



MODULE HANDBOOK ELECTRICAL CIRCUITS



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

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

ENDORSEMENT PAGE

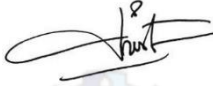


MODULE HANDBOOK Electric Circuits

DEPARTMENT OF BIOMEDICAL ENGINEERING

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

Number : B/21343/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	Dr. Rachmad Setiawan, S.T., M.T.	Dosen Lecturer		November 23, 2019
Pemeriksa dan Pengendalian Review and Control	Ir. Siti Halimah Baki, M.T.	Tim kurikulum Curriculum team		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

ELECTRICAL CIRCUITS

Module name	Electric Circuits	
Module level	Undergraduate	
Code	EW184201	
Course (if applicable)	Electric Circuits	
Semester	Second Semester	
Person responsible for the module	Dr. Rachmad Setiawan, S.T., M.T.	
Lecturer	Totok Mujiono, Djoko Purwanto, Hendra Kusuma, Fajar Budiman	
Language	Indonesian	
Relation to curriculum	Undergraduate degree program, mandatory , 2 nd semester.	
Type of teaching, contact hours	Lectures, <60 students	
Workload	1. Lectures : 2 x 50 = 100 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	2 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	Mathematic 1	
Learning outcomes and their corresponding PLOs	KNOWLEDGE (P02) Mastering concepts, procedures and engineering and realizing them in the form of procedures required for system analysis and design in the fields of electric power systems, regulatory systems, multimedia telecommunications, or electronics. SPECIAL SKILL (KK02) Able to describe procedures for solving engineering problems in the field of electric power systems, regulatory systems, multimedia telecommunications, or electronics. GENERAL SKILLS (KU01) Able to apply logical, critical, systematic, and innovative thinking in the context of the development or	

	implementation of science and technology that pays attention to and applies humanities values in accordance with their field of expertise. ATTITUDE (S09) Showing an independent attitude of responsibility for work in their field of expertise.	
Content	The Electrical Circuits course discusses the basic concepts of circuits and their analysis, the basic laws of circuits which include Ohm and Kirchhoff's Laws, node and mesh analysis methods, circuit theory which includes superposition theorems, Thevenin and Norton equivalent circuits, and maximum power transfer. The next topic of discussion is the working principle of capacitors and inductors, circuits with resistors or inductors (first order), as well as circuits with resistors, capacitors and inductors (second order) both series and parallel.	
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	1. Tim pengajar rangkaian listrik, Handout Mata Kuliah Rangkaian Listrik. 2. Pujiono, Rangkaian Listrik, Graha Ilmu. 3. CK Aexander and MNO Sadiku, Fundamental of Electric Circuit, McGraw Hill, 8th Edition, 2013. 4. WH Hayt, JE Kemmerly, and SM Durbin, Engineering Circuit Analysis, McGraw Hill, 8th Edition, 2007.	

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) COURSE		KODE CODE	Rumpun MK Course Cluster	MATA KULIAH (MK) COURSE		KODE CODE	Rumpun MK Course Cluster
Rangkaian Listrik Electrical Circuits		EW184201	Ilmu Dasar Teknik Basic Engineering	T=2	P=0	II	June 15, 2020
OTORISASI / PENGESAHAN AUTHORIZATION / ENDORSEMENT		Dosen Pengembang RPS Developer Lecturer of Semester Learning Plan		Koordinator RMK Course Cluster Coordinator		Ka DEPARTEMEN Head of Department	
		(Dr. Rachmad Setiawan, S.T., M.T.)		(M. Hilman Fatoni, S.T., M.T.)		(Dr. Achmad Arifin, S.T., M.Eng.)	
Capaian Pembelajaran		CPL-PRODI yang dibebankan pada MK PLO Program Charged to The Course					
Learning Outcomes		CPL-01 PLO-01	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-05 PLO-05	Mampu mendesain komponen, sistem, dan proses dalam bidang Teknik Biomedika yang sistematis, logis, dan realistis sesuai dengan spesifikasi yang ditentukan dengan mempertimbangkan aspek keselamatan, sosial, budaya, lingkungan, dan ekonomi dengan mengenali/memanfaatkan sumber daya lokal dan nasional dengan wawasan global <i>Able to design components, systems, and processes in the field of Biomedical Engineering that are systematic, logical, and realistic appropriate with specified specifications by considering aspects of safety, social, cultural, environmental, and economic by recognizing/ utilizing local and national resources with global insight</i>				
		Capaian Pembelajaran Mata Kuliah (CPMK) Course Learning Outcome (CLO) - If CLO as description capability of each Learning Stage in the course, then CLO = LLO					

