



MODULE HANDBOOK

PHYSICS 2



**BACHELOR DEGREE PROGRAM
DEPARTMENT OF BIOMEDICAL ENGINEERING
FACULTY OF INTELLIGENT ELECTRICAL AND INFORMATICS
TECHNOLOGY**

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

ENDORSEMENT PAGE



MODULE HANDBOOK
Physics 2
DEPARTMENT OF BIOMEDICAL ENGINEERING
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
Number : B/21334/IT2.IX.5.1.2/PP.03.00.00/2020

Proses Process	Penanggung Jawab Person in Charge			Tanggal Date
	Nama Name	Jabatan Position	Tandatangan Signature	
Perumus Preparation	Mariyanto, S.Si., M.T.	Dosen Lecturer	TTD	November 23, 2019
Pemeriksa dan Pengendalian Review and Control	Dr. Didik Khusnul Arif, S.Si, M.Si	Tim kurikulum Curriculum team	TTD	February 10, 2020
Persetujuan Approval		Koordinator RMK Course Cluster Coordinator	TTD	March 02, 2020
Penetapan Determination	Dr. Achmad Arifin, S.T., M.Eng.	Kepala Departemen Head of Department		March 09, 2020

MODULE HANDBOOK

PHYSICS 2

Module name	Physics 2	
Module level	Undergraduate	
Code	SF184202	
Course (if applicable)	Physics 2	
Semester	Second Semester (Genap)	
Person responsible for the module	Mariyanto, S.Si., M.T.	
Lecturer	ITS Physics Lecturer Team	
Language	Bahasa Indonesia	
Relation to curriculum	Undergraduate degree program, mandatory , 2 nd semester.	
Type of teaching, contact hours	Lectures, <60 students	
Workload	1. Lectures : 3 x 50 = 150 minutes per week. 2. Exercises and Assignments : 2 x 60 = 120 minutes (2 hours) per week. 3. Private learning : 2 x 60 = 120 minutes (2 hours) per week.	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 75% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Learning outcomes and their corresponding PLOs	CLO 1 Students understand particles that compose a matter and it's electrical properties, substantial of conductor and dielectric CLO 2 Students understand the strength of an electric field based on Coulomb force and Gauss's law CLO 3 Students are able to understand various forms of electric potential in charged conductors CLO 4 Students understand the capacitance principle of various form of capacitor in capacitor circuits, series, parallel and mixed CLO 5 Able to use magnetic field force formulas for electric currents and moving charges CLO 6 Able to mention the role of magnetization in magnetic material and hysteresis loop. CLO 7 Understand the principle of electromotive force emergences, and current in resistor, capacitor and inductor	Not mention ed

	CLO 8 Able to determine magnitude of the impedance, electric current and phase angle in parallel and series circuit R-L, R-C, RL-C	
Content	In this course students will learn to understand the basic laws of physics, Electric Field; Electric Potential; Electric current ; Magnetic field; Electromotive Force (EMF) of Induction and Alternating Current, through simple math descriptions and introducing the examples of concepts usage	
Study and examination requirements and forms of examination	● In-class exercises ● Assignment 1, 2, 3 ● Mid-term examination ● Final examination	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom.	
Reading list	Main : 1. Halliday & Resnic; 'Fundamental of Physics'. John Wiley and Sons, New York, 1987 2. Tim Dosen, "Diktat Fisika II", "Soal-soal Fisika II", Fisika FMIPA-ITS 3. Giancoli, DC., (terj, Yuhilza H), 'Fisika, jilid 2', Ertangga, Jakarta, 2001. Supporting : 1. Alonso & Finn, "Fundamental University Physics", Addison Wesley Pub Comp Inc, 1st ed, Calif, 1990 2. Tipler, PA, (ted. L Prasetio dan R.W.Adi), "Fisika : untuk Sains dan Teknik, Jilid 2", Erlangga, Jakarta, 1998	

