	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 Mathematics	2020103378	Compulsory Study Program Subjects	T=0	P=0	ECTS=0	3	April 10, 2023

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

Program Learning Outcomes (PLO)

PLO study program which is charged to the course

Program Objectives (PO)

PO - 1	Able to apply basic knowledge of engineering mathematics to gain a thorough understanding of engineering principles
PO - 2	Able to communicate effectively both verbally and in writing regarding basic engineering mathematics topics
PO - 3	Able to apply basic engineering mathematics methods and skills needed to solve problems in the engineering field
PO - 4	Able to work in cross-disciplinary and cultural arts teams
PO - 5	Able to understand the need for lifelong learning in the field of engineering mathematics related to relevant current issues

PLO-PO Matrix

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

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																

Short Course Description: Through this lecture, students can explain and differentiate Real and Complex numbers, solve Functions, Limits and Continuities, Matrices, Differentials and Integrals and can apply them to appropriate applications using the case method learning model in lectures.

References

Main :

1. Danang Mursita. 2011. MATEMATIKA untuk Perguruan Tinggi. Rekayasa Sains, Bandung
2. K.A. Straud. 2010. Matematika untuk Teknik. Erlangga; Bandung

Supporters:

	1. Thomas & Finney, 1988. Calculus dan Analityc Geometry. USA: Addition 7th – Wisley Publishing Company, Inc. 2. Stround, K.A. dan Erwin Sucipto. 1995. Matematika untuk Teknik. Jakarta: Erlangga
Supporting lecturer	Ibrohim, S.T., M.T. Dr. Puput Wanarti Rusimamto, S.T., M.T. Dr. Raden Roro Hapsari Peni Agustin Tjahyaningtijas, S.Si., M.T. Miftahur Rohman, 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 understand real numbers, rational function inequalities and absolute function inequalities.	1. Students can complete or classify real numbers.2. Students can solve rational split function inequalities3. Students can solve absolute function inequalities 4. Students can solve inequality problems related to problems in the field of engineering.	**Criteria:** Maximum score 100 **Form of Assessment** : Participatory Activities	Approach: Scientific Method: questions and answers and problem solving Approach strategy: practice various questions 3 X 50		**Material:** Meeting material 1 **Reader:** *Danang Mursita. 2011. MATHEMATICS for Higher Education. Science Engineering, Bandung*	5%
2	- Students are able to sketch basic graphs with shifts - Students are able to determine the domain and range of a function - Students are able to prove even and odd functions - Students are able to determine the composition of functions	- Students are able to sketch basic graphs with shifts - Students are able to determine the domain and range of a function both in terms of basic function and shift - Students are able to prove even and odd functions through questions - Students are able to determine the composition of functions	**Criteria:** Each number has a maximum score of 100 **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer and group discussion Model: Direct Learning Learning Strategy: approach per group, active during the 2nd meeting 3 X 50		**Material:** Meeting material 2 **Reader:** *KA Straud. 2010. Mathematics for Engineering. Erlangga; Bandung*	10%
3	- Students understand the meaning of left limit and right limit of a ladder function in solving these problems - Students understand the conditions for a function to be continuous at a point given through the problems - Students understand an infinite limit and a limit at infinity.	- Students understand the meaning of left limit and right limit of a ladder function - Students understand the conditions for a continuous function - Students understand an infinite limit and a limit at infinity.	**Criteria:** For each question number, the maximum score is 100	Approach: Scientific Method: Question and answer and discussion Model: Direct learning Learning Strategy: active in class during the meeting (asking questions, working on practice questions, etc.) 3 X 50		**Material:** Meeting material 3 **Readers:** *Stround, KA and Erwin Sucipto. 1995. Mathematics for Engineering. Jakarta: Erlangga*	5%
4	- Students can understand the meaning of derivatives through the concept of limits from solving questions about derivatives - Students are able to solve derivative problems using formulas - Students are able to solve chain derivatives (ordinary substitutions) from questions in books I and II - Students are able to determine high-level derivatives - Students are able to understand derivatives of implicit functions	- Students can understand the meaning of derivatives through the concept of limits. - Students are able to solve derivative problems using formulas - Students are able to solve chain derivatives (ordinary substitution) - Students are able to determine higher order derivatives - Students are able to understand implicit function derivatives	**Criteria:** For each question, the maximum score is 100 **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer and discussion Model: Direct learning Learning Strategy: active in class during the meeting (asking questions, working on practice questions, etc.) 3 X 50		**Material:** Meeting material 4 **References:** *Thomas & Finney, 1988. Calculus and Analytical Geometry. USA: Addition 7th – Wisley Publishing Company, Inc.*	0%