	CP MK 1 CLO 1	Menguasai konsep dasar elemen rangkaian listrik serta definisi atau istilah pada rangkaian listrik. <i>Mastering the basic concepts of electrical circuit elements as well as definitions or terms in electrical circuits.</i>																																																																																																																		
	CP MK 2 CLO 2	Menguasai hukum dasar yang berlaku pada rangkaian listrik seperti Hukum Ohm dan Hukum Kirchoff. <i>Master the basic laws that apply to electrical circuits such as Ohm's Law and Kirchoff's Law.</i>																																																																																																																		
	CP MK 3 CLO 3	Menguasai analisis rangkaian dengan metoda node dan mesh. <i>Mastering circuit analysis using node and mesh methods.</i>																																																																																																																		
	CP MK 4 CLO 4	Menguasai beberapa teknik rangkaian penting. <i>Master several important circuit techniques.</i>																																																																																																																		
	CP MK 5 CLO 5	Menguasai konsep dasar kapasitor dan induktor. <i>Mastering the basic concepts of capacitors and inductors.</i>																																																																																																																		
	CP MK 6 CLO 6	Menguasai teknik analisis rangkaian orde satu RL dan RC. <i>Mastering RL and RC first order series analysis techniques.</i>																																																																																																																		
	CP MK 7 CLO 7	Menguasai teknik analisis rangkaian orde dua. <i>Mastering second order series analysis techniques.</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 CLO 1 / LLO 1</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 CLO 2 / LLO 2</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 CLO 3 / LLO 3</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 CLO 4 / LLO 4</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 CLO 5 / LLO 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> <tr> <td>CPMK 6 / SUB CPMK 6 CLO 6 / LLO 6</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 7 / SUB CPMK 7 CLO 7 / LLO 7</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 CLO 1 / LLO 1	√												CPMK 2 / SUB CPMK 2 CLO 2 / LLO 2	√												CPMK 3 / SUB CPMK 3 CLO 3 / LLO 3					√								CPMK 4 / SUB CPMK 4 CLO 4 / LLO 4					√								CPMK 5 / SUB CPMK 5 CLO 5 / LLO 5	√												CPMK 6 / SUB CPMK 6 CLO 6 / LLO 6	√												CPMK 7 / SUB CPMK 7 CLO 7 / LLO 7					√							
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Diskripsi Singkat MK Short Description of Course	Mata kuliah Rangkaian Listrik membahas tentang Konsep dasar rangkaian dan analisisnya, Hukum dasar rangkaian yang meliputi Hukum Ohm dan Kirchhoff, Metoda analisis node dan mesh, Teori rangkaian yang meliputi teorema superposisi, rangkaian ekuivalen thevenin dan Norton, serta transfer daya maksimum. Topik pembahasan berikutnya adalah prinsip kerja Kapasitor dan induktor, Rangkaian dengan resistor atau induktor (orde satu), serta Rangkaian dengan resistor, kapasitor dan induktor (orde dua) baik seri maupun paralel. <i>The Electrical Circuits course discusses the basic concepts of circuits and their analysis, the basic laws of circuits which include Ohm and Kirchhoff's Laws, node and mesh analysis methods, circuit theory which includes superposition theorems, Thevenin and Norton equivalent circuits, and maximum power transfer. The next topic of discussion is the working principle of capacitors and inductors, circuits with resistors or inductors (first order), as well as circuits with resistors, capacitors and inductors (second order) both series and parallel.</i>				
Bahan Kajian: Materi pembelajaran Course Materials:	1. The basic concept of the circuit. 2. Basic law of circuit. 3. Circuit analysis. 4. Circuit theory. 5. Capacitor and inductor. 6. The first order sequence. 7. Series of second order.				
Pustaka References	<table><tr><td>Utama/ Main:</td></tr><tr><td>1. Tim pengajar rangkaian listrik, Handout Mata Kuliah Rangkaian Listrik. 2. Pujiono, Rangkaian Listrik, Graha Ilmu. 3. CK Aexander and MNO Sadiku, Fundamental of Electric Circuit, McGraw Hill, 8th Edition, 2013.</td></tr><tr><td>Pendukung/Supporting:</td></tr><tr><td>4. WH Hayt, JE Kemmerly, and SM Durbin, Engineering Circuit Analysis, McGraw Hill, 8th Edition, 2007.</td></tr></table>	Utama/ Main:	1. Tim pengajar rangkaian listrik, Handout Mata Kuliah Rangkaian Listrik. 2. Pujiono, Rangkaian Listrik, Graha Ilmu. 3. CK Aexander and MNO Sadiku, Fundamental of Electric Circuit, McGraw Hill, 8th Edition, 2013.	Pendukung/Supporting:	4. WH Hayt, JE Kemmerly, and SM Durbin, Engineering Circuit Analysis, McGraw Hill, 8th Edition, 2007.
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Pendukung/Supporting:					
4. WH Hayt, JE Kemmerly, and SM Durbin, Engineering Circuit Analysis, McGraw Hill, 8th Edition, 2007.					
Dosen Pengampu Lecturers	TM, DP, HK, FB				