I. Rencana Pembelajaran Semester / Semester Learning Plan

		INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS) FACULTY OF INTELLIGENT ELECTRICAL AND INFORMATICS TECHNOLOGY DEPARTMENT OF BIOMEDICAL ENGINEERING					Document Code
SEMESTER LEARNING PLAN							
MATA KULIAH (MK) <i>COURSE</i>		KODE <i>CODE</i>	Rumpun MK <i>Course Cluster</i>	BOBOT (sks) <i>Credits</i>		SEMESTER	Tgl Penyusunan <i>Compilation Date</i>
Fisika 2 <i>Physics 2</i>		SF184202	Ilmu Dasar Teknik <i>Basic Engineering</i>	T=3	P=0	II	
OTORISASI / PENGESAHAN <i>AUTHORIZATION / ENDORSEMENT</i>		Dosen Pengembang RPS <i>Developer Lecturer of Semester Learning Plan</i>		Koordinator RMK <i>Course Cluster Coordinator</i>		Ka DEPARTEMEN <i>Head of Department</i>	
		(Mariyanto, S.Si., M.T.)		(M. Hilman Fatoni, S.T., M.T.)		(Dr. Achmad Arifin, S.T., M.Eng.)	
Capaian Pembelajaran <i>Learning Outcomes</i>	CPL-PRODI yang dibebankan pada MK <i>PLO Program Charged to The Course</i>						
	CPL-01 <i>PLO-01</i>	Mampu menerapkan Ilmu Pengetahuan Alam dan Matematika pada bidang Teknik Biomedika. <i>Able to apply Natural Sciences and Mathematics in the field of Biomedical Engineering.</i>					
	CPL-03 <i>PLO-03</i>	Mampu merancang dan melaksanakan eksperimen laboratorium dan/atau lapangan, menganalisa dan menginterpretasi data, serta menggunakan penilaian yang obyektif untuk menarik kesimpulan. <i>Able to design and implement laboratory experiment and / or field experiments, analyze and interpret data, and use objective assessments to draw conclusions.</i>					
	CPL-06 <i>PLO-06</i>	Mampu menerapkan ilmu pengetahuan, keterampilan, dan metode terkini dalam menyelesaikan permasalahan di bidang Teknik Biomedika <i>Able to apply the latest knowledge, skills and methods in solving problems in the field of Biomedical Engineering</i>					
	Capaian Pembelajaran Mata Kuliah (CPMK) <i>Course Learning Outcome (CLO) - If CLO as description capability of each Learning Stage in the course, then CLO = LLO</i>						
	CP MK 1 <i>CLO 1</i>	Mahasiswa memahami butir-butir penyusun materi serta sifat kelistrikkannya, hakekat konduktor dan dielektrik. <i>Students understand particles that compose a matter and it's electrical properties, substantial of conductor and dielectric</i>					

