Mudule Description

Bachelor of Physics Education

Faculty of Mathematics and Natural Science
Universitas Negeri Jakarta

2023

TABLE OF CONTENTS

General Basic Knowledge

Budhism Educatio

Module name:	Budhism Education	
Module level, if applicable:	Undergraduate	
Code:		
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st & 2nd	
Module coordinator:	Dr. Fera Kurniadewi, M.Si	
Lecturer(s):	Ir. Soelijono, M.M	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		

Course outcomes:	After taking this course the students have ability to:CLO1. Understand the purpose of Buddhism CLO2. Understand history of Buddhism CLO3. Understand dynamics development of moden Buddhism CLO4. Understand the concept of God and the laws of truth (kesunyataan) CLO5. Understand the concept of humans CLO6. Understand history and contents of TripitakaCLO7. Understand social dimension of Buddhism
Content:	
Study/exam achievements:	Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests (45%) and structured tasks (50%).
Media	Power point presentation, Zoom, videos
Literatures	1. AWS, Sudhamek. (2020). Mindfulness Based Business. Jakarta: PTGramedia Pustaka Utama. 2. Chandra, Ariya, Soelijono. (2018). Buku Ajar & Rancangan Pengajaran MPK Agama Buddha. Depok: Universitas Indonesia. 3. Endro, Herman S, (1997). Hari Raya Umat Buddha dan KalenderBuddhis. Jakarta: Yayasan Dhammadiepa Arama. 4. Farrer-Halls, Gill. (2000). Buddhist Wisdom. Wheaton, II: Godsfieldpress. 5. Harris, Ian (ed). (2011). The Illustrated Encyclopedia of Buddhism.Wigston: Anness Publishing Ltd. 6. Keown, Damien (ed). (2000). Contemporary Buddhist Ethics.Richmond: Curzon Press. 7. Van Voorst, Robert E. (2017). Anthology of World Scriptures (9thedition). Boston, USA: Cengage Learning. 8. Widyadharma, MP Sumedha. (2006). Dhamma-Sari. Jakarta:Penerbit Cetiya Vatthu Daya. 9. Widyadharma, MP Sumedha, (1979). Riwayat Hidup Buddha

Catholic Education

Module name:	Catholic Education	
Module level, if applicable:	Undergraduate	
Code:		
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:	Dr. Fera Kurniadewi, M.Si	
Lecturer(s):	Viana Meilani Prasetio, S.S., M.Pd	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		

Course outcomes:	After taking this course the students have ability to: CLO1. Understand oneself's descent and their life purpose as a religious human being who whorship God (Jesus Christ) and as a church member to continue God's redemption in the society CLO2. Understand and fathom the life of Jesus Christ and His redemption CLO3. Have self-realization as church members and actively involvedin the society CLO4. Become a kind Catholic student who is sensitive to the surroundings
Content:	1. Understand oneself's descent and their life purpose as a religious human being who whorship God (Jesus Christ) 2. Understand oneself's descent and their life purpose as a religious human being who whorship God (Jesus Christ) and as a church member to continue God's redemption in the society Fathom the life of Jesus Christ and His redemption 3. Fathom the life of Jesus Christ and His redemption 4. Realizing oneself as church members and actively involved in the society Realizing oneself as church members and actively involved in the society
Study/exam achievements:	Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(70%) and structured tasks (30%).
Media	Power point presentation, Zoom, Google Meet, bible, videos
Literatures	1. Kitab Suci 2. Katolisitas 3. Buku Ajar Mata Kuliah Wajib Umum Pendidikan Agama Katolik Pengajaran Katekase KAJ

Confucianism Education

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

	CLO4. Explain humans foundation, dignity, and responsibility CLO5. Explain the development of Confucianism in response to challenges of era changes CLO6. Explain the concept of education, socioculture, and law and politics CLO7. Explain the concept of science and technology, echonomics, and environment CLO8. Explain the concept of religions as the source of morals and theconcept of diversity and its contribution in the history of world civilization
Content:	1. The concept of God in Confucianism 2. Understand the purpose of life and afterlife 3. Understand the essences and urgency of religious values 4. Understand humans foundation, dignity, and responsibility 5. Understand the development of Confucianism in response to challenges of era changes 6. The concept of education, socioculture, and law and politics 7. Understand the concept of science and technology, echonomics, andenvironment Understand the concept of religions as the source of morals and theconcept of diversity and its contribution in the history of world civilization
Study/exam achievements:	1. Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
Media	2. Power point presentation, Zoom, Google Meet, textbook, videos
Literatures	*1. Si Shu Kitab Yang Empat, Matakin Solo. 2012* *2. Tata Laksana Upacara Agama Khonghucu, Matakin Solo. 1984* *3. Wu Jing Kitab Yang Lima, Matakin Solo. 1984* *4. Xiao Jing Kitab Bakti - Matakin Solo. 1984* *5. Nio Joe Lan 'Peradaban Tionghoa Selayang Pandang' PT. Gramedia Pustaka Jakarta 2013* *6. Tjhie Tjay Ing Xs., Panduan Pengajaran Dasar Agama Khonghucu. Matakin. Solo. 2010* 3. *Materi Terbuka Kesadaran Pajak untuk Perguruan Tinggi. Tim Edukasi Perpajakan Direktorat Jendral Pajak Kementerian Keuangan Republik Indonesia. Tahun 2016.*

Civic Education

Module name:	Civic Education	
Module level, if applicable:	Undergraduate	
Code:	00031062	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:		
Module coordinator:	Dr. Fera Kurniadewi, M.Si	
Lecturer(s):	Tim Dosen Pendidikan Kewarganegaraan MKU	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):	Pendidikan Pancasila	

Course outcomes:	After taking this course the students have ability to:CLO1. Understand basic concept of PKn CLO2. Analyze national identity CLO3. Analyze national integrity CLO4. Analyze nation and constitution CLO5. Apply the rights and obligations of citizens CLO6. Analyze democracy and democracy educationCLO7. Analyze law country and human rights CLO8. Analyze Indonesia's geopolitics CLO9. Analyze regional autonomy CLO10. Analyze Indonesia's geostrategy
Study/exam achievements:	Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
Media	Power point presentation, Zoom, textbook, videos
Literatures	1. Tim Dosen. (2012). Pendidikan Kewarganegaraan, Jakarta: UPT MKU UNJ. 2. Dirjen Belmawa Kemenristekdikti. (2016). Pendidikan Kewarganegaraan untuk Perguruan Tinggi. Direktorat Jenderal Pembelajaran dan Kemahasiswaan, Kementerian Riset dan Pendidikan Tinggi.

English

Module Name	Course Module
Module Level	Undergraduate Programme
Code, if applicable	30050042
Sub-title, if applicable	-
Courses, if applicable	English
Semester(s) in which the module is taught	6 (Even Semester)
Person responsible for the module	Lecturer of Courses
Lecturer (s)	1. Dr. Hanhan Dianhar, M.Si. 2. Ella Fitriani, M.Pd. 3. Yussi Pratiwi, M.Si., M.Sc. 4. Elma Suryani, M.Pd. 5. Elsa Vera Nanda, M.Si.
Language	Bahasa Indonesia dan Bahasa Inggris (Indonesian Language and English Language)
Relation to Curriculum	This course is an elective course and is offered in the 6th semester.
Type of teaching,contact hours	Teaching methods used in this course are: - Lecture (i.e., group investigation, small group discussion, casestudy, and video-based learning) - Structured assignments (i.e., essays and case studies) - Project-based Learning The class size for the lecture is 40 students. Contact hours for the lecture is 26.66 hours, assignments are 32.00 hours, and private study is 32.00 hours.

Workload	For this course, students required to meet a minimum of 90.66 hours in one semester, which consist of: 26.66 hours for lecture, 32.00 hours for structured assignments, 32.00 hours for private study,
Credit Points	3.00 ECTS
Requirements according to the examination regulations	Students should have attended all lectures and submitted all scheduled individual and group assignments prior to the final examination.
Recommendedprerequisites	Students should have attended all lectures and submitted all scheduled individual and group assignments prior tothe final examination.
Program intendedlearning outcomes	PLO 1. Be able to apply religious attitudes, responsibility, leadership, communication skills, professionalism, and can work individually and collaborate in groups. PLO 3. Able to integrate mathematical and basic concepts of science to solve problems in chemistry.;
Content	**Students will learn about:** 1. English for Specific Purposes (ESP) 2. Grammar concepts, words and sentences in english 3. Listening 4. Reading 5. Writing Speaking
Forms of Assessment	Assessment of the learning process according to the following components: attendance 5%, assignments 40%, mid-test 20%, final test 35%.
Study and examination requirements and forms of	**Study and examination requirements:** - Students must attend 15 minutes before the class starts. - Students must switch off all electronic devices. - Students must inform the lecturer if they will not attend the class due to sickness, etc.

examination	- Students must submit all class assignments before the deadline. - Students must attend the exam to get a final grade. **Form of examination:** Forms of examination: project and presentation
Media employed	Laptop, Internet, LCD, Whiteboard, Zoom/Google Meet/Microsoft Teams, LMS, Wikipedia, Kahoot, Edmodo dan Moodle
Reading list	**Main Reference** 1. Asadyan Zhanna. ESP in Classes of Science. YSU 2. Education Department. English for Science. Education, Department, Hong Kong 3. Božena Velebná. 2009. English for Chemist. Univerzita Pavla Jozefa Šafárika v Košiciach 4. Buku teks Kimia Dasar 5. Flavell, H Roger, (1985), Developing English with Young Learners. London: MacMillan Publishers Limited. **Supporting Reference** Internet

Hinduism Education

Module name:	Hinduism Education	
Module level, if applicable:	Undergraduate	
Code:	00051043	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:	Dr. Fera Kurniadewi, M.Si	
Lecturer(s):	Untung Suhardi, S.Pd.H, M.Fil.H	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consists of 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS) structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		

<table>
<tr><td>Course outcomes:</td><td>After taking this course the students have ability to:
CLO1. Explain the purpose of Hinduism
CLO2. Understand the history of Hinduism
CLO3. Understand the dynamics of education of Hinduism
CLO4. Understand moral teachings of Hinduism
CLO5. Understand philosophical and theological concept of Hinduism
CLO6. Understand the Vedas
CLO7. Understand yajna in Hindu CLO8. Understand harmony in diversity</td></tr>
<tr><td>Content:</td><td>1. The purpose of Hinduism
2. Understand the history of Hinduism
3. Understand the history of Hinduism
4. Understand moral teachings of Hinduism
5. Understand philosophical and theological concept of Hinduism
6. Understand the Vedas
7. Understand yajna in Hindu
Understand harmony</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).

<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. 1st assignment
b. 2nd assignment
c. 3rd assignment (case based)
d. 4 th assignment (case based)
e. UTS
UAS</td><td>Written test</td><td>10%
10%
15%
15%
20%
30%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table>
</td></tr>
</table>

Media	Power point presentation, Zoom, Google Meet, textbook, videos
Literatures	1. Abdullah, Irwan. 2009. *Konstruksi dan Reproduksi Kebudayaan* cet. III. Yogyakarta : Pustaka Pelajar 2. Adi Suripto. 2006. *Nilai-nilai Hindu dalam Budaya Jawa*. Jakarta. Media Hindu 3. Adiputra, I Gd Rudia. 2003. *Pengetahuan Dasar Agama Hindu*. Jakarta : STAH Dharma Nusantara. 4. Bagus, I Putu Suamba. 2007. *Siva-Budha Di Indonesia (Ajaran dan perkembangannya)*. Denpasar : Widhya Dharma. 5. Donder. I Ketut. 2006. *Brahmavidya Theologi Kasih Semesta*. Surabaya : Paramita 6. Effendi Djohan. 2001. *Agama-Agama Manusia*. Obor Indonesia. Jakarta 7. Griffith, R.T.H. 2006. *Atharva Veda Samhita (Sukla Yajur Veda).* Surabaya : Paramitha 8. Mantra, IB. 1997. *Tata Susila Hindu Dharma*. Denpasar : upada sastra, Surabaya : Paramitha. 9. Mas Putra, Ny.IGA. 2000. *Panca Yadnya*. Denpasar : pemda Tk 1 Bali
	10. Durkheim, Emile.1965. *The Elementary Forms of the Religious Life*. (terjemahan bahasa Inggris oleh J.W.Swain. Glecoe, Illinois : The Free Press 11. Hadikusuma, Hilman. 1993. *Antropologi Agama*. Bandung. Citra Aditya Bakti 12. Hendro,Puspito. 1983. Sosiologi Agama. Kanisius. Jogjakarta Koenjaraningrat. 1997. *Antropologi Budaya*. Jakarta : Dian Rakyat

Indonesian

Module name:	Indonesian	
Module level, if applicable:	Undergraduate	
Code:	00051142	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st & 2nd	
Module coordinator:	Dr. Fera Kurniadewi, M.Si	
Lecturer(s):	Venus Khasanah, S.S., M.Pd	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		

Course outcomes:	After taking this course the students have ability to: CLO1. Understand the nature of language, standing, and function of Bahasa Indonesia CLO2. Make texts in macro-genre CLO3. Proficient in Bahasa Indonesia
Content:	1. Introduction 2. Explores academic texts in macro-genre 3. Explores the world of books 4. Designs research proposal and activity proposal 5. Reports research results and activity results Self actualization through science articles
Study/exam achievements:	1. Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests, (50%) and structured tasks (50%).
Media	2. Power point presentation, Zoom, textbook, videos
Literatures	1. Tim Penyusun. 2016. Bahasa Indonesia untuk Perguruan Tinggi. Cet. I. Jakarta: Kementerian Riset, Teknologi dan Pendidikan Tinggi Republik Indonesia. 2. Tim Pengajar MKU Bahasa Indonesia. 2015. Bahasa Indonesia: Bahan Ajar MPK Bahasa Indonesia. Jakarta: UPT MKU UNJ. 3. Amran Tasai. 2000. Cermat Berbahasa Indonesia di Perguruan Tinggi. Jakarta: MSP. 4. Dendy Sugono. 1989. Berbahasa Indonesia dengan Benar. Jakarta:PT Priastu. 5. Depdiknas. Dirjen Pendidikan Tinggi, Direktorat Ketenagaan. 2006. Diktat. "Acuan Pembelajaran Mata Kuliah Pengembangan Kepribadian Bahasa Indonesia". Jakarta. 6. Kemendikbud. 2015. Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 50 Tahun 2015 tentang PUEBI. Jakarta. 7. Lamudin Finoza. 2003. Komposisi Bahasa Indonesia untuk Mahasiswa Nonjurusan Bahasa. Jakarta: Diksi Insan Mulia.

	8. Widjono Hs. 2007. Bahasa Indonesia: Mata Kuliah Pengembangan Kepribadian di Perguruan Tinggi. Cet. Ke-2. Edisi Revisi. Jakarta: Grasindo. 9. Maidar, dkk. 1999. Pembinaan Keterampilan Menulis Bahasa Indonesia. Jakarta: Erlangga. 10. Mustakim. 2016. Seri Penyuluhan Bahasa Indonesia: Bentuk danPilihan Kata. Jakarta: Pusbinbangsa. 11. Anton M. Moeliono, dkk. 2017. *Tata Bahasa Baku Bahasa Indonesia*. Jakarta: Badan Pengembangan dan Pembinaan Bahasa, Kemendikbud. http://repositori.kemdikbud.go.id/16351/1/Tata%20Bahasa%20Baku%20Bahasa%20Indonesia%20edisi%20keempat.pdf 12. Sri Suharmini W. "Tips untuk Mahasiswa: Penulisan Biliografi". Komunika: Media Komunikasi Civitas Akademika Universitas Terbuka. Nomor 29/ Tahun IX/2002.Hlm. 58-59. 13. Sriyanto. 2016. *Seri Penyuluhan Bahasa Indonesia: Ejaan*. Jakarta: Pusbinbangsa. 14. Sry Satrya Tj.W.S. 2016. *Seri Penyuluhan Bahasa Indonesia:Kalimat*. Jakarta: Pusbinbangsa. 15. Suladi. 2016. *Seri Penyuluhan Bahasa Indonesia: Paragraf*. Jakarta: Pusbinbangsa. 16. Suparno dan Mohammad Yunus. 2002. *Keterampilan Dasar Menulis*. Jakarta: Pusat Penerbitan UT. 17. Tim Penulis Bahasa Indonesia UT-ASMI. 2002. *Buku Materi Pokok Bahasa Indonesia*. Edisi Kedua. Jakarta: PusatPenerbitan Universitas Terbuka. 18. 2017. Undang-undang Republik Indonesia Nomor 24 Tahun 2009 tentang Bendera, Bahasa, dan Lambang Negara, serta Lagu Kebangsaan. Jakarta: Badan Pengembangan dan Pembinaan Bahasa, Kemendikbud.

Islamic Education

Module name:	Islamic Education	
Module level, if applicable:	Undergraduate	
Code:	00000012	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:	Dr. Fera Kurniadewi, M.Si	
Lecturer(s):	Sari Nurulita, Lc, M.Si	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		

Course outcomes:	After taking this course the students have ability to: CLO1. Understand philosophical and theological foundations ofIslamic education in college CLO2. Understand the concept of monotheism and its applications insocials life CLO3. Understand the concept of humans as divine beings CLO4. Understand the role of religions in build civilization CLO5. Understand Quran as the inspiration of civilization CLO6. Understand Sunnah as the example and inspiration of culture CLO7. Understand ijtihad as mechanism of contextualization of Quran and Sunnah CLO8. Understand the concept of Islamic ethics and aestethics in thedevelopment of science and technology CLO9. Understand work ethics as a form of good deeds CLO10. Understand Islamic concept of fostering in family CLO11. Understand implementation of Islam in multicultural societyCLO12. Understand Islamic concept of nation and government CLO13. Understand Islamic concept of environment CLO14. Understand The role of religions in facing contemporary issues: phenomenon of hijrah, jihad, radicals, Islamic moderation, information literacy, and anti corruption culture
Content:	1. Philosophical and theological foundations of Islamic education incollege 2. The concept of monotheism and its applications in socials life 3. The concept of humans as divine beings 4. The role of religions in life 5. Quran as a main source of Islamic teachings 6. Sunnah as basic professional mental 7. Ijtihad as an effort to maintain the relevance of Islamic teachings inlife 8. The concept of Islamic ethics and aestethics in the development ofculture and science and techlonoly 9. Work ethics as a form of good deeds 10. Islamic concept of fostering in family 11. Implementation of Islam in multicultural society 12. Islamic concept of nation and government 13. Islamic concept of environment The role of religions in facing contemporary issues: phenomenon ofhijrah, jihad, radicals, Islamic moderation, information literacy, andanti corruption culture

<table>
<tr><td></td><td>14. The role of religions in facing contemporary issues: phenomenon ofhijrah, jihad, radicals, Islamic moderation, information literacy, andanti corruption culture</td></tr>
<tr><td>Study/exam achievements:</td><td>Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
<table>
<tr><th>No</th><th>CO</th><th>Assesment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CO 1-9</td><td>a. Assignment (1st)
b. A ssignment (2nd)
c. Case-based assignment (3rd)
d. Case-based assignment (4th)
e. UTS
UAS</td><td>Written test</td><td>10%
10%
15%
15%
20%
30%</td></tr>
<tr><td>Total</td><td colspan="3"></td><td>100%</td></tr>
</table></td></tr>
<tr><td>Media</td><td>Power point presentation, Zoom, textbook, videos</td></tr>
</table>

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

Olympism

Module Name	Course Module
Module Level	Bachelor Degree of Mathematics Education
Code, if applicable	
Sub-title, if applicable	
Courses, if applicable	Olympisme
Semester(s) in which the module is taught	1th semester
Person responsible for the module	Lecturer of Courses
Lecturer (s)	Dr. Lukman El Hakim, M.Pd.
Language	Bahasa Indonesia
Relation to Curriculum	This course is a compulsory course and offered in the 1st semester.
Type of teaching, contact hours	Teaching methods used in this course are: • Lecture (i.e., grup investigation, small grup discussion, dan video-based learning) • Structured assignments (i.e., essai and case study)
Workload	For this course, students required to meet a minimum of 77,33 hours in one semester, which consist of 13,33 hours for lecture 64 hours for private study
Credit Points	1 CP/2.6 ECTA
Requirements according to the examination regulations	Students must attend all lectures and submit all individual and group assignments scheduled before the final exam.
Recommended prerequisites	-
Program intended learning	PLO 1: Able to uphold human values in carrying out duties based on religion, morals, and ethics.

