all. (2010), Science Matters, Singapore, Marshall Cavendish Education, 10. Halliday., Resnick & Walker, Fundamental of Physics, 9th edition, John Willey and Sons, 2011

PLO and CLO mapping

	PLO 1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PLO 13
CLO1				√									
CLO 2				√									
CLO 3	√												
CLO 4							√						
CLO 5							√						
CLO 6		√											
CLO 7							√						
CLO 8													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Advance Nuclear Physics	
Module-level, if applicable:	Undergraduate	
Code:	FI575	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	5	
Module coordinator:	Irma Rahma Suwarma	
Lecturer(s):	Irma Rahma Suwarma	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching and learning: theory 1. Lecture (expository method, discussion, presentation, simulation). 2. Exercise (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study: study literature on application of advanced nuclear physics	1 hour 30 minutes	25
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 100 minutes lectures and student group presentation in 4th meeting (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).	

<table>
<tr><td>Credit points:</td><td>3,2 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td>Nuclear physics, Modern Physics</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After having this courses, students:
CLO1: Have advanced conceptual knowledge about the development of modern physics, atomic nuclei, the discovery of atomic nuclei, and reactions in atomic nuclei..
CLO2: Have advanced conceptual knowledge of quantum mechanics as a basic framework of thinking and solving solutions in explaining models of the atomic nucleus and reactions in the atomic nucleus.
CLO3: Have advanced conceptual knowledge about the application of nuclear decay as a basic framework for understanding radioactive substances.
CLO4: Have advanced conceptual knowledge regarding the application of radioactive substances and their propagation processes in nuclear reactors.
CLO5: Have advanced conceptual knowledge about technology and technological products of radioactive substances that are useful in various fields such as agriculture and health.
CLO6: Use English language skills in reviewing scientific papers regarding the application of nuclear technology in various fields.</td></tr>
<tr><td>Content:</td><td>The application of atomic nuclear radioactivity, the application of the development of atomic models and the discovery of atomic nuclei in general, the application of quantum mechanics, models of the atomic nucleus (liquid drop model, shell, cluster, collective, etc.),the basics of the structure and reactions of fission and fusion of atomic nuclei, the application of the reactor and accelerator work functions, and applications of core physics in health, agriculture, research, industry</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 task
b. Paper report and presentation</td><td>
Performance (rubric of individual task)
Performance
Performance</td><td>
25%
20%</td></tr>
</table></td></tr>
</table>

			c. Exam -Mid test -Final test	Test	30% 30%	
	2.	-	Generic competences	Performance assessment	-	
	3.	-	Social competences	Performance assessment	-	
	Total				100 %	
Forms of media:	Board, LCD Projector, Laptop/Computer, LMS					
Literature:	1. Andrew E. Ekpenyong. (2022). Mathematical Physics for Nuclear Experiments. CRC Press 2. Robertson, J. (2022). Nuclear Physics: Theory and Applications. WILLFORD Press 3. Heyde, K. (2020). Basic Ideas and Concepts in Nuclear Physics: An Introductory Approach, Third Edition. CRC Press 4. Heisenberg, W. (2019). Nuclear Physics. Philosophical Library/Open Road 5. Zelevinsky, V. dan Volya, A. (2017). Physics of Atomic Nuclei. Wiley					

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5	√								√				
CLO6	√								√				

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Module name:	Advance Quantum Physics	
Module-level, if applicable:	Undergraduate	
Code:	FI575	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7	
Module coordinator:	Iyon Suyana	
Lecturer(s):	Iyon Suyana	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of teaching and learning: theory 1. Lecture (expository method, discussion, presentation, simulation). 2. Exercise (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study: study literature on application of advanced nuclear physics	1 hour 40 minutes	25
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 100 minutes lectures and student group presentation in 4th meeting (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).	