	CP MK 2 CLO 2	Mahasiswa memahami kuat medan listrik berdasarkan gaya Coulomb dan hukum Gauss. <i>Students understand the strength of an electric field based on Coulomb force and Gauss's law.</i>																																																																																							
	CP MK 3 CLO 3	Mahasiswa mampu memahami berbagai bentuk potensial listrik pada konduktor bermuatan. <i>Students are able to understand various forms of electric potential in charged conductors..</i>																																																																																							
	CP MK 4 CLO 4	Mahasiswa memahami azas kapasitansi berbagai bentuk kapasitor pada rangkaian kapasitor, seri, paralel dan campuran. <i>Students understand the capacitance principle of various form of capacitor in capacitor circuits, series, parallel and mixed.</i>																																																																																							
	CP MK 5 CLO 5	Mampu menggunakan rumus gaya medan magnet terhadap arus listrik dan muatan bergerak <i>Able to use magnetic field force formulas for electric currents and moving charges</i>																																																																																							
	CP MK 6 CLO 6	Mampu menyebutkan peranan magnetisasi dalam material magnetik dan hysteresis loop <i>Able to mention the role of magnetization in magnetic material and hysteresis loop.</i>																																																																																							
	CP MK 7 CLO 7	Memahami prinsip timbulnya gaya gerak listrik, dan arus dalam resistor, kapasitor dan induktor <i>Understand the principle of electromotive force emergences, and current in resistor, capacitor and inductor</i>																																																																																							
	CP MK 8 CLO 8	Mampu menentukan besar impedansi besar arus listrik dan sudut fasa pada rangkaian seri paralel R-L, R-C, RL- C <i>Able to determine the magnitude of impedance, electric current and phase angle in parallel and series circuit R-L, R-C, RL-C</i>																																																																																							
	Peta CPL – CP MK Map of PLO - CLO	<table border="1"> <thead> <tr> <th></th><th>CPL-01</th><th>CPL-02</th><th>CPL-03</th><th>CPL-04</th><th>CPL-05</th><th>CPL-06</th><th>CPL-07</th><th>CPL-08</th><th>CPL-09</th><th>CPL-10</th><th>CPL-11</th><th>CPL-12</th></tr> </thead> <tbody> <tr> <td>CPMK 1 / SUB CPMK 1 <i>CLO 1 / LLO 1</i></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>CPMK 2 / SUB CPMK 2 <i>CLO 2 / LLO 2</i></td><td>✓</td><td></td><td>✓</td><td></td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>CPMK 3 / SUB CPMK 3 <i>CLO 3 / LLO 3</i></td><td>✓</td><td></td><td></td><td></td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>CPMK 4 / SUB CPMK 4 <i>CLO 4 / LLO 4</i></td><td>✓</td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>CPMK 5 / SUB CPMK 5</td><td></td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>												CPL-01	CPL-02	CPL-03	CPL-04	CPL-05	CPL-06	CPL-07	CPL-08	CPL-09	CPL-10	CPL-11	CPL-12	CPMK 1 / SUB CPMK 1 <i>CLO 1 / LLO 1</i>	✓												CPMK 2 / SUB CPMK 2 <i>CLO 2 / LLO 2</i>	✓		✓			✓							CPMK 3 / SUB CPMK 3 <i>CLO 3 / LLO 3</i>	✓					✓							CPMK 4 / SUB CPMK 4 <i>CLO 4 / LLO 4</i>	✓		✓										CPMK 5 / SUB CPMK 5			✓								
	CPL-01	CPL-02	CPL-03	CPL-04	CPL-05	CPL-06	CPL-07	CPL-08	CPL-09	CPL-10	CPL-11	CPL-12																																																																													
CPMK 1 / SUB CPMK 1 <i>CLO 1 / LLO 1</i>	✓																																																																																								
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CPMK 3 / SUB CPMK 3 <i>CLO 3 / LLO 3</i>	✓					✓																																																																																			
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	CLO 5 / LLO 5													
	CPMK 6 / SUB CPMK 6			✓			✓							
	CLO 6 / LLO 6													
Diskripsi Singkat MK	Pada mata kuliah ini mahasiswa akan belajar memahami hukum-hukum dasar fisika, Medan Listrik; Potensial Listrik; Arus Listrik ; Medan magnet; Gaya Gerak Listrik (EMF) Induksi dan Arus Bolak Balik, melalui uraian matematika sederhana serta memperkenalkan contoh pemakaian konsep.													
Short Description of Course	<i>In this course students will learn to understand the basic laws of physics, Electric Field; Electric Potential; Electric current ; Magnetic field; Electromotive Force (EMF) in Induction and Alternating Current, through simple mathematical descriptions and introducing the examples of concept usage.</i>													
Bahan Kajian: Materi pembelajaran Course Materials:	1. Muatan listrik, Hukum Coulomb; 2. Medan listrik: kuat medan listrik, garis gaya, perhitungan kuat medan listrik untuk muatan titik, muatan garis, cincin, piringan, silinder; 3. Hukum Gauss: fluks, garis gaya, Hukum Gauss dan aplikasinya untuk muatan silinder dan bola; 4. Potensial listrik: energi potensial, beda potensial listrik, hubungan potensial listrik dan medan listrik, perhitungan potensial listrik untuk muatan titik, muatan garis, cincin, piringan, silinder dan bola; 5. Kapasitor: Kapasitansi, perhitungan kapasitansi untuk kapasitor keping sejajar, kapasitor silinder dan kapasitor bola, rangkaian kapasitor seri dan paralel, bahan dielektrik, energi kapasitor; 6. Arus listrik: arus dan gerak muatan, hukum Ohm, resistivitas, resistansi, daya listrik; 7. Rangkaian arus searah: rangkaian resistor seri dan paralel, hukum Kirchoff; 8. Medan magnet: fluks dan induksi magnet, gaya Lorentz, hukum Biot Savard-Ampere, perhitungan medan magnet untuk kawat lurus berarus, cincin, solenoida dan toroida; 9. GGL Induksi : Hukum Faraday, Hukum Lenz, GGL induksi, Induktansi diri dan induktansi gandeng; energi pada induktor; 10. Gejala Transien: perhitungan perubahan arus terhadap waktu untuk rangkaian RC dan CL seri; 11. Arus bolak balik: arus bolak-balik dalam resistor, induktor, kapasitor, Impedansi, rangkaian R-L dan R-C untuk seri dan paralel, R-L-C seri, Daya, Resonansi. 1. <i>Electric charge, Coulomb's Law;</i> 2. <i>Electric field: electric field strength, line of force, calculation of electric field strength for point charges, line of charges, rings, disks, cylinders;</i> 3. <i>Gauss's Law: flux, line of force, Gauss's Law and its application in cylindrical and spherical charges;</i> 4. <i>Electric potential: potential energy, potential difference of electricity, correlation between electric potential and electric field, calculation of electric potential for point charges, line of charges, rings, disks, cylinders and spheres;</i>													