	- During lectures, cellphones are in the off or silent position; - Ask permission (by raising your hand) if you want to speak, ask questions, answer questions, leave class or other needs; - Respect each other and not make noise/disorder/damage in class; - No plagiarism and other forms of violation of norms are permitted; - Always keep the class clean; It is forbidden to wear T-shirts/collarless clothes, flip-flops and the like during lectures.
Media employed	Laptop, Internet, LCD, Whiteboard, Zoom/GoogleTemui/Tim Microsoft, LMS. -
Reading list	Olympisme special hand out or Power Point Presentation from the Olympisme Team

Protestant Christianity Education

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

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

Pancasila

Module name:	Pancasila Education	
Module level, if applicable:	Undergraduate	
Code:	00051122	
Sub-heading, if applicable:		
Classes, if applicable:		
Semester:	1st / 2nd	
Module coordinator:	Dr. Fera Kurniadewi, M.Si	
Lecturer(s):	Yuyus Kardiman, M.Pd and team	
Language:	Bahasa Indonesia	
Classification within thecurriculum:	Compulsory course	
Type of Teaching	Contact hours per week during thesemester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload:	Total workload is 340 minutes (3 ECTS) per semester which consistsof 100 minutes (0.8 ECTS) learning activity, 120 minutes (1.1 ECTS)structured task and 120 minutes (1.1 ECTS) individual learning per week for 16 weeks.	
Credit points:	3 ECTS	
Prerequisite course(s):		
Course outcomes:	After taking this course the students have ability to: CLO1. Understand the introduction to Pendidikan PancasilaCLO2. Understand Pancasila in the history of Indonesia CLO3. Understand Pancasila as national principles of IndonesiaCLO4. Understand Pancasila as national ideology CLO5. Understand Pancasila as philosophical systemCLO6. Understand Pancasila as ethical system CLO7. Understand Pancasila as the fundamental of sciencedevelopment CLO8. Understand Pancasila and anti corruption values	

Content:	1. Introduction to Pendidikan Pancasila 2. Pancasila in the history of Indonesia 3. Pancasila as national principles of Indonesia 4. Pancasila as national ideology 5. Pancasila as philosophical system 6. Pancasila as ethical system 7. Pancasila as the fundamental of science development Pancasila and anti corruption values
Study/exam achievements:	1. Examinations are conducted as Unit Tests. There are two-unit tests, each covers 4-5 chapters. The final marks are derived from unit tests(50%) and structured tasks (50%).
Media	2. Power point presentation, Zoom, textbook, videos
Literatures	1. Tim Penyusun, 2016. *Pendidikan Pancasila*. Kemsitekdikti, Jakarta 2. Tim Penyusun, 2016. *Pendidikan Pancasila*. UNJ, Jakarta 3. Latif, Y. (2014). *Mata Air Keteladanan.* Mizan 4. Kaelan. 2004. *Pendidikan Pancasila*. Paradigma, Yogyakarta 5. Budiardjo, Miriam. 2013. *Dasar-Dasar Ilmu Politik*. Jakarta: PTGramedia Pustaka Utama 6. Yuyun S, Suriasumantri. 1984. *Filsafat ilmu, sebuah PengantarPopuler,* Jakarta: Sinar Harapan 3. Pidato Bung Karno 1 Juni 1945

Pedagogic and Didactic

Education Overview

Student Development

Module Name :	Student Development	
Module Level :	Undergraduate	
Code :		
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	$5^{th}/6^{th}/8^{th}$	
Module coordinator :		
Lecturer(s) :		
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO1. Mastering the concept of learner development CLO2. Application of developmental theories in analyzing individual development CLO3. The implications of developmental theories for the implementation of education in PAUD (kindergarten), elementary school, junior high school, high school, and/or the equivalentImplementation of 21st century skills in physics learning at school.	
Content :	1. Basic concepts of learner development 1.1. Basic concept of development • Basic concept of growth • Basic concepts of maturity • Individual uniqueness • Factors affecting development 2. Principles of development • Individual differences • Tempo of development • Developmental rhythm 3. Aspects of development	

	• Physical growth • Cognitive development • Social development • Emotional development • Language development • Moral development • Religious development 4. Stages and characteristics of development • Stages and characteristics of development of early childhood learners • Stages and characteristics of the development of primary school learners • Stages and characteristics of the development of junior high school students • Stages and characteristics of development of high school students 5. Concepts and theories of learner development from the perspective of psychoanalytic theory (Sigmund Freud) • basic concepts of sigmund freud's psychoanalytic theory (id, ego and superego) • Forms of self-defense mechanisms in individuals (regression, projection, repression, reaction formation, sublimation and fixation) • Stages of psychosexual development (oral, anal, phallic, latent and genital stages) • Implications of Sigmund Freud's theory of psychoanalytic development for the organization of educationPractice 21st century teaching skills in the classroom 6. Concepts and theories of learner development from the perspective of psychosocial theory (Erik H. Erikson) • Basic concepts of Erikson's psychosocial theory • Erikson's stages of psychosocial development (8 stages) • Implications of psychosocial development theory for education provision 7. Concepts and theories of learner development from the perspective of behaviorism theory • Basic concepts of behaviorism theory • Theory of classical conditioning (Ivan Pavlov) and operant conditioning (B.F. Skinner) • Developmental cases related to classical conditioning (Ivan Pavlov) and operant conditioning (B.F. Skinner) theories

	• Basic concepts of social learning theory (Albert Bandura) • Developmental cases related to social learning theory (Albert Bandura) 8. Concepts and theories of learner development from the perspective of cognitive development theory (Piaget and Vygotsky) and moral reasoning (Lawrence Kohlberg) • Basic concepts of cognitive theory • Characteristics of cognitive development at each stage based on Piaget's cognitive development theory • Cases in learning related to Piaget's cognitive development theory • Basic concepts of Zone of Proximal Development theory and Scaffolding theory of Vygotsky • Cases in learning related to the theory of Vygotsky • Characteristics of Moral development at each stage based on Kohlberg's theory of moral development • Cases in learning related to Kohlberg's theory of moral development Kohlberg's theory of moral development 9. Concepts and theories of learner development from the perspective of developmental theory Humanistic • Basic concepts of motivation theory and hierarchy of needs (Abraham Maslow) • Cases in learning related to Maslow's hierarchy of needs theory • Basic concepts of humanistic theory according to Carl R. Rogers • Cases in learning related to the theory of Carl R. Rogers 10. Implications of developmental theories for the organization of education • Implications of developmental theories for the organization of education in PAUD / TK • Implications of developmental theories for the organization of education in primary schools • Implications of developmental theories for the organization of education in junior high school • Implications of developmental theories for the organization of education in senior high school education in senior high school
Study/exam achievements:	Examination are conducted as unit test, as following

	No	Assesment Object	Assesment Technique	Weight
	1	Case Based Learning %	Project Assessment (for group project assessment)	55%
	2	Mid-semester exam (UTS)	Written test	15%
	3	Final semester exam	Written test	15%
	4	Paper presentation 20%	Presentation	20%
Media :	Projector, Computer/leptop, LMS UNJ, Zoom/Microsoft teams/google meet			

Literatures :	1. Bitzenbauer, P. (2021). Development of a Test Instrument to Investigate Secondary School Students' Declarative Knowledge of Quantum Optics. European Journal of Science and Mathematics Education, 9(3), 57-79. https://doi.org/10.30935/scimath/10946 2. del Cerro Velázquez F, Morales Méndez G. Application in Augmented Reality for Learning Mathematical Functions: A Study for the Development of Spatial Intelligence in Secondary Education Students. Mathematics. 2021; 9(4):369. https://doi.org/10.3390/math9040369 3. De Van Vo & Benő Csapó (2021) Development of scientific reasoning test measuring control of variables strategy in physics for high school students: evidence of validity and latent predictors of item difficulty, International Journal of Science Education, 43:13, 2185-2205, DOI: 10.1080/09500693.2021.1957515 4. Dowling, Marion., Young Children'sPersonal, Social and Emotional Development, London: PCP Ltd, 2001. 5. Hurlock, E.B., Psikologi Perkembangan: Suatu Pendekatan Sepanjang Rentang Kehidupan, Jakarta: Erlangga. 6. Papalia, Dianne E., Human Development, 10th ed., Boston: McGraw-Hill, 2007. 7. Santrock, John Paul, Life Span Development, Jilid 1, Jakarta: Erlangga, 2002. 8. Santrock.J. 2005. Educational Psychology. New York: McGraw-Hill. 9. Santrock, John Paul, Life Span Development, Jilid 2, Jakarta: Erlangga, 2003. 10. Schickedanz, Judith A., et.al., Understanding Children and Adolescences, 4th ed., Boston: Allyn and Bacon, 2001. 11. Slavin, Robert. 2006. Educational Psychology: Theory and practice. Pearson: New York. 12. Yusuf, Syamsu, Psikologi Perkembangan Anak dan Remaja, Bandung: PT Remaja Rosda Karya, 2000.

Logic and Reasoning

Science learning strategy

Module Name :	Science Learning Strategies	
Module Level :	Undergraduate	
Code :	3215-116-2	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	2nd	
Module coordinator :	1. Dr. Hadi Nasbey, M.Si 2. Fauzi Bakri, M.Si 3. Raihanati, M.Pd 4. Dwi Susanti, M.Pd 5. Lari A Sanjaya, M.Pd	
Lecturer(s) :	1. Dr. Hadi Nasbey, M.Si 2. Fauzi Bakri, M.Si 3. Raihanati, M.Pd 4. Dwi Susanti, M.Pd 5. Lari A Sanjaya, M.Pd	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	10 minutes	40
Workload	Total workload of this course 135.99 hours (4.5 ECTS) per semester which consist of 51 hours (1.7 ECTS) classroom activity, 42 hours (1.4 ECTS) structured task, and 42 hours (1.4 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO 1: Understanding the basic concepts of the paradigm of science learning. CLO 2: Analyzing the relationships between models, strategies, methods, and learning techniques. CLO 3: Understanding the principles of direct learning strategies along with some of their methods. CLO 4: Understanding the definition of indirect learning strategies along with some of their methods. CLO 5: Explaining experience-based learning strategies along with some of their methods.	

<table>
<tr><td></td><td>CLO 6: Understanding the principles of self-directed learning with some of its methods.
CLO 7: Explaining contemporary learning.
CLO 8: Demonstrating learning strategies with their methods.</td></tr>
<tr><td>Content :</td><td>1. Paradigms of science learning (2 weeks)
2. Models, strategies, and methods of learning (3 weeks)
3. Direct and indirect learning strategies (3 weeks)
4. Direct and indirect learning methods (3 weeks)
5. Various learning strategies (3 weeks)</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based Assignment</td><td>Exploring and discussing some problem in mathematics</td><td>50%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Computer, internet, LCD, whiteboard, online platform (Microsoft Teams/ Zoom, LMS), Microsoft Excel, Microsoft Power Point (untuk materi).Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>References:
1. Filey, Jones et al (1985), Learning Science Proces Skill.
2. Kurikulum SLTP & SMU yang sedang berlaku
3. Buku pegangan guru & siswa untuk bidang studi Fisika di SLTP & SMU.
4. Blovan B.S et al (1972) Taxonomy of Ed abs;
5. Funk, Jemes H et al (1985) Learning Science Proses Skill
6. Joyce, B., Weil, M., & Showers, B. (1992). Models of Teaching (4th ed.). Needham Height Massachusetts: Ally and Bacon, Boston.
7. Husmy (2001) Handout: “Strategi Belajar Mengajar Fisika”,,Jurusan Pendidikan Fisika FPMIPA UPI.</td></tr>
</table>

Foundation of education

<table>
<tr><td>Module Name :</td><td colspan="2">Foundation of Education Science</td></tr>
<tr><td>Module Level :</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code :</td><td colspan="2">32252012</td></tr>
<tr><td>Sub-heading, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Classes, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Semester :</td><td colspan="2">4st</td></tr>
<tr><td>Module coordinator :</td><td colspan="2"></td></tr>
<tr><td>Lecturer(s) :</td><td colspan="2"></td></tr>
<tr><td>Language :</td><td colspan="2">Indonesian</td></tr>
<tr><td>Classification within the curriculum :</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>Lecture (Expository, discussion, exercise)</td><td>150 minutes</td><td>40</td></tr>
<tr><td>Workload</td><td colspan="2">Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.</td></tr>
<tr><td>Credit points :</td><td colspan="2">4.5 ECTS</td></tr>
<tr><td>Prerequisite course(s) :</td><td colspan="2">-</td></tr>
<tr><td>Course Outcomes :</td><td colspan="2">After taking this course the student have ability to :
CLO4. Understand the basic principles of education science
CLO5. Identify the science of education in seeing the relationship between humans and education.
CLO6. Able to solve problems in daily life based on the principles and history of education in the practice of daily life.</td></tr>
<tr><td>Content :</td><td colspan="2">1. Education Concept
2. Nature of Education Science
3. Relationship between Human and Education
4. Foundations of Education (Including New Issues in Education).
5. Principles of Education
6. History of Education
7. Educational Problems in Educational Practice</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based learning</td><td>Project Assessment (for</td><td>55%</td></tr>
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</td></tr>
</table>

<table>
<tr><td></td><td><table>
<tr><td></td><td></td><td>group project assignments)</td><td></td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Smartphone, Camera, Tripod/Other Support, and Rigid Body</td></tr>
<tr><td>Literatures :</td><td>
Allan C. Ornstein, et al, Foundation of Education, 11th Edition. Cengage Learning, 2011.
Edgar Morin, Tujuh Materi Penting Dalam Dunia Pendidikan. Yogyakarta: Kanisius, 2005.
Firdaus M. Yunus. Pendidikan Berbasis Realitas sosial. Jogjakarta: Logung pustaka, 2005.
James Banks and Charry Banks, Multicultural Education- Issues and Perspectives, Boston: Allyn and Bacon. 1977
Langeveld-terjemahan, Pedagogik Teoritis dan Sistematis, Jakarta: FIP IKIP, 1971.
M. Suardi, Pengantar Pendidikan Teori dan Aplikasi, PT Indeks, Jakarta, 2012
Undang-undang No. 20 Tahun 2003, tentang Sistem Pendidikan Nasional serta peraturan terkait lainnya.
Waini Rasyidin, pedagogik teoritis dan praktis, Bandung: Remaja Rosdakarya, 2014.
Zhu, D. X., Liu, H. M., Xu, Y. Y., Zou, Y. T., Wu, X. J., Chu, P. C., & Li, X. H. (2022). Two-proton radioactivity within Coulomb and proximity potential model. Chinese Physics C, 46(4), 044106.
Zhang, M., Liu, B. The Theoretical Foundations of Feng Shui and Science Education in China. Sci & Educ 30, 1473–1490 (2021). https://doi.org/10.1007/s11191-021-00241-y
Ziherl, S., & Torkar, G. (2022). Foundations matter: Pre-service teachers' understanding of osmosis and diffusion in relation to their formal science education backgrounds. Eurasia Journal of Mathematics, Science and Technology Education, 18(6), em2113. https://doi.org/10.29333/ejmste/12041
</td></tr>
</table>

Learning assessment

Curriculum analysis

Development of Physics Learning Media

Module Name :	Development of Physics Learning Media	
Module Level :	Undergraduate	
Code :	32151153	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	5st	
Module coordinator :	Dr.Firmanul Catur Wibowo, M.Pd.	
Lecturer(s) :	Dr. Firmanul Catur Wibowo, M.Pd. Lari A Sanjaya, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student has ability to : CLO7. Students are able to design learning based on the development model CLO8. Students are able to understand the General Information Nature, role and function of teaching aids CLO9. Students are able to understand the types, characteristics of teaching aids media that are in accordance with the demands in practicing 21st-century skills CLO10. Students are able to develop high school physics teaching aids	
Content :	1. General Information • The nature of instructional media tools • The role of instructional media tools • The functions of instructional media tools 2. Types and characteristics of instructional media tools suitable for training 21st-century skills • Types of 21st-century instructional media tools • Characteristics of 21st-century instructional media tools	

	3. Development of Physics Learning Media a. Lesson planning b. Media selection c. Media utilization d. Media evaluation • Lesson planning using instructional media tools • Selection of instructional media tools • Utilization of instructional media tools • Evaluation of instructional media tools 4. Development of Instructional Media (Mechanics) • Measurement of Length • Measurement of Density • Force Table and Vector Addition of Forces • Analysis of the journal "Emerging Practices and Issues of New Media and Learning" 5. Development of Instructional Media (Mechanics) • Uniformly Accelerated Motion • Uniformly Accelerated Motion Using a Photogate • Uniformly Accelerated Motion on the Air • Analysis of the journal "DoWe Really Need Media Education 2.0? Teaching Media in the Age of Participatory Culture" 6. Development of Instructional Media (Mechanics) • Kinematics in Two Dimensions on the Air • Coefficient of Friction • Coefficient of Friction Using a Force Sensor and a Motion Sensor • Analysis of the journal "Learning, Becoming, Embodying: A Review of Embodiment in an Era of Learning with Contemporary Media" 7. Development of Instructional Media (Mechanics) • Newton's Second Law on the Air • Newton's Second Law on the Atwood Machine • Torques and Rotational Equilibrium of a Rigid Body • Analysis of the journal "Games-to-Teach or Games-to-Learn: Addressing the Learning Needs of Twenty-First Century Education Through Performance" 8. Development of Instructional Media (Mechanics) • Conservation of Spring and Gravitational Potential Energy • Energy Variations of a Mass on a Spring Using a Motion Sensor • The Ballistic Pendulum and Projectile Motion • Analysis of the journal "Game Adaptation and Personalization Support serta Issues and

	Challenges of Enacting Game-Based Learning in Schools" 9. Development of Instructional Media (Fluids) • Static Fluids • Dynamic Fluids • Archimedes' Principle • Analysis of the journal "Peer Group Formation for Learning serta The Digital Textbook in South Korea: Opportunities and Challenges" 10. Development of Instructional Media (Mechanics) • The Pendulum-Approximate Simple Harmonic Motion • Simple Harmonic Motion- Mass on a Spring Using a Motion Sensor • Standing Waves on a String • Analysis of the journal "The Digital Textbook in South Korea: Opportunities and Challenges" 11. Development of Instructional Media (Thermodynamics) • Temperature and Heat Transfer • Specific Heat of Metals • Linear Thermal Expansion and The Ideal Gas Law • Analysis of the journal "Implemented Scenarios and Evaluation Results serta mengkaji The Construction of Media in Education Policies: A Comparative Study of Singapore and Taiwan" 12. Development of Instructional Media (Electricity) • Equipotentials and Electric Fields • Measurement of Electrical Resistance and Ohm's Law • Analysis of the journal "Effects of Digital Gaming Among Children and Adolescents in Singapore: A Summary of Research Findings" 13. Development of Instructional Media (Electricity) • Wheatstone Bridge and Bridge Measurement of Capacitance • Voltmeters and Ammeters • Analysis of the journal "Multimedia Learning Using Social Media for Peer Education in Single-Player Educational Games" 14. Development of Instructional Media (Electricity) • Potentiometer and Voltmeter Measurements of the emf of a Dry Cell • Kirchhoff's Rules

<table>
<tr><td></td><td>
Analysis of the journal "Learning in the Twenty-First Century Interactive Multimedia Technology"
15. Development of Instructional Media (Magnetic)
Magnetic Induction of a Solenoid
Magnet and Electromagnetism
Analysis of the journal "Shepherd, Student-Generated Digital Media in Science Education: Learning, Explaining and Communicating Content"
16. Development of Instructional Media (Optics)
Reflection and Refraction with the Ray Box
Focal Length of Lenses
Diffraction Grating Measurement of the Wavelength of Light
Analysis of the journal "Interactive Multimedia Learning Environments
</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based learning</td><td>Project Assessment (for group project assignments)</td><td>55%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Smartphone, Camera, Tripod/Other Support, and Rigid Body</td></tr>
<tr><td>Literatures :</td><td>

Sanjaya Mishra, Ramesh C. Sharma. Interactive Multimedia in Education and Training. Idea Group Inc (IGI), 2005.
David H. Loyd. Physics Laboratory Manual Third Edition. Thomson Higher Education 10 Davis Drive Belmont: USA: 2008.
Stan Gibilisco. Electricity Experiments You Can Do at Home. The McGraw-Hill: USA. 2010.
Johannes Konert. Interactive Multimedia Learning Using Social Media for Peer Education in Single-Player Educational Games. Springer: New York London. 2014.
Tzu-Bin Lin, Victor Chen, Ching Sing Chai. New Media and Learning in the 21st Century: A Socio-Cultural Perspective. Springer Science+Business Media Singapore 2015.
Hoban, G., W. Nielsen, and A. Shepherd. Student-Generated Digital Media in Science Education: Learning,

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

	Explaining, and Communicating Content. Taylor & Francis Group. 2015. 7. Marc J. de Vries. International Handbook of Technology Education: Reviewing the Past Twenty Years. Rotterdam & Taipei: Sense Publishers. 2016.

Learning theory and learning

Module Name :	Learning and Learning Theory	
Module Level :	Undergraduate	
Code :	00052144	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	5th	
Module coordinator :		
Lecturer(s) :		
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO11. Mastering the concepts and principles of learning and learning and motivation in learning CLO12. Master the theories and concepts from various schools of psychology and their application in curriculum curriculum. CLO13. Able to organize learning by applying innovative approaches CLO14. Able to apply concepts and procedures for evaluating learning and learning outcomes	
Content :	1. Definition of learning, characteristics of learning, and types of learning according to certain classifications. Definition of learning & characteristics of learning • Definition of learning • Characteristics of learning • Learning motivation and its influence • Types of learning according to certain classifications classification • Definition and characteristics of learning, • Differences between learning and teaching.	

	2. Learning styles and their relation to the theory of multiple intelligences • Learning styles and their influence on learning • Different learning styles, V-A-K, Field Independent (FI) & Field Dependent (FD) and learning styles according to multiple intelligences 3. Learning theory and application • Behavioristic learning theory and its application in learning • Cognitivistic learning theory and its its application • Humanistic learning theory and its its application • Constructivistic learning theory and its application in learning 4. Definition, types, sources and models of motivation and • Definition of motivation • Types of motivation • sources of motivation its application in learning • Application of motivation in learning • ARCS (attention, relevance, confidence, satisfaction) motivation model and its application in learning learning 5. Learning principles in learning • Principles of learning according to Atwi Suparman's model Atwi Suparman model in learning • Gagne's learning principles (Nine events of instruction) in learning Review of Basic Entrepreneurship Concepts in general 6. Definition, foundation and principles of curriculum development and curriculum approaches • Definition of curriculum • Foundation of curriculum development • Principles of curriculum development • Curriculum approaches (subject-oriented, objective oriented, competency based curriculum) & their its application in the Indonesian curriculum 7. Understanding of media and learning resources, their characteristics and utilization in learning • Concept of media and learning resources • Variety and classification of media • Selection of learning media • Media utilization steps (ASSURE) 8. 21st century learning

	• 21st Century Learning • Role of teacher & student in 21st century learning • Designing & assessing 21st Century learning • Integration of media and technology into learning 9. Learning planning • Definition of lesson planning • Learning design steps (MPI Model, PROGRAM) Writing a learning program plan (RPP) as a result of instructional design • instructional design 10. Definition of approaches, strategies, methods and techniques and identify their application in learning. • Definition of learning approach • Definition of learning strategy • Definition of learning techniques • application of approaches, strategies, methods and techniques in learning. 11. Classification of learning methods and their characteristics (usefulness, advantages and limitations) as well as the selection of methods for learning. • Classification of learning methods • Characteristics of learning methods (usefulness, advantages and limitations) • Selection of methods for learning 12. Innovative approaches and their application in learning • Innovative approach (quantum teaching) and its application in learning • Innovative approach (active learning) and its application in learning • Innovative approaches (cooperative learning) and their application in learning • Innovative approaches (scientific learning) and its application in learning • Innovative approach (project-based learning) and its application in learning • Innovative approach (problem-based learning) and its application in learning • Innovative approach (e-learning) and its application in learning • Innovative approaches (discovery learning and its application in learning 13. Concepts of learning outcome evaluation and learning evaluation • Definition of measurement, assessment and evaluation

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

Function of Learning Outcome Evaluation
Definition of Learning Evaluation and its function
Benchmark Assessment and Norm-referenced Assessment
Formative and summative assessment
Various learning and learning outcome evaluation instruments

</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case Based Learning</td><td>Project Assessment (for group project assessment)</td><td>55%</td></tr>
<tr><td>2</td><td>Mid-semester exam (UTS)</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final semester exam</td><td>Written test</td><td>15%</td></tr>
<tr><td>4</td><td>Paper presentation</td><td>Presentation</td><td>20%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), Projector, Video Conference Software: Zoom Meeting and Ms Team, Reference book, PHET Web</td></tr>
<tr><td>Literatures :</td><td>

Amstrong, Sekolah Para Juara: Menerapkan Multiple Intelegences di Dunia Pendidikan, Bandung: Penerbit Kaifa, 2003.
Anderson & Krathwohl, A Taxonomy for Learning, Teaching and Assessing, USA: Addison WesleTeachery Longman, Inc, 2001
Arikunto, Suharsimi, Dasar-dasar Evaluasi Pendidikan, Jakarta: Bumi Aksara, 1993.
Ashburn, Elizabeth A & Floden, Robert E., Meaningful Learning Using Technology, Teacher College Press, 2006
DePorter, Bobbi, Quantum Teaching: Mempraktikkan Quantum Learning di Ruang- ruang Kelas, Bandung: Penerbit Kaifa,2003
Dick & Carey, The Systematic Design of Instruction, Pearson, 2015
Djiwandono, Sri Esti Wuryani, Psikologi Pendidikan, Penerbit: PT.Gramedia Widiasarana Indonesia, 2002
Kilbane, Clare L & Milman, Natalie B, Teaching Models, Pearson, 2014
Mulyasa, Kurikulum Berbasis Kompetensi: Konsep, Karakteristik dan Implementasi, Bandung: PT.Remaja Rosdakarya, 2004
Paul Suparno, Teori Intelegensi Ganda, Yogyakarta: Penerbit Kanisius, 2004

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

	11. Paulina Pannen dkk., Konstruktivisme dalam Pembelajaran, Jakarta: PAU-PPAI Dirjen Dikti Depdikbud, 2001 12. Siregar Eveline & Hartini Nara, Teori Belajar dan pembelajaran, Jakarta: Ghalia Indonesia, 2010 13. Schunk, Dale.H, Learning Theories, an educational perspectives, pearson, 2012 14. Smaldino dkk, Instructional Technology and Media for Learning, Eleventh edition, 2015 15. Suparman, Atwi, Desain Instruksional, Jakarta: PAU-PPAI Dirjen Dikti Depdikbud, 2001 16. Yuliani Nurani dkk, Strategi Pembelajaran: Materi Pokok Akta 8820, Jakarta: Universitas Terbuka, 2003. 17. Zainul, Asmawi, Alternative Assesment, Jakarta: PAU-PPAI Dirjen Dikti Depdiknas, 2001 18. Video-video pembelajaran yang relevan untuk memberikan ilustrasi dan membuka wawasan mahasiswa.