5	- Students understand the extreme values of a given function - Students can determine stationary points and their types through questions - Students can determine the interval of a function when the function increases and when the function decreases from the given function - Students can determine whether a function is concave up or curved and can determine turning points. - Students can draw curves using first and higher order derivatives	- Students understand the extreme values of a function - Students can determine stationary points and their types - Students can determine the interval of a function when the function increases and when the function decreases - Students can determine whether a function is concave upwards or downwards and can determine the inflection point. - Students can draw curves using first and higher order derivatives	**Criteria:** For each question the maximum score is 100 **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer and discussion Model: Direct learning Learning Strategy: active in class during the meeting (asking questions, working on practice questions, etc.) 3 X 50		**Material:** Meeting material 5 **References:** *Thomas & Finney, 1988. Calculus and Analytical Geometry. USA: Addition 7th – Wisley Publishing Company, Inc.*	0%
6	- Students can determine the interpretation of the first and second derivatives in Physics applications, namely related to distance, speed and acceleration. - Students can determine the interpretation of the first and second derivatives in the tangent gradient equation (PGS), normal line equation (PGN). - Students can determine problems related to derivatives in engineering and other fields.	- Students can determine the interpretation of the first and second derivatives in Physics applications, namely related to distance, speed and acceleration. - Students can determine the interpretation of the first and second derivatives in the tangent gradient equation (PGS), normal line equation (PGN). - Students can determine problems related to derivatives in engineering and other fields.	**Criteria:** Each question has a maximum score of 100 **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer and discussion Model: Direct learning Learning Strategy: active in class during the meeting (asking questions, working on practice questions, etc.) 3 X 50		**Material:** Meeting 6 materials **References:** *Thomas & Finney, 1988. Calculus and Analytical Geometry. USA: Addition 7th – Wisley Publishing Company, Inc.*	5%
7	- Students can determine derivative applications for extreme values - Students can determine the value of a limit using derivatives (delhopital theorem/postulate) - Students can determine applications related to derivatives or differentials in the field of engineering	1. Solve engineering problems related to maximum and minimum extreme values 2. Solving the value of a limit using derivatives (delhopital's theorem/postulate)3. Complete applications related to derivatives or differentials in engineering	**Criteria:** Total score 100 **Form of Assessment** : Participatory Activities	Approach: ScientificMethod: Discussion, question and answerModel: Problem Based LearningLearning Strategy: Tutorial, regular lectures 3 X 50		**Material:** Meeting material 7. **References:** *Thomas & Finney, 1988. Calculus and Analytical Geometry. USA: Addition 7th – Wisley Publishing Company, Inc.*	5%
8	- Students can determine or solve problems in the field of engineering related to derivative or derivative themes by completing group assignments. Speed and acceleration gradients of tangent lines and normal lines limit problems with the concept of derivatives	1. solving problems related to speed and acceleration2. solve problems related to limits using Delhopithal's theorem3. solve problems related to tangent lines and normal lines	**Criteria:** Each group member gets the same score in the same group. **Form of Assessment** : Project Results Assessment / Product Assessment	Approach: Scientific Method: Question and answer, discussion and assignment Model: Direct learning model Strategy: assignment and presentation in turns. Approach: Scientific Method: Question and answer, discussion and presentation Model: cooperative Strategy: assignments and presentations in turns. 3 X 50		**Material:** Meeting material 1-7 **Reader:** *Danang Mursita. 2011. MATHEMATICS for Higher Education. Science Engineering, Bandung*	0%