	5. <i>Capacitors: Capacitance, calculations of capacitance for parallel strip capacitors, cylindrical and ball capacitors, series and parallel capacitor circuits, dielectric materials, capacitor energy;</i> 6. <i>Electric current: current and motion of charge, Ohm's law, resistivity, resistance, electric power;</i> 7. <i>Direct current circuits: series and parallel resistor circuits, Kirchoff's law;</i> 8. <i>Magnetic field: magnetic flux and induction, Lorentz's force, Biot Savard-Ampere's law, calculation of magnetic fields for threaded straight wire, rings, solenoids and toroides;</i> 9. <i>Induced EMF: Faraday's Law, Lenz's Law, Induced EMF, Self-Inductance and Coupled Inductance; energy in the inductor;</i> 10. <i>Transient Phenomenons: calculations of changes in current with time for series RC and CL circuits;</i> 11. <i>Alternating current: alternating current in resistors, inductors, capacitors, impedance, R-L and R-C circuits for series and parallel, series R-L-C, Power, Resonance.</i>				
Pustaka <i>References</i>	Utama / Main:				
	1. Halliday & Resnic; 'Fundamental of Physics'. John Wiley and Sons, New York, 1987 2. Tim Dosen, "Diktat Fisika II", "Soal-soal Fisika II", Fisika FMIPA-ITS 3. Giancoli, DC., (terj, Yuhilza H), 'Fisika, jilid 2', Ertangga, Jakarta, 2001				
	Pendukung / Supporting:				
	1. Alonso & Finn, "Fundamental University Physics", Addison Wesley Pub Comp Inc,13`ed, Calf, 1990 2. Tipler, PA,(ted. L Prasetyo dan R.W.Adi), "Fisika : untuk Sains dan Teknik, Jilid 2", Erlangga, Jakarta, 1998				
Dosen Pengampu <i>Lecturers</i>		ITS Physics Lecturer Team			
Matakuliah syarat <i>Prerequisite</i>		-			
Mg ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) /	Penilaian / Assessment	Bentuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa;	Materi Pembelajaran [Pustaka] /	Bobot Penilaian