Matakuliah syarat Prerequisite		Mathematics 1					
Mg ke/ Week	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) / Final ability of each learning stage (LLO)	Penilaian / Assessment		Bantuk Pembelajaran; Metode Pembelajaran; Penugasan Mahasiswa; [Estimasi Waktu] / Form of Learning; Learning Method; Student Assignment; [Estimated Time]		Materi Pembelajaran [Pustaka] / Learning Material [Reference]	Bobot Penilaian /Assess- ment Load (%)
		Indikator / Indicator	Kriteria & Teknik / Criteria & Techniques	Tatap Muka / In-class (5)	Daring / Online (6)		
(1)	(2)	(3)	(4)			(1)	(2)
1,2	Menguasai konsep dasar elemen rangkaian listrik serta definisi atau istilah pada rangkaian listrik. <i>Mastering the basic concepts of electrical circuit elements as well as definitions or terms in electrical circuits.</i>	- Mampu menerangkan fenomena tegangan, arus, dan resistansi. - Mampu menjelaskan sumber arus dan sumber tegangan baik yang independen maupun yang dependen serta perbedaan diantara keduanya. - Mampu mengidentifikasi node (titik), branch (cabang), mesh, serta loop pada suatu rangkaian listrik. - Able to explain the	- Menunjukkan resistor, sumber listrik (power supply), dan beberapa contoh rangkaian listrik serta cara pengukurannya. - Shows resistors, a power supply, and some examples of electrical circuits and how to	- Pembelajaran di Kelas: Tutorial (2 x 3 x 50 menit) - Belajar Terstruktur (2 x 3 x 60 menit) - Learning in Class: Tutorial (2 x 3 x 50 minutes) - Structured Learning (2 x 3 x 60 minutes)	- Belajar Mandiri – Daring atau Luring (2 x 3 x 60 menit) - Independent Study - Online or Offline (2 x 3 x 60 minutes)	- Tegangan, arus, resistansi. - Sumber bebas dan tak bebas. - Node, branch, mesh, loop. - Voltage, current, resistance. - Free and unfree sources. - Node, branch, mesh, loop.	5