Teaching skills

Module Name :	Teaching skills	
Module Level :	Undergraduate	
Code :	32151264	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	6st	
Module coordinator :	Dr.Firmanul Catur Wibowo, M.Pd.	
Lecturer(s) :	Prof. Dr. Agus Setyo Budi, M.Sc. Dr. Esmar Budi, M.T. Drs. Andreas Handjoko Permana, M.Si Fauzi Bakri, M.Si Dr. Hadi Nasbey, S.Pd., M.Si. Dewi Muliyati, S.Pd., M.Si, M.Sc Dwi Susanti, M.Pd Lari Andres Sanjaya, M.Pd Prof. Dr. Sunaryo, M.Si Dr.Firmanul Catur Wibowo, M.Pd. Dr. Vina Serevina, M.M. Prof. Dr. I Made Astra, M.Si.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	10
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO15. Examining 21st Century Teaching Skills and its Implementation in Physics Education. CLO16. Examining the Display of Opening and Closing Skills in Physics Education. CLO17. Examining the Display of Questioning Skills in Physics Education. CLO18. Examining the Display of Reinforcement Skills in Physics Education.	

<table>
<tr><td></td><td>CLO19. Examining the Display of Variations Skills in Physics Education.
CLO20. Examining the Display of Explanation Skills in Physics Education.
CLO21. Examining the Display of Facilitating Group Discussions Skills in Physics Education.
CLO22. Examining the Display of Classroom Management Skills in Physics Education.</td></tr>
<tr><td>Content :</td><td>1. 21st Century Teaching Skills.
2. Opening and Closing Skills in Physics Education.
3. Questioning Skills in Physics Education.
4. Reinforcement Skills in Physics Education.
5. Variation Skills in Physics Education.
6. Explanation Skills in Physics Education.
7. Facilitating Group Discussion Skills in Physics Education.
8. Classroom Management Skills in Physics Education.
9. Personal and Small Group Approach Skills in Classical Physics Education.</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based learning</td><td>Project Assessment (for group project assignments)</td><td>55%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>1. Desnita, Pembinaan Kompetensi Mengajar (Modul), 2009
2. Kumpulan Permendiknas No. 8 dan 18-24 tahun 2016 tentang berbagai Standar Nasional Pendidikan Indonesia.
3. Janet Looney. Teaching, Learning and Assessment for Adults Improving Foundation Skills. Centre for Educational Research and Innovation: USA. 2008.
4. James M. Cooper. Classroom Teaching Skills Ninth Edition. Wadsworth, Cengage Learning 20 Davis Drive Belmont: USA. 2011.
5. Niels Pinkwart dan Bruce M. McLaren. Educational Technologies for Teaching Argumentation Skills. Bentham Science Publishers: USA. 2012.
6. F. M. Reimers dan C. K. Chung. Teaching and Learning for the Twenty-First Century Educational Goals,</td></tr>
</table>

	Policies, and Curricula from Six Nations. Harvard education press: USA. 2016. 7. Héfer Bembenutty, Marie C. White, Miriam R. Vélez, Developing Self-regulation of Learning and Teaching Skills Among Teacher Candidates. Springer: New York, USA. 2015. 8. Patrick Griffin dan Esther Care. Assessment and Teaching of 21st Century Skills Methods and Approach. Springer: New York, USA. 2015. 9. Byker, E. J., Michael Putman, S., Polly, D., & Handler, L. Examining Elementary Education Teachers and Preservice Teachers' Self-Efficacy Related to Technological Pedagogical and Content Knowledge (TPACK). Self-Efficacy in Instructional Technology Contexts, 119–140. doi:10.1007/978-3-319-99858-9_8 . 2018. 10. AACTE, 21st Century Knowledge and Skills in Educator Preparation, 2010 11. Pacific Policy Research Center 2010, 21st Century Skills for Students and Teachers. Honolulu: Kamehameha Schools, Research & Evaluation Division.

English for Teaching

Module Name :	English For Teaching	
Module Level :	Undergraduate	
Code :	32151242	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	6st	
Module coordinator :	Upik Rahma Fitri, M.Pd.	
Lecturer(s) :	Dr. Hadi Nasbey, S.Pd., M.Si. Upik Rahma Fitri, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO23. Describe shapes and properties of an object CLO24. Describe position and location of an object CLO25. Explain structure of an object or material CLO26. Describe measurement and unit CLO27. Explain function of instrument CLO28. Explain process and procedure CLO29. Explain cause and effect CLO30. Use symbol of mathematics and their pronunciation	
Content :	1. Shapes and properties of an object 1. Shapes of an object (one dimension, two dimensions, and three dimensions) 2. The properties of matter as solid, liquid, and gases 2. Position and location of an object 1. Position and location in two dimensions 2. Position and location in three dimensions 3. Structure of an object or material 1. Parts and the whole 2. Macro and microstructure	

<table>
<tr><td></td><td>
3. Relation between parts
4. Composition of an object
4. Measurement and unit
1. Quantity and Unit
2. Length measurement
3. Mass measurement
4. Time measurement
5. Analog and digital instrument
5. Function of instrument
1. Function and ability
2. Laboratories instruments
6. Process and procedure
1. Events
2. Sequences of events or phenomena
3. Cycle of events or phenomena
4. Stages
7. Cause and effect
1. Actions and results
2. Causing, allowing, and preventing
3. Methods
8. Symbol of mathematics and their pronunciation
1. Symbol of Mathematics
2. Formulas of Mathematics
3. Pronunciation of Mathematics
</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
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<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>

1. Eckstut, Samuela & Diana Lubelska. Widely Read. Singapore: Longman Group UK Limited, 1989
2. Kim, Eliane & Pamela Hartman. Interaction I & II: A Reading Skill Book. SingaporeL Mc Graw-Hill, Inc, 1990
3. Ramsey, James W,. Basics Skills for Academic Reading. New Jersey Prentice Hall, 1986
4. Bates, Martin, Dudley, Tony & Evans. General Science: English for Science and Technology - New Edition with Reading Texts, Longman Group UK Limited, 1982

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

	5. Buku English for Teaching Fisika FMIPA Universitas Negeri Jakarta 6. Bahan Workshop Mata Kuliah Bahasa Inggris Universitas Negeri Jakarta

Science learning design

Module Name :	Science Learning Design	
Module Level :	Undergraduate	
Code :	32252012	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	6st	
Module coordinator :	Dwi Susanti, M.Pd.	
Lecturer(s) :	Prof. Dr. sunaryo, M.Si. Dwi Susanti, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO31. Analyze the concept of Learning design model using various streams as a system. CLO32. Analyze instructional needs according to the demands of the curriculum and society referring to Bloom's Taxonomy. CLO33. Identify measurement/assessment tools, learning strategies and materials to achieve learning objectives. CLO34. Able to solve problems in the preparation of semester programs and formative / summative evaluations.	
Content :	1. Concept of Instructional Design using various psychological streams/learning theories. 1.1 Definition of Design 1.2 Definition of Instructional Learning 1.3 Definition of Instructional Design 1.4 Some related terms to Instructional Design	

	1.5 Psychological Streams/Learning Theories in Learning 2. Concept, Position, and Function of instructional design as a system. 2.1 Definition of System 2.2 System Components 2.3 System Approach 2.4 Instructional System 2.5 Disciplines influencing Instructional Design 2.6 Some related terms to Instructional System Design 3. Instructional Design models based on the ADDIE Model. 3.1 Definition of Model 3.2 Some Instructional Design Models 3.3 Similarities and Differences among Designs 3.4 ADDIE Model 4. Instructional Design models based on the Dick and Carey Model. 4.1 Definition of Model 4.2 Some Instructional Design Models 4.3 Similarities and Differences among Designs 4.4 Dick and Carey Model 5. Instructional Design models based on the MPI Model. 5.1 Definition of Model 5.2 Some Instructional Design Models 5.3 Similarities and Differences among Designs 5.4 MPI Model 6. Instructional needs according to curriculum and societal demands. 6.1 Instructional Needs 6.2 Definition of Competence 6.3 Definition of Ability 6.4 Difference between Competence and Ability 6.5 Instruction, Learning, and Performance 6.6 Basic Principles of Curriculum and Learning 6.7 Competency-Based Learning 7. Formulation of specific learning objectives (indicators) using operational verbs based on Bloom's taxonomy. 7.1 Understanding the Learning Objective (Goal) 7.2 Operational Verbs in Bloom's Taxonomy 7.3 Competency Map 8. Preparation of assessment tools to measure learning outcomes in accordance with specific instructional objectives/indicators. 8.1 Criterion-Referenced Test

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<tr>
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8.2 Norm-Referenced Test
8.3 Learning Outcome Assessment Tools
8.4 Validity
8.5 Reliability
8.6 Types of Tests
8.7 Test Item Blueprint

9. Selection of appropriate learning strategies to achieve learning objectives.
9.1 Definition of Learning Strategies
9.2 Types of Learning Strategies
9.3 Some related terms to strategies: Methods, approaches, techniques, tactics
9.4 Basic Concepts of Learning Strategies
9.5 Learning Stages

10. Selection of learning materials that support learning objectives.
10.1 Definition of Instructional Materials
10.2 Forms of Instructional Activities
10.3 Independent Learning System
10.4 Face-to-Face Learning System
10.5 Combination Learning System
10.6 Development of Conventional Teaching Materials
10.7 Development of Instructional Materials

11. Preparation of complete Semester Programs, Syllabi, and Lesson Plans that meet the criteria for high school levels of Grade X, XI, XII.
11.1 Definition of Syllabus
11.2 Basis for Syllabus Development
11.3 Principles of Syllabus Development
11.4 Syllabus Components
11.5 Mechanism for Syllabus Development
11.6 Steps in Syllabus Development
11.7 Developing Lesson Plans for Grade X, XI, XII in High School

12. Preparation of formative/summative evaluations.
12.1 Concept of Evaluation
12.2 Operational Evaluation
12.3 Formative and Summative Evaluation
</td>
</tr>
<tr>
<td>Study/exam achievements:</td>
<td>
Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
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</table>
</td>
</tr>
</table>

	2	Midterm Test	Written test	15%
	3	Final Test	Written test	20%
	4	Attendance	Presence list	10%
Media :	Power point presentation, textbook, learning management system (LMS)			
Literatures :	1. Branch, R. M. (2009). Instructional Design: The ADDIE Approach. New York: Sringer. 2. Dick, W., Carey, L., & Carey, J. (2009). The Systematic Design of Instruction. New Jersey: Pearson. 3. Gredler, M. E. (2011). Learning and Instruction: Teori dan Aplikasinya. Jakarta: Kercana. 4. Gustafson, K. L., & Branch, R. M. (2002). Survey of Instructional Development Models. New York: ERIC. 5. Joyce, B., Weil, M., & Calhoun, E. (2009). Models of Teaching. Boston: Pearson. 6. Keller, J. M. (2010). Motivational Design for Learning and Performance: The ARCS Model Approach. London: Springer. 7. Moller, L., Huett, J. B., & Harvey, D. M. (2009). Learning and Instructional Technologies for 21st Century: Vision of the Future. New York: Springer. 8. Richey, R. C., Klein, J. D., & Tracey, M. W. (2011). The Instructional Design Knowledge Base: Theory, Research and Practice. New York: Routledge. 9. Riser, R. A., & Dempsey, J. Y. (2012). Trends and Issues in Instructional Design and Technology, Third Edition. New York: Pearson. 10. Rothwell, W. J., & Khazanas, M. (2004). Mastering Instructional Design Process: A Systematic Approach. San Francisco: Pfeiffer. 11. Schunk, D. H. (2012). Learning Theories: An Educational Perspective (Teori-Teori Pembelajaran: Perspektif Pendidikan) Edisi Keenam. Yogyakarta: Pustaka Pelajar. 12. Suparman, M. A. (2012). Desain Instruksional Modern: Panduan Para Pengajar dan Inovator Pendidikan. Jakarta: Erlangga. 13. Association for Educational Communications and Technology (AECT) http://aect.site-ym.com/ 14. Christopher R. Gareis, Leslie W. Grant. Teacher-Made Assessments How to Connect Curriculum, Instruction, and Student Learning. 2015. 15. David D. Williams (Editor). “Online Assessment, Measurement And Evaluation_ Emerging Practices. 2006. 16. Edmund W. Gordon, Kavitha Rajagopalan auth. The Testing and Learning Revolution The Future of Assessment in Education. 2016. 17. Instructional Design.org http://www.instructionaldesign.org/ 18. Instructional Design Center (IDC) http://www.instructionaldesigncentral.com/whatisinstructionaldesign 19. Jayne Bartlett. ”Outstanding Assessment for Learning in the Classroom”. 2015.			

	20. Krathwohl, David R., “A Revision of Bloom's Taxonomy: An Overview”, Theory into Practice, Vol. 41(4), 2002. 21. Munzenmaier, Cecelia and Nancy Rubin, Perspectives Bloom’s Taxonomy: What’s Old Is New Again, (California: The e-Learning Guild, 2013). 22. Susan M. Brookhart. “How to Create and Use Rubrics for Formative Assessment and Grading-Association for Supervision & Curriculum Development”. 2013.

Development of Teaching Materials

Module Name :	Development of Teaching Materials	
Module Level :	Undergraduate	
Code :	00052144	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	$5^{th}/6^{th}/8^{th}$	
Module coordinator :		
Lecturer(s) :	Dr. Firmanul Catur Wibowo, M.Pd	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO35. Understand the concept of teaching materials in high school physics learning. CLO36. Identify the need for teaching materials in accordance with the characteristics of high school physics teaching materials. CLO37. Design teaching materials that are in accordance with high school physics material	
Content :	1. Role and function of teaching materials 2. Types of teaching materials 3. Understand the characteristics of high school physics teaching materials 4. Analyze the concept of high school physics teaching materials 5. Identify the needs of teaching materials according to teaching materials 6. Determine teaching materials that are in accordance with high school physics teaching materials 7. Design teaching materials in the form of descriptive designs	

<table>
<tr><td></td><td>8. Develop teaching materials that are in accordance with high school physics teaching materials</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case Based Learning %</td><td>Project Assessment (for group project assessment)</td><td>55%</td></tr>
<tr><td>2</td><td>Mid-semester exam (UTS)</td><td>Written test</td><td>15%</td></tr>
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<tr><td>4</td><td>Paper presentation 20%</td><td>Presentation</td><td>20%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Ms. Power Point and Demonstration tools</td></tr>
<tr><td>Literatures :</td><td>

Priyanto, Zaky. Making Educational Animation Using Flash. Informatika, 2008
Suciati, Andreas. Menguasai Pembuatan Animasi dengan Macromedia Flash MX. Jakarta ; PT. Elex Media Komputindo, 2003
Sadiman, Arief. Media Pendidikan ; Pengertian, Pengembangan dan Pemanfaatannya. Jakarta ; Raja Grafindo Persada, 2003
Heinich, Robert. Instructional Media and Technologies For Learning. New Jersey ; Prentice-Hall, 1996
Rohani, Ahmad, Media Instruksional Edukatif. Jakarta ; PT. Rineka Cipta, 1997 Smaldino, et al..
Instructional Media and Technology for Learning. New Jersey: Prentice Hall.2005.
Hamalik,Oemar. Media Pendidikan. Bandung: PT.Citra Aditya Bakti.1994
Arsyad,Azhar. Media Pembelajaran.Jakarta:PT Raja Grafindo.2004
</td></tr>
</table>

Research Method for Education

Module Name :	Research Method for Education	
Module Level :	Undergraduate	
Code :	32151283	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	6th	
Module coordinator :	Dr. Firmanul Catur Wibowo, M.Pd	
Lecturer(s) :	Dr. Firmanul Catur Wibowo, M.Pd Dwi Susanti, M.Pd	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.	
Credit points :	4,5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO1. Understanding instruments in learning CLO2. Designing learning instruments	

	CLO3. Applying appropriate instruments in learning
Content :	1. Education research Physics ● Definition of educational research ● Purpose and meaning of conducting research ● Scope of research study to solve Physics education problems ● Physics education research problems 2. Trends and scope of education research physics ● Analyzed 20 international journal articles of the last 5 years related to physics education, the articles different research methods ● How to find thesis research ideas 3. Types of research education ● R&D research ● Quantitative Research ● Qualitative Research ● Mixed Research ● Classroom Action Research ● experimental and quasi-experimental research 4. Preparation of planning Educational research ● Research framework: background of the problem, formulation and research questions, research objectives, research benefits research, and research variables ● Developing literature review, citation writing and literature search ● Operationalizing the research, designing the research and methodology selection, developing a research design research planning and how to manage research planning ● Communicating research results and drawing conclusions, suggestions and implications 5. Data collection techniques data collection and data analysis techniques data analysis techniques, hypothesis testing ● Sampling techniques for research quantitative research ● Techniques for selecting research participants/subjects for qualitative research ● Data collection and data analysis techniques, mean, Standard deviation

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Hypothesis testing techniques, chisquare test, t test, z test and f test

6. Compilation Research instruments

Techniques for preparing test instruments (learning outcomes, Hots)
Non-test instrument preparation techniques (Questionnaires, Interview, Observation)

7. Validity and reliability

Definition and how to measure Validity of test instruments RnD, quantitative, qualitative and mixed methods research
Understanding and how to measure reliability in RnD, quantitative, qualitative and mixed researchD

8. Writing technique reference and bibliography bibliography, as well as proposal rules Thesis

Reference and bibliography writing techniques
Rules in writing a thesis report thesis research report
Plagiarism
Research ethics: licensing, data collection and reporting reporting
Thesis Proposal Writing Rules

9. Free study Thesis Proposal Writing Thesis

Design and demonstrate independent learning by communicating its criticality in knowledge in the form of product presentation thesis proposal design that has been developed

</td>
</tr>
<tr>
<td>Study/exam achievements:</td>
<td>
Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case Based Learning %</td><td>Project Assessment (for group project assessment)</td><td>55%</td></tr>
<tr><td>2</td><td>Mid-semester exam (UTS)</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final semester exam</td><td>Written test</td><td>15%</td></tr>
<tr><td>4</td><td>Paper presentation 20%</td><td>Presentation</td><td>20%</td></tr>
</table>
</td>
</tr>
</table>

Media :	Projector, VOSviewer, Computer/leptop, LMS https://epsilon.smart-unj.id/, Zoom/Microsoft teams/google meet
Literatures :	1. . Cohen, L., Manion, L., & Morrison, K. (2018). Research methods in education. London, UK: Routledge. 2. Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (2nd ed.). Los Angeles, LA: Sage. 3. Denzin, N. K., & Lincoln, Y. S. (Eds.). (2017). The Sage handbook of qualitative research (4th ed.). Los Angeles, LA: Sage. 4. John W. Creswell. (2012). Educational Research_ Planning, Conducting, and Evaluating Quantitative and Qualitative Research, 4th Edition -Addison Wesley 13 5. Buku Pedoman Penyusunan Skripsi & Disertasi. Jakarta: Universitas Negeri Jakarta. 6. Wibowo, F. C. et al. (2021). Effectiveness of Virtual Physics Laboratory (VPL) with Dry Cell Microscopic Simulation (DCMS) to Promote of Inquiry Activity about the Battery J. Phys.: Conf. Ser.1772 012006, 1-6. 7. Wibowo, F.C.; Suhandi, A.; Rusdiana, D.; Samsudin, A.; Darman, D.R.; Faizin, M.N.; Wiyanto; Supriyatman; Permanasari, A.; Kaniawati, I.; Setiawan, W.; Karyanto Y.; Linuwih, S.; Fatah, A.; Subali, B.; Hasani, A.; and Hidayat, S. (2017). Effectiveness of Dry Cell Microscopic Simulation (DCMS) to Promote Conceptual Understanding about Battery. Journal of Physics:Conference Series 877(1), 012009. pp. 1-6 8. Wibowo, et al., Development of the Innovative Smart Orbital (ISO) Mediumto ImprovetheCognitive Skillson the Heat TransferConcept. International Journal of Learning, Teaching and Educational Research, 19 (5), pp. 141-152

Implementation Of Instrument Development In Schools

<table>
<tr><td>Module Name :</td><td colspan="2">Implementation Of Instrument Development In Schools</td></tr>
<tr><td>Module Level :</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code :</td><td colspan="2">32151153</td></tr>
<tr><td>Sub-heading, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Classes, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Semester :</td><td colspan="2">7th</td></tr>
<tr><td>Module coordinator :</td><td colspan="2"></td></tr>
<tr><td>Lecturer(s) :</td><td colspan="2">Dr. Hadi Nasbey, M.Si</td></tr>
<tr><td>Language :</td><td colspan="2">Indonesian</td></tr>
<tr><td>Classification within the curriculum :</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>Lecture (Expository, discussion, exercise)</td><td>100 minutes</td><td>40</td></tr>
<tr><td>Workload</td><td colspan="2">Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.</td></tr>
<tr><td>Credit points :</td><td colspan="2">3 ECTS</td></tr>
<tr><td>Prerequisite course(s) :</td><td colspan="2">-</td></tr>
<tr><td>Course Outcomes :</td><td colspan="2">After taking this course the student have ability to :
CLO38. Understanding instruments in learning
CLO39. Designing learning instruments
CLO40. Applying appropriate instruments in learning</td></tr>
<tr><td>Content :</td><td colspan="2">1. Understand the purpose and function of instruments in teaching
2. Analyze the types of instruments in learning
3. Identify instruments that suit learning needs
4. Designing appropriate instruments in learning
5. Testing the validity of the instrument based on learning criteria
6. Implementing the use of instruments into classroom learning</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case Based Learning %</td><td>Project Assessment (for group project assessment)</td><td>55%</td></tr>
<tr><td>2</td><td>Mid-semester exam (UTS)</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final semester exam</td><td>Written test</td><td>15%</td></tr>
</table></td></tr>
</table>

	4	Paper presentation 20%	Presentation	20%
Media :	Ms. Power Point and Demonstration tools			
Literatures :	1. Priyanto, Zaky. Making Educational Animation Using Flash. Informatika, 2008 2. Suciati, Andreas. Menguasai Pembuatan Animasi dengan Macromedia Flash MX. Jakarta ; PT. Elex Media Komputindo, 2003 3. Sadiman, Arief. Media Pendidikan ; Pengertian, Pengembangan dan Pemanfaatannya. Jakarta ; Raja Grafindo Persada, 2003 4. Heinich, Robert. Instructional Media and Technologies For Learning. New Jersey ; Prentice-Hall, 1996 5. Rohani, Ahmad, Media Instruksional Edukatif. Jakarta ; PT. Rineka Cipta, 1997 6. Smaldino, et al.. Instructional Media and Technology for Learning. New Jersey: Prentice Hall.2005. Hamalik,Oemar. Media Pendidikan. Bandung: PT.Citra Aditya 7. Bakti.1994 Arsyad,Azhar. Media Pembelajaran.Jakarta:PT Raja Grafindo.2004			