	<i>Final ability of each learning stage (LLO)</i>	<i>Indikator / Indicator</i>	<i>Kriteria & Teknik / Criteria & Techniques</i>	<i>[Estimasi Waktu] / Form of Learning; Learning Method; Student Assignment; [Estimated Time]</i>		<i>Learning Material [Reference]</i>	<i>/Assessment Load (%)</i>
(1)	(2)	(3)	(4)	Tatap Muka / In-class (5)	Daring / Online (6)	(7)	(8)
1-3	- Mahasiswa memahami butir-butir penyusun materi serta sifat kelistrikannya, hakekat konduktor dan dielektrik. - Mahasiswa memahami kuat medan listrik berdasarkan gaya Coulomb dan hukum Gauss. <i>Students understand particles that composed a matter and it's electrical properties, substantial of conductor and dielectric.</i> <i>Students understand the strength of an electric field based on Coulomb force and Gauss law.</i>	- Kehadiran - Keaktifan dalam diskusi - Ketepatan dalam menjawab pertanyaan saat diskusi <i>Attendance</i> <i>Activeness in discussions</i> <i>Accuracy in answering questions during discussion</i>	Tidak dijelaskan <i>Not mentioned</i>	- Kontrak belajar, - Kuliah Klasikal, - Tanya jawab, - Diskusi, - Tugas [3x2x50"] - Study contracts, - Presentation, - Ask and answers, - Discussion, - Assignment [3x2x50"]	Tidak dijelaskan <i>Not mentioned</i>	- Bab I Hukum coulomb dan medan listrik; muatan listrik, Hukum Coulomb; - Medan listrik: kuat medan listrik, garis gaya - perhitungan kuat medan listrik untuk muatan titik, muatan garis, cincin, piringan, silinder; <i>Chapter I Coulomb's law and electric fields; electric charge, Coulomb's Law;</i> <i>Electric field: electric field strength, line of force,</i> <i>Calculation of electric field strength for point</i>	0

						<i>charges, line of charges, rings, disks, cylinders;</i>	
4	ASISTENSI 1 <i>ASSISTANCE 1</i>			2x50''			1,67
5		• Kehadiran • Keaktifan dalam diskusi • Ketepatan dalam menjawab pertanyaan saat diskusi • <i>Attendance</i> • <i>Activeness in discussions</i> • <i>Accuracy in answering questions during discussion</i>		• Kuliah klasikal • Tanya jawab • Latihan soal • Tugas dirumah [2x50''] • <i>Presentation</i> • <i>Ask and answers</i> • <i>Exercises</i> • <i>Assignment [2x50'']</i>		• Hukum Gauss: fluks, Hukum Gauss dan aplikasinya • <i>Gauss's Law: flux, Gauss's Law and its applications</i>	0
6-7	Mahasiswa mampu memahami berbagai bentuk potensial listrik pada konduktor bermuatan.	• Kehadiran • Keaktifan dalam diskusi		• Kuliah klasikal, • Tanya jawab lisan • Diskusi		Bab II Potensial Listrik; • Integral garis kuat medan listrik,	0

	<i>Students are able to understand various forms of electric potential in charged conductors.</i>	• Ketepatan dalam menjawab pertanyaan saat diskusi • Attendance • Activeness in discussions • Accuracy in answering questions during discussion		• Tugas [2x2x50''] • Presentation • Ask and answers • Discussion • Assignment [2x50'']		energi potensial, potensial listrik • Perhitungan potensial listrik (muatan diskrit, cincin bermuatan, bola bermuatan) Chapter II Electric Potential; • Integral of lines of electric field, potential energy, electric potential • Calculation of electric potential (discrete charge, charged ring, charged ball)	
8	ASISTENSI 2 ASSISTANCE 2			2x50''			1,67
9	KUIS 1 QUIZ 1	Ketepatan jawaban dalam menyelesaikan soal <i>Accuracy in answering questions</i>		2x50''			20
10-11	Mahasiswa memahami azas kapasitansi berbagai bentuk kapasitor pada rangkaian kapasitor, seri, paralel dan campuran.	• Kehadiran • Keaktifan dalam diskusi • Ketepatan dalam menjawab		• Diskusi kelompok • Presentasi singkat • Diskusi • Tugas		• Potensial listrik dan perhitungan kapasitor • Dielektrikum dan pergeseran listrik	0

	<i>Students understand the capacitance principle of various form of capacitor in capacitor circuits, series, parallel and mixed.</i>	pertanyaan saat diskusi • Attendance • Activeness in discussions • Accuracy in answering questions during discussion		[2x2x50''] • Group discussion • Short presentation • Discussion • Assignment [2x2x50'']		• Electric potential and capacitor calculations • Dielectric and electrical shift	
12	ASISTENSI 3 ASSISTANCE 3			2X50''			1,67
13-14	Mahasiswa memahami rangkaian arus searah, hukum Kirchoff <i>Students understand direct current circuits, Kirchoff's law</i>	• Kehadiran • Keaktifan dalam diskusi • Ketepatan dalam menjawab pertanyaan saat diskusi • Attendance • Activeness in discussions • Accuracy in answering questions during discussion		• Kuliah klasikal, • Latihan soal • Diskusi • Tugas [2x2x50''] • Presentation • Exercises • Discussion • Assignment [2x2x50'']		Bab III Arus Listrik • Arus Listrik dan kerapatan arus, konduktifitas dan resistifitas, hukum Ohm • Rangkaian arus searah: Hukum Kirchoff Chapter III Electric Current • Electric current and current density, conductivity and resistivity, Ohm's law	