		<i>phenomena of voltage, current and resistance.</i> • <i>Able to explain current and voltage sources, both independent and dependent, and the differences between them.</i> • <i>Able to identify nodes (points), branches (branches), mesh, and loops in an electrical circuit.</i>	<i>measure them.</i>				
3,4	Menguasai hukum dasar yang berlaku pada rangkaian listrik seperti Hukum Ohm dan Hukum Kirchoff. <i>Mastering the proper basic laws of electrical circuits such as Ohm's Law and Kirchoff's Law.</i>	• Mampu memahami dan menerapkan hukum ohm pada suatu rangkaian listrik. • Mengetahui dan Mampu memahami dan menerapkan hukum kirchoff arus pada suatu rangkaian listrik. • Mampu memahami dan menerapkan hukum kirchoff tegangan pada suatu rangkaian listrik.	• Menunjukkan cara menjalankan simulator rangkaian (Spice) • <i>Demonstrates how to run a circuit simulator (Spice)</i>	• Pembelajaran di Kelas: Tutorial (2 x 3 x 50 menit) • Belajar Terstruktur (2 x 3 x 60 menit) • <i>Learning in Class: Tutorial (2 x 3 x 50 minutes)</i> • <i>Structured Learning (2 x 3 x 60)</i>	• Belajar Mandiri – Daring atau Luring (2 x 3 x 60 menit) • <i>Independent Study - Online or Offline (2 x 3 x 60 minutes)</i>	• Hukum ohm. • Hukum kirchoff arus. • Hukum kirchoff tegangan. • <i>Ohms law.</i> • <i>Current kirchoff law.</i> • <i>Kirchoff's law of voltage.</i>	5

		• Able to understand and apply ohm's law to an electrical circuit. • Know and Able to understand and apply the current kirchoff law to an electrical circuit. • Able to understand and apply voltage kirchoff law to an electrical circuit.		minutes)			
5,6	Menguasai analisis rangkaian dengan metoda node dan mesh <i>Mastering circuit analysis using node and mesh methods</i>	• Mampu mengidentifikasi node dan super-node pada suatu rangkaian. • Mampu memahami dan menerapkan analisis node pada suatu rangkaian. • Mampu menyelesaikan persamaan yang diturunkan dari analisis node. • Mampu mengidentifikasi mesh pada suatu	Tugas 1 • Analisis rangkaian dengan spice Task 1 • Sequence analysis with spice	• Pembelajaran di Kelas: Tutorial (2 x 3 x 50 menit) • Belajar Terstruktur (2 x 3 x 60 menit) • <i>Learning in Class: Tutorial (2 x 3 x 50 minutes)</i> • <i>Structured Learning (2 x 3 x 60</i>	• Belajar Mandiri – Daring atau Luring (2 x 3 x 60 menit) • <i>Independent Study - Online or Offline (2 x 3 x 60 minutes)</i>	• Analisis Node • Analisis Mesh • <i>Node Analysis</i> • <i>Mesh Analysis</i>	20

		rangkaian. • Mampu memahami dan menerapkan analisis node pada suatu rangkaian. • Mampu menyelesaikan persamaan yang diturunkan dari analisis mesh. • <i>Able to identify nodes and super-nodes in a chain.</i> • <i>Able to understand and apply node analysis in a series.</i> • <i>Be able to solve equations derived from node analysis.</i> • <i>Be able to identify the mesh in a series.</i> • <i>Able to understand and apply node analysis in a series.</i> • <i>Able to solve equations derived from mesh analysis.</i>		<i>minutes)</i>			
7	Menguasai beberapa teknik rangkaian penting.	• Mampu memahami dan menerapkan teorema superposisi	Tugas 2 • Analisis	• Pembelajaran di Kelas: Tutorial (2 x 3	• Belajar Mandiri – Daring atau Luring (2 x 3 x	• Teori Superposisi • Transformasi sumber	20