Implementation Of The Development Of Teaching Materials In Schools

<table>
<tr><td>Module Name :</td><td colspan="2">Implementation Of The Development Of Teaching Materials In Schools</td></tr>
<tr><td>Module Level :</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code :</td><td colspan="2">32151153</td></tr>
<tr><td>Sub-heading, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Classes, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Semester :</td><td colspan="2">7st</td></tr>
<tr><td>Module coordinator :</td><td colspan="2">Dr.Firmanul Catur Wibowo, M.Pd.</td></tr>
<tr><td>Lecturer(s) :</td><td colspan="2">Dr.Firmanul Catur Wibowo, M.Pd.</td></tr>
<tr><td>Language :</td><td colspan="2">Indonesian</td></tr>
<tr><td>Classification within the curriculum :</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>Lecture (Expository, discussion, exercise)</td><td>200 minutes</td><td>40</td></tr>
<tr><td>Workload</td><td colspan="2">Total workload of this course 181,3 hours (6 ECTS) per semester which consist of 53,4 hours (1.76ECTS) classroom activity, 64 hours (2,12 ECTS) structured task, and 64 hours (2,12 ECTS) per semester.</td></tr>
<tr><td>Credit points :</td><td colspan="2">6 ECTS</td></tr>
<tr><td>Prerequisite course(s) :</td><td colspan="2">-</td></tr>
<tr><td>Course Outcomes :</td><td colspan="2">After taking this course the student have ability to :
CLO41. Identify the characteristics of high school students
CLO42. Analyze and evaluate high school physics teaching materials
CLO43. Able to evaluate and solve problems in the use of teaching materials in the classroom</td></tr>
<tr><td>Content :</td><td colspan="2">1. Characteristics of learners
2. Learners' stages of thinking
3. Dimensions of learner development
4. Analyzing printed teaching materials
5. Analyzing non-printed teaching materials
6. Identify the advantages and disadvantages of teaching materials
7. Implementing the use of teaching materials in the classroom
8. Organizing the use of teaching materials in the classroom</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based learning</td><td>Project Assessment (for</td><td>55%</td></tr>
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<tr><td></td><td><table>
<tr><td></td><td></td><td>group project assignments)</td><td></td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Smartphone, Camera, Tripod/Other Support, and Rigid Body</td></tr>
<tr><td>Literatures :</td><td>
Hamalik, Oemar. Media Pendidikan. Bandung: PT. Citra Aditya Bakti. 1994.
Rohani, Ahmad. Media Instruksional Edukatif. Jakarta: PT. Rineka Cipta, 1997.
Heinich, Robert. Instructional Media and Technologies For Learning. New Jersey: Prentice-Hall, 1996.
Suciati, Andreas. Menguasai Pembuatan Animasi dengan Macromedia Flash MX. Jakarta: PT. Elex Media Komputindo, 2003.
Sadiman, Arief. Media Pendidikan; Pengertian, Pengembangan dan Pemanfaatannya. Jakarta: Raja Grafindo Persada, 2003.
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Smaldino, et al. Instructional Media and Technology for Learning. New Jersey: Prentice Hall, 2005.
Arsyad, Azhar. Media Pembelajaran. Jakarta: PT. Raja Grafindo, 2004.
</td></tr>
</table>

Implementing Learning Media Development in Schools

<table>
<tr><td>Module Name :</td><td colspan="2">Implementing Learning Media Development in Schools</td></tr>
<tr><td>Module Level :</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code :</td><td colspan="2">32151153</td></tr>
<tr><td>Sub-heading, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Classes, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Semester :</td><td colspan="2">7st</td></tr>
<tr><td>Module coordinator :</td><td colspan="2">Dr. Hadi Nasbey, S.Pd., M.Si.</td></tr>
<tr><td>Lecturer(s) :</td><td colspan="2">Dr. Hadi Nasbey, S.Pd., M.Si.</td></tr>
<tr><td>Language :</td><td colspan="2">Indonesian</td></tr>
<tr><td>Classification within the curriculum :</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>Lecture (Expository, discussion, exercise)</td><td>200 minutes</td><td>40</td></tr>
<tr><td>Workload</td><td colspan="2">Total workload of this course 181,3 hours (6 ECTS) per semester which consist of 53,4 hours (1.76ECTS) classroom activity, 64 hours (2,12 ECTS) structured task, and 64 hours (2,12 ECTS) per semester.</td></tr>
<tr><td>Credit points :</td><td colspan="2">6 ECTS</td></tr>
<tr><td>Prerequisite course(s) :</td><td colspan="2">-</td></tr>
<tr><td>Course Outcomes :</td><td colspan="2">After taking this course the student have ability to :
CLO44. Identify the characteristics of high school students
CLO45. Analyze and evaluate high school physics learning media
CLO46. Able to evaluate and solve problems in the use of Learning Media in the classroom</td></tr>
<tr><td>Content :</td><td colspan="2">1. Characteristics of learners
2. Learners' stages of thinking
3. Dimensions of learner development
4. Analyzing learning media teaching aids
5. Identify the advantages and disadvantages of learning media
6. Implementing the use of learning media in the classroom
7. Organizing the use of Learning Media in the classroom</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based learning</td><td>Project Assessment (for group project assignments)</td><td>55%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
</table></td></tr>
</table>

	4	Attendance	Presence list	10%
Media :	Laptop/Computer, Smartphone, Camera, Tripod/Other Support, and Rigid Body			
Literatures :	1. Hamalik, Oemar. Media Pendidikan. Bandung: PT. Citra Aditya Bakti. 1994. 2. Rohani, Ahmad. Media Instruksional Edukatif. Jakarta: PT. Rineka Cipta, 1997. 3. Heinich, Robert. Instructional Media and Technologies For Learning. New Jersey: Prentice-Hall, 1996. 4. Suciati, Andreas. Menguasai Pembuatan Animasi dengan Macromedia Flash MX. Jakarta: PT. Elex Media Komputindo, 2003. 5. Sadiman, Arief. Media Pendidikan; Pengertian, Pengembangan dan Pemanfaatannya. Jakarta: Raja Grafindo Persada, 2003. 6. Priyanto, Zaky. Making Educational Animation Using Flash. Informatika, 2008. 7. Smaldino, et al. Instructional Media and Technology for Learning. New Jersey: Prentice Hall, 2005. 8. Arsyad, Azhar. Media Pembelajaran. Jakarta: PT. Raja Grafindo, 2004.			

Teaching Skills Practice

Module Name :	Teaching Skills Practice	
Module Level :	Undergraduate	
Code :	32151264	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	7th	
Module coordinator :	Dr. Hadi Nasbey, S.Pd., M.Si	
Lecturer(s) :	Dr. Anggara, M.Si.Dwi Susanti, M.Pd Dr.rer.nat. Bambang Heru Iswanto, M.Si Dr.Firmanul Catur Wibowo, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	300 minutes	40
Workload	Total workload of this course 272 hours (9 ECTS) per semester which consist of 80 hours (2.652 ECTS) classroom activity, 96 hours (3.18 ECTS) structured task, and 96 hours (3.18 ECTS) per semester.	
Credit points :	9 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO47. Implementation of 21st century skills in physics learning at school. CLO48. Apply eight teaching skills in the classroom independently and integrated high school physics learning process. CLO49. Evaluate the application of mastery of eight teaching skills in the classroomUnderstanding instruments in learning	
Content :	1. Practice 21st century teaching skills in the classroom 2. Practicing skills to open and close physics learning in class 3. Practice of questioning skills in physics learning in class 4. Practice of reinforcement skills in physics learning in class 5. Practicing skills to make variations in physics learning in class 6. Practice of explaining skills in physics learning in class 7. Practicing skills in leading group discussion in physics learning in class	

<table>
<tr><td></td><td>8. Practice of classroom management skills in physics learning in class
9. Skill Practices in conducting personal and small group approaches in classical learning in physics learning in the classroom
10. Evaluation of teaching skills practice using instruments</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case Based Learning %</td><td>Project Assessment (for group project assessment)</td><td>55%</td></tr>
<tr><td>2</td><td>Mid-semester exam (UTS)</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final semester exam</td><td>Written test</td><td>15%</td></tr>
<tr><td>4</td><td>Paper presentation 20%</td><td>Presentation</td><td>20%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Projector, VOSviewer, Computer/leptop, LMS https://epsilon.smart-unj.id/, Zoom/Microsoft teams/google meet</td></tr>
<tr><td>Literatures :</td><td>1. Chris Kyriacou. Essential Teaching Skills Third Edition (4th Edition). Nelson Thornes Ltd Delta Place: United Kingdom. 2007.
2. Janet Looney. Teaching, Learning and Assessment for Adults Improving Foundation Skills. Centre for Educational Research and Innovation: USA. 2008.
3. James M. Cooper. Classroom Teaching Skills Ninth Edition. Wadsworth, Cengage Learning 20 Davis Drive Belmont: USA. 2011.
4. Niels Pinkwart dan Bruce M. McLaren. Educational Technologies for Teaching Argumentation Skills. Bentham Science Publishers: USA. 2012. f.
5. M. Reimers dan C. K. Chung. Teaching and Learning for the Twenty-First Century Educational Goals, Policies, and Curricula from Six Nations. Harvard education press: USA. 2016.
6. Héfer Bembenutty, Marie C. White, Miriam R. Vélez, Developing Self regulation of Learning and Teaching Skills Among Teacher Candidates. Springer: New York, USA. 2015.
7. Patrick Griffin dan Esther Care. Assessment and Teaching of 21st Century Skills Methods and Approach. Springer: New York, USA. 2015.
8. Byker, E. J., Michael Putman, S., Polly, D., & Handler, L. Examining Elementary Education Teachers and Preservice Teachers' Self-Efficacy Related to Technological Pedagogical and Content Knowledge</td></tr>
</table>

	(TPACK). Self-Efficacy in Instructional Technology Contexts, 119–140. doi:10.1007/978-3-319-99858-9_8 . 2018. 9. AACTE, 21st Century Knowledge and Skills in Educator Preparation, 2010 10. Pacific Policy Research Center 2010, 21st Century Skills for Students and Teachers. Honolulu: Kamehameha Schools, Research & Evaluation Division. 11. Desnita, Pembinaan Kompetensi Mengajar (Modul), 2009 12. Kumpulan Permendiknas No. 8 dan 18-24 tahun 2016 tentang berbagai Standar Nasional Pendidikan Indonesia.

Physics and Its application

Basic Physics I

Module Name :	Basic Physics I	
Module Level :	Undergraduate	
Code :	32250683	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	1st	
Module coordinator :	Dwi Susanti, M.Pd.	
Lecturer(s) :	Dwi Susanti, M.Pd. Dr. Anggara, M.Si. Prof. Dr. I Made Astra, M.Si.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.	
Credit points :	4.5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO50. Able to analyze and criticize the concepts of the basics of physics. CLO51. Able to build an understanding of the basics of physics CLO52. Able to implement the basics of physics. CLO53. Able to design the basics of Physics experiments.	
Content :	1. Physics, Quantities, Units, and Vectors • The development of physics • Quantities and SI units • Measurement and uncertainty • Vectors 2. Motion in One Dimension • Particle motion • Velocity and acceleration • Equations of particle motion • Free-fall motion 3. Motion in Two Dimensions	

	• Position, displacement, velocity, and acceleration vectors in two dimensions • Projectile motion • Circular motion 4. Newton's Laws and Their Applications • Newton's laws of motion • Friction and normal force • Acceleration in circular motion 5. Work and Energy • Work done by constant and non-constant forces • Work-energy theorem • Conservative forces • Potential energy • Conservation of mechanical energy 6. Momentum and Collisions • Momentum and impulse • Center of mass • Linear momentum of a particle system • Law of conservation of momentum • Collisions • Systems with changing mass and rocket motion 7. Rotational Motion of Rigid Bodies • Kinematic equations of rotational motion • The kinetic energy of rotation • Torque and moment of inertia • Newton's Second Law for rotational motion • Angular momentum and conservation of angular momentum • Rolling motion 8. Equilibrium of Rigid Bodies • Forces and moments of forces • Conditions for an equilibrium of bodies and their applications 9. Gravitation • Newton's law of gravitation • Gravitational acceleration near the Earth's surface • Gravitational potential energy • The motion of planets and satellites • Kepler's laws of planetary motion 10. Fluid Mechanics • Hydrostatic pressure • Pascal's law • Buoyant force and Archimedes' principle • Fluid flow and the continuity equation

<table>
<tr><td></td><td>
Bernoulli's equation
11. Oscillations
Harmonic motion
The energy of harmonic motion
Resonance
12. Mechanical Waves
Waves and their characteristics
Wave equation
Wave speed
Standing waves
13. Sound
Sound waves
Intensity of sound
Interference of sound waves
Resonance and sound resonance
Tones from pipes, organs, and strings
Doppler effect
14. Heat and Temperature
Temperature and thermal equilibrium
Heat and phase changes
Expansion of substances and gases
Heat transfer
Ideal gases and gas laws
Kinetic theory of ideal gases
</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based Assignment</td><td>Exploring and discussing some problem in mathematics</td><td>50%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>1. David Halliday, Robert Resnick, dan Jearl Walker (2014) Fundamentals of Physics, 10th Ed., John Wiley & Sons
2. Douglas C. Giancoli (2016), Physics: Principles With Applications, Publisher: Pearson
3. Hugh D. Young dan Roger A. Freedman (2016) University Physics 14th Ed., Pearson Education.
4. Physics Tutorial: http://www.masteringphysics.com/
5. Physics Simulation: http://phet.colorado.edu/en/simulations/category/physics</td></tr>
</table>

	6. Youtube Physics Channel: http://www.youtube.com/user/univphys Artikel 7. Umiatin, dkk, The bone microstructure identification model based on backscatter mode of ultrasound, Spektra : Jurnal Fisika dan Aplikasinya. Vol 6 Issue : 1. http://journal.unj.ac.id/unj/index.php/spektra/article/view/16424 8. Umiatin, dkk. Studi karakteristik kavitasi larutan menggunakan metode gelombang berdiri ultrasonic, Prosiding Seminar Nasional Fisika SNF 2020, Vol 9 (2020) http://journal.unj.ac.id/unj/index.php/prosidingsnf/article/view/2030 9. Umiatin, dkk. Design of bone density identification method using transmission quantitative ultrasound, AIP Conference Proceedings 2169, 030012 (2019); https://aip.scitation.org/doi/10.1063/1.5132662 10. Umiatin, dkk. Design baby mass and height monitoring system based on Arduino and Android application, AIP Conference Proceedings 2169, 030013 (2019); https://doi.org/10.1063/1.5132663 11. A S Budi, 2020, Kajian Koefisien Redaman Melalui Percobaan Laboratorium Osilasi Harmonis Untuk Pembelajaran Fisika. 12. E Budi, 2021, Analisis Osilasi Harmonis Melalui Percobaan Dan Simulasi Untuk Pembelajaran Fisika Jarak Jauh. 13. E Budi, 2020, Kajian Tetapan Elastisitas Melalui Percobaan Laboratorium Hukum HOOKE Untuk Pembelajaran Fisika. 14. I Sugihartono, 2022, Membangun Literasi Sains Melalui Pendekatan Bermain Menggunakan Perangkat Sederhana. 15. A B Susila, 2020, Pelatihan Desain Alat peraga Pembelajaran Fisika Di Islamic Boarding School Dwiwarna Desa Pamegarsari, Kecamatan Parung, Kabupaten Bogor Provinsi Jawa Barat. 16. T B Prayitno, 2020, Pembelajaran Sederhana Konsep Teori Relativitas Umum untuk Pelajar SMA. 17. H Nasbey, 2022, Pelatihan Pembuatan Alat Praktikum Sederhana Materi Fisika Berbasis Project-based Learning di MAN 2 Jakarta. 18. M A Marpaung, 2020, Pelatihan Pembuatan Mikrohidro Untuk Pembangkit Listrik Daya Rendah Di Daerah Parung Kabupaten Bogor Provinsi Jawa Barat. 19. H Nasbey, 2021, Rancang Bangun Sistem Wind Tunnel Sebagai Instrumen Pengukuran Karakteristik Turbin Angin Pembangkit Listrik Tenaga Angin. 20. H Nasbey, 2020, Rancang Bangun Sistem Pembangkit Listrik Hybrid (Gabungan Energi Angin Dan energi Surya) Sebagai Energi Alternatif Di FMIPA UNJ. 21. H Nasbey, 2020, Pelatihan Pembuatan Mini Microhidro Bagi Pelajar SMA.

Basic Physics Practicum I

Module Name :	Basic Physics Practicum I	
Module Level :	Undergraduate	
Code :	32251021	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	1st	
Module coordinator :	Dr. Hadi Nasbey, S.Pd., M.Si	
Lecturer(s) :	Dr. Hadi Nasbey, S.Pd., M.Si. Dr.Firmanul Catur Wibowo, M.Pd. Upik Rahma Fitri, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	50 minutes	40
Workload	Total workload of this course 45,3 hours (1,5 ECTS) per semester which consist of 13,34 hours (0,44 ECTS) classroom activity, 16 hours (0,53 ECTS) structured task, and 16 hours (0,53 ECTS) per semester.	
Credit points :	1.5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO54. Students have an understanding of the objectives, scope of material, strategies and evaluation of lectures (understand and agree on the Practicum contract). CLO55. Determine the value of young's modulus in bar elasticity CLO56. Determine the force constant of a loaded spring undergoing simple harmonic motion. CLO57. Determine the local acceleration of gravity in a mathematical swing. CLO58. Determine the coefficients of viscosity of a liquid, in this case glycerin, by measuring the fall time of balls in the fluid. CLO59. Determine the amount of surface tension of a liquid. CLO60. Determine surface tension by the maximum pressure of bubbles and capillary rise methods. CLO61. Determine the equivalence number of heat and energy, the Joule constant. CLO62. Determine the air humidity of a room using a hygrometer.	
Content :	1. Error Theory	

	a. Error theory b. Statistical data calculation and processing. 2. Elasticity of Rods a. Young's Modulus theory b. Experiment on elasticity of rods c. Data processing and calculation using error theory. 3. Simple Harmonic Motion a. Theory of force constant of springs b. Experiment on simple harmonic motion c. Data processing and calculation using error theory. 4. Mathematical Pendulum a. Theory of gravitational acceleration b. Experiment on the mathematical pendulum c. Data processing and calculation using error theory. 5. Coefficient of Viscosity of Liquid a. Theory of the weight of an object b. Buoyant force and drag force on the liquid c. Experiment on the coefficient of viscosity of liquid d. Data processing and calculation using error theory. 6. Surface Tension I a. Theory of surface tension in a material b. Experiment on surface tension in ropes and soap films c. Data processing and calculation using error theory. 7. Surface Tension II a. Theory of intermolecular forces in the air b. Experiment on the surface tension of an upper layer c. Data processing and calculation using error theory. 8. Joule's Constant a. Theory of energy changes b. Conducting the Joule's constant experiment

<table>
<tr><td></td><td>
c. Data processing and calculation using error theory.

9. Thermal Conductivity
a. Theory of heat per unit time
b. Specific heat capacity of the receiver
c. Decrease in heat per unit time.

10. Humidity of Air
a. Theory of partial air pressure by water vapor
b. Experiment on air humidity
c. Data processing and calculation using error theory.

11. Flow Calorimeter
a. Flow calorimeter theory
b. Continuous flow of water
12. c. Specific heat capacity.
</td></tr>
<tr><td>Study/exam achievements:</td><td>
Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Project Based Learning</td><td>Non-test in the form of a report, Preliminary Report, Final Report</td><td>60%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Presentation skills/ argumentation</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>UAP</td><td>15%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Computer/laptop, internet, projector, laboratory equipment.</td></tr>
<tr><td>Literatures :</td><td>
1. Tim Dosen Fisika Dasar Jurusan Fisika FMIPA UNJ, “Panduan Praktikum Fisika Dasar I”, Laboratorium Fisika Dasar, Jurusan Fisika FMIPA, UNJ, 2013.
2. Tipler, P. A., & Mosca, G. (2007). Physics for scientists and engineers. Macmillan.
3. Halliday, Resnick, Jearl Walker, “Principles of Physics 9th”, John Wiley, 2011.
4. Indrasari, W., & Rustana, C. E. (2021, February). Development a practicum tools to measure the speed of the air using Arduino Uno Microcontroller. In Journal of Physics: Conference Series (Vol. 1816, No. 1, p. 012109). IOP Publishing.
5. Silva, G. D. S. F., & Villani, A. (2021). The Physics Teaching Practice course and the student-teachers’ activity in the
</td></tr>
</table>

	beginning of the supervised practicum at schools+. Caderno Brasileiro de Ensino de Física, 38(3), 1561- 1588.

Calculus I

Module Name :	Calculus I	
Module Level :	Undergraduate	
Code :	32250683	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	1st	
Module coordinator :	Dr. Teguh Budi Prayitno, M.Si	
Lecturer(s) :	Dr. Teguh Budi Prayitno, M.Si Prof. Mangasi Alion Marpaung, M.Si	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 135.99 hours (4.5 ECTS) per semester which consist of 51 hours (1.7 ECTS) classroom activity, 42 hours (1.4 ECTS) structured task, and 42 hours (1.4 ECTS) per semester.	
Credit points :	4.5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO63. Understand basic knowledge of mathematics. CLO64. Find exact solution of mathematical problems. CLO65. Analyze the solution for certain boundary conditions.	
Content :	1. Functions, Limit, and Continuity (2 weeks) • Introduction to functions • Graphics of functions • Limit and continuity 2. Derivative of function (2 weeks) • Formal definition of derivative of function • Implicit derivative • Application of derivative 3. Integral of Function (3 weeks) • Formal definition of integral of function • Finite and infinite integral • Riemann method of integral 4. Application of Integral (3 weeks) • Definition of length, area, and volume • Definition of work and force	

<table>
<tr><td></td><td>
Definition of moment and centre of mass
5. Transcendental Function (3 weeks)
Natural logarithm and its derivative
Natural exponential and its derivative
Integral of transcendental functions
6. Integral Techniques (2 weeks)
Integration by parts
Rationalizing substitutions
Integration of rational functions
</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based Assignment</td><td>Exploring and discussing some problem in mathematics</td><td>50%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>

H. Anton, I. Bivens, and S. Davis (2013) Calculus 10th edition, John Wiley & Sons.
G. B. Thomas, M. D. Weir, J. Hass (2010) Calculus 12th Edition, Addison Wesley
E. J. Purcell and D. Varberg (2006) Calculus 9th Edition, Pearson

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</table>

General Chemistry

Introduction to Information Technology

Module Name :	Introduction to Information Technology	
Module Level :	Undergraduate	
Code :	32252012	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	1st	
Module coordinator :	Dewi Muliyati, S.Pd., M.Si, M.Sc	
Lecturer(s) :	Dr. rer.nat Bambang Heru Iswanto, M.Si. Dewi Muliyati, S.Pd., M.Si, M.Sc	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO66. Students are expected to be able to operate computer systems with various operating systems CLO67. Students are expected to recognize various information technology devices and their functions CLO68. Students are expected to be able to use it practically for simple work.	
Content :	1. Information Technology Development 1.1 Information Technology 1.2 Computer History 1.3 Information Technology Trends 2. Computer System Fundamentals 2.1 Von Neumann Computer Architecture 2.2 Data Representation, Character Format, and Number Format (Integer and Real) 2.3 CPU & ALU 2.4 Instructions in Assembly Language 2.5 Computer Hardware 2.6 Computer Memory 2.7 Input and Output 3. Operating Systems	

	3.1 Operating System (OS) Development 3.2 Embedded Systems 3.3 Input and Output Management 3.4 Basic Operating System Operations 3.5 Memory Management 3.6 Virtual Memory 3.7 OS Process Monitoring 3.8 File Management 3.9 Operating Systems: DOS, Windows, Unix, and Linux 3.10 System Utility Applications 4. Telecommunications & Networking 4.1 Computer Networks and Client-Server Model 4.2 Computer Network Hardware and Software 4.3 OSI and TCP/IP 4.4 Network Protocols and Layers 4.5 Network Process Monitoring Applications 4.6 Internet of Things (IoT) 4.7 Internet Concepts 4.8 Internet Applications 4.9 WWW, HTTP, and HTML 4.10 Web Analytics 4.11 Simple Website with CMS 5. Multimedia Technology 5.1 Multimedia Development 5.2 Software for Productivity and Creativity 5.3 Document Processing Applications 5.4 Digital Images 5.5 Graphics Processing Applications 5.6 Illustration Graphics 6. Artificial Intelligence 6.1 Artificial Intelligence (AI) Development 6.2 Statistical Theory for Decision Making 6.3 Machine Learning 6.4 Information Theory 6.5 Control in Robotics 6.6 Sound and Image Recognition with AI Approach 7. Big Data & Information Systems 7.1 Big Data 7.2 Types of Big Data 7.3 Big Data Technologies 7.4 Data Analysis Methods 7.5 Data Clustering

<table>
<tr><td></td><td>7.6 Data Visualization
7.7 Predictions from Big Data Analysis
7.8 Regression Modeling
7.9 Big Data Separation

Cybersecurity and Ethics
8.1 Cybercrime
8.2 Ethical Theories and Computer Security Concepts
8.3 Privacy and Encryption
8.4 Viruses, Hackers, and Computer System Maintenance
8.5 Information and Electronic Transactions Law (ITE Law)</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based Assignment</td><td>Exploring and discussing some problem in mathematics</td><td>50%</td></tr>
<tr><td>2</td><td>Assignment</td><td>Portofolio</td><td>20%</td></tr>
<tr><td>3</td><td>Midterm Test</td><td>Written test</td><td>10%</td></tr>
<tr><td>4</td><td>Final Test</td><td>Written test</td><td>10%</td></tr>
<tr><td>5</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>1. Carl Reynolds and Paul Tymann, Principles of Computer Science, Schaum’s Outline Series. Mcgraw-Hill, 2008.
2. J. Glenn Brookshear and Dennis Brylow, Computer Science: An Overview, 12th Ed., Pearson, 2015.
3. Brian K. Williams and Stacey C. Sawyer. 2010. Using Information Technology: A Practical Introduction to Computers & Communications. McGraw-Hill.
4. Fernando Lafrate, Artificial Intelligence and Big Data, ISTE Ltd, 2018
5. Judith Hurwitz et al, Big Data For Dummies, John Wiley & Sons, 2013
6. George M. Marakas and James A. O’brien, Introduction To Information Systems 16 Ed., McGraw-Hill, 2013
7. Stephen L. Nelson, Excel 2007 Data Analysis For Dummies, Wiley Publishing, 2007.
8. Li, Z. N., Drew, M. S., & Liu, J. (2021). Introduction to multimedia. In Fundamentals of Multimedia (pp. 3-26). Springer, Cham.
9. Park, N., & Lee, D. (2018). Electronic identity information hiding methods using a secret sharing scheme in multimedia-centric internet of things</td></tr>
</table>

	environment. Personal and Ubiquitous Computing, 22(1), 3-10. 10. Ambarwulan, D., & Muliyati, D. (2016). The Design of Augmented Reality Application as Learning Media Marker-Based for Android Smartphone. Jurnal Penelitian & Pengembangan Pendidikan Fisika, 2(1), 73-80. 11. Muliyati, D., Wahdaniyah, N., & Bakri, F. (2021, October). Development of Educational Adventure Game on Fluid Physics Material. In Journal of Physics: Conference Series (Vol. 2019, No. 1, p. 012062). IOP Publishing. 12. E Handoko, 2021, Penerapan Aplikasi HEALTH NOTIFICATION Terhadap Covid-19 Berbasis Android Bagi Masyarakat Di Wilayah Jakarta. 13. M Delina, 2020, Pengembangan Website Dalam Pembelajaran Fisika Di Kelas Untuk Guru Fisika Di SMA Dwiwarna Kabupaten Bogor Provinsi Jawa Barat. 14. T B Prayitno, 2022, Pembelajaran Aplikasi Microsoft Excel dalam Fisika untuk Pelajar SMA di Kelurahan Ciracas Jakarta Timur. 15. H Nasbey, 2021, Pelatihan Pembuatan Aplikasi Android Sebagai Media Pembelajaran IPA Berbasis Problem-Based Learning.