						• <i>Direct current circuits: Kirchoff's law</i>	
15-16	EVALUASI TENGAH SEMESTER			2x50''			25
	MID-TERM EXAM						
17-19	Mampu menggunakan rumus gaya medan magnit terhadap arus listrik dan muatan bergerak Mampu menyebutkan peranan magnetisasi dalam material magnetik dan hystensis loop <i>Able to use the magnetic field force formulas in electric current and moving charges</i> <i>Able to mention the role of magnetization in magnetic material and hystensis loop</i>	• Kehadiran • Keaktifan dalam diskusi • Ketepatan dalam menjawab pertanyaan saat diskusi • <i>Attendance</i> • <i>Activeness in discussions</i> • <i>Accuracy in answering questions during discussion</i>		• Kuliah klasikal, • Latihan soal • Diskusi • Tugas [2x2x50''] • <i>Presentation</i> • <i>Exercises</i> • <i>Discussion</i> • <i>Assignment</i> [2x2x50'']		Bab IV Medan magnet: • Gaya Magnet, Gerak muatan dalam medan Magnet. • Kumparan dalam medan magnet, Induksi magnet oleh arus listrik. • Perhitungan Induksi Magnet. Chapter IV Magnetic Field: • <i>Magnetic Force, motion of charge in magnetic field.</i> • <i>Coils in a magnetic field, magnetic induction by electric current.</i> • <i>Magnetic Induction Calculations.</i>	0

20	ASISTENSI 4 <i>ASSISTANCE 4</i>			2X50''			1,67
21-22	Memahami prinsip timbulnya gaya gerak listrik, dan arus dalam resistor, kapasitor dan induktor <i>Understand the principle of electromotive force emergences, and current in resistors, capacitors and inductors</i>	• Kehadiran • Keaktifan dalam diskusi • Ketepatan dalam menjawab pertanyaan saat diskusi • Attendance • Activeness in discussions • Accuracy in answering questions during discussion		• Kuliah klasikal, • Diskusi • Tugas [2x2x50''] • Presentation • Discussion • Assignment [2x50'']		Bab V Gaya Gerak Listrik Induksi. • Hukum faraday, GGL induksi oleh B konstan pada konduktor, GGL Induksi oleh B yang berubah terhadap waktu. • Induktansi bolak-balik, tenaga magnet yang tersimpan pada induktor dan hukum Lenz. Chapter V Induced Electromotive Force. • Faraday's law, induced EMF by constant B in conductor, time varying induced EMF by B. • Alternating inductance, magnetic energy stored in the	0

						<i>inductor and Lenz's law.</i>	
23	ASISTENSI 5 <i>ASSISTANCE 5</i>			2X50''			1,67
24	KUIS <i>QUIZ</i>			2X50''			20
25-27	Mampu menentukan besar impedansi, besar arus listrik, dan sudut fasa pada rangkaian seri, paralel R-L, R-C, RL-C <i>Able to determine magnitude of impedance, electric current, and phase angle in series and parallel R-L, R-C, RL-C circuits.</i>	• Kehadiran • Keaktifan dalam diskusi • Ketepatan dalam menjawab pertanyaan saat diskusi • Attendance • Activeness in discussions • Accuracy in answering questions during discussion		• Diskusi • Tugas [2x2x50''] • Discussion • Assignment [2x50'']		Bab VI Arus bolak balik: • Gejala Transien • Harga Efektif Arus dan Tegangan, arus bolak balik pada resistor, induktor dan kapasitor • rangkaian R-L, R-C, R-L-C, Diagram fasor, impedansi Resonansi. Chapter VI Alternating Current: • Transient phenomenon • Effective Rates of Current and Voltage, alternating current in resistors,	0