<table>
<tr><td>Credit points:</td><td>3,2 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td>Nuclear physics, Modern Physics</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After having this courses, students:
CLO1: Able to complete lecture assignments given according to quality standards and time given
CLO2: Represent the state of the quantum system in the Dirac representation
CLO3: Describing stationary scattering and calculating cross section
CLO4: Describe the special properties of the half spin
CLO5: Describe the sum of the angular momentum
CLO6: Describe the time-independent perturbation theory
CLO7: Explain the application of stationary perturbation theory to various physical phenomena</td></tr>
<tr><td>Content:</td><td>The application of atomic nuclear radioactivity, the application of the development of atomic models and the discovery of atomic nuclei in general, the application of quantum mechanics, models of the atomic nucleus (liquid drop model, shell, cluster, collective, etc.),the basics of the structure and reactions of fission and fusion of atomic nuclei, the application of the reactor and accelerator work functions, and applications of core physics in health, agriculture, research, industry</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. Individual task

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

Test
Test</td><td>
10%

20%

30%
40%</td></tr>
<tr><td>2.</td><td>-</td><td>Generic competences</td><td>Performance assessment</td><td>-</td></tr>
<tr><td>3.</td><td>-</td><td>Social competences</td><td>Performance assessment</td><td>-</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>
</table>

Literature:	1. Ney, A. (2021). The world in the wave function: a metaphysics for quantum physics. Oxford University Press. 2. French, A. P., & Taylor, E. F. (2018). An introduction to quantum physics. Routledge. 3. Lvovsky, A. I. (2018). Quantum Physics: An Introduction Based on Photons. Springer. 4. Friebe, C., Kuhlmann, M., Lyre, H., Näger, P. M., Passon, O., & Stöckler, M. (2018). The philosophy of quantum physics. Wiesbaden: Springer. 5. Le Bellac, M. (2011). Quantum physics. Cambridge University Press.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											
CLO5	√								√				
CLO6	√								√				
CLO7	√								√				

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Advance Solid-State Physics	
Module-level, if applicable:	Undergraduate	
Code:	FI577	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7	
Module coordinator:	Heni Rusnayati	
Lecturer(s):	Heni Rusnayati, Hera Novia	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (Expository, Discussion, Problem Solving with certain techniques and discuss examples of the physical concepts and phenomena discussed in the lectures) 2. Structured activities (Assessment Tasks Activities) 3. Self-study (literature-study)	1 hour 40 minutes	45
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)	
Pre-requisites course(s):	Thermodynamic, Quantum Physics	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1: acquire the basic knowledge of crystallography and electronic structure in solids, and the knowledge of fundamental differences between metals and insulators
CLO2: derive the Bloch theorem, and apply it to study band structures of toy models; able to analyze basic thermodynamic and transport properties of metals
CLO3: compute the Berry phase and topological properties of insulators in certain toy models
CLO4: Acquire the basic knowledge of quantum Hall effects, edge states, topological insulators, Berry phase effect in metals</td></tr>
<tr><td>Content:</td><td>Review of crystal structure, band theory, tight-binding models, concept of metals and insulators, Thermodynamic properties, specific heat, Transport properties of metals, Measuring Fermi surfaces, quantum oscillations, Band insulators, Berry phases, topological band theory, Introduction to theories of quantum Hall effects, edge transport, topological insulators, topological orders, Berry phase effect in transport properties of metals</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-CLO3</td><td>Subject specific competences
a. Individual assignments
b. Exam
- Mid exam
- Final exam</td><td>Performance assessment
Test</td><td>10%

30%
40%</td></tr>
<tr><td>2</td><td>CLO4</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td>3</td><td>CLO4</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, LMS</td></tr>
<tr><td>Literature:</td><td>1. Snoke, D. W. (2020). Solid state physics: Essential concepts. Cambridge University Press.
2. Junker, G. (2019). Supersymmetric methods in quantum, statistical and solid state physics. Bristol: IOP Publishing.
3. Lawrence, A. (2019). Solid State Physics. LARSEN & KELLER EDUCATION
4. Kittel, C., & McEuen, P. (2018). Introduction to solid state physics. John Wiley & Sons.
5. Sinaga, P. (2016). Fisika Modern. UPI</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1		√											
CLO2		√											
CLO3		√											
CLO4		√											