Basic Physics II

Module Name :	Basic Physics II	
Module Level :	Undergraduate	
Code :	32151253	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	2st	
Module coordinator :	Dr. Anggara, M.Si.	
Lecturer(s) :	Dr. Anggara, M.Si. Prof. Dr. I Made Astra, M.Si.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.	
Credit points :	4.5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO69. Able to analyze and criticize the concepts of the basics of physics. CLO70. Able to build an understanding of the basics of physics CLO71. Able to implement the basics of physics. CLO72. Able to design basic physics experiments	
Content :	1. Electric Charge and Electric Force 1.1 Static electricity phenomena 1.2 Electric charge, quantization of charge, and the law of conservation of charge 1.3 Coulomb's law 1.4 Electric force among multiple point charges 2. Electric Fields 2.1 Electric field due to point charges 2.2 Electric field due to electric dipoles 2.3 Electric field due to continuous charge distributions 2.4 Point charges in an electric field 2.5 Electric dipoles in an electric field 3. Gauss's Law 3.1 Electric field flux	

	3.2 Gauss's law 3.3 Isolated conductors and their charges 3.4 Applications of Gauss's law for spherical, cylindrical, and planar symmetries 4. Electric Potential 4.1 Electric potential and potential difference 4.2 Relationship between electric potential and electric field 4.3 Electric potential due to point charges 4.4 Electric potential due to electric dipoles 4.5 Electric potential due to continuous charge distributions 4.6 Calculating electric fields from electric potentials 4.7 Electric potential energy, work in electric fields, and equipotential surfaces 4.8 Electric potential energy of point charge systems 4.9 Potential of isolated conductors 4.10 Capacitance and dielectrics 4.11 Electrical energy storage 5. Electric Current and Resistance 5.1 Electric current, current intensity, and current density 5.2 Resistance and resistivity 5.3 Ohm's law 5.4 Energy and power in electrical circuits 5.5 Semiconductors and superconductors 6. Direct Current Circuits 6.1 Series and parallel resistor circuits 6.2 Voltage sources (EMF) 6.3 Kirchhoff's laws and loop circuits 6.4 Resistor and capacitor circuits (RC) 7. Magnetism 7.1 Magnets and magnetic fields 7.2 Magnetic fields due to current-carrying conductors 7.3 Magnetic force on moving charges in a magnetic field 7.4 Magnetic force on current-carrying conductors in a magnetic field 7.5 Magnetic force on parallel current-carrying conductors 7.6 Ampere's law 7.7 Solenoids and toroids 7.8 Magnetic fields in magnetic materials

<table>
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<td>
7.9 Applications of magnetism in speakers, mass spectrometers, and accelerators

8. Electromagnetic Induction
8.1 Faraday's law
8.2 Lenz's law
8.3 Electromotive force (EMF) induced in a moving conductor in a magnetic field
8.4 Electric generators
8.5 RL circuits
8.6 Inductors and inductance
8.7 Energy in magnetic fields

9. Electromagnetic Oscillations and Alternating Current
9.1 Oscillations in LC circuits
9.2 Damped oscillations in RLC circuits
9.3 Alternating current (AC)
9.4 Series RLC circuits
9.5 Power in AC circuits

10. Electromagnetic Waves
10.1 Maxwell's equations
10.2 Generation of electromagnetic waves
10.3 Speed of light in the electromagnetic spectrum
10.4 Energy of electromagnetic waves
10.5 Applications of electromagnetic waves in communication devices
10.6 Reflection and refraction
10.7 Polarization
10.8 Interference
10.9 Diffraction
10.10 Dispersion of light

11. Photons and Matter Waves
11.1 Photons and the quantum of light
11.2 Photoelectric effect
11.3 Photons, momentum, and Compton scattering
11.4 The birth of quantum physics
11.5 Electrons and matter waves
</td>
</tr>
<tr>
<td>Study/exam achievements:</td>
<td>
Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case Base Learning</td><td>Examine cases in related fields of work as a means of solving them</td><td>50%</td></tr>
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<table>
<tr><td></td><td><table>
<tr><td>2</td><td>Midterm Test</td><td>Presentation skills/ argumentation</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>UAP</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Computer/laptop, internet, projector, and Reference Book.</td></tr>
<tr><td>Literatures :</td><td>1. Fundamentals of Physics, 10th Ed. by David Halliday, Robert Resnick, and Jearl Walker (John Wiley & Sons, 2014).
2. Physics: Principles With Applications by Douglas C. Giancoli (Pearson, 2016).
3. University Physics 14th Ed. by Hugh D. Young and Roger A. Freedman (Pearson Education, 2016).
4. Design and Development of Pulse Electromagnetic Fields (PEMF) as Adjuvant Therapy for Fracture Healing, AIP Conference Proceeding 2092, 020028 (2019) by Umiatin et al.
5. Desain dan Pembuatan Prototipe Pulse Electromagnetic Therapy (PEMFT) untuk Studi Biolektromagnetik, Spektra, Jurnal Fisika dan Aplikasinya, Vol 2 No 3 (2017) by Umiatin et al.
6. Pelatihan Pembuatan Mikrohidro Untuk Pembangkit Listrik Daya Rendah Di Daerah Parung Kabupaten Bogor Provinsi Jawa Barat (2020) by M A Marpaung.
7. Rancang Bangun Sistem Wind Tunnel Sebagai Instrumen Pengukuran Karakteristik Turbin Angin Pembangkit Listrik Tenaga Angin (2021) by H Nasbey.
8. Rancang Bangun Sistem Pembangkit Listrik Hybrid (Gabungan Energi Angin Dan energi Surya) Sebagai Energi Alternatif Di FMIPA UNJ (2020) by H Nasbey.
9. Pelatihan Pembuatan Mini Microhidro Bagi Pelajar SMA (2020) by H Nasbey.
10. Physics Tutorial: http://www.masteringphysics.com/
11. Physics Simulation: http://phet.colorado.edu/en/simulations/category/physics
12. Youtube Physics Channel: http://www.youtube.com/user/univphys</td></tr>
</table>

Basic Physics Practicum II

Module Name :	Basic Physics Practicum II	
Module Level :	Undergraduate	
Code :	32251041	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	2st	
Module coordinator :	Dwi Susanti, M.Pd	
Lecturer(s) :	Dwi Susanti, M.Pd Lari Andres Sanjaya, M.Pd	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	50 minutes	40
Workload	Total workload of this course 45,3 hours (1,5 ECTS) per semester which consist of 13,34 hours (0,44 ECTS) classroom activity, 16 hours (0,53 ECTS) structured task, and 16 hours (0,53 ECTS) per semester.	
Credit points :	1.5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO73. Students have an understanding of the objectives, scope CLO74. material, strategy and evaluation of lectures (understand and agree on the Practicum contract). CLO75. agree on the Practicum contract). CLO76. Able to analyze and criticize the concepts of the basics of physics. CLO77. Able to build an understanding of the basics of physics CLO78. Able to implement the basics of physics. CLO79. Able to design the basics of physics experiments	
Content :	1. Refractive Index 1.1 Determining the refractive index of a solution 1.2 Finding the critical angle of a solution 2. Mirrors 2.1 Determining the focal point of concave and convex mirrors 2.2 Finding the object distance and image distance in concave and convex mirrors 3. Lens Properties and Image Defects	

	3.1 Lens refraction properties 3.2 Determining the focal length of a lens 3.3 Image defects caused by lenses 4. Microscope 4.1 Using a microscope 4.2 Microscope working principle 4.3 Image magnification 5. Spectrometer 5.1 How to use a spectrometer 5.2 Determining the angle of deviation 5.3 Finding the refractive index of a prism 6. Polarimeter 6.1 How to use a polarimeter 6.2 Determining the sugar content of a solution 7. Oscilloscope 7.1 How to use an oscilloscope 7.2 Determining Lissajous patterns 7.3 Determining frequency 8. Alternating Current 8.1 Characteristics of alternating current 8.2 Impedance of alternating current 8.3 Resonance analysis 9. Incandescent Lamp Characteristics 9.1 Incandescent lamp characteristics 9.2 Measuring resistance in lamps 9.3 Interpreting electrical diagrams 10. Resistors and Ohm's Law 10.1 Calculating resistor resistance values 10.2 Building series and parallel circuits 11. Kirchhoff's Laws 11.1 Kirchhoff's laws 11.2 Measuring equivalent resistance 12. Transformer 12.1 Working principle of a transformer 12.2 Measuring power loss, winding, turns ratio, and regulation values
Study/exam achievements:	Examination are conducted as unit test, as following

<table>
<tr><td></td><td>
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Project Based Learning</td><td>Non-test in the form of a report, Preliminary Report, Final Report</td><td>60%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Presentation skills/ argumentation</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>UAP</td><td>15%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
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</td></tr>
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<tr><td>Literatures :</td><td>1. Tim Dosen Fisika Dasar Jurusan Fisika FMIPA UNJ, “Panduan Praktikum Fisika Dasar I”, Laboratorium Fisika Dasar, Jurusan Fisika FMIPA, UNJ, 2013.
2. Tipler, P. A., & Mosca, G. (2007). Physics for scientists and engineers. Macmillan.
3. Halliday, Resnick, Jearl Walker, “Principles of Physics 9th”, John Wiley, 2011.
4. Indrasari, W., & Rustana, C. E. (2021, February). Development a practicum tools to measure the speed of the air using Arduino Uno Microcontroller. In Journal of Physics: Conference Series (Vol. 1816, No. 1, p. 012109). IOP Publishing.
5. Silva, G. D. S. F., & Villani, A. (2021). The Physics Teaching Practice course and the student-teachers’ activity in the beginning of the supervised practicum at schools+. Caderno Brasileiro de Ensino de Física, 38(3), 1561- 1588.</td></tr>
</table>

Calculus II

Module Name :	Calculus II	
Module Level :	Undergraduate	
Code :	32250703	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	2nd	
Module coordinator :	Dr. Teguh Budi Prayitno, M.Si	
Lecturer(s) :	Dr. Teguh Budi Prayitno, M.Si Prof. Mangasi Alion Marpaung, M.Si	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 135.99 hours (4.5 ECTS) per semester which consist of 51 hours (1.7 ECTS) classroom activity, 42 hours (1.4 ECTS) structured task, and 42 hours (1.4 ECTS) per semester.	
Credit points :	4.5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO80. Understand basic knowledge of mathematics. CLO81. Find exact solution of mathematical problems. CLO82. Understand the transformation of coordinates. CLO83. Analyze the solution for certain boundary conditions.	
Content :	1. Infinite Series (2 weeks) • Introduction to series • Convergence test • Taylor and Maclaurine series 2. Parametric Equation (2 weeks) • Formal definition of parametric equation • Conics and polar coordinates • Curves on the plane 3. Transformation of Coordinates (3 weeks) • Cylindrical and spherical coordinates • Vectors in three-dimensional coordinates • Jacobian method 4. Motion in Space (3 weeks) • Dot and Cross product • Derivative and integral vector • Curvilinear motion	

<table>
<tr><td></td><td>5. Partial Derivative (3 weeks)
• Functions of two or more variables
• Definition of partial derivative
• Application of partial derivative
6. Multiple Integral (2 weeks)
• Double and triple integral
• Change variable in multiple integral
• Triple integral in curvilinear coordinates
7. Introduction to Differential Equation (2 weeks)
• Linear differential equation
• Method of separation of variables
• Application of first-order differential equation</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as follows
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based Assignment</td><td>Exploring and discussing some problem in mathematics</td><td>50%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
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<tr><td>Literatures :</td><td>1. H. Anton, I. Bivens, and S. Davis (2013) Calculus 10th edition, John Wiley & Sons.
2. G. B. Thomas, M. D. Weir, J. Hass (2010) Calculus 12th Edition, Addison Wesley
3. E. J. Purcell and D. Varberg (2006) Calculus 9th Edition, Pearson</td></tr>
</table>

General Biology

Mathematical Physics I

Module Name :	Mathematical Physics I	
Module Level :	Undergraduate	
Code :	32254034	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	3rd	
Module coordinator :	Dr. Teguh Budi Prayitno, M.Si	
Lecturer(s) :	Dr. Teguh Budi Prayitno, M.Si Prof. Mangasi Alion Marpaung, M.Si	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	200 minutes	40
Workload	Total workload of this course 181.3 hours (6 ECTS) per semester which consist of 90.6 hours (3 ECTS) classroom activity, 45.3 hours (1.5 ECTS) structured task, and 45.3 hours (1.5 ECTS) per semester.	
Credit points :	6 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the students have ability to: CLO84. Understand the mathematical concepts to solve physical problem. CLO85. Understand the special function that is almost used in physical problem. CLO86. Apply the boundary condition for differential equation. CLO87. Apply available method to solve differential equation.	
Content :	1. Complex Numbers (2 weeks) • Introduction to complex numbers • Complex plane • Euler's formula 2. Differential Equation (2 weeks) • Second-order differential equation • Solution with Boundary and initial conditions • Application of differential equation 3. Laplace Transform (2 weeks) • Definition of Laplace transform • Inverse Laplace transform	

<table>
<tr><td></td><td>
Convolution method
4. Linear Equation (1 weeks)
Operation of matrices
Linear functions and linear operators
Special matrices
5. Special Functions (2 weeks)
Definition of factorial function
Definition of beta function
Application of special functions
6. Series Solution of Differential Equations (3 weeks)
Frobenius method
Legendre polynomial
Bessel function
7. Eigen-value Problem (2 weeks)
Eigen value dan eigen vector
Diagonalization of matrix
Application of eigen-value problem
</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as follows
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Projects Assignment</td><td>Exploring and discussing some problem in mathematical physics</td><td>50%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>

M. L. Boas (2006) Mathematical Methods in the Physical Sciences, 3rd Edition, John Wiley & Sons Inc.
E. Kreyszig (2006) Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons Inc.
G. B. Arfken and H. J. Weber (2005) Mathematical Methods for Physicists, 6th Edition, Elsevier Academic Press.

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

Electronics

Module Name :	Electronics
Module Level :	Undergraduate
Code :	32253014
Sub-heading, if applicable :	
Classes, if applicable :	
Semester :	3rd
Module coordinator :	Prof. Dr. Agus Setyo Budi, M.Sc
Lecturer(s) :	Prof. Dr. Agus Setyo Budi, M.Sc Dewi Muliyati, S.Pd., M.Si, M.Sc
Language :	Indonesian
Classification within the curriculum :	Compulsory course
Type of Teaching	Contact hours per week during the semester: Class Size
Lecture (Expository, discussion, exercise)	200 minutes: 40
Workload	Total workload of this course 181,3 hours (6 ECTS) per semester which consist of 53,4 hours (1.76ECTS) classroom activity, 64 hours (2,12 ECTS) structured task, and 64 hours (2,12 ECTS) per semester.
Credit points :	6 ECTS
Prerequisite course(s) :	-
Course Outcomes :	After taking this course the student have ability to : CLO1. Understand the basic concepts of electrical circuits and describe the associated magnitudes. CLO2. Understand the elements of an electrical circuit and describe the properties of each element of an electrical circuit. CLO3. Understand the concept of resistive circuits and apply them to series-parallel relationships.

	CLO4. Analyze resistive circuits. CLO5. Understand the concept of circuit theorem and analyze electrical circuits using the circuit theorem. CLO6. Understand the basic concepts of capacitors and inductors and analyze capacitor and inductor circuits. CLO7. Understand alternating current and apply it to analyzing alternating current circuits. CLO8. Understand the concept of semiconductors. CLO9. Understand the basic concepts of diodes in electrical circuits and analyze diode circuits. CLO10. Understand the basic concepts of transistors and analyze transistor circuits transistors. CLO11. Understand the basic concepts of Op-Amplifiers and analyze the circuits of Op-Amplifier circuit.
Content :	1. Basic Concepts and Elements of Electrical Circuits ● System of Units ● Electric Charge and Current ● Voltage ● Power and Energy ● Active and passive elements ● Independent current and voltage sources ● Voltmeter and ammeter ● Source dependent current and voltage 2. Circuit Analysis Resistive ● Kirchoff's Law ● Voltage divider circuit ● Current divider circuit ● Node Analysis ● Mesh Analysis 3. Circuit Theorem ● Superposition Theorem ● Source Transformation ● Thevenin Theorem ● Norton's equivalent circuit ● Maximum power transfereaknesses of Classical Physics 4. RL and RC circuits ● Series and parallel capacitor circuits ● Series and parallel inductor circuits ● First order circuit ● Complete response first-order circuit ● Differential operator

	● Second-order circuit ● Complete Response Second-order circuit 5. Alternating Current ● Sinusoidal Sources ● Fasors ● Series and parallel impedance ● Mesh and Node Equations ● Thevenin and Norton equivalent circuits ● Superposition principle ● Phasor diagram ● Complete response of RL and RC 6. Semiconductors ● Conductors ● Semiconductors ● Intrinsic semiconductor ● Extrinsic semiconductor ● P-n junction ● Potential barrier 7. Diodes ● Ideal diode ● Second and third approximation ● Diode load line ● Half-wave rectifier circuit ● Transfomator ● Full wave rectifier circuit ● Bridge-rectifier circuit ● The Choke-Input Filter ● The Capacitor-Input Filter ● Peak Inverse Voltage and Surge Current 8. Basic principles of Transistors Bipolar ● Transistors without leads ● Rewarded transistor ● Current in the transistor ● Curves at base and collector ● Transistor approximation ● Load line and working point of the transistor ● Saturation and cut-off ● Transistor as a switch 9. Transistor circuit Retrieved ● Emitter Bias ● LED Diver ● Voltage Divider Bias

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

Load line and working point on VDB
Two-Supply Emitter Bias

10. Op-Amplifier

Differential Amplifier
Common Mode Gain
Integrated circuit
Op-Amp basics
Ideal Op-Amp
Inverting Amplifier
Noninverting Amplifier

11. Amplifier Basics

Base-Based Amplifier
Emitter-Biased Amplifier
Small Signal Operation
AC Resistance of the Emitter Diode
Two Models of Transistors

</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Individual Assignment</td><td>Written test</td><td>20%</td></tr>
<tr><td>2</td><td>Class activity</td><td>Discussion</td><td>10%</td></tr>
<tr><td>3</td><td>Quiz</td><td>Written test</td><td>10%</td></tr>
<tr><td>4</td><td>Midterm Test</td><td>Written test</td><td>30%</td></tr>
<tr><td>5</td><td>Final Test</td><td>Written test</td><td>30%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), University LMS, Projector, Video Conference Software: Zoom Meeting, Multisim</td></tr>
<tr><td>Literatures :</td><td>

Alexander, Charles K. & Sadiku, Mathew N.O., 2013, Fundamental of Electric Ciscuits, 5th Edition, New York: McGraw-Hill.
Dorf, Richard C. & Svoboda, James A., 2014, Introduction to Electric Circuits, 9th Edition, United States: Wiley.
Schultz, Mitchel E., 2011, Grob’s Basic Electronics, 11th Edition, New York: McGra-Hill.
Malvino, Albert Paul & Bates, David J., 2016, Electronic Principles, 8th Edition, New York: McGraw-Hill.

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

Electronics Practicum

Module Name :	Electronics Practicum	
Module Level :	Undergraduate	
Code :	32253021	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	3rd	
Module coordinator :	Upik Rahma Fitri, M.Pd.	
Lecturer(s) :	Upik Rahma Fitri, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	50 minutes	40
Workload	Total workload of this course 45,3 hours (1,5 ECTS) per semester which consist of 13,34 hours (0,44 ECTS) classroom activity, 16 hours (0,53 ECTS) structured task, and 16 hours (0,53 ECTS) per semester.	
Credit points :	1,5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO88. Mastering and skilled in operate measuring instruments in the field of electronics. CLO89. Mastering and skillful in analyzing RC differential and integrating circuits. CLO90. Mastering and skilled in analyzing low pass filter circuit and high pass filter high pass filter. CLO91. Master and skillful in analyzing diode circuits. CLO92. Mastering and skilled in analyzing transistor circuit.Able to plan advanced physics experiments.	
Content :	1. Data Processing • Data Processing • Regression 2. Introduction to Electric Circuit • Installing Multisim • Electric Circuit • Devices 3. Module 1 Operation of Measuring Instruments • Multimeter • Oscilloscope • Signal Generator 4. Module 2 Differential and RC Integrators • RC Differential Circuit	

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

RC Integral circuit

5. Module 3 Low pass filter

Low pass filter

6. Module 4 High pass filter

High pass filter

7. Module 5 Diode Characteristics

Diode Characteristics

8. Module 6 Wave Rectifiers

Half Wave Rectifier
Full Wave Rectifier

9. Module 7 Transistor Circuits: Grounded Base

Base Transistor Circuit

10. Grounded Module 8 Transistor Circuit: Emitter Grounded

Emitter Transistor Circuit PublishedPlanck's constant measurement

</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Individual Assignment</td><td>Written test</td><td>15%</td></tr>
<tr><td>2</td><td>Practicum Report</td><td>Written test</td><td>40%</td></tr>
<tr><td>3</td><td>Group Presentation</td><td>Discussion</td><td>15%</td></tr>
<tr><td>4</td><td>Final Practicum Exam</td><td>Practicum and written test</td><td>30%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon Laptop/Computer (E-Learning Study Program), Project Board / Circuit Board / Board PCB Board, Video Conference Software: Zoom Meeting and Ms Team, Multisim 13, Office, Gitlab repository, Git Bash Terminal</td></tr>
<tr><td>Literatures :</td><td>

Alexander, Charles K. & Sadiku, Mathew N.O., 2013, Fundamental of Electric Ciscuits, 5th Edition, New York: McGraw-Hill.
Dorf, Richard C. & Svoboda, James A., 2014, Introduction to Electric Circuits, 9th Edition, United States: Wiley.
Schultz, Mitchel E., 2011, Grob’s Basic Electronics, 11th Edition, New York: McGraw-Hill.
Malvino, Albert Paul & Bates, David J., 2016, Electronic Principles, 8th Edition, New York: McGraw-Hill.