9	SUB SUMATIVE TEST (UTS) - Understanding rational and absolute split inequalities - Understanding drawing graphs with shifts, determining the domain and range of a function - Determining the conditions for continuity of a function, through 3 conditions. - Determining derivatives of algebraic functions, trigonometric functions, both explicit and implicit functions - Determining or solving derivative problems (extreme values, PGS, PGN, speed and acceleration)	Understanding rational and absolute split inequalities - Understanding drawing graphs with shifts, determining the domain and range of a function - Determining the conditions for continuity of a function, through 3 conditions. - Determining derivatives of algebraic functions, trigonometric functions, both explicit and implicit functions - Determining or solving derivative problems (extreme values, PGS, PGN, speed and acceleration)	**Criteria:** The number of questions is 4 numbers, and each question number has a maximum score of 25, so the maximum score is 100 **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer, discussion and assignment Model: Direct learning model Strategy: assignment and presentation in turns. Approach: Scientific Method: Question and answer, discussion and presentation Model: cooperative Strategy: assignments and presentations in turns. 3 X 50		**Material:** Meeting material 9 **Reader:** *Danang Mursita. 2011. MATHEMATICS for Higher Education. Science Engineering, Bandung*	5%
10	- Students can determine integrals as anti-derivatives in indefinite integrals - Students can determine definite integrals and can determine the properties of an integral whether definite or indefinite. - Students can determine integrals using existing formulas, both algebraic integral formulas and trigonometric functions	- Students can determine integrals as anti-derivatives in indefinite integrals - Students can determine definite integrals and can determine the properties of an integral whether definite or indefinite. - Students can determine integrals using existing formulas, both algebraic integral formulas and trigonometric functions	**Criteria:** 1.Evaluation: 2.can complete daily tasks and practice face to face **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer, discussion and assignment Model: Direct learning model Strategy: assignment and presentation in turns. Approach: Scientific Method: Question and answer, discussion and presentation Model: cooperative Strategy: assignments and presentations in turns. 3 X 50		**Material:** Meeting material 10 **References:** *Thomas & Finney, 1988. Calculus and Analytical Geometry. USA: Addition 7th – Wisley Publishing Company, Inc.*	5%
11	- Students can determine partial integrals - Students can determine integrals of rational split functions - Students can determine trigonometric substitution integrals	- Students can determine partial integrals - Students can determine integrals of rational split functions - Students can determine trigonometric substitution integrals	**Criteria:** 1.Assessment Criteria: 2.1. Maximum scoring of 100 for each formative test or PTS and PAS 3.2. Follow the UNESA scoring format: participation (2), Assignments (3), PTS (2) and PS (3) 4.3. Minimum attendance requirement is 75% **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer, discussion and assignment Model: Direct learning model Strategy: assignment and presentation in turns. 3 X 50		**Material:** Meeting material 11 **Reader:** *KA Straud. 2010. Mathematics for Engineering. Erlangga; Bandung*	5%