						<i>inductors and capacitors</i> • <i>R-L, R-C, R-L-C circuits, Phasor diagrams, Resonance impedance.</i>	
28	ASISTENSI 6 <i>ASSISTANCE 6</i>			2X50''			1,67
29-32	EVALUASI AKHIR SEMESTER <i>FINAL-SEMESTER EXAM</i>						25

I. Rencana Asesmen & Evaluasi (RAE) / *Assessment & Evaluation Plan*

	ASSESSMENT & EVALUATION PLAN BACHELOR DEGREE PROGRAM OF BIOMEDICAL ENGINEERING - FTEIC ITS Course : Physics 2		RA&E
			Write Doc Code
Kode/code: SF184202	Bobot sks/credits (T/P): 3/0	Rumpun MK: Ilmu Dasar Teknik Course Cluster: Basic Engineering	Smt: II
OTORISASI AUTHORIZATION	Penyusun RA & E Compiler A&EP Mariyanto, S.Si., M.T.	Koordinator RMK Course Cluster Coordinator M. Hilman Fatoni, S.T., M.T.	Ka DEP Head of DEP Dr. Achmad Arifin, S.T., M.Eng.

Mg ke/ Wee k (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
1-3	- Mahasiswa memahami butir-butir penyusun materi serta sifat kelistrikannya, hakekat konduktor dan dielektrik. - Mahasiswa memahami kuat medan listrik berdasarkan gaya Coulomb dan hukum Gauss. <i>Students understand particles that composed a matter and it's electrical properties,</i>	Tidak ada penilaian <i>No assessment</i>	0

	<i>substantial of conductor and dielectric.</i> • <i>Students understand the strength of an electric field based on Coulomb force and Gauss law.</i>		
4	ASISTENSI 1 <i>ASSISTANCE 1</i>	Melakukan percobaan untuk mengukur kuat medan listrik dari suatu kawat lurus <i>Doing experiment to measure the strength of electric field in a straight wire</i>	1,67
6-7	Mahasiswa mampu memahami berbagai bentuk potensial listrik pada konduktor bermuatan. <i>Students are able to understand various forms of electric potential in charged conductors.</i>	Tidak ada penilaian <i>No assessment</i>	0
8	ASISTENSI 2 <i>ASSISTANCE 2</i>	Menyelesaikan permasalahan yang berhubungan dengan konduktor bermuatan <i>Solving problems related to charged conductor</i>	1,67
9	KUIS 1 <i>QUIZ 1</i>	- Menjelaskan hakekat konduktor - Menghitung besarnya kuat medan listrik - Penerapan hukum Coulomb dan Gauss - Menghitung potensial listrik pada konduktor bermuatan - <i>Explain conductor substantial</i> - <i>Calculate the strength of electric field</i> - <i>Application of Coulomb's and Gauss's Law</i> - <i>Calculate the electric potential of charged conductor</i>	20
10-11	Mahasiswa memahami azas kapasitansi berbagai bentuk kapasitor pada rangkaian	Tidak ada penilaian <i>No assessment</i>	0

	kapasitor, seri, paralel dan campuran. <i>Students understand the capacitance principle of various form of capacitor in capacitor circuits, series, parallel and mixed.</i>		
12	ASISTENSI 3 <i>ASSISTANCE 3</i>	Melakukan simulasi perancangan rangkaian kapasitor secara seri, paralel dan campuran menggunakan software Proteus atau sejenisnya <i>Doing simulation to design capacitor circuit in series, parallel or mixed circuit using software such as Proteus and so on</i>	1,67
13-14	Mahasiswa memahami rangkaian arus searah, hukum Kirchoff <i>Students understand direct current circuits, Kirchoff's law</i>	Tidak ada penilaian <i>No assessment</i>	0
15-16	EVALUASI TENGAH SEMESTER <i>MID-TERM EXAM</i>	Tes: Ujian Tulis/Ujian Daring Test: <i>Written exam/Online exam</i>	25
17-19	Mampu menggunakan rumus gaya medan magnet terhadap arus listrik dan muatan bergerak Mampu menyebutkan peranan magnetisasi dalam material magnetik dan hystensis loop <i>Able to use the magnetic field force formulas in electric</i>	Tidak ada penilaian <i>No assessment</i>	0