	<i>Master several important circuit techniques.</i>	pada suatu rangkaian • Mampu memahami dan menerapkan transformasi sumber pada suatu rangkaian. • Mampu mendapatkan rangkaian ekuivalen thevenin dan norton pada suatu rangkaian kompleks. • Mampu memahami dan menerapkan konsep transfer daya maksimum pada suatu rangkaian. • <i>Able to understand and apply the superposition theorem to a series</i> • <i>Able to understand and apply source transformation in a series.</i> • <i>Able to obtain the equivalent circuit of thevenin and norton in a complex circuit.</i>	rangkaian dengan spice Task 2 Sequence analysis with spice	x 50 menit) • Belajar Terstruktur (2 x 3 x 60 menit) • <i>Learning in Class: Tutorial (2 x 3 x 50 minutes)</i> • <i>Structured Learning (2 x 3 x 60 minutes)</i>	60 menit) • <i>Independent Study - Online or Offline (2 x 3 x 60 minutes)</i>	Rangkaian ekivalen Thevenin • Rangkaian ekivalen Norton. • Transfer daya maksimum • <i>Superposition Theory</i> • <i>Source transformation</i> • <i>Thevenin equivalent circuit</i> • <i>Norton equivalent circuit.</i> • <i>Maximum power transfer</i>	
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		• <i>Able to understand and apply the concept of maximum power transfer in a circuit.</i>					
8	EVALUASI TENGAH SEMESTER MID-SEMESTER EXAM						
9, 10	Menguasai konsep dasar kapasitor dan inductor. <i>Mastering the basic concepts of capacitors and inductors.</i>	• Mampu menunjukkan kapasitor, menerangkan fenomena kapasitansi dan model matematikanya. • Mampu menganalisis rangkaian kapasitor yang terhubung seri maupun parallel. • Mampu menunjukkan induktor, menerangkan fenomena induktansi dan model matematikanya. • Mampu menganalisis rangkaian induktor yang terhubung seri	Menunjukkan komponen kapasitor dan inductor dan cara pengukurannya <i>Shows the capacitor and inductor components and how to measure them</i>	• Pembelajaran di Kelas: Tutorial (2 x 3 x 50 menit) • Belajar Terstruktur (2 x 3 x 60 menit) • <i>Learning in Class: Tutorial (2 x 3 x 50 minutes)</i> • <i>Structured Learning (2 x 3 x 60 minutes)</i>	• Belajar Mandiri – Daring atau Luring (2 x 3 x 60 menit) • <i>Independent Study - Online or Offline (2 x 3 x 60 minutes)</i>	• Komponen Kapasitor. • Komponen Induktor. • Rangkaian Kapasitor seri dan paralel. • Rangkaian Inductor seri dan paralel. • <i>Capacitor Components.</i> • <i>Inductor Components.</i> • <i>Series and parallel capacitor circuits.</i> • <i>Inductor circuits in series and parallel.</i>	10

		maupun parallel. • <i>Be able to show capacitors, explain capacitance phenomena and mathematical models.</i> • <i>Able to analyze capacitor circuits connected in series or parallel.</i> • <i>Be able to show inductors, explain inductance phenomena and mathematical models.</i> • <i>Able to analyze inductor circuits connected in series or parallel.</i>					
11, 12	Menguasai teknik analisis rangkaian orde satu RL dan RC. <i>Mastering RL and RC first order series analysis techniques.</i>	• Mampu melakukan analisis rangkaian RC tanpa sumber. • Mampu melakukan analisis rangkaian RL tanpa sumber. • Mampu menganalisis tanggapan unit step	Tugas 3 • Analisis rangkaian dengan spice Task 3 Sequence analysis	• Pembelajaran di Kelas: Tutorial (2 x 3 x 50 menit) • Belajar Terstruktur (2 x 3 x 60 menit)	• Belajar Mandiri – Daring atau Luring (2 x 3 x 60 menit) • <i>Independent Study - Online or Offline (2 x 3 x 60 minutes)</i>	• Rangkaian tanpa sumber. • Respon terhadap unit step. • <i>Sourceless circuit.</i> • <i>Response to unit steps.</i>	20

