	Universitas Negeri Surabaya **Faculty of Engineering** **, Electrical Engineering Education Undergraduate Study Program**	**Document Code**

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Advanced Electromagnetic Fields	8320102252		T=2	P=0	ECTS=3.18	3	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Dr. Nur Kholis, S.T., M.T.

Learning model	**Project Based Learning**
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**
	Program Objectives (PO)
	PLO-PO Matrix

	P.O

PO Matrix at the end of each learning stage (Sub-PO)

P.O	Week															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Short Course Description	Understanding and studying Ampere‘s law and magnetic fields, magnetic force and torque, inductance and magnetic circuits, induced electromotive force, fields that change over time and Maxwell‘s equations, electromagnetic waves.
References	**Main :**

1. Hayt,, William. 1981. Engineering electromagnet, fifth Edition, terjemahan oleh The Houw Liong (ITB). MacGrarw-Hill.
2. Seri Buku Schaum,. 1984. Elektromagnetika J.D. Kraus.
3. Liang Chi Shen, Jin An Kong. 1995. Aplikasi elektromagnetik, edisi 3. Penerbit Erlangga, Jakarta.
4. Krauss John E., 1999. Electromagnetics. McGraww-Hill Book Co. tirth Edition.

	Supporters:
Supporting lecturer	Dr. Puput Wanarti Rusimamto, S.T., M.T.

Week-	Final abilities of each learning stage (Sub-PO)	Evaluation		Help Learning, Learning methods, Student Assignments, [Estimated time]		Learning materials [References]	Assessment Weight (%)
		Indicator	Criteria & Form	Offline (*offline*)	Online (*online*)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

1	Students are able to explain theories regarding static magnetic fields and the application of Biot-Savart and Ampere‘s Laws	1. Explain Biot Savart‘s law 2. Explain Ampere‘s integral law 3. Explain Stoke‘s theorem 4. Explain magnetic flux and magnetic flux density 5. Explain scalar potential and magnetic vector potential 6. Explain the law of steady magnetic fields		Presentation, discussion and reflection 2 X 50			0%
2	Students are able to explain theories regarding static magnetic fields and the application of Biot-Savart and Ampere‘s Laws	1. Explain Biot Savart‘s law 2. Explain Ampere‘s integral law 3. Explain Stoke‘s theorem 4. Explain magnetic flux and magnetic flux density 5. Explain scalar potential and magnetic vector potential 6. Explain the law of steady magnetic fields		Presentation, discussion and reflection 2 X 50			0%
3	Students are able to explain theories regarding static magnetic fields and the application of Biot-Savart and Ampere‘s Laws	1. Explain Biot Savart‘s law 2. Explain Ampere‘s integral law 3. Explain Stoke‘s theorem 4. Explain magnetic flux and magnetic flux density 5. Explain scalar potential and magnetic vector potential 6. Explain the law of steady magnetic fields		Presentation, discussion and reflection 2 X 50			0%

4	Students are able to explain force and torque in a magnetic field	1. Explain the magnetic force on particles 2. Explain the combination of electric fields and magnetic fields 3. Explain the magnetic force on a current element 4. Explain work and power 5. Explain torque 6. Explain the magnetic moment of a plane coil		Presentation, discussion and reflection 2 X 50			0%
5	Students are able to explain force and torque in a magnetic field	1. Explain the magnetic force on particles 2. Explain the combination of electric fields and magnetic fields 3. Explain the magnetic force on a current element 4. Explain work and power 5. Explain torque 6. Explain the magnetic moment of a plane coil		Presentation, discussion and reflection 2 X 50			0%
6	Students are able to explain inductance and magnetic circuits	- Explain self-induction voltage - Explain inductors and inductance - Explain magnetic circuits - Explain cores with air gaps - Explain double coils - Explain parallel magnetic circuits		Presentation, discussion and reflection 2 X 50			0%
7	Students are able to explain inductance and magnetic circuits	- Explain self-induction voltage - Explain inductors and inductance - Explain magnetic circuits - Explain cores with air gaps - Explain double coils - Explain parallel magnetic circuits		Presentation, discussion and reflection 2 X 50			0%

8	Students are able to explain inductance and magnetic circuits	- Explain self-induction voltage - Explain inductors and inductance - Explain magnetic circuits - Explain cores with air gaps - Explain double coils - Explain parallel magnetic circuits		Presentation, discussion and reflection 2 X 50			0%
9	Students are able to explain displacement currents and induced electromotive forces	- Explain displacement currents - Explain Faraday's law - Explain conductors that move in a field that are independent of time - Explain conductors that move in a changing field		Presentation, discussion and reflection 2 X 50			0%
10	Students are able to explain displacement currents and induced electromotive forces	- Explain displacement currents - Explain Faraday's law - Explain conductors that move in a field that are independent of time - Explain conductors that move in a changing field		Presentation, discussion and reflection 2 X 50			0%
11	Students are able to explain displacement currents and induced electromotive forces	- Explain displacement currents - Explain Faraday's law - Explain conductors that move in a field that are independent of time - Explain conductors that move in a changing field		Presentation, discussion and reflection 2 X 50			0%
12	Students are able to explain Maxwell's equations and boundary conditions	- Explain the boundary conditions for magnetic fields - Explain the boundary conditions - Explain Maxwell's equations		Presentation, discussion and reflection 2 X 50			0%
13	Students are able to explain Maxwell's equations and boundary conditions	- Explain the boundary conditions for magnetic fields - Explain the boundary conditions - Explain Maxwell's equations		Presentation, discussion and reflection 2 X 50			0%
14	Students are able to explain the theories of electromagnetic waves and solve cases	- Explaining the Wave Equation and its Solution in Rectangular Coordinates - Explaining Wave Propagation in various Media - Explaining Interfacial Conditions for Normal Collisions - Explaining Oblique Collisions and Snell's Law		Presentation, discussion and reflection 2 X 50			0%

15	Students are able to explain the theories of electromagnetic waves and solve cases	- Explaining the Wave Equation and its Solution in Rectangular Coordinates - Explaining Wave Propagation in various Media - Explaining Interfacial Conditions for Normal Collisions - Explaining Oblique Collisions and Snell's Law		Presentation, discussion and reflection 2 X 50			0%
16							0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
		0%

Notes

1. **Learning Outcomes of Study Program Graduates (PLO - Study Program)** are the abilities possessed by each Study Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study program obtained through the learning process.
2. **The PLO imposed on courses** are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
4. **Subject Sub-PO (Sub-PO)** is a capability that is specifically described from the PO that can be measured or observed and is the final ability that is planned at each learning stage, and is specific to the learning material of the course.
5. **Indicators for assessing** ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
6. **Assessment Criteria** are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
7. **Forms of assessment:** test and non-test.
8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
10. **Learning materials** are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
11. **The assessment weight** is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
12. TM=Face to face, PT=Structured assignments, BM=Independent study.