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

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Antennas and Wave Propagation	2010102023		T=2	P=0	ECTS=4.48	2	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Unit Three Kartini, S.T., M.T., Ph.D.

Learning model	**Case Studies**	
Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**	
	Program Objectives (PO)	
	PO - 1	Shows a general overview of antennas, radiation mechanisms and current distribution.
	PO - 2	Shows describing the types of antennas and their applications
	PO - 3	Identifying antenna performance in the form of: Radiation Pattern, Power Density and Radiation Intensity and efficiency
	PO - 4	Describe Beamwidth and directivity, Numerical Technique, Gain, Beam efficiency, Bandwidth, Polarization, Input Impedance
	PO - 5	Describe potential sources of electric and magnetic currents and fields, wave equations, far field radiation, dipole antennas, grounding effects, circular loops, polygonal loop antennas.
	PO - 6	Describe Linear, Planar and Circular Array, N element array, MIMO antenna, smart antenna
	PLO-PO Matrix	

P.O
PO-1
PO-2
PO-3
PO-4
PO-5
PO-6

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																
PO-3																
PO-4																
PO-5																
PO-6																

Short Course Description	Conduct studies and provide an understanding of the general description of antennas, radiation mechanisms and current distribution, types of antennas and their applications, antenna performance in the form of: Radiation Pattern, Power Density and Radiation Intensity and efficiency, Beamwidth and directivity, Numerical Technique, Gain, Beam efficiency, Bandwidth, Polarization, Input Impedance, potential sources of electric and magnetic currents and fields, Wave equations, Far field radiation, Dipole antennas, grounding effects, Circular loops, Polygonal loop antennas, Planar and Circular Arrays, 3-dimensional design and characteristics for N element array, MIMO antenna, smart antenna, simulate and use in measurements. designing Broadband Dipole Antenna, Biconical Antenna, Triangular, Bow Tie, Cylinder, Folded Dipole, Spiral Antenna, log periodic, Fraactal antenna, Horn Antenna and Microstrip Antenna.	
References	**Main :**	

	1. John D. Kraus. 2001. Antenna for all application . McGraw-Hill Education Singapore 2. Fawwaz T Ulaby. 2015. Fundamentals of applied electromagnetics. Pearson Education Dorling Kindersley 3. Constantine A. Balanis,. 2005 . Antenna Theory Analysis and Design . John WilleY
Supporters:	
	1. G. Ray, K.Kumar, Broadband Microstrip Antennas. British: ARTECH HOUSE, INC, 2003 2. F. B. Gross, Frontiers in Antennas Next Generation Design & Engineering. New York: Mc Graw Hill, 2011 3. C. A. Balanis, MODERN ANTENNA HANDBOOK. John Wiley & Sons, Inc, 2008
Supporting lecturer	Dr. Nurhayati, 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	Describe a general overview of an antenna		**Criteria:** 1.• Describe the basic concept of antennas 2.• Explain the mechanism of radiation and current distribution 3.• Explain transmission channels **Form of Assessment** : Participatory Activities, Practice/Performance		Lectures, discussions and questions and answers 2 X 50		5%
2	Shows describing the types of antennas and their applications	1.• Identify types of antennas and their applications 2.• describe the types of Antennas and their applications.	**Form of Assessment** : Participatory Activities, Tests	discussions, lectures and questions and answers			5%
3	Identifying antenna performance in the form of: Radiation Pattern, Power Density and Radiation Intensity and efficiency	Describes radiation patterns, power density and radiation intensity and efficiency	**Criteria:** 5 **Form of Assessment** : Participatory Activities, Practice/Performance	discussions, lectures and questions and answers			5%
4	Describe Beamwidth and directivity, Numerical Techniques, Gain, Beam efficiency, Bandwidth, Polarization, Input Impedance, potential sources of current and electric and magnetic fields, Wave equations, Far field radiation, Dipole antennas, grounding effects, Circular loops, Polygonal loop antennas.	1.Describe Beamwidth and directivity, Numerical Technique, Gain, Beam efficiency, Bandwidth, Polarization 2.Determining input impedance, potential sources of current and electric and magnetic fields, wave equations, far field radiation 3.• Explain dipole antenna, grounding effect, circular loop, polygonal loop antenna.	**Forms of Assessment** : Participatory Activities, Practice/Performance, Tests	discussions, lectures and questions and answers			5%