		rangkaian RC. • Mampu menganalisis tanggapan unit step Rangkaian RL. • Mampu melakukan analisis transient dengan simulator Spice. • <i>Able to perform sourceless RC circuit analysis.</i> • <i>Able to perform sourceless RL circuit analysis.</i> • <i>Able to analyze the response of the RC circuit step unit.</i> • <i>Able to analyze the response of the unit step of the RL circuit.</i> • <i>Able to perform transient analysis with Spice simulator.</i>	with spice	• <i>Learning in Class: Tutorial (2 x 3 x 50 minutes)</i> • <i>Structured Learning (2 x 3 x 60 minutes)</i>			
13,14	Menguasai teknik analisis rangkaian orde dua. <i>Mastering second order series analysis techniques.</i>	• Mampu melakukan analisis rangkaian RLC seri tanpa sumber. • Mampu melakukan analisis rangkaian	Tugas 4 • Analisis rangkaian dengan spice	• Pembelajaran di Kelas: Tutorial (2 x 3 x 50 menit) • Belajar Terstruktur (2	• Belajar Mandiri – Daring atau Luring (2 x 3 x 60 menit) • <i>Independent</i>	• Rangkaian tanpa sumber. • Respon terhadap unit step • Rangkaian lossless	20

		RLC parael tanpa sumber. • Mampu menganalisis tanggapan unit step rangkaian RLC seri. • Mampu menganalisis tanggapan unit step rangkaian RLC paralel. • Mampu melakukan analisis transient rangkaian RLC dengan simulator Spice. • <i>Able to perform sourceless serial RLC circuit analysis.</i> • <i>Able to perform sourceless parael RLC circuit analysis.</i> • <i>Able to analyze the response of a series RLC circuit unit step.</i> • <i>Able to analyze the response of a parallel RLC circuit step unit.</i> • <i>Able to perform</i>	Task 4 Sequence analysis with spice	x 3 x 60 menit) • <i>Learning in Class: Tutorial (2 x 3 x 50 minutes)</i> • <i>Structured Learning (2 x 3 x 60 minutes)</i>	<i>Study - Online or Offline (2 x 3 x 60 minutes)</i>	• <i>Sourceless circuit.</i> • <i>Response to unit steps</i> • <i>Lossles circuit</i>	
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		<i>transient analysis of RLC circuits using Spice simulator.</i>					
15-16	EVALUASI AKHIR SEMESTER <i>FINAL-SEMESTER EXAM</i>						

TM=Tatap Muka, **PT**=Penugasan Terstruktur, **BM**=Belajar Mandiri

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

	ASSESSMENT & EVALUATION PLAN BACHELOR DEGREE PROGRAM OF BIOMEDICAL ENGINEERING - FTEIC ITS Course : Electrical Circuits		RA&E
			Write Doc Code
Kode/code: EW184201	Bobot sks/credits (T/P): 2/0	Rumpun MK: Ilmu Dasar Teknik Course Cluster: Basic Engineering	Smt: II
OTORISASI <i>AUTHORIZATION</i>	Penyusun RA & E <i>Compiler A&EP</i> Dr. Rachmad Setiawan, S.T., M.T.	Koordinator RMK <i>Course Cluster Coordinator</i> Muhammad Hilman Fatoni, S.T., M.T.	Ka DEP <i>Head of DEP</i> Dr. Achmad Arifin, S.T., M.Eng.