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

Classical Mechanics

Module Name :	Clasical Mechanics	
Module Level :	Undergraduate	
Code :	32255014	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	3rd	
Module coordinator :	Dr.rer.nat. Bambang Heru Iswanto, M.Si	
Lecturer(s) :	Dr.rer.nat. Bambang Heru Iswanto, M.Si Dr. Hadi Nasbey, S.Pd., M.Si Dewi Muliyati, S.Pd., M.Si, M.Sc Riser Fahdiran, M.Si. Dr.Firmanul Catur Wibowo, M.Pd. Upik Rahma Fitri, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	200 minutes	40
Workload	Total workload of this course 181,3 hours (6 ECTS) per semester which consist of 53,4 hours (1.76ECTS) classroom activity, 64 hours (2,12 ECTS) structured task, and 64 hours (2,12 ECTS) per semester.	
Credit points :	6 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO93. Describe the concepts of fundamental concepts of vectors and apply them to explain particle motion CLO94. Apply basic concepts of Newtonian mechanics to explain particle motion Newtonian mechanics to explain straight motion of particles CLO95. Analyze oscillatory motion and the energy that accompanies it CLO96. Analyze general motion in three CLO97. Analyze the motion of bodies by the in planetary orbital systems CLO98. Analyze the dynamics of particle systems CLO99. Identify the motion of bodies in non-inertial reference systems CLO100. Mechanics of Objects CLO101. Apply the concepts of fundamental concepts of Lagrangian mechanics to particle dynamics	
Content :	1. Vectors and Kinematics	

	• Vectors and their derivatives • Vector and scalar products • Particle position vectors • Velocity and acceleration in cartesian and polar coordinate systems • Velocity and acceleration in cylindrical and spherical coordinate systems 2. Newtonian Mechanics • Newtonian Mechanics and its scope • Newton's Laws of Motion • Straight motion by a constant force • Position-dependent force • Velocity-dependent force • Terminal velocity 3. Oscillatory Motion • Harmonic motion • Energy in harmonic motion • Damped oscillatory motion • Resonance • Mechanical analogy to the electric oscillator 4. General motion of particles • General principles of motion • Principle of effort • Conservative force • Split-type forces: bullet motion • Harmonic oscillator in three dimensions 5. Central Force • Gravitational force • Potential energy in a gravitational field • Conservation theorem • Equation of motion of particles in the central force • Planetary orbits in the central force • Kepler's laws of plane motion 6. Dynamics of Particle Systems • Linear momentum of systems • Angular momentum and kinetic energy of systems • Motion of two interacting bodies • Collisions 7. Non-Inertial Reference Systems • Motion of bodies in accelerated coordinate systems

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

Particle dynamics in coordinate systems rotating coordinate system

8. Mechanics of Rigid Bodies

Center of mass of rigid bodies
Moment of inertia of a body
Angular momentum of a rigid body

9. Lagrangian Mechanics

Variational principle
Generalized coordinate system
Lagrange equation of motion and the law of conservation conservation
Application of Lagrange formalism to coupled motion problems
Constrained forces: the concept of Lagrange multipliersFree harmonic oscillation, damped oscillation, forced oscillation and coupled oscillation.

</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Individual Assignment/Quiz</td><td>Written test</td><td>30%</td></tr>
<tr><td>2</td><td>Seminar</td><td>Presentation</td><td>35%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>35%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), University LMS, Projector, Video Conference Software: Zoom Meeting, Software according to the topic simulation</td></tr>
<tr><td>Literatures :</td><td>

Fowles G.R. dan Cassiday, G.L. (2005) Analytical Mechanics, 2nd Ed., Thomson Brooks Cole. Sumber Lainnya
Kleppner dan Kolenkow (2014) An Introduction to Mechanics, 2nd Ed., Cambridge University Press.
Thornton, S.T., dan Marion, J. B. (2004): Classical Dynamics of Particles & Systems, 5th Edition, Thomson Brooks Cole

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

Modern Physics

Module Name :	Modern Physics
Module Level :	Undergraduate
Code :	32255013
Sub-heading, if applicable :	
Classes, if applicable :	
Semester :	3rd
Module coordinator :	Dr. Esmar Budi, M.T.
Lecturer(s) :	Dr. Esmar Budi, M.T. Fauzi Bakri, M.Si Dr. Hadi Nasbey, S.Pd., M.Si
Language :	Indonesian
Classification within the curriculum :	Compulsory course
Type of Teaching	Contact hours per week during the semester: Class Size
Lecture (Expository, discussion, exercise)	150 minutes: 40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.
Credit points :	4,5 ECTS
Prerequisite course(s) :	-
Course Outcomes :	After taking this course the student have ability to : CLO1. Able to study the concepts and theories of modern physics. CLO2. Able to apply the concepts and theories of Modern Physics to solve atomic physics and relativity problems.

	CLO3. Able to design Modern Physics experiments. Able to produce vibration system design.
Content :	1. Weaknesses of Classical Physics ● Classical Physics Review ● The weaknesses of classical physics in the concept of space-time ● Weaknesses of classical theory in the concept of particle statistics 2. Special Theory of Relativity ● Classical relativity ● Michelson-Morley experiment ● Einstein's postulates ● Lorentz transformation 3. Particle like nature of radiation Electromagnetic ● Review of electromagnetic waves ● Photoelectric effect ● Thermal radiation ● Compton effect 4. Wave nature of particles. ● De'Broglie hypothesis and evidence Experiment ● Uncertainty relationship in classical ● Heisenberg uncertainty ● Wave packet 5. Schrodinger equation ● Wave properties on the boundary plane ● Schrodinger equation ● Applications of Schrodinger Equation ● Simple harmonic oscillator 6. Atomic Model ● Basic properties of atoms ● Scattering and Thomson Model ● Rutherford's atomic nucleus ● Line spectra ● Bohr's Atomic Model ● Frank-Hertz experiment 7. Many-electron atoms ● Pauli exclusion principle ● Electronic states in atoms many electrons ● Optical transitions ●
Study/exam achievements:	Examination are conducted as unit test, as following

<table>
<tr><td></td><td>
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Individual Assignment</td><td>Written test</td><td>10%</td></tr>
<tr><td>2</td><td>Group Paper</td><td>Presentation</td><td>10%</td></tr>
<tr><td>3</td><td>Group Presentation</td><td>Discussion</td><td>10%</td></tr>
<tr><td>4</td><td>Midterm Test</td><td>Written test</td><td>35%</td></tr>
<tr><td>5</td><td>Final Test</td><td>Written test</td><td>35%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), University LMS, Office, Zoom Meeting</td></tr>
<tr><td>Literatures :</td><td>

Thomton, S. T. and Rex, A. Modern Physics for Scientists and Engineers 3rd Edition. Singapore: Thomson, 2006. (Thomton and Rex)
Krane, K. Modern Physics 2nd Edition. New York: John Wiley & Sons, 1996. (Krane)
Beiser, A. Concept of Modern Physics 5th Edition. New York: Mc Graw Hill, 1995. (Beiser)
Salasnich, L. (2022). Modern Physics: Introduction to Statistical Mechanics, Relativity, and Quantum Physics. Springer Nature.
Salasnich, L., & Salasnich, L. (2017). The Origins of Modern Physics. Quantum Physics of Light and Matter: Photons, Atoms, and Strongly Correlated Systems, 1- 20.
Heilbron, J. L. (2022). Elements of early modern physics. Univ of California Press.
Planck, M. (2022). The universe in the light of modern physics. DigiCat

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

Modern Physics Practicum

Module Name :	Modern Physics Practicum	
Module Level :	Undergraduate	
Code :	32251021	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	3rd	
Module coordinator :	Fauzi Bakri, M.Si	
Lecturer(s) :	Fauzi Bakri, M.Si Dr. Hadi Nasbey, S.Pd., M.Si Dwi Susanti, M.Pd Upik Rahma Fitri, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	50 minutes	40
Workload	Total workload of this course 45,3 hours (1,5 ECTS) per semester which consist of 13,34 hours (0,44 ECTS) classroom activity, 16 hours (0,53 ECTS) structured task, and 16 hours (0,53 ECTS) per semester.	
Credit points :	1,5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO102. Able to plan advanced physics experiments. CLO103. Able to produce experimental designs of advanced physics phenomena.Understand the basic concepts of transistors and analyze transistor circuits transistors.	
Content :	1. Planck's constant measurement • Concept of photoelectric effect • Planck's constant measurement experiment planck constant • Data processing and calculation using the least-square method 2. Hall Effect Experiment • Hall Effect Concept • Hall effect measurement experiment • Data processing and calculation using the least-square method 3. Balmer series experiment • Balmer series concept • Balmer series measurement experiment	

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

Data processing and calculation using the theory of perversion

4. Thomson experiment

Thomson experiment concept
Thomson experiment experiment
Data processing and calculation using the least-square method

5. Milikan drops experiment

Concept of milikan drops
Millipede drip experiment
Data processing and calculation using the theory of perversion

6. Interferometer experiment

Interferometer concept
Interferometer experiment
Data processing and calculation using the theory of misdirection

</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Initial Report</td><td>Written test</td><td>35%</td></tr>
<tr><td>2</td><td>Final Report</td><td>Written test</td><td>35%</td></tr>
<tr><td>3</td><td>Attitude</td><td>Discussion</td><td>10%</td></tr>
<tr><td>4</td><td>Presentation skills</td><td>Argumentation</td><td>15%</td></tr>
<tr><td>5</td><td>Final Practicum Exam</td><td>Practicum</td><td>15%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, University LMS, Projector, Video Conference Software: Zoom Meeting, Tools and Materials Laboratory, Software according to laboratory equipment</td></tr>
<tr><td>Literatures :</td><td>

Tim Dosen Fisika Modern Jurusan Fisika FMIPA UNJ, “Panduan Praktikum Fisika Modern”, Laboratorium Fisika Modern, Jurusan Fisika FMIPA, UNJ, 2018.
Thomton, S. T. and Rex, A. Modern Physics for Scientists and Engineers 3rd Edition. Singapore: Thomson, 2006. (Thomton and Rex)
Halliday, Resnick, Jearl Walker, “Principles of Physics 9th”, John Wiley, 2011 .
da Silva, G. D. S. F., & Villani, A. (2021). The Physics Teaching Practice course and the student-teachers’ activity in the beginning of the supervised practicum at schools+. Caderno Brasileiro de Ensino de Física, 38(3), 1561-158

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

Mathematical Physics II

Module Name :	Mathematical Physics II	
Module Level :	Undergraduate	
Code :	32254044	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	4th	
Module coordinator :	Dr. Teguh Budi Prayitno, M.Si	
Lecturer(s) :	Dr. Teguh Budi Prayitno, M.Si Prof. Mangasi Alion Marpaung, M.Si	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	200 minutes	40
Workload	Total workload of this course 181.3 hours (6 ECTS) per semester which consist of 90.6 hours (3 ECTS) classroom activity, 45.3 hours (1.5 ECTS) structured task, and 45.3 hours (1.5 ECTS) per semester.	
Credit points :	6 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the students have ability to: CLO104. Understand the concept of scalar and vector field. CLO105. Understand the periodic function and its applications. CLO106. Seek for the solution of partial differential equation with appropriate boundary conditions. CLO107. Understand the function of complex variables and its applications.	
Content :	1. Operators in Curvilinear Coordinates (2 weeks) • Operator in polar coordinates • Operator in cylindrical coordinates • Operator in spherical coordinates 2. Vector Analysis I (2 weeks) • Vector derivative • Scalar and vector fields • Divergence and curl 3. Vector Analysis II (2 weeks) • Line integral • Green theorem • Divergence and Stokes theorems	

<table>
<tr><td></td><td>4. Fourier Series (1 week)
• Periodic functions
• Definition of Fourier series
• Sine and cosine Fourier series
5. Fourier Transforms (2 weeks)
• Definition of Fourier integral and its inverse integral
• Sine and cosine Fourier integral
• Application of Fourier integral
6. Partial Differential Equations (3 weeks)
• Laplace equation
• Diffuse equation
• Wave equation
7. Functions of Complex Variables (2 weeks)
• Analytical functions
• Contour integral
• Harmonic functions</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as follows
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Projects Assignment</td><td>Exploring and discussing some problem in mathematical physics</td><td>50%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>1. M. L. Boas (2006) Mathematical Methods in the Physical Sciences, 3rd Edition, John Wiley & Sons Inc.
2. E. Kreyszig (2006) Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons Inc.
3. G. B. Arfken and H. J. Weber (2005) Mathematical Methods for Physicists, 6th Edition, Elsevier Academic Press.</td></tr>
</table>

Wave

Module Name :	Waves	
Module Level :	Undergraduate	
Code :	32255034	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	4th	
Module coordinator :	Riser Fahdiran, M.Si	
Lecturer(s) :	Riser Fahdiran, M.Si Lari Andres Sanjaya, M.Pd	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	200 minutes	40
Workload	Total workload of this course 181,3 hours (6 ECTS) per semester which consist of 53,4 hours (1.76ECTS) classroom activity, 64 hours (2,12 ECTS) structured task, and 64 hours (2,12 ECTS) per semester.	
Credit points :	6 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO108. Able to produce vibration system design. CLO109. Able to produce a wave generating system design. CLO110. Able to produce appropriate waves Able to apply basic electrical concepts to solve related technology problems.	
Content :	1. Oscillations • Free harmonic oscillations, damped oscillations, forced oscillations and oscillations, damped oscillations, forced oscillations and coupled oscillations. oscillations. • Formulation of general oscillation equations free, damped, forced and coupled. • Analysis of simple harmonic oscillations, damped oscillations, forced oscillations and coupled oscillations in various applications. 2. Traveling Wave • Physical concept of traveling wave. • Formulation of general equation of of mechanical waves. • Definition of mechanical wave transverse	

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Reflected and transmitted waves Free harmonic oscillation, damped oscillation, forced oscillation and coupled oscillation.
Analysis of wave superposition and wave group.
Stationary wave analysis
Definition of mechanical wave longitudinal
Analysis of wave propagation in solid, search and gas medium.
Analysis of mechanical wave applications running.
Waves on transmission lines.
Two- and three-dimensional waves

3. Electromagnetic waves

Maxwell's equations
General formulation of waves electromagnetic waves
Formulation of wave propagation in a medium.
Reflection and transmission of electromagnetic waves.

4. Superposition of waves

Fourier and delta dirac rule rules in wave analysis.
Amplitude and frequency modulation of of waves.
Analysis of superposition application of waves.

5. Interference and diffraction

Definition of diffraction and interference of of electromagnetic waves.
Diffraction and interference of electromagnetic waves electromagnetic waves in a single slit slit.
Diffraction and interference of electromagnetic waves electromagnetic waves in a double slit.
Diffraction and interference of electromagnetic waves electromagnetic waves in multiple slits multiple slits.
Analysis of applications of diffraction and wave interference.

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<tr>
<td>Study/exam achievements:</td>
<td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Individual Assignment</td><td>Written test</td><td>10%</td></tr>
<tr><td>2</td><td>Group Paper</td><td>Presentation</td><td>10%</td></tr>
<tr><td>3</td><td>Group Presentation</td><td>Discussion</td><td>10%</td></tr>
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<tr><td></td><td><table>
<tr><td>4</td><td>Midterm Test</td><td>Written test</td><td>35%</td></tr>
<tr><td>5</td><td>Final Test</td><td>Written test</td><td>35%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon Laptop/Computer (E-Learning Study Program), Projector, Video Conference Software Projector: Zoom Meeting/Ms Team, Office Software Reference Book</td></tr>
<tr><td>Literatures :</td><td>
A.P. French (1971) Vibration and waves: the MIT introductory physics series. W.W. Norton & Company.inc. New York.
Hayden, H.W. 1965. The structure and Properties of Material. John Wiley and sons, Inc
Tjia May On. (1994). Gelombang. Solo: Dabara Publisher (Jurusan Fisika ITB)
Hirose, A., Lonngren, K.E. (1985). Introduction to Wave Phenomena. New York: John Wiley & sons
Subrahmanyam, N., Lal, B. (1994). Wave and Oscillation. 2nd ed. New Delhi: Vikas Publishing
Pratama, M., Umiatin, Taryudi (2020). Studi Karakteristik Kavitasi Larutan Menggunakan Metode Gelombang Berdiri Ultrasonik, Prosiding Seminar Nasional Fisika (E-Journal) SNF2020
</td></tr>
</table>

Electromagnetic

Module Name :	Electromagnetic	
Module Level :	Undergraduate	
Code :	32252012	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	4th	
Module coordinator :	Umiatin, M.Si	
Lecturer(s) :	Umiatin, M.Si Riser Fahdiran, M.Si	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	200 minutes	40
Workload	Total workload of this course 181,3 hours (6 ECTS) per semester which consist of 53,4 hours (1.76ECTS) classroom activity, 64 hours (2,12 ECTS) structured task, and 64 hours (2,12 ECTS) per semester.	
Credit points :	6 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO111. Able to apply basic electrical concepts to solve related technology problems. CLO112. Able to apply basic concepts of magnetism to solve related technological problemsFind exact solution of mathematical problems.	
Content :	1. Vector Analysis • Vectors • Gradient • Divergence • Curl • Cylindrical coordinates • Spherical coordinates 2. Electrostatics • Electrostatics: Point charge, Law of Coulomb's Law, Continuous Charge • Electric Field : Electric field by point charge, electric field by continuous charge • Gauss's Law: Flux and flux density electricity, Gauss's Law, Application Gauss's Law	

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

Electric Potential and Energy: Potential electric potential of a point charge, electric potential of continuous energy, electric potential and energy, capacitors and capacitance, energy in a capacitor and energy density
Conductors in an electrostatic field

3. Potential Determination Techniques

Shadow Method
Variable Separation Method
Multipole Expansion
Scalar potential of Multipole Expansion
Dipole electric field

4. Electrostatic Field in Materials

Dielectrics and conductors
Continuity equation
Meeting of bound and free charges
Electric field in dielectric materials
Classification of dielectrics
Energy in capacitors with dielectric materials

5. Magnetostatics

Lorentz force
Biot-Savart Law
Divergence and Rotation of B
Ampere's Law
Magnetic Potential Vector

6. Magnetostatic Field in Materials

Magnetization
Magnetic field in magnetized materials magnetized materials linear magnetic materials and non linie Free harmonic oscillation, damped oscillation, forced oscillation and coupled oscillation.

</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Task</td><td>Written test</td><td>10%</td></tr>
<tr><td>2</td><td>Paper</td><td>Presentation</td><td>20%</td></tr>
<tr><td>3</td><td>Midterm Test</td><td>Written test</td><td>30%</td></tr>
<tr><td>4</td><td>Final Test</td><td>Written test</td><td>30%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (E-Learning Study Program), Projector, Video Conference Software: Zoom Meeting / MS Team, Reference Books, Office Software.</td></tr>
<tr><td>Literatures :</td><td>1. H.J. Pain (2005) The Physics of Vibrations and Waves (6th edition), Wiley.</td></tr>
</table>

	2. George C. King. (2009). Vibrations and waves, West Sussex: John Wiley and sons. 3. E. Hecht (2002) Optics. 4th edition. Addison Wesley. 4. E. Budi (2013) Gelombang. Remaja Rosdakarya B. 5. A.P. French (1971) Vibration and waves: the MIT introductory physics series. W.W. Norton & Company.inc. New York 6. Hayden, H.W. 1965. The structure and Properties of Material. John Wiley and sons, Inc 7. Tjia May On. (1994). Gelombang. Solo: Dabara Publisher (Jurusan Fisika ITB) 8. Hirose, A., Lonngren, K.E. (1985). Introduction to Wave Phenomena. New York: John Wiley & sons 9. Subrahmanyam, N., Lal, B. (1994). Wave and Oscillation. 2nd ed. New Delhi: Vikas Publishing [6] Pratama, M., Umiatin, Taryudi (2020). Studi Karakteristik Kavitasi Larutan Menggunakan Metode Gelombang Berdiri Ultrasonik, Prosiding Seminar Nasional Fisika (E-Journal) SNF2020

Computational Physics

Module Name :	Computational Physics	
Module Level :	Undergraduate	
Code :	32251013	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	4st	
Module coordinator :	Drs. Andreas Handjoko Permana, M.Si.	
Lecturer(s) :	Drs. Andreas Handjoko Permana, M.Si. Dewi Muliyati, S.Pd., M.Si, M.Sc.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.	
Credit points :	4.5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO113. Describe programming and computing in physics and the limitations of computers in mathematical calculations. CLO114. Analyze numerical methods used to solve non-linear equations. CLO115. Analyze elimination, decomposition and iteration methods and apply them in solving systems of linear equations to solve physics problems. CLO116. Analyze numerical differential methods and apply them in solving ordinary differential equations in physics problems such as radioactive decay and capacitors. CLO117. Formulate ordinary differential equations to numerically solve parabolic motion and simple harmonic motion problems. CLO118. Analyze numerical integration methods to apply them in solving integral problems. CLO119. Analyze Monte-Carlo method and its application in numerical integral solving and statistical simulation. CLO120. Apply linear and polynomial interpolation methods and curve fitting of measurement data to data analysis problems. CLO121. Apply interpolation and regression methods to data analysis problems.	

