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 Engineering Mathematics	8320103236	Compulsory Study Program Subjects	T=3	P=0	ECTS=4.77	2	July 17, 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

PLO-5	Able to align the electrical and electronics engineering training curriculum in vocational education that is relevant to the demands of global industrial development (Education).
PLO-7	Able to apply applied research to innovate vocational learning methods, optimize production process technology and electrical engineering services relevant to industry (Education).
PLO-10	Have a responsible character and be committed to professional ethics (General/SSC4.6).

Program Objectives (PO)

PO - 1	Students are able to explain Complex Numbers, Systems of linear equations, matrices, and determinants, Vectors, Integrals, Differentiation, Laplace Transformation, Fourier Series, Z Transformation, and Inverse Z Transformation. And this knowledge allows them to understand phenomena specific to electrical engineering or information technology.
PO - 2	Students are able to work together in solving problems about Complex Numbers, Systems of linear equations, matrices, and determinants, Vectors, Integrals, Differentiation, Laplace Transformation, Fourier Series, Z Transformation, and Inverse Z Transformation. And with this knowledge it is possible for them to understand phenomena specifically for electrical engineering or information technology.
PO - 3	Students have extensive knowledge of Complex Numbers, Systems of linear equations, matrices, and determinants, Vectors, Integrals, Differentiations, Laplace Transforms, Fourier Series, Z Transformations, and Inverse Z Transformations. And this knowledge allows them to understand phenomena specific to engineering electricity or information technology.

PLO-PO Matrix

P.O	PLO-5	PLO-7	PLO-10
PO-1			
PO-2			
PO-3			

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																

Short Course Description

This course discusses Complex Numbers, Systems of linear equations, matrices, and determinants, Vectors, Integrals, Differentiation, Laplace Transformation, Fourier Series, Z Transformation, and Inverse Z Transformation. In addition, it discusses the application of this topic to specific phenomena for electrical engineering or information technology.

References	Main :
	1. 1. Mursita, Danang. 2011. Matematika untuk Perguruan Tinggi . . Bandung: Rekayasa Sains. 2. K.A. Stroud. 2015. Matematika untuk Teknik. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003
	Supporters:
Supporting lecturer	Dr. Puput Wanarti Rusimamto, S.T., M.T. Dr. Raden Roro Hapsari Peni Agustin Tjahyaningtijas, S.Si., M.T. Dr. Farid Baskoro, 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 solve Complex Number problems	Students are able to solve the Complex Number problems given	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct Instruction and Problem Based Learning 3 X 50	Direct Instruction and Problem Based Learning	**Material:** Complex Numbers **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%
2	Students are able to solve Complex Number problems	Students are able to solve the Complex Number problems given	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct Instruction and Case Method 3 X 50	Direct Instruction and Case Method	**Material:** Complex Numbers **Library:**	7%
3	Students are able to solve Systems of linear equations, matrices, and determinants problems	Students are able to solve the Systems of linear equations, matrices, and determinants problems given	**Criteria:** Criteria: Analytical Rubric Form: Non Test	Direct Instruction and Case Method 3 X 50	Direct Instruction and Case Method	**Material:** Linear Equations, Matrices and Determinants **Literature:**	7%

4	Students are able to solve Systems of linear equations, matrices, and determinants problems	Students are able to solve the Systems of linear equations, matrices, and determinants problems given	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct Instruction and Case Method 3 X 50	- Learning Form: Lecture via vinesa/gc/meet Direct Instruction and Case Method	**Material:** Linear Equations, Matrices and Determinants **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%
5	Able to solve engineering problems regarding vectors	Students are able to solve the vector problems given	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct Instruction and Case Method 3 X 50	Direct Instruction and Case Method	**Material:** vectors **Library:** **Material:** vector **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. KA Stroud. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%

6	Students are able to apply integral material in solving given integral problems	Students are able to solve the vector problems given	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct Instruction and Case Method 3 X 50	Direct Instruction and Case Method	**Material:** Integral **Literature:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. KA Stroud. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%
7	Students are able to solve the problems given by Gauss's Divergence Theorem and Stokes' Theorem	Students are able to solve the problems given by Gauss's Divergence Theorem and Stokes' Theorem	**Criteria:** 7% **Form of Assessment** : Participatory Activities	Direct Instruction and Case Method 3 X 50	Direct Instruction and Case Method	**Material:** Gauss' Divergence Theorem and Stokes' Theorem **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%