12	- Students can determine questions related to integrals, discuss assignments in groups - Determine the activity for each group in the presentation. - Students can determine integrals using integral techniques by characterizing the characteristics of the problem	- Students can determine questions related to integrals, discuss assignments in groups - Determine the activity for each group in the presentation. - Students can determine integrals using integral techniques by characterizing the characteristics of the problem	**Criteria:** 1. 1. Maximum scoring of 100 for each formative test or PTS and PAS 2. 2. Follow the UNESA scoring format: participation (2), Assignments (3), PTS (2) and PS (3) 3. 3. Minimum attendance requirement is 75% **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer, discussion and presentation Model: cooperative Strategy: assignments and presentations in turns. 3 X 50		**Material:** Meeting material 12 **Reader:** *Danang Mursita. 2011. MATHEMATICS for Higher Education. Science Engineering, Bandung*	5%
13	- Students can determine the application of the integral to the area of a flat plane to the x-axis (pias to the x-axis) - Students can determine the application of the integral to the area of a flat plane to the y-axis (pias to the y-axis) - Students can solve engineering problems related to area and volume rotating objects with integrals	- Students can determine the application of the integral to the area of a flat plane to the x-axis (pias to the x-axis) - Students can determine the application of the integral to the area of a flat plane to the y-axis (pias to the y-axis) - Students can solve engineering problems related to area and volume rotating objects with integrals	**Criteria:** 1. 1. Maximum scoring of 100 for each formative test or PTS and PAS 2. 2. Follow the UNESA scoring format: participation (2), Assignments (3), PTS (2) and PS (3) 3. 3. Minimum attendance requirement is 75%	Approach: Scientific Method: Question and answer, discussion and presentation Model: cooperative Strategy: assignments and presentations in turns. 3 X 50		**Material:** Meeting material 13 **Reader:** *KA Straud. 2010. Mathematics for Engineering. Erlangga; Bandung*	5%
14	- Students can determine the application of the integral to the contents or volume of a flat plane when rotated about the x-axis (rotation axis to the x-axis) - Students can determine the integral application to the content or volume of a flat plane when rotated about the y-axis (rotation axis to the y-axis) - Students can determine special integral application related to the volume of a rotating object from a combination of several known functions	- Students can determine the application of the integral to the contents or volume of a flat plane when rotated about the x-axis (rotation axis to the x-axis) - Students can determine the integral application to the content or volume of a flat plane when rotated about the y-axis (rotation axis to the y-axis) - Students can determine special integral application related to the volume of a rotating object from a combination of several known functions	**Criteria:** 1. 1. Maximum scoring of 100 for each formative test or PTS and PAS 2. 2. Follow the UNESA scoring format: participation (2), Assignments (3), PTS (2) and PS (3) 3. 3. Minimum attendance requirement is 75% **Form of Assessment** : Participatory Activities	Approach: Scientific Method: Question and answer, discussion and assignment Model: Direct learning model Strategy: assignment and presentation in turns. 3 X 50		**Material:** Meeting material 14 **References:** *Thomas & Finney, 1988. Calculus and Analytical Geometry. USA: Addition 7th – Wisley Publishing Company, Inc.*	5%
15	- Students can determine the application of integrals to the length of a curve or the circumference of a curve regarding the x-axis. - Students can determine the application of the integral to the length of a curve or the circumference of a curve to the y axis - Students can determine the application of the integral to the length of a curve or the circumference of a parameter function curve to the variable t.	- Students can determine the application of integrals to the length of a curve or the circumference of a curve regarding the x-axis. - Students can determine the application of the integral to the length of a curve or the circumference of a curve to the y axis - Students can determine the application of the integral to the length of a curve or the circumference of a parameter function curve to the variable t.	**Criteria:** 1. 1. Maximum scoring of 100 for each formative test or PTS and PAS 2. 2. Follow the UNESA scoring format: participation (2), Assignments (3), PTS (2) and PS (3) 3. 3. Minimum attendance requirement is 75% **Form of Assessment** : Participatory Activities	Method: Question and answer, discussion and presentation Model: cooperative Strategy: assignments and presentations in turns. 1 X 1		**Material:** 15th meeting material **References:** *Thomas & Finney, 1988. Calculus and Analytical Geometry. USA: Addition 7th – Wisley Publishing Company, Inc.*	5%

16	Sub Summative Exam-2 (2nd UTS) - Students can solve questions related to integrals and integral techniques of algebra, composite functions (substitution), and partial integrals - Students can solve questions related to integrals and integral techniques of rational functions and trigonometry substitution - Students can solve questions related to the application of integrals, namely the area to each slope. - Students can solve questions related to the application of integrals, namely volume to each slope. - Students can solve questions related to the application of integrals, namely the length of the curve to each slope.-		**Form of Assessment** : Participatory Activities	3 X 50		**Material:** Meeting material 1-15 **Reader:** *Danang Mursita. 2011. MATHEMATICS for Higher Education. Science Engineering, Bandung*	5%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	60%
		60%

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.