	CLO122. Analyze the discrete Fourier transform and its application to periodic and non-periodic data analysis. CLO123. Analyze the finite difference method and apply it in solving elliptic partial differential equations such as heat distribution physics problems.
Content :	1. Modeling and Error Analysis, Case: Enzyme Kinematics 1.1 Mathematical Modeling and Engineering Problem Solving 1.2 Approximations and Error Analysis 1.3 Case: Enzyme Kinematics 2. Roots of Equations, Case: Bernoulli Equation 2.1 Bracketing Method 2.2 Open Method 2.3 Case: Bernoulli Equation 3. Linear Algebraic Equations, Case: Currents and Voltages in Resistor Circuits 3.1 Small Numbers of Equations 3.2 Naive Gauss Elimination 3.3 Techniques for Improving Solutions 3.4 Another Techniques 3.5 Case: Currents and Voltages in Resistor Circuits 4. Interpolation & Curve Fitting, Case: Electrostatic Force System 4.1 Polynomials Interpolation 4.2 Spline Interpolation 4.3 Least-Squares Fit Outline Image Fitting, Linear Regression Fitting 4.4 Curve Fitting Linear Regression 4.5 Case: Electrostatic Force System 4.6 Case: Outline Image 4.7 Case: Curve Fitting 5. Numerical Differentiation, Case: Kinematics 5.1 Finite Difference Approximations 5.2 Richardson Extrapolations 5.3 Case: Kinematics 6. Numerical Integration, Case: Kinematics 6.1 The Trapezoidal Rule 6.2 Simpson's Rules 6.3 Another Techniques 6.4 Case: Kinematics

<table>
<tr><td></td><td>7. Optimization
7.1 Introduction to optimization

8. Ordinary Differential Equations, Case: Transient Current for an Electric Circuit
8.1 Euler’s Method
8.2 Runge Kutta Methods
8.3 Case: Transient Current

9. Partial Differential Equations,
Case: Heat Transfer
9.1 Euler’s Method
9.2 Runge Kutta Methods
9.3 Case: Heat Transfer</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based Assignment</td><td>Exploring and discussing some problem in mathematics</td><td>50%</td></tr>
<tr><td>2</td><td>Task</td><td>6 individual assignments</td><td>20%</td></tr>
<tr><td>3</td><td>Midterm Test</td><td>Written test</td><td>10%</td></tr>
<tr><td>4</td><td>Final Test</td><td>Written test</td><td>10%</td></tr>
<tr><td>5</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>1. Steven Chapra, Raymond Canale - Numerical Methods for Engineers (7th edition) - McGraw-Hill (2014)
2. Rubin H. Landau, Manuel J Pérez, Cristian C. Bordeianu - Computational Physics: Problem Solving with Python - Wiley-VCH (2015)
3. Benjamin A. Stickler, Ewald Schachinger (auth.) - Basic Concepts in Computational Physics - Springer International Publishing (2016)
4. Franklin J. - Computational Methods for Physics - Cambridge University Press (2013)
5. Piotr Kulczycki, László T. Kóczy, Radko Mesiar, Janusz Kacprzy. Advances in Intelligent Systems and Computing 462. - Information Technology and Computational Physics - Springer International Publishing
6. B H Iswanto, 2022, Workshop Pengembangan Alat Peraga Berbasis Smart Digital Devices (SDD) untuk Peningkatan Kompetensi Guru Fisika Jakarta Timur</td></tr>
</table>

	7. B H Iswanto, 2020, Pelatihan Pemrograman Simulasi Komputer Untuk Guru Fisika Di Kabupaten Bogor 8. M Delina, 2022, Simulasi Gerakan Droplet Virus Covid-19 dengan Metode Monte Carlo 9. M Delina, 2021, Simulasi pergerakan droplet virus Covid-19 dengan Metode Monte Carlo 10. M Delina, 2020, Sisi Sebaran Abu Vulkanis Dengan Metode Puff Lagrangian Studi Kasus Erupsi Gunung Tangkuban Perahu

Computational Physics Practicum

Module Name :	Computational physics practicum	
Module Level :	Undergraduate	
Code :	32152303	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	4st	
Module coordinator :	Dewi Muliyati, S.Pd., M.Si, M.Sc.	
Lecturer(s) :	Drs. Andreas Handjoko Permana, M.Si. Dewi Muliyati, S.Pd., M.Si, M.Sc.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	50 minutes	40
Workload	Total workload of this course 45,3 hours (1,5 ECTS) per semester which consist of 13,34 hours (0,44 ECTS) classroom activity, 16 hours (0,53 ECTS) structured task, and 16 hours (0,53 ECTS) per semester.	
Credit points :	1.5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO124. Understand the basic concepts of programming, modeling, computation, and system simulation. CLO125. Analyze the problem of solving non-linear equations and systems of linear equations with numerical methods. CLO126. Analyze the Monte-Carlo method and its application in numerical integral solving and statistical simulation. CLO127. Analyze data processing and data analysis with interpolation, regression, transformation, and finite difference methods.	
Content :	1. Modeling and Error Analysis 1.1 Mathematical Modeling and Engineering Problem Solving 1.2 Approximations and Error Analysis 1.3 IDE (Jupyter Notebook) 2. Modul-1 Bracket Method for Nonlinear Equations Problem: Semiconductor 2.1 Bisection Method 2.2 False Position Method	

<table>
<tr><td></td><td>3. Modul-2 Open Method for Nonlinear Equations
Problem: Mechanics
3.1 Newton Raphson Method

4. Modul-3 Linear Algebraic Equations
4.1 Naive Gauss Elimination
4.2 Gauss-Jordan Technique

5. Modul-4 Interpolation
5.1 Polynomials Interpolation
5.2 Newton Interpolation
5.3 Project-1

6. Modul-5 Regression
6.1 Linear Regression

7. Modul-6 Numerical Differentiation
7.1 The Trapezoidal Rule
7.2 Simpson’s Rules

8. Modul-7 Numerical Integration
8.1 Finite-Methods

9. Optimization in Physics Problem
9.1 Optimization

10. Modul-8 Ordinary Differential Equation – Euler Method
10.1 Euler’s Method
10.2 Runge Kutta Methods

11. Modul-9 Ordinary Differential Equation – Runge-Kutta Method
11.1 Euler’s Method
11.2 Runge Kutta Methods

2. Physics Problem using Partial Differential Equations
12.1 Heat Distribution
12.2 Wave Equation</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Project Based Learning</td><td>Non-test in the form of a report, Preliminary Report, Final Report</td><td>60%</td></tr>
</table></td></tr>
</table>

	2	Task	Error Analysis and Optimasi	10%
	3	Final Test	UAP	20%
	4	Attendance	Presence list	10%
Media :	Computer/laptop, internet, projector.			
Literatures :	1. Steven Chapra, Raymond Canale - Numerical Methods for Engineers (7th edition) - McGraw-Hill (2014) 2. Rubin H. Landau, Manuel J Pérez, Cristian C. Bordeianu - Computational Physics: Problem Solving with Python - Wiley-VCH (2015) 3. Benjamin A. Stickler, Ewald Schachinger (auth.) - Basic Concepts in Computational Physics - Springer International Publishing (2016) 4. Franklin J. - Computational Methods for Physics - Cambridge University Press (2013) 5. Piotr Kulczycki, László T. Kóczy, Radko Mesiar, Janusz Kacprzy. Advances in Intelligent Systems and Computing 462. - Information Technology and Computational Physics - Springer International Publishing 6. Bartels, S. (2015). Numerical methods for nonlinear partial differential equations (Vol. 47). Berlin: Springer. 7. Folland, G. B. (2020). Introduction to partial differential equations. In Introduction to Partial Differential Equations. Princeton university press. 8. Rabczuk, T., Ren, H., & Zhuang, X. (2019). A nonlocal operator method for partial differential equations with application to electromagnetic waveguide problem. Computers, Materials & Continua 59 (2019), Nr. 1. 9. Nytrebych, Z., Il'Kiv, V., Pukach, P., & Malanchuk, O. (2018). On nontrivial solutions of homogeneous Dirichlet problem for partial differential equations in a layer. Kragujevac Journal of Mathematics, 42(2), 193-207. 10. Samaniego, E., Anitescu, C., Goswami, S., Nguyen-Thanh, V. M., Guo, H., Hamdia, K., ... & Rabczuk, T. (2020). An energy approach to the solution of partial differential equations in computational mechanics via machine learning: Concepts, implementation, and applications. Computer Methods in Applied Mechanics and Engineering, 362, 112790. 11. B H Iswanto, 2022, Workshop Pengembangan Alat Peraga Berbasis Smart Digital Devices (SDD) untuk Peningkatan Kompetensi Guru Fisika Jakarta Timur 12. B H Iswanto, 2020, Pelatihan Pemrograman Simulasi Komputer Untuk Guru Fisika Di Kabupaten Bogor			

	13. M Delina, 2022, Simulasi Gerakan Droplet Virus Covid-19 dengan Metode Monte Carlo 14. M Delina, 2021, Simulasi pergerakan droplet virus Covid-19 dengan Metode Monte Carlo 15. M Delina, 2020, Sisi Sebaran Abu Vulkanis Dengan Metode Puff Lagrangian Studi Kasus Erupsi Gunung Tangkuban Perahu

Quantum Physics

Module Name :	Quantum Physics	
Module Level :	Undergraduate	
Code :	32256033	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	5th	
Module coordinator :	Dr. Teguh Budi Prayitno, M.Si	
Lecturer(s) :	Dr. Teguh Budi Prayitno, M.Si Fauzi Bakri, M.Si	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.	
Credit points :	4,5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO128. Able to produce quantum formulations using physics concepts. CLO129. Able to produce a formulation of the state function of a quantum.	
Content :	1. The failure of the concepts of Classical Mechanics in explaining some phenomena Physics • Stefan Boltzman's Law • Wien's Shift Law • Classical Model: Rayleigh and Jean and Wien • Plank Model 2. Wave and particle dualism • Wave properties of particles • De Broglie hypothesis • Heisenberg's uncertainty 3. Wave functions, probabilities, and operators • Equations and wave functions • Interpretation of probability • Normalization calculation • Energy operators • Momentum operator 4. Schrodinger equation	

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Schrodinger equation
Free particle
Particle in a box

5. Eigenvalues, eigenfunctions, and Schrodinger Equation time-dependent/free Schrodinger Equation

Eigenvalues and eigenfunctions
time-dependent Schrodinger equation time.
Time-free Schrodinger equation time

6. One dimensional potential, barrier potential, and harmonic oscillator

One-dimensional potential
Barrier potential
Harmonic oscillator

7. Hamiltonian operators and vector spaces

Hamiltonian operators
Vector spaceData Processing

</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Individual Assignment</td><td>Written test</td><td>10%</td></tr>
<tr><td>2</td><td>Group Paper</td><td>Written test</td><td>10%</td></tr>
<tr><td>3</td><td>Group Presentation</td><td>Discussion</td><td>10%</td></tr>
<tr><td>4</td><td>Midterm Test</td><td>Written Test</td><td>35%</td></tr>
<tr><td>5</td><td>Final Test</td><td>Written Test</td><td>35%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), University LMS, Office, Zoom Meeting</td></tr>
<tr><td>Literatures :</td><td>

Giancoli, Douglas C. C. Physics: Principle with Applications 5th Edition. 2005. (Giancoli)
D. Haliday, R. Resnick, and J. Walker. Fundamental of Physics 7th Edition. 2005. (Dr. Haliday, Resnick and Walker)
Scheck, Florian. Quantum Physics. Springer: New York, 1965. (Scheck)
Stephen Gasiorowicz. Quantum Physics. 3rd, Wiley, 2003
Serway, R. A. and J. W. Jewett Jr. Physics for Scientists and Engineers with Modern Physics 6th Edition. 2004. (Serway and Jewett Jr)
Sutopo. Pengantar Fisika Kuantum. Malang: Jurusan Fisika FMIPA UM, 2005. (Sutopo)
Dereziński, J., & Gérard, C. (2013). Mathematics of quantization and quantum fields (p. 674). Cambridge University Press.

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

	8. Freire Jr, O., Bacciagaluppi, G., Darrigol, O., Hartz, T., Joas, C., Kojevnikov, A., & Pessoa Jr, O. (Eds.). (2022). The Oxford Handbook of the History of Quantum Interpretations. Oxford University Press.

Thermodynamics

Module Name :	Thermodynamics	
Module Level :	Undergraduate	
Code :	32255023	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	5th	
Module coordinator :	Fauzi Bakri, M.Si	
Lecturer(s) :	Fauzi Bakri, M.Si Dr. Esmar Budi, M.T	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.	
Credit points :	4,5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO130. Able to examine the concepts and theories of thermodynamics. CLO131. Able to apply the concepts and theories of thermodynamics to solve physics problems CLO132. Able to design thermodynamic experiments.Able to produce quantum formulations using physics concepts.	
Content :	1. Introduction to thermodynamic • Coordinates of thermodynamics Mathematics of thermodynamics (single and double variables of differential function, partial differential, exact differential) • Isobaric volume expansion coefficient, • Isotherms compressibility • Intensive and extensive variables • Dimension and unit • Open and closed system, isolated system • Energy forms • System's properties • Equilibrium state • Process and cycle • Mathematics of thermodynamics	

	2. Temperature and the zeroth law of thermodynamics • Thermal equilibrium • Concept of temperature, • Temperature measurement, • Thermometric quantities • The types of thermometers based on thermometric quantities • Temperature of ideal gas • Thermometer scale. 3. Properties of pure substances: • Pure substance • Phases and phase transformation • Phase transformation diagram of P-V-T 4. System and equation of state: • Thermodynamics equilibrium (mechanical, chemistry, phase and thermal equilibrium), • The state equation of several thermodynamics systems (systems of hydrostatic, paramagnetics, dielectric ,etc) • Determine the equation of state 5. Work: • External work • Internal work, • Quasi-static process • Work in changing system volume, • Diagram of P-V, • Work depend on path, g. calculation of work in quasi-static process, • Work in other various systems (stretched wire,reversible cell, dielectric and magnetic rod) 6. Heat and the first law of thermodynamics (closed system): • Introduction to the first law of thermodynamics . • Heat transfer, • Forms of mechanical works, • Concept of heat • Adiabatic work, • Function of internal energy, • Heat specific and heat transfer rate. • Analysis volume control of thermodynamics 7. Ideal and real Gas • The state of ideal and real gases • Compressibility fctors, • Internl energy of gas

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

Concept of ideal gas,
State equations of other thermodynamics system,
Determine gas constant at critical point
Determine experimental heat capacity of gas and quasistatic adiabatic

8. The second law of thermodynamics

Introduction to the second law of thermodynamics
Heat reservoir
Heat engine
Refrigerator engine and heat pump,
Formulation of the second law of thermodynamics and engine efficiency,
Analysis of the second law of thermodynamic on closed system
Application of the second law of thermodynamics in daily life

9. Entropy

The equation of Clausius Clapeyron
Entropy,
Principles of the entropy change
The change of entropy in various process
Diagram of T-S
Realtion of T dS in the first law of thermodynamics
Entropy change of pure substance, solid and liquid

10. Formulation in thermodynamics potential

Maxwell relation: Entalphy, Helmholtz, Gibbs
General relation for dU, dS, dH, dG, dF, Cv, and Cp, ΔH, ΔS, ΔU of gases

</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Student Activity</td><td>Based on CBL/PBL</td><td>50%</td></tr>
<tr><td>2</td><td>Assignment</td><td>Written test</td><td>10%</td></tr>
<tr><td>3</td><td>Midterm Test</td><td>Written Test</td><td>20%</td></tr>
<tr><td>4</td><td>Final Test</td><td>Written Test</td><td>20%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Laptop/Computer Epsilon (E-Learning Study Program), Projector, Video Conference Software Projector: Zoom Meeting and Ms Team, VOSviewer</td></tr>
<tr><td>Literatures :</td><td>1. Yunus A. Cengel and Michael Boles. Thermodynamics An Engineering Approach,2nd Edition, McGraw-Hill</td></tr>
</table>

	2. Mark W. Zemansky and Richard H.Dittman. Heat and Thermodynamics,6th Edition, McGraw-Hill. Translated by The Houw Liong. Kalor dan Termodinamika, terbitan ke-6, Penerbit Institut Teknologi Bandung (ITB). 3. Paul A Tipler. Physics for Scientiss and Engineers, 3rd Edition, Worth Publisher, Inc. translated by Lea Prasetio and Rahmad W Adi. Fisika untuk Sains danTeknik, Edisi ketiga, Jilid I, Erlangga 4. Fauzi Bakri, Esmar Budi, Fisika Termodinamika, LPP UNJ Press. 2005 5. Darmawan, Termodinamika, Penerbit FMIPA ITB. 6. Dimiski Hadi. Termodinamika. Depdiknas, Direktorat Jenderal Pendidikan Tinggi. 7. Fr ederick Reif, Fundamental of Statistical and Thermal Physics, McGraw-Hill, International Student Edition. 8. F.W. Sears and G.L. Salinger, Thermodinamics, Kinetic Theory, and Statistical Thermodinamics, Addison-Wesley

Introduction to Solid State Physics

Module Name :	Introduction to Solid State Physics	
Module Level :	Undergraduate	
Code :	1306600064	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	5^{th}	
Module coordinator :	Prof. Erfan Handoko, M.Si	
Lecturer(s) :	Prof. Erfan Handoko, M.Si Dr. Iwan Sugihartono, M.Si	
Language :	Bahasa Indonesia	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.3 ECTS) per semester which consist of 40 hours (1.3 ECTS) classroom activity, 48 hours (1.5 ECTS) structured task, and 48 hours (1.5 ECTS) per semester.	
Credit points :	4 ECTS	
Prerequisite course(s) :	Quantum Physics, Statistical Physics	
Course Outcomes :	After taking this course the student have ability to : CLO133. Demonstrate an understanding understanding of crystal structures: Describe and analyze the crystal structures of solids, including simple cubic, body-centered cubic, face-centered cubic, and other common crystal structures. Understand the relationships between crystal symmetry and physical properties. CLO134. Explain the principles of crystallography: Apply crystallographic principles to determine crystal symmetries, unit cells, lattice parameters, and crystal planes. Understand the Bragg's law and its application to X-ray diffraction. CLO135. Understand electronic band theory: Explain the concept of energy bands in solids, including valence and conduction bands. Describe the origin of band gaps and the distinction between conductors, insulators, and semiconductors. Analyze the effects of crystal symmetry and doping on electronic band structures. CLO136. Analyze lattice vibrations and phonons: Describe the behavior of lattice vibrations in solids using concepts of phonons. Understand the relationship between phonon properties, crystal structure, and thermal conductivity.	

	Interpret phonon dispersion relations and calculate specific heat capacities. CLO137. Explore electronic properties of solids: Investigate electronic transport phenomena, including electrical conductivity, Hall effect, and thermoelectric effects. Understand the concepts of charge carriers, carrier concentrations, and mobility in different solid-state materials. CLO138. Study magnetism and magnetic properties: Understand the principles of magnetism in solids, including ferromagnetism, antiferromagnetism, and paramagnetism. Analyze magnetic ordering, magnetic domains, and the effects of temperature and external fields on magnetic properties. CLO139. Investigate optical properties of solids: Analyze the behavior of light in solid-state materials, including reflection, absorption, and transmission. Understand the concept of bandgap and its role in determining the optical properties of semiconductors and insulators. Study optoelectronic devices and their applications. CLO140. Apply quantum mechanics to solid-state systems: Apply quantum mechanical principles to explain phenomena such as energy quantization, electronic states, and wave functions in solids. Understand the concept of energy bands and band theory as a manifestation of quantum mechanics in solid-state physics.
Content :	1. Introduction to solid state material structure (2 weeks) • Crystal structure and basic symmetry • Crystallography : Unit cells and lattice parameters • X-ray diffraction and bragg's law 2. Phonon in matters (2 weeks) • Lattice vibrations and thermal properties • Phonon dispersion relations • Electronic transport : conductivity and ohm's law • Carrier concentration mobility 3. Electronic structure in solid (5 weeks) • Energi band in solids : basics and band theory • Conductors, Insulators, and Semiconductors • Electronic band structures : Metal and Fermi Surfaces • Density of states and effective mass 4. Magnetism in solids (2 weeks) • Basic principle and magnetic ordering • Magnetics material classification : ferromagnetic, paramagnetic, diamagnetics 5. Special topics (2 weeks) • Superconductivity and Jossephson effect • Quantum hall effect

<table>
<tr><td></td><td>6. Nanostructure (2 weeks)
Nanoscale material : basic and properties
Nanomaterial synthesis and characterization techniques</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Projects Assignment</td><td>Material analysis and project report</td><td>50%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Power point presentation, textbook, learning management system (LMS)</td></tr>
<tr><td>Literatures :</td><td>Charles Kittel. 1996. Introduction to Solid State Physics, 6th Edition, John Wiley & Sons, Inc.
Omar, M.A. (1975). Elementary Solid State Physics: Principle and Applications. Addison Wesley Publishing company.
Ashcroft, N.W., Mermin, N.D. (1976). Solid State Physics. Sounders College Publishing.</td></tr>
</table>

Introduction to Nuclear Physics

Module Name :	Introduction To Nuclear Physics	
Module Level :	Undergraduate	
Code :	32256063	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	7th	
Module coordinator :	Fauzi Bakri, M.Si	
Lecturer(s) :	Fauzi Bakri, M.Si Dr. Anggara, M.Si.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.	
Credit points :	4,5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO141. Able to plan isotope-based experiments. CLO142. Able to produce isotopes. CLO143. Able to produce radioisotopes	
Content :	1. Structure and properties of nuclear properties • Nuclear transformation • Nuclear structure • Nuclear size and shape • Nuclear electric and magnetic moments • Nuclear forces • Binding energy Resiogiromagnetic proton neutron • Nuclear resonogromagnetics 2. Radioactivity • Quantity of radioactivity • Successive disintegration • Radioactivity balance • Radioactivity engineering 3. Nuclear radiation • Alpha decay • Beta decay • Gamma decay	

<table>
<tr><td></td><td>4. Nuclear reactions
Classification of nuclear reactions
Nuclear reaction mechanism
Utilization of nuclear technology</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Individual Assignment</td><td>Written Test</td><td>10%</td></tr>
<tr><td>2</td><td>Group Paper</td><td>Written Test</td><td>10%</td></tr>
<tr><td>3</td><td>Group Presentation</td><td>Discussion</td><td>10%</td></tr>
<tr><td>4</td><td>Midterm Test</td><td>Written Test</td><td>35%</td></tr>
<tr><td>5</td><td>Final Test</td><td>Written Test</td><td>35%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), Projector, Video Conference Software: Zoom Meeting and Ms Team, Reference book, PHET WEB</td></tr>
<tr><td>Literatures :</td><td>Jean-Louis Basdevant-James Rich-Michel Spiro, Fundamentals in Nuclear Physics, Springer, USA, 2004.
Kenneth S. Krane, Introduction Nuclear Physics, John Wiley & Sons, Inc. 1988 B.
A. Das and T. Ferbel, Introduction to Nuclear and Particle Physics, World Scientific, New Jersey, 2005. [R.R. Roy & B.P. Nigam, Nuclear Physics : Theory and Experiment, Wiley Eastern Limited, New New Delhi, 1979
Marsongkohadi, dkk. Pengantar Ilmu Pengetahuan dan Teknologi Nuklir, Batan, Jakarta 1978.
Lasijo, Fisika Inti, Batan-ITB, Bandung, 1978</td></tr>
</table>

Statistical physics

Module Name :	Statistical physics	
Module Level :	Undergraduate	
Code :	32256043	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	7th	
Module coordinator :	Dr. Anggara Budi Susila, M.Si.	
Lecturer(s) :	Dr. Anggara Budi Susila, M.Si. Dr. Hadi Nasbey, S.Pd., M.Si	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	150 minutes	40
Workload	Total workload of this course 136 hours (4.5 ECTS) per semester which consist of 40 hours (1.32 ECTS) classroom activity, 48 hours (1.59 ECTS) structured task, and 48 hours (1.59 ECTS) per semester.	
Credit points :	4,5 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO144. Students have an understanding of binomial and polynomial systems, probability distributions discrete and continuous, Poisson and Gauss equations, micro states, macro states, Maxwell-Boltzmann distribution, Bose-Einstein distribution, Fermi-Dirac distribution. Maxwell-Boltzmann distribution, Bose-Einstein distribution, Fermi-Dirac distribution.Able to examine the concepts and theories of thermodynamics.	
Content :	1. Distribution function and probability • Discrete Distribution Function • Discrete distribution function of binomial form • Discrete distribution function of polynomial form • Continuous distribution function • Probability of discrete distribution function • Probability of continuous distribution function • Poisson equation • Gauss equation 2. Thermodynamic coordinates and thermodynamic potential • Thermodynamic coordinates • Thermodynamic potential	

	• Gibbs paradox differential equation • Differential equation of enthalpy • Inner energy differential equation • Helmholtz energy function differential equation 3. Gas Kinetics Theory • Particle flux • Rate relationship with pressure and temperature • Deviations from the ideal nature of the equation of state: ✓ According to Clausius According to Van der Walls 4. Velocity and rate distribution of gas particles • Rate and velocity distribution according to Maxwell • Rate and velocity distribution according to MaxwellBoltzmann • Energy distribution • Energy equipartition principle • Thermal capacity at fixed volume • Thermal capacity at fixed pressure • Laplace's constant 5. Transport phenomenon • Collision cross section • Mean free path • Viscosity coefficient • Diffusion coefficient • Transport equation 6. Maxwell-Boltzmann statistics • Macro and micro states in the system • Maxwell-Boltzmann particle distribution • Partition function • Entropy and Helmholtz function in view of statistical mechanics 7. Bose-Einstein statistics (Bozon) • Bose-Einstein distribution • Blackbody radiance • Wien's shift law • Stefan-Boltzmann law 8. Fermi-Dirac statistics (fermions) • Fermi-Dirac distribution • Electrons in solids • Canonical ensemble • Microcanonical ensemble and its limitations • Canonical ensembles and non-ideal gases
Study/exam achievements:	Examination are conducted as unit test, as following

<table>
<tr><td></td><td>
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Assignment/Quizzes/Project</td><td>Written Test</td><td>20%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written Test</td><td>40%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written Test</td><td>40%</td></tr>
</table>
</td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Epsilon (Study Program E-Learning), University LMS, Projector, Video Conference Software: Zoom Meeting, Reference Book</td></tr>
<tr><td>Literatures :</td><td>

A.J. Pointon, An Introduction to Statistical Physics, Longman 1967.
F.W. Sears & G.L. Salinger, Thermodinamics Kinetic Theory and Statistical Thermodinamics, Addison Welley, New York, 1975
F. Reif, Fundamentals of Statistical and Thermal Physics, McGraw-Hill, Inc, 1985
A. Mikrajuddin, Fisika Statistik untuk Mahasiswa MIPA, Diktat Kuliah ITB, 2009.
M.G.V. Rosser, An Introduction to Statistical Physics, Chicester Brisbane, Toronto, New York, Elis Horwood Publisher.

