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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Engineering Physics I	2020102391	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	1	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

Program Objectives (PO)

PO - 1	Have the ability to communicate effectively, think critically, and make appropriate decisions
PO - 2	Master basic physics concepts and apply them to the field of electrical engineering

PLO-PO Matrix

P.O
PO-1
PO-2

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
PO-1																
PO-2																

Short Course Description	Study of basic physics concepts and their application in electrical engineering, including quantities and vectors, Coulomb's law, electric magnetism, electromagnetic induction, and capacitance.

References

Main :

1. Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.
2. Sears Zemansky. 1986. Fisika Untuk Universitas I. Binacipta.
3. Frederick j. Buece. 2006. Schaums Outline of theory and problems of College Physics, edisi kesepuluh. Erlangga.

Supporters:

1. Frederick j. Buece. 2006. Schaums Outline of theory and problems of College Physics, edisi kesepuluh. Erlangga.

Supporting lecturer	Dr. Puput Wanarti Rusimamto, S.T., M.T. Dr. Nurhayati, S.T., M.T. Roswina Dianawati, S.Pd., M.Ed.

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 interpret vector concepts and calculations in the context of engineering physics	1. Students are able to explain the basic concepts of vectors and scalars 2. Students are able to apply vector operations in real cases	**Criteria:** 1. Ability to explain the definition of vectors and their differences with scalars 2. Ability to solve problems related to vector operations **Form of Assessment** : Participatory Activities	Discussion lecture and question and answer Case study 2 X 50	Discussion lectures and case study questions and answers	**Material:** Definition and types of vectors; Vector operations; Application of vectors in physics; Representation of vectors in cartesian, polar and other coordinates **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
2	Students are able to describe their understanding of the properties of electric charges and their interactions in various environments	1. Students are able to define electric charge and its types 2. Students are able to analyze interactions between contents in case studies	**Criteria:** 1. Ability to explain the concept of charge and its properties 2. Ability to apply Coulomb's law in real contexts **Form of Assessment** : Participatory Activities	Discussion lecture and question and answer Case study 2 X 50	Discussion lectures and case study questions and answers	**Material:** Basic concepts of electric charge; Laws of conservation of charge; Interaction between charges; Causes and effects of electric charges **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
3	Students are able to describe their understanding of the properties of electric charges and their interactions in various environments	1. Students are able to define electric charge and its types 2. Students are able to analyze interactions between contents in case studies	**Criteria:** 1. Ability to explain the concept of charge and its properties 2. Ability to apply Coulomb's law in real contexts **Form of Assessment** : Participatory Activities	Discussion lecture and question and answer Case study 2 X 50	Discussion lectures and case study questions and answers	**Material:** Basic concepts of electric charge; Laws of conservation of charge; Interaction between charges; Causes and effects of electric charges **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
4	Students are able to dissect the main aspects of electric fields and communicate their application in real situations	1. Students are able to identify sources of electric fields 2. Students are able to analyze the distribution of electric fields in case studies	**Criteria:** 1. Ability to define and describe sources of electric fields 2. Ability to calculate the electric field at a certain point based on case information **Form of Assessment** : Participatory Activities	Discussion lecture and question and answer Case study 2 X 50	Discussion lectures and case study questions and answers	**Material:** Definition and basic properties of electric fields, electric fields due to point charges, principle of superposition in electric fields, electric field lines and equipotential surfaces. **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%

5	Students are able to dissect the main aspects of electric fields and communicate their application in real situations	1. Students are able to identify sources of electric fields 2. Students are able to analyze the distribution of electric fields in case studies	**Criteria:** 1. Ability to define and describe sources of electric fields 2. Ability to calculate the electric field at a certain point based on case information **Form of Assessment** : Participatory Activities	Discussion lecture and question and answer Case study 2 X 50	Discussion lectures and case study questions and answers	**Material:** Definition and basic properties of electric fields, electric fields due to point charges, principle of superposition in electric fields, electric field lines and equipotential surfaces. **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
6	Students are able to describe the phenomena and applications of magnetic fields in an engineering context	1. Students are able to explain the nature and sources of magnetic fields 2. Students are able to describe magnetic fields from electric currents in case studies	**Criteria:** 1. Ability to describe magnetic fields and their effects on matter 2. Ability to apply the Biot-Savart law based on case information **Form of Assessment** : Participatory Activities	Discussion lecture and question and answer Case study 2 X 50	Discussion lectures and case study questions and answers	**Material:** Basic concepts of magnetic fields and their sources, Magnetic fields due to electric currents, Lorentz force and its application, Effects of magnetic fields on material **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
7	Students are able to describe the phenomena and applications of magnetic fields in an engineering context	1. Students are able to explain the nature and sources of magnetic fields 2. Students are able to describe magnetic fields from electric currents in case studies	**Criteria:** 1. Ability to describe magnetic fields and their effects on matter 2. Ability to apply the Biot-Savart law based on case information	Discussion lecture and question and answer Case study 2 X 50	Discussion lectures and case study questions and answers	**Material:** Basic concepts of magnetic fields and their sources, Magnetic fields due to electric currents, Lorentz force and its application, Effects of magnetic fields on material **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
8	Midterm Exam (UTS)	Able to understand the concept of quantities in physics, vectors, Coulomb's law, and electric fields	**Criteria:** Full marks are obtained if you do all the questions correctly **Form of Assessment** : Test	2 X 50		**Material:** Vectors and scalars, electric charge, Coulomb's law, electric field. **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	15%