8	Students are able to solve the problems given by Gauss's Divergence Theorem and Stokes' Theorem	Students are able to solve the problems given by Gauss's Divergence Theorem and Stokes' Theorem	**Criteria:** 7% **Form of Assessment** : Participatory Activities	Direct Instruction and Case Method 3 X 50	Direct Instruction and Case Method	**Material:** Gauss' Divergence Theorem and Stokes' Theorem **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%
9	Students are able to explain differentiation, and this knowledge allows them to understand phenomena specific to electrical engineering or information technology.	Students are able to explain differentiation well. Students are able to solve problems using differentiation well and with this knowledge they explain special phenomena in the field of electrical engineering or information technology.	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Case Method 3 X 50	Case Method	**Material:** Differentiation **Literature:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%

10	Students are able to explain differentiation, and this knowledge allows them to understand phenomena specific to electrical engineering or information technology.	Students are able to explain differentiation well. Students are able to solve problems using differentiation well and with this knowledge they explain special phenomena in the field of electrical engineering or information technology.	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Case Method 3 X 50	Case Method	**Material:** Differentiation **Literature:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%
11	Students are able to explain the Laplace Transformation well. Students are able to solve problems using the Laplace Transformation well. Students explain the application of the Laplace Transformation in the field of electrical engineering or information technology.	Solving problems using the Laplace Transformation Explains the application of the Laplace Transformation in the fields of Electrical Engineering and Information Technology	**Criteria:** Criteria: Holistic Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct learning and Case Method 3 X 50	Case Method	**Material:** Laplace Transformation **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	6%

12	Students are able to explain the Laplace Transformation well. Students are able to solve problems using the Laplace Transformation well. Students explain the application of the Laplace Transformation in the field of electrical engineering or information technology.	Solving problems using the Laplace Transformation Explains the application of the Laplace Transformation in the fields of Electrical Engineering and Information Technology	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct learning and Case Method 3 X 50	Case Method	**Material:** Laplace Transformation **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%
13	Students are able to explain the Fourier Series, and this knowledge allows them to understand phenomena specific to electrical engineering or information technology.	Students are able to explain Fourier Series well. Students are able to solve problems using Fourier Series well and explain the application of Fourier Series in the fields of electrical engineering or information technology.	**Criteria:** 7% **Form of Assessment** : Participatory Activities	Direct Instruction, Case Method 3 X 50	Direct Instruction, Case Method	**Material:** Fourier Series **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%

14	Students are able to explain the Z Transformation, and this knowledge allows them to understand phenomena specific to electrical engineering or information technology.	Students are able to explain the Z Transformation well. Students are able to solve problems using the Z Transformation well. Students are able to explain the application of the Z Transformation in the field of electrical engineering or information technology.	**Criteria:** Criteria: Analytical Rubric Form: Non Test	Case Method 3 X 50	Case Method	**Material:** Z Transformation **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%
15	Students are able to explain the Inverse Z Transformation and its application in electrical engineering or information technology.	Students are able to explain the Inverse Transformation Z well. Students are able to solve problems using the Inverse Transformation Z well	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct Instruction, Case Method 3 X 50	Direct Instruction, Case Method	**Material:** Z Transformation **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	7%

16	Students are able to explain the Inverse Z Transformation and its application in electrical engineering or information technology.	Students are able to explain the Inverse Transformation Z well. Students are able to solve problems using the Inverse Transformation Z well	**Criteria:** Criteria: Analytical Rubric Form: Non Test **Form of Assessment** : Participatory Activities	Direct Instruction, Case Method 3 X 50	Direct Instruction, Case Method	**Material:** Z Transformation **References:** *1. Mursita, Danang. 2011. Mathematics for Higher Education. . Bandung: Science Engineering. 2. Stroud Train. 2015. Mathematics for Engineering. Bandung: Erlangga 2. Attenborough Mary, Mathematics for Electrical Engineering and Computing, f Elsevier Linacre House, Jordan Hill, Oxford, 2003*	10%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	100%
		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** 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.