



Universitas Negeri Surabaya
Faculty of Mathematics and Natural Sciences
Bachelor of Mathematics Education Study Program

Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date																																																																																																				
Ordinary Differential Equations	8420203173	Analysis	T=3	P=0	ECTS=4.77	4	June 13, 2022																																																																																																				
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator																																																																																																					
	Budi Priyo Prawoto, M.Si		Dr. Dian Savitri, M.Si			Dr. Endah Budi Rahaju, M.Pd.																																																																																																					
Learning model	Case Studies																																																																																																										
Program Learning Outcomes (PLO)	PLO study program which is charged to the course																																																																																																										
	PLO-7	Apply basic mathematical principles to solve simple mathematical problems																																																																																																									
	PLO-12	Demonstrate mathematical knowledge and insight																																																																																																									
	Program Objectives (PO)																																																																																																										
	PO - 1	able to classify GDP order 1 and order 2																																																																																																									
	PO - 2	able to understand methods for solving GDP order 1 and order 2																																																																																																									
	PO - 3	able to model natural phenomena in the form of GDP order 1 and order 2																																																																																																									
	PO - 4	able to use methods to solve GDP order 1 and order 2																																																																																																									
	PLO-PO Matrix																																																																																																										
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Short Course Description	This course examines analytical solutions for first order GDP, second order linear GDP with constant coefficients, uncertain coefficients and variations in parameters, series solutions for GDP, the Laplace transformation method and series through learning that involves students in collaborative group discussions to understand, construct, solve, simulate and interpreting differential equations and their applications as well as providing IT-assisted assignments.																																																																																																										
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	<ol style="list-style-type: none"> Boyce W.E. & DiPrima R.C. 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Wiley and Sons. Prawoto, Budi Priyo. 2019. Persamaan Diferensial Biasa. Surabaya: Unesa Press 																																																																																																										
	Supporters:																																																																																																										
<ol style="list-style-type: none"> Kreyszig, E. 2011. Advanced Engineering Mathematics 10th edition. New York: John Wiley and Sons. Finan, Marcel B. 2010. A First Course in Elementary Differential Equations, Arkansas Tech University. 																																																																																																											
Supporting lecturer	Rudianto Artiono, S.Pd., M.Si. Budi Priyo Prawoto, S.Pd., M.Si.																																																																																																										

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	Understand the meaning of differential equations through examples of equations and their applications	1. Demonstrates the benefits of differential equations through mathematical models of real problems 2. Classify ordinary PDs based on order, rank and degree when given examples. 3. Determine the first order ordinary PD solution curve. 4. Solving the problem of ordinary PD initial values	Criteria: Attached Form of Assessment : Participatory Activities	Classical Discussion 150		Material: definition and classification of PD Library: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i> <hr/> Material: definition and classification of PD Library: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i>	2%
2	Understand special forms of first order differential equations and apply methods for solving them	Apply the integration factor method to solve first-order ordinary PD.	Criteria: Attached Form of Assessment : Participatory Activities	Collaborative learning approach (lectures, discussions and questions and answers) 150		Material: integration factors References: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i> <hr/> Material: integration factors References: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i>	2%

3	Solving first order ordinary PD with separate and homogeneous variable methods	<ol style="list-style-type: none"> 1.Explain the steps to prove the Existence and Singleness Theorem for solving initial value problems 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. 	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities</p>	Classical and Group Discussions 150		<p>Material: separate PD, homogeneous PD</p> <p>Reference: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: separate PD, homogeneous PD</p> <p>Reader: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	2%
4	Understand exact equations and apply the integration factor method to solve ordinary inexact PD	<ol style="list-style-type: none"> 1.Using the exact equation method to solve first order ordinary PD. 2.Using the integration factor method to solve ordinary inexact PD 	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities</p>	Collaborative learning approach (lectures, discussions and questions and answers) 150		<p>Material: exact PD</p> <p>Reference: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: Exact PD, Inexact PD</p> <p>Reference: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	2%
5	Classifying Exact and Inexact PD and applying methods to solve ordinary exact and inexact PD	<ul style="list-style-type: none"> • Use the integration factor method to solve ordinary first order inexact PD cases 2 and 3 	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities</p>	Collaborative learning approach (lectures, discussions and questions and answers) 150		<p>Material: inexact PD</p> <p>Reference: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: PD inexact</p> <p>References: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	2%

6	<p>1. <input type="checkbox"/> Understand the Bernouli equation as a special form of first order GDP.</p> <p>2. <input type="checkbox"/> Understand the Clairut equation as a special form of first order GDP</p>	<p>1. <input checked="" type="bullet"/> Solve the Bernouli equation</p> <p>2. Solving the Ricatti equation</p>	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities</p>	Collaborative learning 150		<p>Material: PD Bernoulli, PD Ricatti</p> <p>Reader: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: PD Bernoulli, PD Ricatti</p> <p>Reader: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	2%
7	Modeling a real problem in the form of a first order ordinary PD, solving, and interpreting it	<p>1. Create a mathematical model (in the form of a first order ordinary PD) of a real problem</p> <p>2. Completing the obtained mathematical model</p> <p>3. Interpret the results obtained</p>	<p>Criteria: Attached</p>	Exploration, discussion and question and answer 150		<p>Material: 1st order PD modeling</p> <p>Reference: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: modeling of real phenomena</p> <p>References: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	2%
8	UTS	All indicators before UTS	<p>Criteria: Attached</p> <p>Form of Assessment : Test</p>	UTS 100		<p>Material: All material before UTS</p> <p>Reader: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: All material before UTS</p> <p>Reader: <i>Prawoto, Bbudi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	20%