9	Students are able to explore and explain the principles of electric potential and their implications in the world of engineering	1. Students are able to explain the concept of electric potential 2. Students are able to apply potential concepts in case analysis	**Criteria:** 1. Basic understanding of electric potential and its relationship with electric fields 2. Ability to calculate potential changes based on case information **Form of Assessment** : Participatory Activities	Lecture and question and answer Case study 2 X 50	Lecture and question and answer Case study	**Material:** Concept of potential and electric potential, Relationship between electric field and electric potential, Electric potential energy, Application in electrical circuits and their components. **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
10	Students are able to explore and explain the principles of electric potential and their implications in the world of engineering	1. Students are able to explain the concept of electric potential 2. Students are able to apply potential concepts in case analysis	**Criteria:** 1. Basic understanding of electric potential and its relationship with electric fields 2. Ability to calculate potential changes based on case information **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Lecture and question and answer Case study 2 X 50	Lecture and question and answer Case study	**Material:** Concept of potential and electric potential, Relationship between electric field and electric potential, Electric potential energy, Application in electrical circuits and their components. **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
11	Students are able to detail the basic concepts of capacitance and communicate its relevance in engineering physics systems	1. Students are able to explain capacitance and its function 2. Students are able to design capacitors based on the case studies given	**Criteria:** Full marks are obtained if you do all the questions correctly **Form of Assessment** : Practical Assessment	Lecture, discussion Case study 2 X 50	Lectures, Case study discussions	**Material:** Introduction to capacitors and capacitance, Basic formulas and capacitance calculations, Types of capacitors and their applications, Capacitors in series and parallel circuits **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%

12	Students are able to communicate their understanding of the principles of inductance and its application in electrical circuits	1. Students are able to define the concept of inductance 2. Students are able to calculate inductance based on the case study given	**Criteria:** 1. Basic understanding of self-inductance and cross-inductance 2. Ability to apply inductance formulas to real cases **Form of Assessment** : Participatory Activities	Lecture and discussion Case study 2 X 50	Case study lectures and discussions	**Material:** Basic principles of inductance and inductors, Self-inductance and cross-inductance, Inductance formulas and calculations, Application of inductors in AC and DC circuits **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
13	Students are able to communicate their understanding of the principles of inductance and its application in electrical circuits	1. Students are able to define the concept of inductance 2. Ability to apply inductance formulas to real cases	**Criteria:** 1. Basic understanding of self-inductance and cross-inductance 2. Ability to apply inductance formulas to real cases **Form of Assessment** : Portfolio Assessment	Lecture and discussion Case study 2 X 50	Case study lectures and discussions	**Material:** Basic principles of inductance and inductors, Self-inductance and cross-inductance, Inductance formulas and calculations, Application of inductors in AC and DC circuits **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
14	Students are able to demonstrate a deep understanding of electromagnetic waves and their impact on modern technology	1. Students are able to explain the properties of electromagnetic waves 2. Students are able to analyze the impact of electromagnetic waves in modern technology through case studies	**Criteria:** 1. Understanding of the spectrum, properties, and applications of electromagnetic waves 2. Ability to connect the principles of electromagnetic waves with technological applications **Form of Assessment** : Participatory Activities	Lecture and discussion Case study 2 X 50	Case study lectures and discussions	**Material:** Basic properties of electromagnetic waves, Spectrum of electromagnetic waves, Propagation of electromagnetic waves **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
15	Students are able to demonstrate a deep understanding of electromagnetic waves and their impact on modern technology	1. Students are able to explain the properties of electromagnetic waves 2. Students are able to analyze the impact of electromagnetic waves in modern technology through case studies	**Criteria:** 1. Understanding of the spectrum, properties, and applications of electromagnetic waves 2. Ability to connect the principles of electromagnetic waves with technological applications **Form of Assessment** : Participatory Activities, Portfolio Assessment	Lecture and discussion Case study 2 X 50	Case study lectures and discussions	**Material:** Basic properties of electromagnetic waves, Spectrum of electromagnetic waves, Propagation of electromagnetic waves **References:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	5%
16	Final Semester Examination (UAS)	Able to understand the concepts of potential, capacitance, inductance and electromagnetic waves	**Criteria:** Full marks are obtained if you do all the questions correctly **Form of Assessment** : Test	2 X 50		**Material:** Potential, Capacitance, Inductance, Electromagnetic Waves **Library:** *Halliday, Resnic, Jearl Walker. 2011. Principles of Physics, Ninth Edition. John Wiley & Son.*	20%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	50%
2.	Project Results Assessment / Product Assessment	2.5%
3.	Portfolio Assessment	7.5%
4.	Practical Assessment	5%
5.	Test	35%
		100%

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.