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

Environmental Physics Education

Module Name :	Environmental Physics Education	
Module Level :	Undergraduate	
Code :	32259012	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	$5^{st}/6^{st}/8^{st}$	
Module coordinator :	Prof. Dr. Sunaryo, M.Si.	
Lecturer(s) :	Prof. Dr. Sunaryo, M.Si.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO145. Able to master the basic principles of physics, its development, and application comprehensively to reveal and explain various physical phenomena in nature CLO146. Able to solve Physics problems analytically, numerically, and experimentally CLO147. Able to apply basic mathematical principles and their applications in the field of Physics to model and describe various physical phenomena in nature CLO148. Able to solve physics problems logically - analytically with well-defined and procedural solutions CLO149. Able to master new scientific facts using the basic principles of Physics for community education	
Content :	1. Introduction 1.1. Macro Environment 1.2. Energy Exchange 1.3. Mass and Momentum Transport 1.4. Application of Transport Laws 2. Temperature 2.1. Role of Temperature 2.2. Atmospheric Characteristics and Temperature	

	2.3. Vertical Variation Modeling of Air Temperature 2.4. Changes in Ground Temperature with Depth and Time 2.5. Thermal Time 3. Environmental Humidity 3.1. Specification 3.2. Saturation Condition 3.3. Partial Saturation Condition 3.4. Atmospheric Water Vapor Density 3.5. Liquid Phase Water 3.6. Relationship between Liquid and Gas Phases of Water 4. Wind 4.1. Characteristics of Atmospheric Turbulence 4.2. Flux and Profile Equations 4.3. Wind within Canopy 5. Heat, Mass, and Momentum Transfer 5.1. Molecular Diffusion 5.2. Heat and Mass Transport Resistance 5.3. Free Convection 5.4. Molecular Transport 6. Sound Waves and Noise 6.1. Definition of Noise 6.2. Types of Noise 6.3. Sound Intensity Level 6.4. Effects of Noise on Humans 7. Organic and Non-organic Waste Management 7.1. Types of Organic Waste 7.2. Types of Non-organic Waste 7.3. Organic Waste Processing Cycle 7.4. Non-organic Waste Processing Cycle 8. Soil Physics, Flooding, and Earthquakes 8.1. Types of Soil 8.2. Physical Properties of Soil 8.3. Landslides 8.4. Study of Landslide Dynamics 8.5. Earthquakes 9. Atmosphere and Radiation 9.1. Structure and Composition of Earth's Atmosphere 9.2. Layers of Earth's Atmosphere 9.3. Photochemical Pollution

<table>
<tr><td></td><td>9.4. Aerosols
9.5. Ozone Layer
9.6. Global Warming
9.7. Physics Concept of Global Warming

10. Renewable Energy Sources
10.1. Wind Energy Potential and its Conversion into Electricity
10.2. Geothermal Energy
10.3. Types of Earth Resources and their Conversion into Electrical Energy</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based learning</td><td>Project Assessment (for group project assignments)</td><td>55%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Smartphone, Camera, Tripod/Other Support.</td></tr>
<tr><td>Literatures :</td><td>1. RPS matatakuliah Fisika Lingkungan
2. Nur’islamia, A. S., Indrasari, W., & Budic, E. KARAKTERISASI SENSOR PH TANAH DAN SENSOR KONDUKTIVITAS PADA RANCANG BANGUN SISTEM PENGUKURAN KUALITAS TANAH.
3. Sari, Z. A. K., Permana, H., & Indrasari, W. (2017). Karakterisasi Sensor Photodioda, DS18B20, Dan Konduktivitas Pada Rancang Bangun Sistem Deteksi Kekeruhan Dan Jumlah Zat Padat Terlarut Dalam Air. Spektra: Jurnal Fisika dan Aplikasinya, 2(2), 149-156.
4. Rukandar D. (2017). Pencemaran Air: Pengertian, Penyebab, dan Dampaknya. Jurnal Mimbar Hukum Vol.21, 1(23-24).
5. Jansen, Freddy dkk (2011). Tingkat Pencemaran Udara CO Akibat Lalu Lintas Dengan Model Prediksi Polusi Udara Skala Mikro.Jurnal Ilmiah Media Engineering. Vol 1, 2(119-126).
6. Kencanawati, C. I. 2017. Bahan Ajar Mata Kuliah: Akustik, Noise dan Material Penyerap Suara. Denpasar: Universitas Udayana.
7. Yulianto, Bambang & Darjati. 2017. Fisika Lingkungan. Jakarta: PPSDM Kemenkes RI.</td></tr>
</table>

	8. Andayani, M., Indrasari, W., & Iswanto, B. H. (2016, October). Kalibrasi Sensor Ultrasonik HC-SR04 sebagai Sensor Pendeteksi Jarak pada Prototipe Sistem Peringatan Dini Bencana Banjir. In PROSIDING SEMINAR NASIONAL FISIKA (E-JOURNAL) (Vol. 5, pp. SNF2016-CIP). 9. Sakinah, F., Indrasari, W., & Umiatin, U. (2022). PENGUKURAN KUALITAS AIR TERCEMAR LIMBAH MIKROPLASTIK BERDASARKAN PARAMETER FISIKA. PROSIDING SEMINAR NASIONAL FISIKA (E-JOURNAL), 10(1), FA-89. 10. Wirawan, R., Djamal, M., Hartono, A., Sanjaya, E., Indrasari, W., & RAMLI, R. (2012). Aplikasi Sensor Ultrasonik Untuk Pengukuran Getaran Frekuensi Rendah. 11. Purnomo, T. (2023). 4.2 Karakteristik Air. Pencemaran Lingkungan, 45.

Environmental Studies in Physics Learning

<table>
<tr><td>Module Name :</td><td colspan="2">Environmental Studies in Physics Learning</td></tr>
<tr><td>Module Level :</td><td colspan="2">Undergraduate</td></tr>
<tr><td>Code :</td><td colspan="2">32259012</td></tr>
<tr><td>Sub-heading, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Classes, if applicable :</td><td colspan="2"></td></tr>
<tr><td>Semester :</td><td colspan="2">5st/6st/8st</td></tr>
<tr><td>Module coordinator :</td><td colspan="2">Prof. Dr. Sunaryo, M.Si.</td></tr>
<tr><td>Lecturer(s) :</td><td colspan="2">Prof. Dr. Sunaryo, M.Si.</td></tr>
<tr><td>Language :</td><td colspan="2">Indonesian</td></tr>
<tr><td>Classification within the curriculum :</td><td colspan="2">Compulsory course</td></tr>
<tr><td>Type of Teaching</td><td>Contact hours per week during the semester</td><td>Class Size</td></tr>
<tr><td>Lecture (Expository, discussion, exercise)</td><td>100 minutes</td><td>40</td></tr>
<tr><td>Workload</td><td colspan="2">Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.</td></tr>
<tr><td>Credit points :</td><td colspan="2">3 ECTS</td></tr>
<tr><td>Prerequisite course(s) :</td><td colspan="2">-</td></tr>
<tr><td>Course Outcomes :</td><td colspan="2">After taking this course the student have ability to :
CLO150. Able to master the basic principles of the environment for learning
CLO151. Able to solve problems related to the environment for learning
CLO152. Able to master new scientific facts using the basic principles of environmental studies</td></tr>
<tr><td>Content :</td><td colspan="2">1. Understanding of the educational environment
2. The influence of the environment on education
3. Function of environment in education
4. The role of environment in education
5. Implementation of environmental knowledge for learning</td></tr>
<tr><td>Study/exam achievements:</td><td colspan="2">Examination are conducted as unit test, as following
<table>
<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
<tr><td>1</td><td>Case-based learning</td><td>Project Assessment (for group project assignments)</td><td>55%</td></tr>
<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
</table>

Media :	Laptop/Computer, Smartphone, Camera, Tripod/Other Support.
Literatures :	1. RPS matatakuliah Fisika Lingkungan 2. Nur'islamia, A. S., Indrasarib, W., & Budic, E. Characterization of Soil pH and Conductivity Sensors in the Design of Soil Quality Measurement System. 3. Sari, Z. A. K., Permana, H., & Indrasari, W. (2017). Characterization of Photodiode, DS18B20, and Conductivity Sensors in the Design of a System for Detecting Turbidity and the Amount of Dissolved Solids in Water. Spektra: Journal of Physics and Its Applications, 2(2), 149-156. 4. Jansen, Freddy et al. (2011). Levels of CO Air Pollution Due to Traffic with Micro-scale Air Pollution Prediction Model. Scientific Journal of Media Engineering. Vol 1, 2(119-126). 5. Kencanawati, C. I. 2017. Teaching Materials for Acoustics, Noise, and Sound Absorbing Materials. Denpasar: Udayana University. 6. Yulianto, Bambang & Darjati. 2017. Environmental Physics. Jakarta: PPSDM Ministry of Health of the Republic of Indonesia. 7. Andayani, M., Indrasari, W., & Iswanto, B. H. (2016, October). Calibration of HC-SR04 Ultrasonic Sensor as a Distance Detection Sensor in the Prototype of Early Warning System for Flood Disaster. In PROCEEDINGS OF THE NATIONAL SEMINAR ON PHYSICS (E-JOURNAL) (Vol. 5, pp. SNF2016-CIP). 8. Sakinah, F., Indrasari, W., & Umiatin, U. (2022). MEASUREMENT OF POLLUTED WATER QUALITY WITH MICROPLASTIC WASTE BASED ON PHYSICAL PARAMETERS. PROCEEDINGS OF THE NATIONAL SEMINAR ON PHYSICS (E-JOURNAL), 10(1), FA-89. 9. Wirawan, R., Djamal, M., Hartono, A., Sanjaya, E., Indrasari, W., & RAMLI, R. (2012). Application of Ultrasonic Sensor for Low-Frequency Vibration Measurement. 10. Purnomo, T. (2023). 4.2 Water Characteristics. Environmental Pollution, 45. 11. Watts, D. G. (2022). Environmental studies. Taylor & Francis. 12. Li, Y., & Singh, C. (2021). Effect of gender, self-efficacy, and interest on perception of the learning environment and outcomes in calculus-based introductory physics courses. Physical Review Physics Education Research, 17(1), 010143.

	13. Yao, H., Li, X., & Yang, X. (2022). Physics-aware learning-based vehicle trajectory prediction of congested traffic in a connected vehicle environment. IEEE Transactions on Vehicular Technology, 72(1), 102-112. 14. Yusuf, R., Yunus, M., Maimun, M., & Fajri, I. (2022). Environmental Education: A Correlational Study among Environmental Literacy, Disaster Knowledge, Environmental Sensitivity, and Clean-Living Behavior of Post Tsunami Disaster in Aceh Communities, Indonesia. Polish Journal of Environmental Studies, 31(1). 15. Torzoni, M., Rosafalco, L., Manzoni, A., Mariani, S., & Corigliano, A. (2022). SHM under varying environmental conditions: An approach based on model order reduction and deep learning. Computers & Structures, 266, 106790.

ICT-based learning of Physics

Module Name :	ICT-based learning of Physics	
Module Level :	Undergraduate	
Code :	32252012	
Sub-heading, if applicable :		
Classes, if applicable :		
Semester :	$5^{st}/6^{st}/8^{st}$	
Module coordinator :	Dr.Firmanul Catur Wibowo, M.Pd.	
Lecturer(s) :	Dr.Firmanul Catur Wibowo, M.Pd. Dr. Hadi Nasbey, S.Pd., M.Si. Upik Rahma Fitri, M.Pd.	
Language :	Indonesian	
Classification within the curriculum :	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
Lecture (Expository, discussion, exercise)	100 minutes	40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.	
Credit points :	3 ECTS	
Prerequisite course(s) :	-	
Course Outcomes :	After taking this course the student have ability to : CLO153. Students are able to design learning based on instructional development model with ADDIE approach. CLO154. Students are able to use electronic teaching materials in learning and package them in an integrated learning system (e-learning system). CLO155. Students are able to implement digital video processing to support learning CLO156. Students are able to make a variety of ICT-based assessments. CLO157. Students are able to abstract the report of all media development activities into articles and publish them.	
Content :	1. How to Develop ICT-based Physics Learning Course: Research and Development using ADDIE Models. 1.1 Identify Required Resources 1.2 Determine Potential Delivery System 1.3 Compose Performance Objectives 1.4 Generate Content and Develop Media 1.5 Generate Content 1.6 An Implementation Strategy	

	1.7 Determine Evaluation Criteria 2. Electronic Book: Project to develop Physics Book in electronic format using 3D-Pageflip Professional Software or related software. 2.1 PDF Creator Software 2.2 Office Word & PowerPoint 2.3 Animation 2.4 Short Video 2.5 3D-Pageflip Professional or related software 3. Simulation and Animation: Project to create simulation and animation for Physics Teaching Using I-Spring Software or related software. 3.1 Office PowerPoint 3.2 I-Spring or related plugin for Office 4. The Video for Motion Analysis: Project to record various motion based on kinematic topics using tracker software for analyzing motion and then create a worksheet for motion analysis. 4.1 Smartphone 4.2 Video Editor software 4.3 Tracker Software 5. The Video for Learning Purpose: Project to make a YouTube Channel as learning media. Preservice Physics teachers create a YouTube channel, record a learning video, upload and share. 5.1 Video Editor software 5.2 YouTube Channel 6. Assessment Tools: Project to create assessments based on ICT. 6.1 QuizMaker or related software 6.2 Kahoot! or related software 7. Augmented & Virtual Reality: Project to create Augmented & Virtual Reality for Physics Teaching and use the provided apps. 7.1 Unity Pro and Sample Project 7.2 Provided Apps 8. E-Learning Platform: Packaging all electronic resources in an e-learning platform. 8.1 LMS Platform

<table>
<tr><td></td><td>8.2 Moodle

9. Writing Report and Portfolio Profile: Create a report (scientific article) and linking the scholar profile based on the project using Google Scholar and ResearchGate.
9.1 Search the relevant studies
9.2 Writing media development report
9.3 Google Scholar
10. 9.4 ResearchGate</td></tr>
<tr><td>Study/exam achievements:</td><td>Examination are conducted as unit test, as following
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<tr><th>No</th><th>Assesment Object</th><th>Assesment Technique</th><th>Weight</th></tr>
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<tr><td>2</td><td>Midterm Test</td><td>Written test</td><td>15%</td></tr>
<tr><td>3</td><td>Final Test</td><td>Written test</td><td>20%</td></tr>
<tr><td>4</td><td>Attendance</td><td>Presence list</td><td>10%</td></tr>
</table></td></tr>
<tr><td>Media :</td><td>Laptop/Computer, Smartphone, Camera, Tripod/Other Support, and Rigid Body</td></tr>
<tr><td>Literatures :</td><td>1. Branch, R. M. (2009). Instructional Design: The ADDIE Approach. Springer, Boston, MA.
2. Lee, W. W., & Owens, D. L. (2004). Multimedia-based instructional design: computer-based training, web-based training, distance broadcast training, performance-based solutions. John Wiley & Sons.
3. Chesky, N. Z., & Wolfmeyer, M. R. (2015). Philosophy of STEM education: A critical investigation. Springer.
4. Iinuma, M. (2015). Learning and Teaching with Technology in the Knowledge Society: New Literacy, Collaboration and Digital Content. Springer.
5. Marshall, C. C. (2009). Reading and writing the electronic book. Synthesis lectures on information concepts, retrieval, and services, 1(1), 1-185.
6. http://fmipa.unj.ac.id/pfisika/wp-content/uploads/2016/08/3D-Pageflip-Professional-3.pdf
7. https://www.ispringsolutions.com/support/suite/video-tutorials
8. https://physlets.org/tracker/
9. Joe, D. (2016). Learn Adobe Premiere Pro CC for Video Communication. Adobe Press.
10. https://www.ispringsolutions.com/free-quiz-maker
11. https://kahoot.com/
12. Glover, J. (2018). Unity 2018 Augmented Reality Projects: Build four immersive and fun AR applications</td></tr>
</table>

	using ARKit, ARCore, and Vuforia. Packt Publishing Ltd. 13. Mealy, P. (2018). Virtual & augmented reality for dummies. Hoboken, NJ Wiley. 14. Jemni, M., & Khribi, M. K. (2017). Toward empowering open and online education in the Arab world through OER and MOOCs. In Open education: from OERs to MOOCs (pp. 73-100). Springer, Berlin, Heidelberg. 15. Mendoza-Gonzalez, R. (2016). User-Centered Design Strategies for Massive Open Online Courses (MOOCs). Springer. 16. Waks, L. J. (2016). The evolution and evaluation of massive open online courses: MOOCs in motion. Springer. 17. Muliyati, D., Bakri, F., Yulia A., & Efrita, K.A. (2017). CMS wordpress: media e-learning sains. CV Green CircLe Digital. 18. Bowden, J. (2011). Writing A Report: How to prepare, write & present really effective reports. Hachette UK. 19. Aliotta, M. (2018). Mastering Academic Writing in the Sciences: A Step-by-step Guide. CRC Press. 20. Updated Resources in https://www.dmuliyati.com/p/pembelajaran-fisika-berbasis-ict.html.

Management Laboratories

Module Name :	Management Laboratories
Module Level :	Undergraduate
Code :	00052144
Sub-heading, if applicable :	
Classes, if applicable :	
Semester :	$5^{th}/6^{th}/8^{th}$
Module coordinator :	
Lecturer(s) :	
Language :	Indonesian
Classification within the curriculum :	Compulsory course
Type of Teaching	Contact hours per week during the semester: Class Size
Lecture (Expository, discussion, exercise)	100 minutes: 40
Workload	Total workload of this course 90,6 hours (3 ECTS) per semester which consist of 26,67 hours (0,89 ECTS) classroom activity, 32 hours (1.06 ECTS) structured task, and 32 hours (1.06 ECTS) per semester.
Credit points :	3 ECTS
Prerequisite course(s) :	-
Course Outcomes :	After taking this course the student have ability to : CLO1. Mastering the concepts and principles of learning and learning and motivation in learning CLO2. Master the theories and concepts from various schools of psychology and their application in curriculum curriculum. CLO3. Able to organize learning by applying innovative approaches

	CLO4. Able to apply concepts and procedures for evaluating learning and learning outcomes
Content :	1. Definition of learning, characteristics of learning, and types of learning according to certain classifications. Definition of learning & characteristics of learning ● Definition of learning ● Characteristics of learning ● Learning motivation and its influence ● Types of learning according to certain classifications classification ● Definition and characteristics of learning, ● Differences between learning and teaching. 2. Learning styles and their relation to the theory of multiple intelligences ● Learning styles and their influence on learning ● Different learning styles, V-A-K, Field Independent (FI) & Field Dependent (FD) and learning styles according to multiple intelligences 3. Learning theory and application ● Behavioristic learning theory and its application in learning ● Cognitivistic learning theory and its its application ● Humanistic learning theory and its its application ● Constructivistic learning theory and its application in learning 4. Definition, types, sources and models of motivation and ● Definition of motivation ● Types of motivation ● sources of motivation its application in learning ● Application of motivation in learning ● ARCS (attention, relevance, confidence, satisfaction) motivation model and its application in learning learning 5. Learning principles in learning ● Principles of learning according to Atwi Suparman's model Atwi Suparman model in learning ● Gagne's learning principles (Nine events of instruction) in learning Review of Basic Entrepreneurship Concepts in general

	6. Definition, foundation and principles of curriculum development and curriculum approaches ● Definition of curriculum ● Foundation of curriculum development ● Principles of curriculum development ● Curriculum approaches (subject-oriented, objective oriented, competency based curriculum) & their its application in the Indonesian curriculum 7. Understanding of media and learning resources, their characteristics and utilization in learning ● Concept of media and learning resources ● Variety and classification of media ● Selection of learning media ● Media utilization steps (ASSURE) 8. 21st century learning ● 21st Century Learning ● Role of teacher & student in 21st century learning ● Designing & assessing 21st Century learning ● Integration of media and technology into learning 9. Learning planning ● Definition of lesson planning ● Learning design steps (MPI Model, PROGRAM) Writing a learning program plan (RPP) as a result of instructional design ● instructional design 10. Definition of approaches, strategies, methods and techniques and identify their application in learning. ● Definition of learning approach ● Definition of learning strategy ● Definition of learning techniques ● application of approaches, strategies, methods and techniques in learning. 11. Classification of learning methods and their characteristics (usefulness, advantages and limitations) as well as the selection of methods for learning. ● Classification of learning methods ● Characteristics of learning methods (usefulness, advantages and limitations) ● Selection of methods for learning 12. Innovative approaches and their application in learning ● Innovative approach (quantum teaching) and its application in learning

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Innovative approach (active learning) and its application in learning
Innovative approaches (cooperative learning) and their application in learning
Innovative approaches (scientific learning) and its application in learning
Innovative approach (project-based learning) and its application in learning
Innovative approach (problem-based learning) and its application in learning
Innovative approach (e-learning) and its application in learning
Innovative approaches (discovery learning and its application in learning

13. Concepts of learning outcome evaluation and learning evaluation

Definition of measurement, assessment and evaluation
Function of Learning Outcome Evaluation
Definition of Learning Evaluation and its function
Benchmark Assessment and Norm-referenced Assessment
Formative and summative assessment
Various learning and learning outcome evaluation instruments

</td></tr>
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<tr><td>3</td><td>Final semester exam</td><td>Written test</td><td>15%</td></tr>
<tr><td>4</td><td>Paper presentation</td><td>Presentation</td><td>20%</td></tr>
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</td></tr>
</table>

Media :	Laptop/Computer, Epsilon (Study Program E-Learning), Projector, Video Conference Software: Zoom Meeting and Ms Team, Reference book, PHET Web
Literatures :	1. Filey, Jones H i al (1985), Learning Science Proces & Skill. 2. Joyce B. At al (1992) Models of Teaching, Allym dan Bacun 3. Kurikulum SLTP & SMU yang sedang berlaku 4. Buku pegangan guru & siswa untuk bidang studi Fisika di SLTP & SMU.