Mg ke/ Week (1)	Sub CP-MK / <i>Lesson Learning Outcomes (LLO)</i> (2)	Bentuk Asesmen (Penilaian) <i>Form of Assessment</i> (3)	Bobot / <i>Load (%)</i> (4)
1,2	Sub CP-MK 1: Menguasai konsep dasar elemen rangkaian listrik serta definisi atau istilah pada rangkaian listrik. LLO-1: <i>Mastering the basic concepts of electrical circuit elements as well as definitions or terms in electrical circuits.</i>	Test Sederhana: Menunjukkan resistor, sumber listrik (power supply), dan beberapa contoh rangkaian listrik serta cara pengukurannya. Small Test: <i>Shows resistors, a power supply, and some examples of electrical circuits and how to measure them.</i>	5
3,4	Sub CP-MK 2: Menguasai hukum dasar yang berlaku pada rangkaian listrik seperti Hukum Ohm dan Hukum Kirchhoff. LLO-2: <i>Mastering the</i>	Test Sederhana: Menunjukkan cara menjalankan simulator rangkaian (Spice) Small Test: <i>Demonstrates how to run a circuit simulator (Spice)</i>	5

Mg ke/ Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
	<i>proper basic laws of electrical circuits such as Ohm's Law and Kirchoff's Law.</i>		
5,6	Sub CP-MK 3: Menguasai analisis rangkaian dengan metoda node dan mesh LLO-3: <i>Mastering circuit analysis using node and mesh methods</i>	Tugas 1 Analisis rangkaian dengan spice Task 1 <i>Sequence analysis with spice</i>	20
7,8	Sub CP-MK 4: Menguasai beberapa teknik rangkaian penting. LLO-4: <i>Master several important circuit techniques.</i>	Tugas 2 Analisis rangkaian dengan spice Task 2 <i>Sequence analysis with spice</i>	20
9,10	Sub CP-MK 5: Menguasai konsep dasar kapasitor dan inductor. LLO-5: <i>Mastering the basic concepts of capacitors and inductors.</i>	Test Sederhana: Menunjukkan komponen kapasitor dan inductor dan cara pengukurannya Small Test: <i>Shows the capacitor and inductor components and how to measure them</i>	10
11,12	Sub CP-MK 6: Menguasai teknik analisis rangkaian orde satu RL dan RC. LLO-6: <i>Mastering RL and RC</i>	Tugas 3 Analisis rangkaian dengan spice Task 3 <i>Sequence analysis with spice</i>	20

Mg ke/ Week (1)	Sub CP-MK / Lesson Learning Outcomes (LLO) (2)	Bentuk Asesmen (Penilaian) Form of Assessment (3)	Bobot / Load (%) (4)
	<i>first order series analysis techniques.</i>		
13,14	Sub CP-MK 7: Menguasai teknik analisis rangkaian orde dua. LLO-7: <i>Mastering second order series analysis techniques.</i>	Tugas 4 Analisis rangkaian dengan spice Task 4 <i>Sequence analysis with spice</i>	20
Total bobot penilaian			100%

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

CPL yang dibebankan pada MK / PLO charged to the course	CPMK / Course Learning Outcome (CLO)	Minggu ke / Week	Bentuk Asesmen / Form of Assessment	Bobot / Load (%)
CPL-01 / PLO-1	CPMK 1 / CLO-1	Week- 1-2	Simple Test	5
	CPMK 2/ CLO-2	Week- 3-4	Simple Test	5
	CPMK 5/ CLO-5	Week- 5-6	Task 1	20
	CPMK 5/ CLO-6	Week- 7-8	Task 2	20
CPL-05 / PLO-5	CPMK 3/ CLO-3	Week- 9-10	Simple Test	10
	CPMK 4/ CLO-4	Week- 11-12	Task 3	20
	CPMK 5/ CLO-7	Week- 13-14	Task 4	20
				Σ = 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	Simple Test	0.05												0.05
2	Simple Task	0.05												0.05
3	Task 1					0.2								0.2
4	Task 2					0.2								0.2
5	Simple Task					0.1								0.1
6	Task 3	0.2												0.2
7	Task 4	0.2												0.2
	Total	0.5				0.5								1