9	<p>1.Understand the definition, classification, special forms and methods of solving second order differential equations</p> <p>2.Solving homogeneous Second Order Differential Equations</p>	<p>Applying the characteristic equation to solve second order homogeneous differential equations with constant coefficients</p>	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities</p>	<p>Collaborative learning approach (lectures, discussions and questions and answers) 150</p>		<p>Material: Homogeneous PD with similar characteristics References: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: Homogeneous PD with similar characteristics References: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	6%
10	<p>Understanding inhomogeneous ordinary PD of order 2 using indeterminate coefficients</p>	<p>Solving inhomogeneous ordinary PD of order 2 using indeterminate coefficients</p>	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities, Practice/Performance</p>	<p>Collaborative learning approach (lectures, discussions, questions and answers, and assignments) 150</p>		<p>Material: Indefinite Coefficients Reference: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: Indefinite Coefficient Reference: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	5%
11	<p>Understanding inhomogeneous ordinary PD of order 2 using parameter variations</p>	<p>Solving inhomogeneous ordinary PD of order 2 using parameter variations</p>	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities</p>	<p>Collaborative learning approach (lectures, discussions, questions and answers and assignments) 150</p>		<p>Material: Parameter Variation References: <i>Boyce WE & DiPrima RC 2012. Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i></p> <hr/> <p>Material: Parameter Variations References: <i>Prawoto, Budi Priyo. 2019. Ordinary Differential Equations. Surabaya: Unesa Press</i></p>	5%

12	Understand the use of the Laplace transform to solve ordinary inhomogeneous PD	<ol style="list-style-type: none"> 1. Determine the Laplace transform of a function 2. Determining the inverse Laplace transform of a function 3. Solving regular inhomogeneous PD using the Laplace Transform method 	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities, Practice/Performance</p>	Collaborative learning approach (lectures, discussions and questions and answers) 150		<p>Material: Laplace Transformation</p> <p>Bibliography: Boyce WE & DiPrima RC 2012. <i>Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition</i>, New York: John Willey and Sons.</p> <hr/> <p>Material: Laplace Transformation</p> <p>References: Prawoto, Budi Priyo. 2019. <i>Ordinary Differential Equations</i>. Surabaya: Unesa Press</p>	5%
13	Understand the use of the Laplace transform to solve ordinary inhomogeneous PD	<ol style="list-style-type: none"> 1. Determine the Laplace transform of a function 2. Determining the inverse Laplace transform of a function 3. Solving regular inhomogeneous PD using the Laplace Transform method 	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities, Practice/Performance</p>	Collaborative learning approach (lectures, discussions and questions and answers) 150		<p>Material: Laplace Transformation</p> <p>Bibliography: Boyce WE & DiPrima RC 2012. <i>Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition</i>, New York: John Willey and Sons.</p> <hr/> <p>Material: Laplace Transformation</p> <p>References: Prawoto, Budi Priyo. 2019. <i>Ordinary Differential Equations</i>. Surabaya: Unesa Press</p>	5%
14	Understand the Laplace transform to solve differential equations with initial values.	Applying the Laplace transform to solve differential equations with initial values	<p>Criteria: Attached</p> <p>Form of Assessment : Participatory Activities, Practice/Performance</p>	Collaborative learning approach (lectures, discussions and questions and answers) 150		<p>Material: Laplace Transformation</p> <p>Bibliography: Boyce WE & DiPrima RC 2012. <i>Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition</i>, New York: John Willey and Sons.</p> <hr/> <p>Material: Laplace Transformation</p> <p>References: Prawoto, Budi Priyo. 2019. <i>Ordinary Differential Equations</i>. Surabaya: Unesa Press</p>	6%

15	Understand the Laplace transform to solve differential equations with initial values.	Applying the Laplace transform to solve differential equations with initial values	Criteria: Attached Form of Assessment : Participatory Activities, Practice/Performance	Collaborative learning approach (lectures, discussions and questions and answers) 150		Material: Laplace Transformation Bibliography: Boyce WE & DiPrima RC 2012. <i>Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i> Material: Laplace Transformation References: Prawoto, Budi Priyo. 2019. <i>Ordinary Differential Equations. Surabaya: Unesa Press</i>	6%
16	UAS	All indicators before UAS	Criteria: Attached Form of Assessment : Test	UAS 100		Material: All material before UAS Library: Boyce WE & DiPrima RC 2012. <i>Elementary Ordinary Differential Equations and Boundary Value Problems 10th Edition, New York: John Willey and Sons.</i> Material: All material before UAS Reader: Prawoto, Bbudi Priyo. 2019. <i>Ordinary Differential Equations. Surabaya: Unesa Press</i>	30%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	36.5%
2.	Practice / Performance	13.5%
3.	Test	50%
		100%

Notes

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.