	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
Numerical Methods		8420203123				**T=3** **P=0** **ECTS=4.77**		6	July 17, 2024

AUTHORIZATION		SP Developer		Course Cluster Coordinator		Study Program Coordinator	
		....		....		Dr. Endah Budi Rahaju, M.Pd.	

Learning model	Case Studies

Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**
	Program Objectives (PO)
	PLO-PO Matrix

P.O

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

Short Course Description	The Numerical Methods course aims to provide the basic principles of numerical solutions without abandoning the analytical proof scheme. Understanding numerical solutions includes the concept of error including sources and ways to prevent them, approximation of the roots of nonlinear equations including solution methods and analytical proof schemes, interpolation including data approximation and smoothing, as well as numerical differentiation and integration with analytical proof schemes. Learning is carried out by applying a combination of problem-based learning approaches and collaborative learning based on problems determined based on echo-techno-entrepreneur-maths. The assessment is determined with proportional weights and is carried out during the learning process with active interactive participation, presentations, assignments and mid-semester exams, as well as final semester exams.

References	**Main :**	

1. Atkinson, K., 1985. Elementary Numerical Analysis, John Wiley and Sons.
2. Boyce, W.E. and DiPrima, R.C., 1977. Elementary Differential Equations and Boundary Value Problems. John Wiley & Sons.
3. Chalsnov, J.R., 2012. Introduction to Numerical Methods: Lecture Notes. The Hong Kong University of Science and Technology.
4. Fisher, M.E. 1985. Introductory Numerical Methods for Scientists and Engineers, Revised Edition, Department of Mathematics, The Univesity of Western Australia.
5. Fuad, Y. 2004. Metode Numerik I. University Press Unesa.
6. Gerald, C.F. and Weatley, P.O., 2004. Applied Numerical Analysis. Pearson Addison Wesley.
7. Mathews, J.O. and Fink, K.D., 1999. Numerical Methods: Using MATLAB. Third Edition. Prentice Hall.
8. Sumber dari browsing internet (sesuai kesepakatan).

	Supporters:	

Supporting lecturer	Dr. Dian Savitri, S.Si., M.Si. Dimas Avian Maulana, S.Si., M.Si. Riska Wahyu Romadhonia, S.Si., 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	Understand basic numerical principles and numerical solutions	1.Explain the definition and differences between analytical solutions and numerical solutions. 2.Shows the use of numbers in everyday life and the role of computers in numbers 3.Explain what is meant by significant figures		Collaborative learning approach (lectures, discussions and questions and answers) 3 X 50			0%
2	Understand errors and their applications	1.Shows precision, accuracy 2.Mention sources of errors 3.Determine relative error and absolute error		Collaborative learning approach (lectures, discussions and questions and answers) 3 X 50			0%

| 3 | Understand the principles of approximating the roots of nonlinear equations, error estimation, and their applications | 1. Determining the roots of nonlinear equations using closed methods (table method, bisection, or falsi rule) 2. Resolving application problems with closed methods (table, bisection, or falsi regula methods) 3. Determining the roots of nonlinear equations using open methods (simple iteration method, Newton Raphson and Secant) 4. Solving application problems with open methods (simple iteration method, Newton Raphson and Secant) | | Collaborative learning approach (lectures, discussions and questions and answers) 6 X 50 | | | 0% |

No							
4	Understand the principles of approximating the roots of nonlinear equations, error estimation, and their applications	1. Determining the roots of nonlinear equations using closed methods (table method, bisection, or falsi rule) 2. Resolving application problems with closed methods (table, bisection, or falsi regula methods) 3. Determining the roots of nonlinear equations using open methods (simple iteration method, Newton Raphson and Secant) 4. Solving application problems with open methods (simple iteration method, Newton Raphson and Secant)		Collaborative learning approach (lectures, discussions and questions and answers) 6 X 50			0%
5							0%
6							0%
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
		0%

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.