		Universitas Negeri Surabaya **Faculty of Mathematics and Natural Sciences** **Undergraduate Mathematics Study Program**			**Document Code**

SEMESTER LEARNING PLAN					

Courses		**CODE**	**Course Family**	**Credit Weight**			**SEMESTER**	**Compilation Date**
Ordinary Differential Equations		4420103106	Compulsory Study Program Subjects	T=3	P=0	ECTS=4.77	3	July 17, 2024
AUTHORIZATION		**SP Developer**		**Course Cluster Coordinator**			**Study Program Coordinator**	
		....		....			Prof. Dr. Raden Sulaiman, M.Si.	

Learning model	Case Studies	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	Program Objectives (PO)	
	PO - 1	Analyzing applied problems of ordinary differential equations in order to model, determine solutions, and interpret solutions to ordinary differential equations obtained either independently or in groups with or without IT assistance
	PO - 2	Using Laplace transformations and series to solve initial value problems for theoretical and applied problems logically, critically and systematically
	PO - 3	Develop mathematical thinking starting from understanding definitions, classifications, solutions, initial value problems, existence and singularity theorems of first order (second/higher order) differential equations, special forms and methods of solving first order (second order/higher) differential equations higher)
	PLO-PO Matrix	

	P.O
	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 examines analytical solutions for first order GDP and second order linear GDP with constant coefficients. Some of the methods used are the variable separation method, integration factors, the uncertain coefficient method, the parameter variation method and the Laplace transformation method which is implemented through learning that involves students in collaborative group discussions to understand, construct, solve, simulate and interpret differential equations and their applications. as well as providing IT-assisted tasks.
References	**Main :**
	1. Boyce W.E. & DiPrima R.C. 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition. New York: John Willey and Sons. 2. Finan, Marcel B. 2010. A First Course in Elementary Differential Equations. Arkansas Tech University. 3. Kreyszig, E. 2011. Advanced Engineering Mathematics 10th edition. New York: John Wiley and Sons.
	Supporters:
Supporting lecturer	Dr. Abadi, M.Sc.

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	1.1. Understand the meaning of differential equations through examples of equations and their applications. 2.2. Classify ordinary PDs based on the order, rank and degree of a differential equation	1.1. Demonstrate the benefits of differential equations through mathematical models of real problems 2.2. Classify ordinary PDs based on order, rank and degree if given examples 3.3. Determine the first order ordinary PD solution curve. 4.4. Solve the problem of ordinary PD initial values	**Criteria:** Quantitative and test **Forms of Assessment**: Participatory Activities, Practice/Performance, Tests	Discussing answers to quiz 1, Question and answer and discussion of material on Slide 1, Question and answer and discussion of material on Slide 2 Question and answer and discussion of material on Slide 3 50	Independently study Quiz 1, Slide 1, Slide 2, and Slide 3 in LMS 100	**Material:** Understanding GDP and its solutions. **References:** *Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition. New York: John Willey and Sons.*	5%
2	Understand the special form of first order differential equations and apply methods for solving them	1.1. Apply the integration factor method to solve first order linear ordinary PD both manually and numerically 2.2. Apply the variable separation method to solve first order ordinary PD both manually and numerically	**Criteria:** Understand and be able to apply the method of integrating factors and separating variables. **Forms of Assessment**: Participatory Activities, Practical Assessment, Practical / Performance	Questions and answers and class discussions discussing the material and practice questions in video 4 and video 5	Students study Video 4 and Video 5 and try to do practice questions and upload answers on SiDia independently/in groups.	**Material:** Solving 1st order PD using the integration factor method and variable separation. **References:** *Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition. New York: John Willey and Sons.*	10%
3	1.Understand and be able to apply the Existence and Singleness Theorem to the solution of an initial value problem 2.Understand exact equations and apply the integration factor method to solve ordinary inexact PD	1.1. Explain the steps to prove the Existence and Singleness Theorem for solving initial value problems 2.2. Using the Existence and Singleness Theorem to conclude whether an initial value problem has a solution or not, whether the solution is single or not. 3.3. Complete the exact first order ordinary PD both manually and numerically. 4.4. Using the integration factor method to solve ordinary inexact PD both manually and numerically	**Criteria:** 1.Understand and be able to apply the Existence and Singleness Theorem to the solution of an initial value problem 2.Understand exact equations and apply the integration factor method to solve ordinary inexact PD **Forms of Assessment**: Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment, Practical / Performance	Questions and answers and discussions Questions and discussions discuss the material in Video 6, Video 7 & Video 8 and practice questions	Students study Video 6, Video 7 and Video 8 and try to do practice questions and upload answers on SiDia independently/in groups.	**Material:** Applying methods for solving exact and inexact PD. **Reference:** *Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition. New York: John Willey and Sons.*	15%

4	Understand the meaning of Homogeneous, Bernoulli, Riccati, Implicit, Clairaut and D'Alembert differential equations and their solution methods.	1.1. Complete a homogeneous PD. 2.2. Solve PD Bernoulli. 3.3. Complete PD Riccati	**Forms of Assessment**: Participatory Activities, Practical Assessment, Practical / Performance	Questions and answers and discussions discuss the material in Video 9, Video 10, and Video 11 and answers to practice questions that have been uploaded to SiDia. Verify PD solution with DESolver/Maple	Students study Video 9, Video 10, and Video 11 and try to do practice questions and upload answers on SiDia independently/in groups	**Material:** Understanding homogeneous PD, Bernoulli PD and Riccatti PD and their solution methods. **References:** *Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition. New York: John Willey and Sons.*	5%
5	Understand the meaning of implicit differential equations and methods for solving them.	Able to understand implicit PD and its solution methods.	**Criteria:** able to complete Implicit PD **Forms of Assessment**: Participatory Activities, Practical Assessment, Practical / Performance	Questions and answers and discussion discussing material and answers to practice questions in Video 12 and Video 13 as well as verifying PD solutions with DE Solver/Maple 3x 50 minutes	Students study Video 12 and Video 13 and try to do practice questions and upload answers on SiDia independently/in groups 3 x 50 minutes	**Material:** PD Lagrange, PD Clairaut and Solving Singular PD Implicit **References:** *Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition. New York: John Willey and Sons.* **Material:** Implicit PD and methods for solving it **References:** *Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition. New York: John Willey and Sons.*	10%
6	Understand the meaning of differential, implicit, Clairaut and D'Alembert/Lagrange equations and their solution methods.	1.Able to understand PD Lagrange, PD Clairaut and their solution methods. 2.Able to determine the singular solution of an implicit PD	**Criteria:** 1.able to solve PD Lagrange and PD Clairaut 2.Able to determine the singular solution of an implicit PD **Forms of Assessment**: Participatory Activities, Practical Assessment, Practical / Performance		Students study Video 14, Video 15, and Video 16 and try to do practice questions and upload answers on SiDia independently/in groups 3 x 50 minutes	**Material:** PD Lagrange, PD Clairaut and Solving Singular PD Implicit **References:** *Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition. New York: John Willey and Sons.*	10%
7							0%
8							0%
9							0%

10							0%
11							0%
12							0%
13							0%
14							0%
15							0%
16							0%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	17.08%
2.	Project Results Assessment / Product Assessment	3.75%
3.	Practical Assessment	15.41%
4.	Practice / Performance	17.08%
5.	Test	1.67%
		54.99%

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.