5	Describe Beamwidth and directivity, Numerical Techniques, Gain, Beam efficiency, Bandwidth, Polarization, Input Impedance, potential sources of current and electric and magnetic fields, Wave equations, Far field radiation, Dipole antennas, grounding effects, Circular loops, Polygonal loop antennas.	1. Describe Beamwidth and directivity, Numerical Technique, Gain, Beam efficiency, Bandwidth, Polarization 2. Determining input impedance, potential sources of current and electric and magnetic fields, wave equations, far field radiation 3. • Explain dipole antenna, grounding effect, circular loop, polygonal loop antenna.	**Forms of Assessment** : Participatory Activities, Practice/Performance, Tests	discussions, lectures and questions and answers			5%
6	Describe Linear, Planar and Circular Array, N element array, MIMO antenna, smart antenna and Broadband Dipole Antenna, Biconical Antenna, Triangular	1. • Describe Linear, Planar and Circular Array, N element array, MIMO antenna, smart antenna 2. • Shows Broadband Dipole Antenna, Biconical Antenna, Triangular	**Forms of Assessment** : Participatory Activities, Practical Assessment, Practical / Performance	discussions, lectures and questions and answers			5%
7	Describe Linear, Planar and Circular Array, N element array, MIMO antenna, smart antenna and Broadband Dipole Antenna, Biconical Antenna, Triangular	1. • Describe Linear, Planar and Circular Array, N element array, MIMO antenna, smart antenna 2. • Shows Broadband Dipole Antenna, Biconical Antenna, Triangular	**Forms of Assessment** : Participatory Activities, Practical Assessment, Practical / Performance	discussions, lectures and questions and answers			5%
8	Shows Bow Tie, Cylinder, Folded Dipole	• Explain Bow Tie, Cylinder, Folded Dipole	**Form of Assessment** : Participatory Activities	discussions, lectures and questions and answers			5%
9	UTS		**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance		Project presentation		10%
10	Shows software supporting antenna design		**Form of Assessment** : Participatory Activities, Practice/Performance	Discussion. question and answer			0%

11	Antenna simulation along with applications and measurements and Design and performance analysis of Broadband Dipole Antenna, Biconical Antenna, Planar Antenna	1. Antenna simulation along with applications and measurements 2. Design and performance analysis of Broadband Dipole Antenna, Biconical Antenna, Planar Antenna	**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Presentations, discussions, project questions and answers			5%
12	Antenna simulation along with applications and measurements and Design and performance analysis of Broadband Dipole Antenna, Biconical Antenna, Planar Antenna	1. Antenna simulation along with applications and measurements 2. Design and performance analysis of Broadband Dipole Antenna, Biconical Antenna, Planar Antenna	**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Presentations, discussions, project questions and answers			5%
13	Design and performance analysis of microstrip, Triangular, Bow Tie, Cylinder, Folded Dipole antennas		**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practices / Performance	Presentations, discussions, questions and answers			5%
14	Design and performance analysis of Spiral Antenna.log periodic, Fraactal antenna, Design and performance analysis of Antenna array, MIMO	- Design and performance analysis of Spiral Antenna. log periodic, Fraactal antenna	**Form of Assessment** : Participatory Activities	Presentations, discussions, questions and answers			9%
15	Design and performance analysis of Spiral Antenna.log periodic, Fraactal antenna, Design and performance analysis of Antenna array, MIMO	- Design and performance analysis of Spiral Antenna. log periodic, Fraactal antenna	**Form of Assessment** : Participatory Activities	Presentations, discussions, questions and answers			15%
16	UAS		**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment, Practical / Performance	Presentations, questions and answers			10%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	54.02%
2.	Project Results Assessment / Product Assessment	10.84%
3.	Practical Assessment	5.84%
4.	Practice / Performance	22.52%
5.	Test	5.84%
		99.06%

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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.