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, e-mail: fisika @upi.edu

Bachelor of Physics Education **MODULE HANDBOOK**

Module name:	Astrophysics	
Module level, if applicable:	Undergraduate	
Code:	FI578	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	7	
Module coordinator:	Winny Liliawati	
Lecturer(s):	Winny Liliawati	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
Type of teaching: theory 1. Lecture : expository, discussion, presentation, problem based, simulation 2. Exercise: working on problem set practice, virtual lab activities, and virtual astronomy observation 3. Self-study:working on experiment report	1 hours and 30 minutes	25
Workload:	Total workload is 90 hours 40 minutes (3.2 ECTS) per semester which consists of 100 minutes lectures and student group presentation in 4th meeting (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):	Earth and Space Science	

<table>
<tr><td>Course Learning Outcomes:</td><td>After having this course, the students:
CLO1. Have logical, critical, systematic and innovative thinking skills.
CLO2. Have the ability to solve problems based on the results of analysis of astronomical information and data independently, openly, critically, innovatively, and confidently
CLO3. Have conceptual knowledge of the concepts, principles, laws and theories of physics applied to astronomy
CLO4. Have procedural knowledge of the concepts, principles, laws and theories of physics applied to astronomy
CLO5. Have an honest attitude and uphold ethics
CLO6. Have a spirit of independence, not giving up easily, being responsible, internalizing academic values, norms and ethics</td></tr>
<tr><td>Content:</td><td>(i) light as information from the sky includes electromagnetic waves and telescopes; (ii) the laws of black body radiation include specific intensity, flux, luminosity, and stars as black bodies; (iii) fundamental quantities and laws in astronomy; (iv) stellar photometry includes the magnitude system (UBV), color index, bolometric magnitude, bolometric correction, relationship between bolometric magnitude and effective temperature, and absorption of starlight; (v) stellar spectroscopy includes basic theory of spectroscopy, formation of stellar spectra, stellar spectrum classification, Hertzsprung-Russell diagram, luminosity class, stars with special spectra, and the Boltzmann equation & Saha equation; and (vi) the true motion of the star. In-class laboratory activities are also carried out using simulator software to make virtual astronomical observations, data processing and analysis, in addition to exploring astronomical instruments through direct sky observation activities using available telescopes or remote & robotic telescopes.</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</th></tr>
<tr><td>1.</td><td>CLO1
CLO2</td><td>Subject specific competences
a. Individual assignments

b. Exam
-Mid test
-Final test</td><td>Performance (rubric of individual assignment)
Test</td><td>15%

30%
35%</td></tr>
<tr><td>2.</td><td>CLO3
CLO4</td><td>Generic competences</td><td>Performance assessment</td><td>10%</td></tr>
<tr><td>3.</td><td>CLO5
CLO6</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>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS
Literature:	1. Judith Ann Irwin. (2021). Astrophysics: Decoding the Cosmos. Wiley 2. Stan Owocki. (2021). Fundamentals of Astrophysics. Cambridge University Press 3. Kenneth R Lang. (2018). A Brief History Of Astronomy And Astrophysics. World Scientific Publishing Company 4. LeBlanc, F. (2010). *An Introduction to Stellar Astrophysics*. Wiley.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CO1		√							√				
CO2		√							√				
CO3		√							√				
CO4		√							√				
CO5													√
CO6													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Teaching Practice In School	
Module-level, if applicable:	Undergraduate	
Code:	FI590	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	8	
Module coordinator:		
Lecturer(s):		
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Type of Teaching: Theory Teaching and Learning Description: 1. Lecture (Program briefing, Modeling in the microteaching laboratory and Clinical supervision). 2. Structured activities (Development of Programs/Learning Implementation Plans Educate, Supervised Teaching, Report on Teaching Practice In School) 3. Self-study (Orientation/ Observation)	3 hour 20 minutes	one supervisor for three students
Workload:	Total workload is 3 hours 20 minutes (6.4 ECTS) which consist of 6 hours 40 minutes of program briefing (0.24 ECTS), 10 hours of modeling (0.35 ECTS), 20 hours of teaching observation (0.71 ECTS), 128 hours of teaching practice (4.52 ECTS), 3 hours 20 minutes for one exam (0.12 ECTS), and 13 hours 20 minutes of exam (0.12 ECTS) for exam preparation	