	<i>current and moving charges</i> <i>Able to mention the role of magnetization in magnetic material and hysteresis loop</i>		
20	ASISTENSI 4 <i>ASSISTANCE 4</i>	Menyelesaikan permasalahan yang berkaitan dengan gaya medan magnet Menyebutkan peranan magnetisasi dalam material magnetik dan hysteresis loop <i>Solving problems related to magnetic field force</i> <i>Mention the role of magnetization in magnetic material and hysteresis loop</i>	1,67
21-22	Memahami prinsip timbulnya gaya gerak listrik, dan arus dalam resistor, kapasitor dan induktor <i>Understand the principle of electromotive force emergences, and current in resistors, capacitors and inductors</i>	Tidak ada penilaian <i>No assessment</i>	
23	ASISTENSI 5 <i>ASSISTANCE 5</i>	- Menjelaskan konsep gaya gerak listrik - Menghitung besar arus yang mengalir pada rangkaian resistor, kapasitor, dan induktor - <i>Explain the concept of electromotive force</i> - <i>Calculate the amount of current in resistor, capacitor, and inductor circuit</i>	1,67
24	KUIS <i>QUIZ</i>	- Aplikasi medan magnet - Menghitung besarnya gaya gerak listrik - Menghitung nilai arus pada rangkaian resistor, kapasitor, dan induktor - <i>Application of magnetic field</i>	20

		- Calculate the magnitude of electromotive force - Calculate amount of current in resistor, capacitor, and inductor circuit	
25-27	Mampu menentukan besar impedansi, besar arus listrik, dan sudut fasa pada rangkaian seri, paralel R-L, R-C, RL-C <i>Able to determine magnitude of impedance, electric current, and phase angle in series and parallel R-L, R-C, RL-C circuits.</i>	Tidak ada penilaian <i>No Assessment</i>	0
28	ASISTENSI 6 <i>ASSISTANCE 6</i>	- Menghitung besarnya impedansi pada rangkaian seri, paralel, dan campuran - Menentukan sudut fasa pada berbagai jenis rangkaian - Calculate the amount of impedance in series, parallel, and mixed circuit - Determine phase angle in various circuit	1,67
29-31	EVALUASI AKHIR SEMESTER <i>FINAL-SEMESTER EXAM</i>	Tes: Ujian Tulis/Ujian Daring Test: <i>Written exam/Online exam</i>	25
Total bobot penilaian Total assessment load			100%

Indikator Pencapaian CPL Pada MK / *Indicator of PLO achievement charged to the course*

CPL yang dibebankan pada MK / <i>PLO charged to the course</i>	CPMK / <i>Course Learning Outcome (CLO)</i>	Minggu ke / <i>Week</i>	Bentuk Asesmen / <i>Form of Assessment</i>	Bobot / <i>Load (%)</i>
CPL-01 / <i>PLO-01</i>	CPMK 3 / <i>CLO 3</i>	Week- 5-6	Task 1 stage 2	12
		Week- 8	Mid Exam Question 2 and 3	18
	CPMK 4 / <i>CLO 4</i>	Week- 10	Task 2	5
		Week- 16	Final Exam Question 1 and 2	16
CPL-03 / <i>PLO-03</i>	CPMK 1 / <i>CLO 1</i>	Week- 1	Task 1 stage 1	4
	CPMK 2 / <i>CLO 2</i>	Week- 2	Task 1 stage 1	4
		Week- 8	Mid Exam Question 1	12
	CPMK 5 / <i>CLO 5</i>	Week- 12	Task 3	5
		Week- 16	Final Exam Question 3	12
	CPMK 6 / <i>CLO 6</i>	Week- 16	Final Exam Question 4	12
				$\Sigma = 100\%$

No	Form of Assessment	PLO-01	PLO-02	PLO-03	PLO-04	PLO-05	PLO-06	PLO-07	PLO-08	PLO-09	PLO-10	PLO-11	PLO-12	Total
1	Task 1	0.12		0.05			0.03							0.2
2	Task 2	0.05												0.05
3	Task 3			0.05										0.05
4	Mid Exam	0.18		0.02			0.1							0.3
5	Final Exam	0.16		0.12			0.12							0.4
	Total	0.51		0.24			0.25							1