<table>
<tr><td>Credit points:</td><td>6.4 ECTS</td></tr>
<tr><td>Pre-requisites course(s):</td><td>At least 80% of the credits of the entire study program have reached 80% with a minimum GPA of > 2.50; Have passed all General Courses, Fundamentals In Education Courses, Program Expertise Course, and Concentration Competency Courses</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:

CLO1 : describe the general characteristics of students who will later become responsibilities in educational practice,
CLO2 : describe the organizational structure and work procedures of the school,
CLO3 : describe school rules and regulations,
CLO4 : identify ceremonial-formal activities in schools,
CLO5 : identify routine activities in the form of curricular, co-curricular and extracurricular activities,
CLO6 : describe the practices of refraction and positive habits in schools.
CLO7 : analyze curriculum,
CLO8 : compile learning tools (Learning Implementation Plan, media, worksheets, teaching materials, assessment instruments);
CLO9 : carry out learning activities using a variety of learning strategies, especially on basic teaching skills that must be fully mastered at Level 6
CLI10 : create and use learning media;
CLO11: manage classes;
CLO12: utilize information and communication technology in learning;
CLO13: carry out assessment and evaluation of learning;
CLO14: manage co-curricular and extracurricular activities; and
CLO15: help with teacher administration work.</td></tr>
<tr><td>Content:</td><td>Carrying out observation activities, assisting teachers in carrying out extra-curricular activities and making learning tools (helping in preparing teaching preparations (learning implementation plans), taking into account the provisions of the aspects assessed in the learning implementation plans instrument for the guidance of teachers and lecturers, helping manage and perfecting learning tools, Seeing and observing the teaching performance of the civil servant teacher teaching practice in class), Implementing the learning process (Creating learning tools that will be used to perform teaching according to the direction of the teacher and supervisor, Carrying out teaching performances)</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>Weig</th></tr>
<tr><td>1</td><td>CLO1-CLO2</td><td>Subject Specific competences
a. mastery of</td><td></td><td></td></tr>
</table>
</td></tr>
</table>

			concepts, principles, laws and theories of physics b. use of concepts, principles, and applications of computing, electronics, an language in the learning process	Performance & Clinical supervision	20% 10%
	2	CLO1-CLO15	Generic competences a. Daily activities (learning activities (Learning Implementation Plan and Performance), personal social, and teaching practice reports in schools. b. Individual reports of teaching practices in schools c. Teaching practice exams in schools (learning implementation plans and performance)	Observation, Clinical supervision Performance assessment (assessment instrument for Individual reports of teaching practices in schools) Performance Test (assessment instrument for teaching practice exam)	20% 20% 25%
	3	CLO5	Social competences	Performance assessment	5%
	Total				100%
Forms of media:	Microteaching laboratory, Partner school				
Literature:	Division of Teacher Professional Education and Professional Services, Directorate of Education. (2021). *Handbook of Teaching Practice in Schools for Undergraduate Education Students in the field of Bachelor of Education Study Program*. Universitas Pendidikan Indonesia: Bandung.				

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1	√												
CLO2		√											
CLO3											√		
CLO4												√	
CLO5												√	
CLO6												√	
CLO7				√									
CLO8					√								
CLO9						√							
CLO10			√					√					
CLO11						√	√						
CLO12									√	√			
CLO13			√										
CLO14													√
CLO15													√

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Module name:	Thesis	
Module-level, if applicable:	Undergraduate	
Code:	FI598	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	8th	
Module coordinator:	Coordinator of thesis team	
Lecturer(s):	The lecturer appointed by the thesis team coordinator through the dean's decree	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
100 minutes consultation and 920 minutes structured activities per week	272 hours	one student guided by two lecturers
Workload:	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	
Credit points:	9.6 ECTS	
Pre-requisites course(s):	1. Have passed a minimum of 105 credits with a minimum GPA of 2.5. 2. Have graduated or are taking part in teaching practice in school 3. Have passed all Concentration Competency Course 4. Currently contracting a Thesis course	
Course Learning Outcomes (CLO):	After taking this course the students have ability to: CLO1 : conduct independent studies on a particular topic, CLO2 : apply the knowledge that has been learned in previous courses, CLO3 : analyze and provide solutions from the point of view of physics/physics education. CLO4 : write scientific presentations.	

<table>
<tr><td></td><td>CLO5 : has self-confidence, good ethics, and good performance in communication.</td></tr>
<tr><td>Content:</td><td>The thesis topic can come from students or research groups</td></tr>
<tr><td>Study/exam achievements:</td><td>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-CLO15</td><td>a. Attitude and work ethic in thesis research
- Independence, craft, tenacity and perseverance
- Collaboration with supervisors/fellow researchers
- Creativity in dealing with various problems that arise during research and thesis preparation
b. Scientific insight in research
- Mastery of basic knowledge and skills related to research material
- Critical ideas or ideas to solve the problem under study
c. Skills in writing and compiling thesis
- Use of writing rules
- Systematics of thesis writing
- Skills in writing thesis</td><td>Performance assessment (rubric of thesis assessment)</td><td>30%
40%
40%</td></tr>
<tr><td colspan="3">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>White Board, paper, Laptop/Computer, LMS, Books or journals related to the topics. laboratory, Partner school</td></tr>
</table>

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

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1	√	√		√			√						
CLO2					√				√				
CLO3						√				√			
CLO4			√				√						√
CLO5								√			√	√	

UNIVERSITAS PENDIDIKAN INDONESIA
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
Jalan Dr. Setiabudi 229 Bandung 40154
Telepon: (022) 2004548 Fax. (022) 2004548
Laman: fisika.upi.edu, E-mail: fisika@upi.edu

Bachelor of Physics Education **MODULE HANDBOOK**

Module name:	Thesis Defence	
Module-level, if applicable:	Undergraduate	
Code:	FI599	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	8	
Module coordinator:	Coordinator of thesis team	
Lecturer(s):	The lecturer appointed by the thesis team coordinator through the dean's decree	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching:	Contact hours per week during the semester	Class Size
Oral examination carried out by the examiner team: 15 minutes presentation and 45 minutes question and answer by the examiners team	1 hours	one student tested by three lecturers
Workload:	Total workload is 1 hours per session, which consists of 15 minutes presentation, 45 minutes defending thesis	
Credit points:	0 ECTS	
Pre-requisites course(s):	1. Pass all compulsory and elective courses in accordance with the applicable curriculum. 2. Minimum number of credits obtained is 138 credits with GPA 2.50. 3. Has conducted research and completed the preparation of the thesis and obtained the approval of the thesis supervisor. 4. Has made scientific publications 5. The manuscript has been declared fit for trial. 6. Paying tuition fees until the current semester and fulfilling other administrative requirements.	
	After taking this course the students have ability to: CLO1 : present research results effectively, confidently, attractively, orderly, clear, and easy to	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>understand
CLO2 : convey mastery & scientific insight from the contents of the thesis
CLO3 : defend the thesis with logical arguments, supported by scientific attitude and facts</td></tr>
<tr><td>Content:</td><td>Mastery and defense of thesis topics</td></tr>
<tr><td>Study/exam achievements:</td><td>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-CLO15</td><td>a. Presentation (Use of spoken language; Flow of exposure; Time of presentation; Media of presentation)
b. Mastery & scientific insight (Accuracy; Accuracy; Speed)
c. Argumentation (Attitude in arguing; Logical, supported by scientific facts; Based on scientific attitude)</td><td>Performance assessment (rubric of thesis defense assessment)</td><td>30%
30%
40%</td></tr>
<tr><td colspan="3">Total</td><td>100%</td></tr>
</table></td></tr>
<tr><td>Forms of media:</td><td>Thesis, White Board, Paper, Laptop/Computer, LCD Projector, LMS</td></tr>
<tr><td>Literature:</td><td>1. Academic Directorate.(2020). Guidelines for the Implementation of Education at the Indonesian University of Education. Indonesian University of Education: Bandung
2. Education and Teaching Quality Control Group. (2010). Standard Operating Procedures. Department of Physics Education, FPMIPA, Indonesian University of Education: Bandung</td></tr>
</table>

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13
CLO1	√	√	√	√			√			√			
CLO2				√	√	√	√						
CLO3								√	√		√	√	√